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**DEVELOPING AN AUGMENTED  
REALITY BUSINESS MODEL FOR  
CULTURAL HERITAGE TOURISM:  
THE CASE OF GEEVOR MUSEUM**

**E E Cranmer**

**PhD                    2017**

**DEVELOPING AN AUGMENTED REALITY  
BUSINESS MODEL FOR CULTURAL  
HERITAGE TOURISM: THE CASE OF  
GEEVOR MUSEUM**

**ELEANOR ELIZABETH CRANMER**

A Thesis Submitted in Partial Fulfilment of the Requirements of the  
Manchester Metropolitan University for the Degree of Doctor of  
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Department of Operations, Technology, Events and Hospitality  
Management

Faculty of Business and Law

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## **ABSTRACT**

The use of Augmented Reality (AR) in cultural heritage tourism has gained increased research attention, and studies identify many ways AR adds value to, and enhances the tourist experience. However, contrary to expectations and opportunities presented, AR adoption has been slower than predicted. It could be argued that the tourism sector is losing out of the benefits presented by AR, despite the fact adopting modern technologies is considered essential for tourist organisations to remain competitive and attractive. Through a comprehensive literature review this study has identified a need to develop a business model to explore the added value and realise ARs full potential. As a result of a review of existing Business Models (BMs), the study adopted the V4 model as a framework to scaffold initial research questions. The case of UNESCO recognised Geevor Tin Mine Museum was used to develop and validate 'The ARBM' using a mixed method approach combining interviews and questionnaires. Phase one data collection, involving fifty Geevor stakeholder interviews revealed support for, and recognition of ARs potential to add value to Geevor, as well as confirming the need to develop a clear implementation strategy. Using thematic analysis the ARBM was developed, consisting of five components; resources, AR value, stakeholder benefits, responsibilities and revenue. Each component contained a number of criteria which were ordered into a hierarchy of importance in the second phase of data collection: fifteen stakeholder questionnaires, completed and analysed using the Analytic Hierarchy Process (AHP). AHP is a multi-criteria decision-making method that organised criteria into a hierarchy based on perceived importance. This validated the ARBM for Geevor, providing strong proof of concept, aggregating stakeholder perceptions to produce a group decision identifying the most preferable ARBM options to pursue when implementing AR at Geevor. Theoretically, the study found a number of AR values not previously identified, enriching the existing pool of knowledge. Practically, developing and validating the ARBM, provides tourist organisation managers with a framework to effectively implement AR, turning its potential into actual value adding benefits. Overall, it is clear, investment in, and adoption of innovative technologies is a necessity for tourist organisations that wish to remain sustainable and competitive in the future. This study moves closer toward meaningful implementation of AR.

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## **ABBREVIATIONS**

2D	Two Dimensional
3D	Three Dimensional
AHP	Analytic Hierarchy Process
App	Application
API	Application Programming Interface
AR	Augmented Reality
ATLAS	Association for Tourism and Leisure Education and Research
BM	Business Model
BMI	Business Model Innovation
B2B	Business to Business
B2C	Business to Customer
CAQDAS	Computer Assisted Qualitative Data Analysis Software
CI	Consistency Index
CR	Consistency Ratio
CRM	Customer Relationship Management
C2C	Customer to Customer
eBusiness	Electronic Business
eCommerce	Electronic Commerce
EVM	Eigen Vector Method
GCI	Geometric consistency Index
GPS	Global Positioning System
HMD	Head Mounted Display
ICT	Information Communication Technology
IS	Information Systems
MAR	Mobile Augmented Reality
MR	Mixed Reality
mBusiness	Mobile Business
mCommerce	Mobile Commerce
MCDM	Multi-Criteria Decision-Making Method
PDA	Personal Digital Assistant
SBM	Sustainable Business Models
QR	Quick Response [Code]
RBV	Resource Based View
RGMM	Row Geometric Mean Method
R-V Continuum	Reality-Virtuality Continuum
UI	User Interface
UNESCO	United Nations Educational, Scientific, and Cultural Organisation
VP	Value Proposition
VR	Virtual Reality
WIFI	Wireless Fidelity Wireless Internet

# **CHAPTER 1 INTRODUCTION**

## **1.1 Introduction**

Research increasingly suggests technology use has increased to the point it has become fully integrated into our everyday lives (Palumbo et al., 2013; Wang et al., 2014; Wang et al., 2016). Smartphones have overtaken laptops as the most popular device to access the internet (Ofcom, 2015), and smartphone penetration in the UK has increased from 52% to 81% of the population between 2012 and 2016 (Deloitte, 2016). This has had a significant impact on many industries especially the tourism sector, changing travel behaviours; such as decision making, information searching (Wang et al., 2014), transforming traditional business channels and altering value networks (Buhalis, 2003; Livi, 2008). In response to the increased use and impact of technologies within the tourism sector, a number of studies have begun to explore the changes this has introduced into all aspects of the tourist experience; for example the use of idle time, experience-documenting and sharing (Tussyadiah and Zach, 2012; Wang et al., 2016). The increased use of mobile devices and Web 2.0, has created new opportunities for tourist organisations to engage, attract and interact with tourists. The unique characteristics of mobile technology, namely ubiquity, flexibility, personalisation and dissemination, make it a useful tool and present benefits for both tourism providers and consumers (Kim et al., 2008). Thus, tourism organisations have pursued new ways to enhance tourist experiences (Neuhofer et al., 2014; Tussyadiah, 2014), and provide value-adding services (Garcia-Crespo et al., 2009) to create enriched and unique experiences (Leue et al., 2014; Yovcheva et al., 2013).

Augmented Reality (AR) technology “represents a system where a view of a live real physical environment is supplemented by computer-generated, elements such as sound, video, graphic or location data” (Taqvi, 2013, p.11). Hence, AR facilitates seamless integration between the physical and virtual worlds, enhancing user’s perception of their real-world environment (Kesim and Ozarslan, 2012). Based on these characteristics, AR has been widely praised for its ability to create richer, more immersive content, enhancing our interaction with, and perception of, the world around us. It has been recognised to offer many benefits to tourist organisations, creating opportunities to enhance and add value to the tourist experience. However, the adoption and integration of AR by tourism organisations has been much slower than anticipated (Chung et al., 2015). This study proposes that there is a gap identifying how to actually implement and benefit from AR, to increase awareness,

recognition of its benefits, barriers and costs, and translate its value-potential into actual value-adding benefits.

Business Models (BMs) have had a significant impact on management and business competitive success (Wirtz et al., 2016), and the use of BMs have increased due to their ability to secure and expand competitive advantage (Johnson et al., 2008). BMs are therefore considered critical for success (Magretta, 2002). This study argues that to ensure tourist organisations do not lose out on the potential presented by AR, it is critical an AR BM is developed to create and capture returns from ARs potential. Although, business modelling remains a challenging concept to define, it has been identified organisations that embrace its principles outperform those who do not, securing and gaining competitive advantage (Johnson et al., 2008; Magretta, 2002; Wirtz et al., 2016). Therefore, this thesis aims to develop an AR BM to bridge the gap between the potential AR presents to the tourism sector, and actual implementation, so as to gain value-adding benefits. The next section introduces the background of the study, outlining the research aim and objectives, and an overview of each chapter.

## **1.2 Background and Justification**

Tourism is a multidimensional, multifaceted activity, affecting the lives of many, and impacting different economic activities (Horner and Swarbrooke, 2016). Tourism is often used to stimulate development and improve the economy, whilst creating other benefits such as revitalising cultures and preserving traditions (Gursoy et al., 2002; Ko and Stewart, 2002). Tourist activities have a significant impact on most nations and play a key role in competitiveness, success and development (Lazzeretti and Petrillo, 2006). Officially, the World Tourism Organisation (1994, p.1) defined tourism, as “comprising the activities of persons travelling to and staying in places outside their usual environment for no more than consecutive one year for leisure, business and other purposes”. Tourism is considered an umbrella industry, encompassing a set of related businesses, such as travel companies, accommodation facilities, catering organisations, tour operators, travel agents, and providers of recreation and leisure facilities (Smith, 2014). Conceptually, all these businesses deal with the organisation of journeys away from home, how tourists are welcomed and catered for by destination countries (Holloway and Humphreys, 2012). Over the years, tourist's motivations for travel and the conceptualisation of the tourist experience has undergone much change. Because of this complexity Holloway and Humphreys (2012) identified a number of unique tourism

characteristics; intangibility, heterogeneity, inseparability and perishability. They noted these are, and have been, subjected to change sparked by the evolution of tourism products and services, such as the internet revolution.

Distinction between the tourist experience and daily life has become increasingly blurred (Urry, 1990). In recent years use of technology has gained more influence and has had more impact upon the tourist experience (Buhalis and Law, 2008; Cranmer et al., 2016; Lash and Urry, 1993), defined as ‘spill-overs’, whereby an individual’s use of technology in their daily lives ‘spills’ into their travel experiences (MacKay and Vogt, 2012). As a result the tourism industry has had to continually react and change to remain competitive, responding to external pressures and those introduced by the increased use of the internet and mobile devices. In a study of American tourists use of technology, Wang et al. (2016) identified a ‘spill-over’ of 22 activities including; communication, social activity, entertainment, facilitation, information acquisition and search. Concluding that tourists use smartphones during travel experiences because they are a large part of their “daily habits, social norms and obligations” (Wang et al., 2016, p.59).

The internet has had a significant impact on all sectors of tourism, transforming the traditional tourist offering (Ukpabi and Karjaluoto, 2016). The increased use of mobile devices and access to the internet has revolutionised the industry, creating many benefits, such as allowing tourists to search for “tourism-related information, purchase tourism products and services, and obtain others’ opinions” (Ukpabi and Karjaluoto, 2016, p.3). However, it has also created many challenges, forcing organisations to find new ways to do business (Al-Debei et al., 2008), disrupting traditional distribution channels and networks (Buhalis, 2003; Livi, 2008). As a result, competition among tourism organisations has intensified, and a new type of ‘modern’ empowered tourist has emerged (Jung et al., 2015), demanding tailored and personalised information available anytime, anywhere (Kounavis et al., 2012; Holmner, 2011). It is considered that the adoption of modern technologies is a necessity for tourism organisations wishing to remain competitive and continue attracting tourists (Han et al., 2014; Tscheu and Buhalis, 2016). Thus, it has been argued that to be competitive in the future tourism organisations should introduce technologies that add value to the tourist experience (Carlsson and Walden, 2010; Cranmer et al., 2016; Deloitte, 2013).

Having gained increased attention over the past few years for its ability to create an enhanced experience, AR technology has been praised for its potential to add value to the tourist experience (Garcia-Crespo et al., 2009; Leue et al., 2015), improving the users interaction with, and perception, of the real-world environment (Wang et al., 2013). Tourism studies have identified that AR can add value (Cranmer et al., 2016), create unique and memorable experiences (Yovcheva et al., 2013) increasing visitor numbers (Palumbo et al., 2013). A number of studies have explored the use of AR in cultural heritage tourism, where it has been praised for its capacity to spread and enhance value by seamlessly adding elements and providing different versions of knowledge (Fino et al., 2013). In this way, AR is considered the perfect complement to cultural heritage tourism, linking authentic content to a user's immediate surroundings to enhance their experience (Lee et al., 2015).

In addition to this, research has started to explore the benefits of AR for museums and attractions, where it has been acknowledged as a tool to create more engaging content (Jung et al., 2015; Neuburger and Egger, 2017; Olsson et al., 2012), and re-enact historic events bringing history to life (tom Dieck and Jung, 2015). Used in these ways, it is argued AR can positively contribute to competitiveness and long-term sustainability (Radsky, 2015). Despite this, given the potential AR presents, it remains under-utilised in the tourism sector and specifically in museum and attraction contexts (Cranmer and Jung, 2014).

This study proposes that it is unclear to organisations how to go about implementing AR to capitalise upon its potential and value-adding benefits. A gap exists identifying AR BMs as tools to help cultural heritage attractions effectively implement AR to explore the potential it presents technologically, and in terms of creating value, increasing competitiveness and revenue. Within the tourism industry, AR is still not being actively used or explored (Chung et al., 2015), despite the fact it has been argued that the use and adoption of modern technologies is crucial to future success and competitive advantage of cultural heritage tourism attractions, such as museums (Haugstvedt and Krogstie, 2012; Tscheu and Buhalis, 2016). This represents a disconnect between academic studies identifying the potential AR presents to the tourism sector, and tourism organisations actually adopting and integrating AR to benefit from this potential. In recognition of this gap, a number of scholars identified a need for further research (e.g Jung and Han, 2014; tom Dieck and Jung, 2017; Tscheu and Buhalis, 2016) and Jung and tom Dieck (2017, p.11)

emphasised the need to develop “a suitable business model for the investment and implementation of multiple technologies into cultural heritage places”.

BMs have been identified as successful tools to increase innovation, sustainability (Amit and Zott, 2012; Bocken et al., 2014; Chesbrough, 2007; Teece, 2010), commercialise new ideas and technologies (Chesbrough, 2010). It is considered that technology does not succeed by itself but requires a consistent and effective organisational setting and structure to increase success and provide value to the intended users (Al-Debei and Avison, 2010). Thus, BMs are used to unlock the “latent value from a technology” (Chesbrough and Rosenbloom, 2002, p.529).

This study aims to develop a BM to ensure cultural heritage tourism organisations do not lose out on the potential AR offers in capturing the attention of the modern tourist (Palumbo et al., 2013; Weber, 2014). In addition to overcoming challenges faced by cultural heritage attractions, such as creating a source of supplementary income in the face of decreased government support (Lee et al., 2015). This study has identified a need to develop an AR BM to provide a framework to guide cultural heritage tourism organisations in the implementation of AR as an effective tool to explore the benefits AR presents technologically and in terms of creating value, increasing competitiveness, visitor numbers and profits. Not only would this help progress AR closer toward meaningful implementation in tourism (Jung et al., 2015; Lee et al., 2015), but also allow its full potential to be explored and realised. Therefore, this study aims to develop an AR BM, based on a case study of Geevor Tin Mine Museum.

Geevor is a UNESCO recognised Tin Mine Museum and popular cultural heritage attraction, based in Cornwall, UK. Geevor management sought to explore the use and adoption of technologies, as a way to create an enhanced visitor experience, whilst helping to overcome some of their recognised barriers, such as seasonality and funding limitations. Geevor has won numerous awards, and have a positive visitor relationship, however as a council-owned, publicly-funded venture, remaining economically viable as a tourist attraction is crucial (Coupland and Coupland, 2014). Thus, AR was recognised as a potential tool to enhance the visitor experience whilst introducing a number of other benefits. Yet, prior to the adoption of AR at Geevor, it was considered imperative to understand ARs potential, benefits and uses, in addition to understanding Geevor stakeholder perceptions to confirm support of, and a need for AR before developing an AR BM.

### **1.3 Research Aim and Objectives**

Having identified a gap in research, this study intends to achieve the following aim, and five objectives:

**Aim:** To develop an Augmented Reality Business Model for the cultural heritage tourism sector

**Objectives:**

- (1) To evaluate Augmented Reality and its usefulness in the cultural heritage tourism sector
- (2) To critically review the theory of Business Models
- (3) To assess the understanding of stakeholders towards the implementation of Augmented Reality
- (4) To develop a business model to implement Augmented Reality in a cultural heritage tourist organisation
- (5) To validate the proposed Augmented Reality Business Model

### **1.4 Structure of the study**

This study has nine chapters, the first provides an introduction to the study, identifying the purpose, research problem, aims and objectives, introducing the research context and justifying the intended contributions of the PhD study.

The second chapter is the first of three literature reviews. Chapter two explores AR technology; its development, uses, benefits, criticisms, requirements and potential, focusing predominantly upon ARs use in the context of tourism, cultural heritage, and museums.

Linking with the previous chapter, chapter three critically reviews the theory of BMs, with the aim of selecting an existing BM to provide a framework to scaffold research themes and questions. It analyses the importance of business modelling, components, design, while benefits and criticisms are explored with application to traditional business, electronic business, tourism and AR. The chapter concludes by highlighting a gap in research identifying AR BMs.

Chapter four provides context to the study, presenting the characteristics and complexity of the tourism industry and specifically the cultural heritage tourism sector. Previous chapters identify the benefits and potential of AR, the importance of BMs, and the current gap in research identifying effective AR BMs, confirming the aim of the study; to develop a BM to implement AR in the cultural heritage tourism

sector. Thus, the chapter provides context and introduces the case study: Geevor Tin Mine Museum.

The fifth chapter discusses the methodology used, starting by defining the philosophy, approach, strategy and design. The stages of research are outlined, detailing the research instruments, sample population and size, data collection techniques and analysis methods. The chapter ends with a discussion on time horizon, ethics and quality of the overall research process.

Chapter six presents the analysis of the first phase of primary data; stakeholder interviews. The chapter analyses the key themes and findings from fifty Geevor stakeholder interviews towards the implementation and development of an AR BM. Identifying criteria to develop an AR BM, and based on these, the chapter concludes by proposing “The ARBM”.

The seventh chapter presents the findings of the second phase of primary data collection, fifteen stakeholder questionnaires, to validate the proposed ARBM. A description of the analysis process is detailed and the outcome of the different stages presented. The chapter concludes by identifying the most important, and preferable, criteria for each of the ARBM components, ranked in order of importance.

Chapter eight discusses the overall findings of primary data collection in relation to literature and previous studies, tying the different stages of the study together. In addition, the chapter discusses the achievement of objective five, proposing consideration and recommendations for Geevor management to introduce AR using the ARBM.

The final chapter, nine, concludes the study by reviewing the aim and objectives, evaluating how each has been achieved. The chapter also provides recommendations to practitioners, researchers and industry, whilst also identifying opportunities for future research. Moreover, the chapter identifies theoretical and practical contributions to knowledge and a discussion of limitations and reflection on the overall research process concludes the study.

## **CHAPTER 2 AUGMENTED REALITY**

### **2.1 Introduction**

As discussed in chapter one, there is a gap in research identifying AR BMs as frameworks to support tourism managers to harness and capitalise upon ARs potential value-adding benefits. Research identified that AR can be used to enhance our perception of and interaction with the real-world (Roesner et al., 2014), its potential and opportunities to innovate are vast (Hassan and Rahimi, 2016). However factors, like technological constraints (Taqvi, 2013), costs (Layar, 2013), user adoption (Kleef et al., 2010) and a lack of awareness (JuniperResearch, 2013), are currently delaying widespread implementation. Therefore, this chapter examines previous studies discussing ARs development, processes, potential, barriers, and uses in a tourism, cultural heritage tourism, museums and educational context, to understand ARs potential use at Geevor.

### **2.2 Defining Augmented Reality**

Despite a recent growth of interest in AR, it has been revealed the term is often given different meanings by different researchers (Wu et al., 2013). As a result, AR has no universally-accepted definition. It was suggested that many organisations “make use of the hype surrounding the term to include any product that adds something to reality” (Kleef et al., 2010, p.1). However, Kounavis et al. (2012) criticised that such a definition was too all-encompassing, because AR promotes social interaction.

The first and widely recognised definition of AR was developed by Azuma (1997) who defined that AR systems have three distinctive characteristics, they; combine real and virtual, are interactive and in real-time and register in 3D. Azuma (1997) also pointed out AR has the ability to remove information or physical objects from view, and replace it with alternative content. Azuma’s definition defined AR based upon its features and characteristics (Wu et al., 2013). In comparison to Kleef et al. (2010) definition, Klopfer and Squire (2008) argued that it was too restrictive, because AR can be applied to any technology that blends real and virtual information in a meaningful manner. With this in mind, Klopfer and Squire (2008, p. 205) proposed a broader definition suggesting AR is a “situation in which real world context is dramatically overlaid with coherent location or context-sensitive virtual information”, thus acknowledging AR creates technology-mediated immersive experiences, where real and virtual worlds are combined. Dunleavy et al. (2009) supported that a user’s interactions can be augmented and to avoid being criticised as restrictive,

Klopfer and Squire (2008) claimed AR applies to any technology that blends real and virtual information in a meaningful way, proposing AR was a concept rather than a type of technology. Wu et al. (2013) supported this perspective, recommending it was the most practical and constructive way to view AR.

In recognition of ARs importance increased use and popularity the Oxford Dictionary (2014) recently added AR, defining it as a technology that superimposes computer-generated images on a user's view of the real world to provide a composite view. The addition of AR to the English dictionary demonstrates acknowledgement of its significance and relevance in common dialect. However, the dictionary definition suggests AR allows digital content (audio, video, textual information) to be seamlessly overlaid and mixed into our perceptions of the real world (Rhodes and Allen, 2014; Yuen et al., 2011), but many have previously criticised that adopting such a perspective is restrictive. For instance, Höllerer and Feiner (2004) and Salmon and Nyhan (2013) highlighted the use of AR to enhance the physical environment can relate to any human sense, including sight (visual AR), hearing (audio AR), touch (haptic AR), smell (olfactory AR) and taste (gustatory AR) and therefore definitions should not be restricted to human senses. In line with this perspective, Geroimenko (2012 p.447) proposed that "AR is a real-time device mediated perception of a real-world environment that is closely or seamlessly integrated with computer-generated sensory objects". However, this has also been critiqued for being biased toward visual based AR systems, constraining ARs potential to create multi-sensory experiences. Therefore, in response, Geroimenko (2012, p.448) modified the definition to include "artificially-generated sensory inputs" and thus applicable to all senses.

Yet, despite ARs potential to apply to all senses, development is in the early stages and most recent AR uses only exploit its visual and audio potential. Although, technological advancements will see haptic, olfactory and gustatory AR become increasingly feasible. With this in mind, Van Krevelen and Poelman (2010) recognised, because AR can appeal to all senses, it should not be limited to a particular display technology, such as Head Mounted Displays (HMDs) or a sense of sight. Considering this, Kleef et al. (2010, p.1) defined AR as a "technique that combines a live view in real-time with virtual computer-generated images, creating real-time augmented experiences of reality". In this way AR enhances the users perception of reality and their surrounding environment (Kounavis et al., 2012). Thus, Hassan and Rahimi (2016, p.130) supported that "AR is an advanced stage

of virtual reality that merges reality with computer-simulated imageries in the real environment". This definition was supported by Jung et al. (2015) and Dadwal and Hassan (2015) who viewed AR as a blend of computer simulations of digital imageries in real environments.

In examination of AR definitions, there are a variety of stances, however, most scholars agreed on the fact that AR incorporates a series of technologies to allow a mix between the real-world, digitally-generated layers of information and imagery to enhance the specific reality (Bulearca and Tamarjan, 2010; Clawson, 2009; Lamantia, 2009; Shute, 2009). It is often agreed, that "collectively, these augmentations can serve to aid and enhance individual's knowledge and understanding of what is going on around them" (Yuen et al., 2011, p.119). The author supports this perspective, agreeing that AR can be used to add an extra level of information to improve the user's experience. For the purpose of clarity, throughout the study the following definition was assumed;

*Augmented reality allows real-time digital content such as audio, video or textual information to be seamlessly overlaid and mixed into our perceptions of the real-world (Author, 2017)*

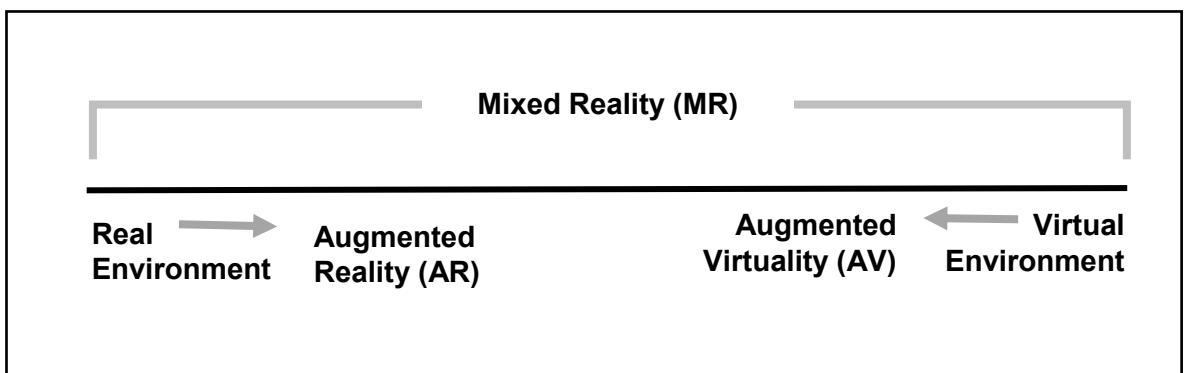
However, the author recognises that a fixed definition of AR has not yet been developed or agreed (Wu et al., 2013). Agreeing that "despite AR's long existence, there is still some disagreement over its definition, due mainly to the fact that AR is still evolving and its uses are still being explored" (Salmon and Nyhan, 2013, p.55) and often definitions are tweaked to suit the context in which AR is being applied.

### **2.2.1 Augmented Reality and Virtual Reality**

Similar to lack of definition, there is disagreement among researchers about the position of AR in relation to Virtual Reality (VR) and physical presence in the real-world. Chang et al. (2010) argued that AR seamlessly bridges the gap between real and virtual. This assumes AR occurs when digital images are added into real-life contexts, whereas VR creates a new world (Guerra et al., 2015). Thus, VR users experience a computer-generated virtual environment, whereas, using AR, the environment is real, but extended with information and imagery from the AR system (Lee, 2012). However, Taqvi (2013) and Feiner et al. (1997) disagreed suggesting AR is a variation of VR because it supplements, rather than replaces, the real-world. Likewise, Roesner et al. (2014, p.88) claimed, unlike VR, "AR systems sense properties of the physical world and overlay computer-generated visual, audio and

haptic signals onto real-world feedback in real-time". Hassan and Rahimi (2016, p.130) supported that "AR is an advanced stage of virtual reality that merges reality with computer simulated imageries in the real environment", in this assumes AR combines reality with a virtual world.

Attempting to demonstrate the differences between AR and VR, Milgram et al. (1994) created the Reality-Virtuality (R-V) Continuum, using a linear scale with the real-world on one end and a completely virtual environment at the other (See Figure 2.1). Because AR lacks consistent definition, Milgram et al. (1994) claimed VR and AR to be at opposite ends of the continuum, despite the fact the evolution and development of visual AR was closely related to the history and development of VR. These differences remain the subject of ongoing debate and disagreement. For instance, Azuma (1997) suggested AR user's perception centres within the real world, and is merely supplemented with virtual superimposed objects, to create a perception that real and virtual objects coexist in the same place. Likewise, Yuen et al. (2011, p.121) argued AR should be "closer to the real-world on one end of the gamut with the dominant perception being the real world which is improved by digital data or assets", whereas a VR user's frame of reference is completely tied to a virtual world. These perspectives support that AR is a mediated reality, situated between the physical and a completely-virtual environment (Salmon and Nyhan, 2013), part of the general area of Mixed Reality (MR) (Van Krevelen and Poelman, 2010), and thus AR and VR lie at opposites ends of the continuum.



Source: Milgram et al. (1994, p.282)

**Figure 2.1 Reality-Virtuality Continuum**

Although, in contrast, developers of the R-V Continuum, Milgram et al. (1994) believed that reality in fact includes AR which lies closer to physical reality, and augmented virtuality that lies closer to VR. Van Krevelen and Poelman (2010)

disagreed, arguing that removing real objects by overlaying virtual ones was in fact mediated or diminished reality, a component of AR.

Hence, Milgram et al. (1994) proposed that AR can be defined from two approaches; broad, and restricted. In a broad sense, they suggested AR involves “augmenting natural feedback to the operator with stimulated cues” (Milgram et al., 1994, p.283). In contrast, a restrictive approach accentuates the technology aspect, defining AR as “a form of virtual reality where the participant’s head-mounted display is transparent, allowing a clear view of the real-world” (Milgram et al., 1994, p.283). In some contexts, defining AR by a specific approach is considered more productive, for example, within education it is perceived to be more beneficial to define AR broadly, recognising that AR is not limited to a particular type of technology or device (Johnson et al., 2010). Wu et al. (2013) also supported this, noting AR can be conceptualised beyond technology, despite the fact it may be based upon, and accompanied by technology. These perspectives, contribute to common agreement that the main purpose of AR is to integrate virtual information into a person’s physical surroundings so they perceive information as existing in their environment (Höllerer and Feiner, 2004), and can apply to all senses, connecting the user to more meaningful content in their everyday life (Layar, 2013).

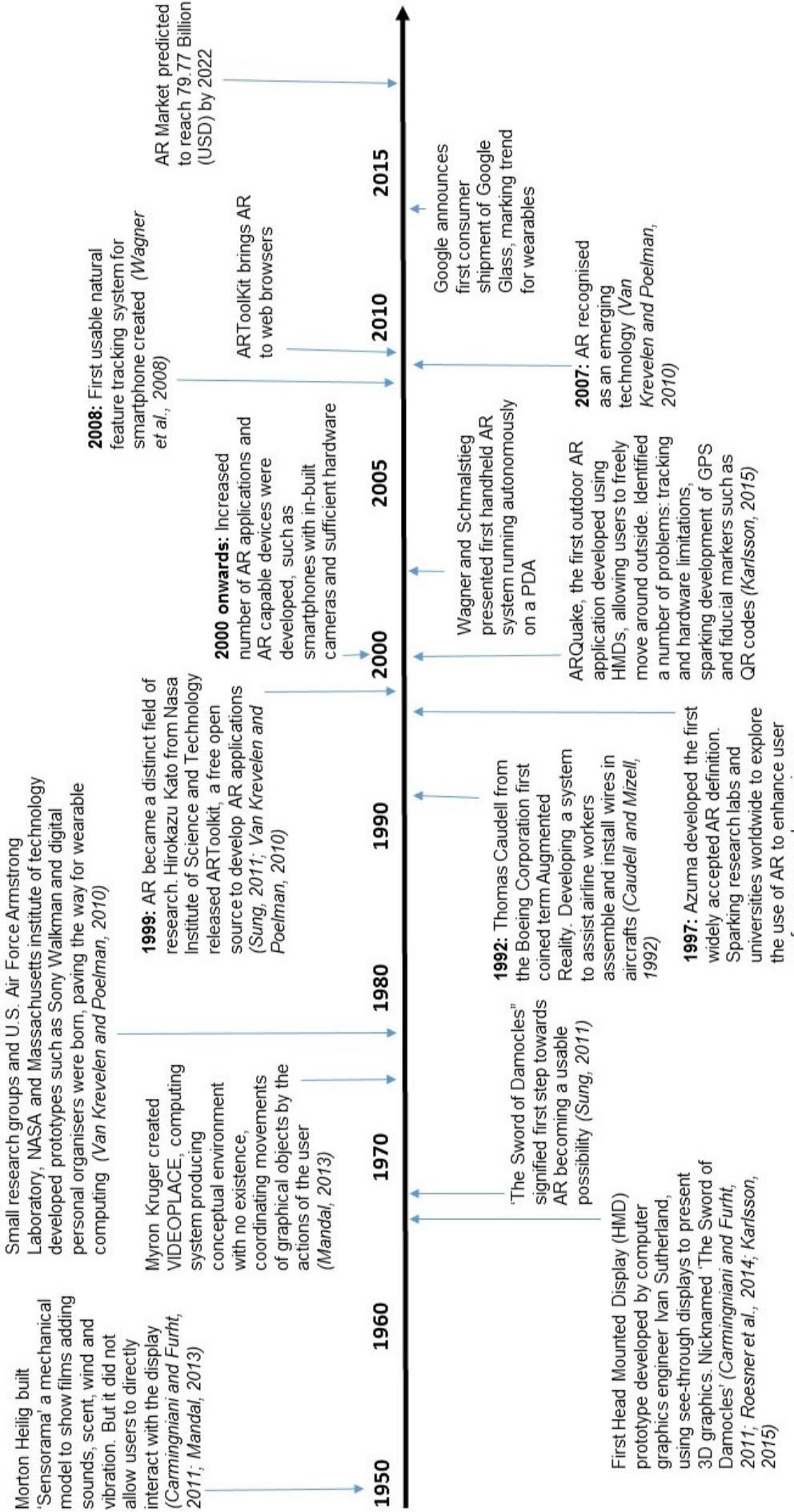
Regardless of incongruity surrounding AR and VR, there is a common agreement that both add an additional layer of information enhancing the users view of the world (Salmon and Nyhan, 2013). Therefore, inclusively, AR can refer to a wide range of technologies that project computer-generated materials and content onto the user’s perceptions of the real world. Moreover, it is commonly agreed that AR and VR share distinct similarities, in that they are both interactive, immersive and include information sensitivity (Yuen et al., 2011). However, the range of perspectives identified within research, contribute further to the disagreement and confusion stemming from the lack of a universal definition. The concept is still evolving and developing, and it has been suggested “as technologies continue to rapidly advance, it seems possible that the virtual elements and real-world elements will become more and more difficult to tell apart” (Yuen et al., 2011, p.121).

### **2.3 A brief history of AR**

AR has a long history dating back to the 1950s, but prior to 1999 it was considered that AR remained very much a ‘toy of the scientist’ held back from society by expensive, bulky equipment and complicated software (Sung, 2011a). The research

and development necessary to facilitate current AR implementations has spanned four decades (Billinghurst and Henrysson, 2009). AR was only made available to mainstream society when Hirokazu Kato, of the Nara Institute of Science and Technology released the ARToolkit as an open source for the community to develop AR applications (Sung, 2011a). This is believed to have marked the start of the AR application revolution, whereby freely available software kits made it possible for developers to experiment with AR, developing ideas to exploit its potential (Van Krevelen and Poelman, 2010). However, it has only been in the last few years that technology has caught up with the idea of AR, because devices have become cheaper, smaller and sufficiently more powerful to support and run AR applications (Salmon and Nyhan, 2013). The significant rise in smartphone ownership and use propelled AR to become a mainstream technology (Engine Creative, 2012). Figure 2.2 presents a timeline of some of the most notable stages of ARs development.

The AR market is expected to grow from \$515 million in 2016 to \$5.7 billion in 2021 (Juniper Research, 2016). Implementations such as the recent launch and popularity of Pokémon Go in July 2016, have been suggested to have brought AR into the public domain. For instance, Pokémon Go, reached a total of 45 million users during August 2016 (Javornik, 2016), rising to 50 million by September 2016 (Zach and Tussyadiah, 2017). Successes such this, demonstrate the potential of AR, and a number of studies have begun to explore the consequences of such AR applications, and its impacts on business and revenue generation, motivation, play, enjoyment, money spent, behaviour, wellbeing and perception (e.g. Zach and Tussyadiah, 2017).



Source: Author (2017)

**Figure 2.2 AR Development Timeline**

## **2.4 Augmented Reality Systems**

AR has undergone decades of development to reach the point where it has become widely accessible and feasible on consumer devices. For AR systems to work, a number of components are necessary. AR applications require an overlay of computer graphics into the user's actual field of view: in basic terms reality and the virtual world are enhanced or augmented, to allow users to experience a combination of both worlds (Carmignani and Furht, 2011). Virtual images are generated by computers, and superimposed onto real world physical objects in real-time (Celtek, 2015), with the help of a device camera, AR images, videos or sounds are superimposed on the real-world environment (Biseria and Rao, 2016). For AR to work, different processes in the AR system must occur and decisions regarding AR; forms, necessary components, types, functions, platforms, displays, methods and interactions must be made. Below is a brief description of each, followed by a summary presented in Appendix 1.

There are two forms of AR; mobile and fixed (Kipper and Rampolla, 2012). Mobile AR (MAR) gives users mobility to move freely around their environment, whereas fixed systems cannot be moved and have to be used in specially equipped areas (Höllerer and Feiner, 2004; Kipper and Rampolla, 2012). MAR is more popular than fixed AR, emerging as one of the fastest growing research fields of AR, driven by increased use of smartphones, providing powerful platforms to support "AR during locomotion (mobile as a motion)" (Arth et al., 2015, p.1). MAR has become increasingly popular (Bernardos and Casar, 2011; Kleef et al., 2010), due to advances in tablets, smartphones and other devices that combine fast processors with graphics, hardware, touch screen and embedded sensors such as GPS, WIFI, a compass and accelerometer making them ideal for indoor and outdoor MAR (Billinghurst and Duenser, 2012). Moreover, MAR applications support mobile commerce (mCommerce), facilitating the buying and selling of goods or services through a mobile device anytime and anywhere, because of this MAR has been argued to have played a central role in the shift from desktop computing to ubiquitous computing (Olsson et al., 2012).

Whether creating mobile or fixed AR environments, there are a number of necessary hardware and software components required to build compelling AR environments, such as tracking, registration and calibration (Azuma et al. 2001). Scholars such as Craig (2013), Celtek (2015), Kipper and Rampolla (2012), Sung (2011b) and Van Krevelen and Poelman (2010) identified various components

needed to implement AR. However, there was much variation among these, from essential components divided simply into software and hardware, to more detailed lists involving sensors, processors and display technology. Therefore, based on work from Casella and Coelho (2013) and Höllerer and Feiner (2004) who analysed AR systems by the necessary components needed to function, a list of nine necessary AR components is presented in Appendix 1.

The two types of AR are called marker-less and marker-based (Chung et al., 2015; Johnson et al., 2010; Ma et al., 2013). AR works by identifying the positioning of markers using the device software and accessing information hidden in the marker, or identifying the location of the device through GPS and displaying content according to the device's field of view (Biseria and Rao, 2016). Marker-based AR uses specific markers to overlay objects into the user's environment, whereas marker-less AR detects specific features based on GPS location (Biseria and Rao, 2016; Kipper and Rampolla, 2012; Lee et al., 2013).

In a tourism context, AR application Wikitude used markers in the form of image-recognition to display additional information about restaurants and tourism landmarks in the user's vicinity, triggered by markers such as GPS location and camera orientation (Pokric et al., 2014). One of the first markerless AR systems used GPS to aid tourist's in the exploration of urban environments (Shepard, 2013), developed by Feiner et al. (1997) the system overlaid information about points-of-interest within the user's surrounding environment, allowing them to navigate and explore their location. For tourism, marker-less systems offer wider applicability, because they can function anywhere without special labelling, supplementary reference points or codes and are thus better suited to outdoor environments (Chung et al., 2015; Johnson et al., 2010; Jung et al., 2013; Lee et al., 2013). GPS is too weak in indoor environments, it faces problems in highly-populated areas, so is better confined to open outdoor spaces (Shepard, 2013). Marker-less AR applications are often preferred by tourism organisations due to ease of implementation, low costs, reliability and the fact most smartphones satisfy the basic requirements to run AR applications (Chung et al., 2015; Schmalsteig et al., 2011).

AR can also play a different role in users perception, either creating an augmented perception of reality, or an artificial environment to satisfy different objectives (Kipper and Rampolla, 2012). Furthermore, there are four main platforms used to display AR (See Appendix 1). AR displays are "the device that provides the signals that our

senses perceive” (Craig, 2013, p.91), including mobile handheld displays, video spatial displays and wearable displays or Head-Mounted Displays (HMDs) (Van Krevelen and Poelman, 2010). Ultimately, AR can apply to all senses, but currently sight and sound are the most common and widely applied. Currently, mobile handheld, such as smartphones, tablets or PDAs are the most commonly used AR display (Carmigniani and Furht, 2011; Celtek, 2015), popular because of their minimal intrusiveness, wide social acceptance, availability and mobility (Zhou et al., 2008) ease-of-use and commercial availability (Marimon et al., 2014; Van Krevelen and Poelman, 2010).

British communications regulator Ofcom (2015) reported over two-thirds (93%) of UK adults have a mobile phone, of which 71% have a smartphone. It was also noted, that smartphones have overtaken laptops as the most widely-used internet-enabled device and half of UK smartphone users claim they are ‘hooked’ to their phone, spending an average of nearly two hours (114 minutes), using the internet on their phone. Interestingly, despite many functions, users (72%) still operate smartphones mainly as a communications device (e.g. emails, social media), although 45% make purchases online, 44% use online-banking, 42% watch short video clips and 21% stream TV programmes (Ofcom, 2015). Such statistics mirror the increased proliferation, use of mobile devices and interest in AR among all demographics (Deloitte, 2014; Gherghina et al., 2013; Johnson et al., 2010; Yuen et al., 2011).

AR systems also use different recognition methods, which encourage different interactions with applications (See Appendix 1), revolutionising access to information allowing the world to become the user-interface (Olsson et al., 2012). AR recognition methods facilitate appropriate interaction between the user and virtual content of AR applications (Carmigniani and Furht, 2011; Kipper and Rampolla, 2012), allowing the end-user to interact with virtual content in an intuitive way (Zhou et al., 2008).

## **2.5 Augmented Reality Applications**

Despite the global economic crisis, the mobile internet devices sector has been one of the few to experience continued and fast growth (Palumbo et al., 2013). Developments in hardware and software technologies allowed AR systems to support functionalities in real-time, enabling AR users to better interact with their real-world surroundings (Taqvi, 2013), viewing an enhanced version of reality (Olsson and Salo, 2011). Roesner et al. (2014, p.96) commented that “AR systems

with their sophisticated and pervasive input, output, and processing capabilities, have the potential to significantly benefit many users". As a result of this, a number of AR applications have been developed to exploit this potential in a range of sectors, both commercial and industrial (Biseria and Rao, 2016). AR applications have been developed for a range of purposes, from improving daily routine, increasing access to information, improving efficiency and the attainment of learning objectives. Furthermore, AR applications have "tremendous potential for all fields where rapid information transfer is crucial" (Yuen et al., 2011, p.124). In this way, Taqvi (2013) believes in general AR offers a common service to humanity, adding value to almost any industry.

New developments continually push AR further into the consumer market (Roesner et al., 2014; Taqvi, 2013) and the number of AR application developments and downloads continues to rise. However, recent excitement and increased public awareness has raised expectations of user experiences, creating problems for application developers and researchers tasked with creating rich AR experiences without putting devices under too much stress to perform (Gherghina et al., 2013; Juniper Research, 2016). There are limitations and challenges researchers needs to solve, for example, most current-model smartphones are equipped with the basic components to support AR functions, but are limited by factors like processing power, memory and storage, preventing the full use and integration of AR (Nazri and Ramblí, 2014). These issues require further research and development prior to wide scale AR adoption. Nevertheless, the number of AR applications has continued to increase and diversify, which McQuarter (2013) and Yuen et al. (2011) claimed demonstrates progression from the initial phase of 'gimmicky' simple applications.

There is evidence of AR applications developed for sectors such as: marketing, entertainment, sightseeing, fashion, medicine, games, military applications, advertising, marketing, sports, the arts, healthcare, architecture, construction, entertainment, art, leisure, tourism, the workplace (Biseria and Rao, 2016; Celtek, 2015; Kounavis et al., 2012; Kipper and Rampolla, 2012), automotive, retail, finance, publishing (Engine Creative, 2012) and aviation (Salmon and Nyhan, 2013). Most of which were developed to provide genuine utility to the user, adding value to their experience. Much research attention has focused on classifying AR applications: for instance Hamilton (2011) conducted an extensive breakdown, identifying AR applications for education, media, entertainment, gaming, tourism, travel, marketing and online social media. Whereas, although noting a range of possibilities,

Carmignani and Furht (2011) proposed the types of AR applications most frequently used belong to specific categories namely; advertising and commercial, entertainment, education, medical and MAR applications. Yet, more recently, Ierache et al. (2015) identified five groups, based on their field of application; entertainment (films), entertainment (television), entertainment (videogames) education, marketing, cultural tourism, and social. Although there is variety within such categorisations, similarities are apparent, for instance, the use of AR to enhance education or entertainment. Yet, it remains that there is “no consensus as to what constitutes true AR applications and technologies, or how the possible applications of AR should be conceptually organised” (Yuen et al., 2011, p.123).

Irrespective of categorisations, a wide range of AR applications have been developed for implementation in various different fields, to deliver services, value, and benefits to users. With this in mind, Juniper Research (2013) predicted by 2018 there will be 200 million global unique AR application users, increasing recognition that AR has the potential to create significant economic, as well as socio-economic benefits for businesses and stakeholders. From examining uses of AR in these contexts, it is clear that AR can create value in two ways. Firstly by enhancing users perceptions, knowledge and interactions with the real-world (Azuma et al., 2001; Yuen et al., 2011). Secondly, by improving productivity of real world tasks (Schmalsteig, 2001).

This study focuses on the use of AR in the context of the tourism sector, therefore the following sections explore the application and use of AR in tourism, cultural heritage tourism, museum and educational contexts.

### **2.5.1 AR in Tourism**

Tourism is the world’s largest industry, and a significant contributor to the global economy (Horner and Swarbrooke, 2016). Technology and tourism have a long history (Scarles et al., 2016a; Tan et al., 2017), but in recent years technological advancements, innovation and the internet have forced tourism organisations to find new ways of doing business (Al-Debei et al., 2008). At the start of the 21<sup>st</sup> century, adaptive and interactive technologies emerged, changing the tourism sector and sub-sectors completely (Buhalis and Law, 2008), altering value-networks, changing traditional distribution channels (Buhalis, 2003; Livi, 2008), and transforming the dissemination and retrieval of information (Hjalager, 2015). ICT has had a significant

impact on tourism, influencing all sectors and transforming traditional offerings (Ukpabi and Karjaluoto, 2016).

In response to these changes, a new empowered ‘modern’ tourist has emerged, demanding access to tailored and personalised information anytime and anywhere (Jung and Han, 2014; Kounavis et al., 2012; Tan et al., 2017). This has created both a number of problems and opportunities within the sector. Increased competition has pushed organisations to move away from mass-market products, in pursuit of creating more individualistic and personalised products (Holmner, 2011). In response, researchers have progressively started to explore the impacts, role and value of ICTs upon the tourism experience (Neuhofer et al., 2014; Tussyadiah, 2014), and equally organisations have started to pursue new ways to enhance (Garcia-Crespo et al., 2009), enrich (Scarles et al., 2016a), create unique (Yovcheva et al., 2013) and immersive tourist experiences (Leue et al., 2014). In this way, it has been argued the future success and competitiveness of tourist organisations depends upon investment into new and emerging technologies to both address and satisfy the change in tourist’s needs through the visitor experience (Deloitte, 2013). Therefore the adoption of modern technologies in tourism is considered a necessity (Han et al., 2014).

The increased use of mobile devices and internet access have revolutionised the tourism sector, creating a number of benefits, such as allowing tourists to search for “tourism-related information, purchase tourism products and services, and obtain others’ opinions” (Ukpabi and Karjaluoto, 2016, p.3). Hereby, in recent years, research has focused on exploring the ways in which technologies can be used to create enhanced, richer and more participatory tourist experiences (Oh et al., 2007; Pine and Gilmore, 1998). Furthermore, Xu et al. (2017, p.247) identified “with the fast development of new technology, tourists are now seeking more personal, unique and memorable experiences, which require a deeper engagement and a multi-sensory stimulation”.

AR technology has been recognised and gained increasing attention for its ability to create an enhanced tourist experience (e.g. Casella and Coelho, 2013; Crespo et al., 2009; Garcia-Crespo et al., 2009; Jung et al., 2015; Kounavis et al., 2012; Marimon et al., 2014; tom Dieck et al., 2015; Vera and Sánchez, 2016). ARs ability to overlay information on the real world environment, has propelled it to emerge as a popular tool to enhance the tourist experience (Hume and Mills, 2011),

augmenting users interaction with, and perception of their surroundings (Roesner et al., 2014). Therefore, AR has become an accepted and valuable tool for tourism, largely because of its ability to enable tourists with limited knowledge of an area to naturally and realistically experience it (Chung et al., 2015; Martínez-Graña et al., 2013b). In addition, AR can create personalised and tailored information (Kourouthanassis et al., 2015; Kounavis et al., 2012), helping to minimise frustration caused by information-overload (Chung et al., 2015), and thus facilitate quality tourism (Rey-López et al., 2011).

A number of MAR tourism applications have been developed to help tourists “in accessing valuable information and improving their knowledge regarding a touristic attraction or a destination, while enhancing the tourist experience and offering increased levels of entertainment throughout the process” (Kounavis et al., 2010, p.2). Yovcheva et al. (2012) were amongst some of the first to identify the potential of AR to overlay digital content in tourist’s real-world surroundings, but nowadays more and more organisations have begun to explore the opportunities offered by AR (tom Dieck and Jung, 2016). Hassan and Rahimi (2016) suggested that adopting innovative technologies in tourism sectors was critical to ensure business-profitability, which in the context of the tourism sector concerns innovation consumption, and bettering products and services. tom Dieck and Jung (2016a) have reported an increased adoption of AR in the tourism sector, most notably by visitor attractions and museums.

Table 2.1 summarises the main uses and benefits AR presents to tourism, although it should be noted there are also a number of barriers to successful implementation. Limitations such as tracking technology and 3G connectivity, are considered to cause user-dissatisfaction and frustration which therefore detract from the tourist experience if not addressed adequately (Kounavis et al., 2012). Developers and service-providers face an increasing challenge of being able to rapidly supply customer-orientated, engaging content at low costs or free, whilst also meeting increasing user-expectations (Palumbo et al., 2013).

Therefore, MAR tourism applications must be constantly re-developed to account for the changing demands of tourists and to make use of continual technical advancements (Yovcheva et al., 2012). In an examination of existing tourism AR applications, Kennedy-Eden and Gretzel (2012) recommended that during development, it was important adopt a customer-centric value chain focusing on

adding value, and secondly, introduce features to encourage interactivity and user-control.

**Table 2.1 Uses and benefits of AR in tourism**

Theme	Uses and Benefits	Author/s
<b>Audience reach</b>	AR gives organisations more scope to reach and connect with wider audiences, through offering content fine-tuned toward different knowledge levels	<i>Chung et al. (2015); Fritz, et al. (2005); Kennedy-Eden and Gretzel (2012)</i>
<b>Availability</b>	Provides access to information, available anytime, anywhere	<i>Han and Jung (2014); Rey-López et al. (2011)</i>
<b>Competitiveness</b>	Technology attracts tourists, thus AR is one way to increase competitiveness	<i>Lashkari et al. (2010); tom Dieck and Jung (2017)</i>
<b>Context-aware experiences</b>	Provides information about objects, places or points of interest placed directly into context, based on real-world locations	<i>Chou and ChanLin (2012); Höllerer and Feiner (2004); Yovcheva et al. (2013)</i>
<b>Differentiation</b>	Creates ways for destinations to differentiate themselves	<i>Chung et al. (2015); tom Dieck and Jung (2017)</i>
<b>Engagement</b>	Can engage and address the needs of new modern and young tourists combining elements of entertainment and education from all demographics specifically younger and 'modern' tourists	<i>Han et al. (2014); Kasinathan et al. (2016); Weber (2014); Xu et al. (2017)</i>
<b>Enhanced experience</b>	AR creates a more enhanced tourist experience	<i>Casella and Coelho (2013); Garcia-Crespo et al. (2009); Herbst et al. (2008); Kounavis et al. (2012); Marimon et al. (2014); Martínez-Graña et al. (2013a); tom Dieck and Jung (2017); Yovcheva et al. (2012); Vera and Sánchez (2016); Yuen et al. (2011)</i>
<b>Enhancement of surroundings</b>	Adding elements into their real-world surroundings and offering different versions of knowledge helps tourists to seamlessly and efficiently explore their surroundings	<i>Celtek (2015); Chung et al. (2015); Fino et al. (2013); Fritz et al. (2005); Garcia-Crespo et al. (2009); Han et al. (2014); Marimon et al. (2014); Palumbo et al. (2013); Wang et al. (2013); Wasko (2013); Yovcheva et al. (2012)</i>
<b>Enjoyment</b>	Creates a more enjoyable experience	<i>Chung et al. (2015); Fritz et al. (2005); Kounavis et al. (2012); tom Dieck and Jung (2015); Yovcheva et al. (2014)</i>
<b>Entertainment</b>	AR can combine elements of fun and entertainment into the tourist experience	<i>Palumbo et al. (2013); Weber (2014); Xu et al. (2017)</i>
<b>Interactivity</b>	Enhances how users interact with the physical world, by adding additional information to evoke memories or complement current stories	<i>Marimon et al. (2014); tom Dieck and Jung (2015); Yovcheva et al (2014)</i>
<b>Learning</b>	AR extends beyond enhancing the senses by contributing to learning. Discovery based learning, adding another layer to the learning experience	<i>Aluza-Sorzbabal et al. (2006); Hassan and Jung (2016); Yoon et al. (2012); Yuen et al. (2011)</i>

<b>Theme</b>	<b>Uses and Benefits</b>	<b>Author/s</b>
<b>Marketing</b>	Market tourist services; catalogues, brochures and paper based promotional materials can come to life, offering a better sense of what the customer is buying	Celtek (2015); Hassan and Jung (2016); Haugstvedt and Krogstie (2012); Kounavis et al. (2012); Yovcheva et al. (2011)
<b>Mobile Commerce</b>	MAR apps can support functions for mobile commerce	Yovcheva et al. (2012)
<b>Mobility</b>	MAR mobility and portability is practical and useful improving accessibility	Marimon et al. (2014); Chung et al. (2015); Martínez-Graña et al. (2013b); von der Pütten et al. (2012)
<b>Navigation</b>	Tourists have little or no knowledge of surroundings and require precise information. AR allows tourists to naturally and realistically explore their surroundings	Martínez-Graña et al. (2013b); von der Pütten et al. (2012); Takada et al. (2009); Yuen et al. (2011); Yovcheva et al. (2012); van Krevelen and Poelman (2010)
<b>Orientation</b>	Ability to replace tour guides, signs and maps. Tourists need detailed information	Chung et al. (2015); Jung et al. (2015); Marimon et al. (2014)
<b>Personalisation</b>	Can filter information tailored to traveller's needs and wants to create a more personal experience, personalise content to specific needs, knowledge levels, interests, age and professions, desires and expectations	Chung et al. (2015); Fino et al. (2013); Fritz et al. (2005); Holmner (2011); Kounavis et al. (2012); Kourouthanassis et al. (2015); Lee (2012); Selvam et al. (2016); Sparacino (2002)
<b>Quality information</b>	Helps avoid information overload of non-profiled information Easier access to information while travelling, precise information. Information only available upon request	Chung et al. (2015); Jung et al. (2015); Kounavis et al. (2012); Marimon et al. (2014); Rey-López et al. (2011)
<b>Sharing and connectivity</b>	Adds value by providing instant sharing and connectivity, combining information from the web, social media and stream techniques, allowing tourists to instantly share, update and exchange knowledge	Han et al. (2014); Kounavis et al. (2012); Marimon et al. (2014)
<b>AR Tour Guides</b>	AR travel guides have been developed to come alive in real-time	Chung et al. (2015); Fino et al. (2013); Tekin (2016)
<b>Value</b>	AR has been proven to create a more valuable tourist experience, increasing satisfaction	Chung et al (2015); Kounavis et al. (2012); tom Dieck and Jung (2016a)
<b>Visualisation</b>	Knowledge about the world is increasingly visually articulated therefore one of ARs main strengths is that it allows tourist destinations to enhance the experience through the visualization of information, bringing it back to life	Alzua-Sorzabal et al. (2006); Gervautz and Schmalstieg (2012); Jung and Han (2014)

Source: Author (2017)

Industry practitioners and academics believe creating an enhanced experience makes AR the perfect complement to tourism because it can link content to the user's immediate surroundings (Chung et al., 2015; Fritz et al., 2005; Han et al., 2014). Thus, AR demonstrates potential of becoming a mainstream technological tool within the tourism industry (Bernardos and Casar, 2011). Therefore, investments into new technologies to enhance the tourist experience are important

to provide value-added service, but also address the needs of young tourists, through combining elements of entertainment and education to increase engagement (Weber, 2014). Research suggests technology attracts tourists (Lashkari et al., 2010), which implies investing in and developing AR applications is one way for the tourism sector and tourist organisations to gain competitive advantage and increase tourist numbers.

In one of the only studies of the mobile applications market analysing travel applications, Mickael (2011) found travel applications were the seventh most popular application category downloaded. Similarly, Trip Advisor noted 60% of smartphone users have downloaded travel applications and of these, 45% plan to use the applications for travel planning and research (Mickael, 2011). Furthermore, 55% of travel applications are purchased within 3 days of travel while tourists are at the destination, which highlights how important mobile applications are in influencing en-route decision-making (Kennedy-Eden and Gretzel, 2012), because tourists exploring unfamiliar environments require large amounts of information (Yovcheva et al., 2012). However, despite an increasing number of tourism MAR applications, the true potential of AR remains to be seen. Although research has identified AR has passed the hype stage and is on the verge of meaningful implementation in tourism (Han et al., 2014), it is still an emerging field (Hassan and Jung, 2016).

### **2.5.2 AR in Cultural Heritage Tourism**

In tourism sectors, such as cultural heritage, AR has been identified as particularly useful, culture and heritage are key arenas where the application of AR has been explored. As far back as 1999, Brogni et al. (1999) identified the revolutionary impact of ICT on the way visitors explore cultural heritage sites. In 2005, Fritz et al. identified AR's potential to allow tourists to explore unfamiliar surroundings at cultural heritage sites in an enjoyable and thrilling way. Since 2010, the development of AR applications in cultural heritage has continued to rise (Scarles et al., 2016b; Tscheu and Buhalis, 2016). Yet, only since AR's benefits and potential have been demonstrated has implementation in cultural heritage gained wider attention (Weber, 2014).

Recently, a number of studies have explored the impact of technology on cultural heritage tourism. For instance, Minazzi (2015) claimed the increased availability and penetration of technology has impacted marketing and promotion of cultural heritage places. Similarly, Jung et al. (2015) and Jung and tom Dieck (2017) identified the

use of technologies, such as AR, have affected the way visitors experience their surroundings. Therefore, a number of studies have examined the potential AR presents to the cultural heritage sector and the use of AR in the cultural heritage sector has increased considerably over the last few years (Jung and tom Dieck, 2017; Scarles et al., 2016b). In a recent study, tom Dieck and Jung (2017, p.2) claimed “nowadays many destinations and organisations have either implemented or begun to consider the opportunities offered by this new and innovative technology to enhance the visitor experience”.

Jung et al. (2016) found AR effectively spreads and enhances the value of cultural heritage by virtue of the fact that it does not replace reality but can be used to enhance its contents. In this way, AR has also been reported to increase competitiveness (Jung and tom Dieck, 2017; Tscheu and Buhalis, 2016), create new value (Cranmer and Jung, 2014), and provide a richer experience (Han et al., 2014). Hassan and Rahimi (2016) suggested AR creates a bridge between reality and augmentation, visibly, but seamlessly blending reality and computer simulations. In this way, Kounavis et al. (2012) proposed AR creates a more superior experience by providing additional content. This was supported by Selvam et al. (2016) who confirmed that AR creates a deeper experience, providing more ‘exclusive’ information.

Recent studies have investigated the use of AR pre-visit, to help attract tourists and market the destination. For example, Kasinathan et al. (2016) identified AR can effectively provide experience-orientated tourism encounters, using activities, events, virtual tours and interactive maps to help tourists develop expectations about what they can expect at the destination. This was also identified as important by Selvam et al. (2016) who noted tourists are increasingly dependent on the internet and smartphones to obtain information about unknowns. Jung and tom Dieck (2017) supported that visitor attractions need to think of new ways, such as these, to attract visitors directly to cultural heritage sites.

Exploring history in compelling ways has become increasingly challenging, however AR offers a solution (Keil et al., 2011). Han et al. (2013) recognised AR allows tourists to receive instant information in unknown surroundings, especially important at cultural heritage sites, because AR facilitates the provision of digital information and signage without compromising or interfering with the landscape. From a supply-side perspective, Yovcheva et al. (2013) argued this to be one of the most significant

benefits, because tourists are increasingly demanding unique experiences. Due to their nature, it is common for cultural heritage attractions to face conflict imposed by regulatory restrictions limiting the use of information boards and signage, as well as a need to protect the landscape which can negatively impact the attraction (Jung and Han, 2014). AR has been identified as a tool to help prevent degradation of cultural heritage sites (Haugstvedt and Krogstie, 2012; Jung and Han, 2014; Van Krevelen and Poelman, 2010), and is therefore particularly useful to sensitive and outdoor (Kalay et al., 2007) and cultural heritage sites (Van Krevelen and Poelman, 2010).

Heritage is an important motivating factor in tourism (Ch'ng et al., 2011) and learning has been found to be a main reason for travel by broadening horizons and enhance understanding of other cultures and history (Falk et al., 2012). AR presents an opportunity to re-enact historic events and bring sites back to life (Gervautz and Schmalstieg, 2012), improving understanding and educational outcomes (Jung and tom Dieck, 2017). AR applications have been developed to capitalise upon AR's educational potential within a variety of cultural heritage settings. One of the first AR cultural heritage applications was Archeoguide (i.e. Augmented Reality-based Cultural Heritage On-Site Guide), developed in Olympia Greece to bridge the gap between recreation, education and scientific research (Vlahakis et al., 2002). Arcehoguide is now a well-established AR system used to enhance the exploration of cultural heritage sites, providing personalised contextual information based on a user's position and orientation (Haugstvedt and Krogstie, 2012). The system visualises missing and reconstructed artefacts, whereby damaged areas are overlaid with information allowing users to freely walk around and explore what sites used to look like (Keil et al., 2011), in this way AR techniques can enhance information to reconstruct sites and recreate ancient life (Vlahakis et al., 2002). However, despite the availability of successful examples of AR cultural heritage applications such as this, they represent a small proportion of the overall application market (Tscheu and Buhalis, 2016).

In a study of the effects of implementing an interactive AR tourist guide for cultural heritage tourism in San Cristobal de la Laguna, Tenerife, Fino et al. (2013) found as a result of implementing the AR tourist-guide, the town recorded increased interest toward cultural tourism and its impacts upon the site. The guide was also recognised to help alleviate visits to specific sites causing overcrowding, by offering routes to less popular attractions such as streets and buildings, by providing detailed

information through the application. In a more recent study, Tekin (2016) explored the impact of AR on tour guides, describing AR had a positive effect on service quality, increasing retention of knowledge and tourists' indicated AR made information easy to interpret. However, both studies had small samples, and therefore whilst the findings represent ARs potential, a more comprehensive examination of the benefits of AR tour guides remain to be seen.

Han et al. (2014) developed an interactive application in Dublin, Ireland, to superimpose tourist relevant information to reconstruct and relive stories of the past, assisting tourists in creating an emotional experience with the intangible tourist product. The application was developed to support Dublin's bid to be the 'city of innovation' in Europe, increasing the city's competitiveness and attract tourists. The application aimed to benefit not only tourists, but also residents and other stakeholders such as small businesses, but above all to help aid the city's development. As a result of the study Han et al. (2014) found that all respondents saw the potential that the application provided in assisting with planning, trip-advice, recommendations, social-connectivity, reviews and the ability to offer multi-lingual content.

In addition, recent studies such as Scarles et al. (2016b) reported AR use could increase dwell-time across demographic groups, facilitate deeper visitor experiences and empower visitors to personalise their experiences. Whereas, Jung and tom Dieck (2017) explored AR value co-creation; identifying that cultural heritage places can facilitate co-production of experiences, engagement and personalisation through the provision of thought-out AR experience spaces, increasing visitor intention to spend. Moreover, tom Dieck and Jung (2017) identified economic, experimental, social, epistemic, cultural, historical and educational values of AR from both internal and external stakeholder perspectives. As well as the benefits identified in Table 2.1, AR also creates a number of other benefits specific to cultural heritage tourism (See Table 2.2).

Despite examples of AR cultural heritage applications, the number of successful implementations is low; therefore, the use of AR in cultural heritage requires further exploration (Jung and Han, 2014; Tscheu and Buhalis, 2016). Equally, regardless of the benefits presented in Table 2.2, concern has been raised toward user-adoption of AR applications in cultural heritage tourism because of a lack of research (Olsson et al., 2012). Haugstvedt and Krogstie (2012, p.247) commented

that “acceptance studies of mobile augmented reality applications with cultural heritage resources are rare”. However, understanding the antecedents of the user-experience is crucial to create added-value (Palumbo et al., 2013), especially when implementing new technologies, Kristensson et al. (2008) highlighted that it was essential to understand perceived value from a consumer perspective, to ensure high acceptance and intention to use. In a comprehensive study of MAR acceptance, Haugstvedt and Krogstie (2012) found perceived enjoyment and usefulness were important determinants of intention to use AR applications with historical information and pictures. However, Yovcheva et al., (2012) disagreed, commenting that some tourists still prefer traditional sources of information such as guide books and paper-based materials. Thus, it is important to remember, the availability of AR applications does not automatically guarantee enhanced tourist experiences (Jung et al., 2014).

**Table 2.2 Uses and benefits of AR for Cultural Heritage Tourism**

Theme	Uses and benefits	Author/s
<b>Accuracy of information</b>	AR provides accurate information about attractions and services in tourists immediate surroundings, to avoid information overload	Höllerer and Feiner, (2004); Rey-López et al. (2011); Sparancino (2002); Scarles et al. (2016b)
<b>Booking experience</b>	Can create an enhanced booking experience, such as virtual tour of hotels or attractions	Han et al. (2014); Jung et al. (2016)
<b>Competitiveness</b>	Technology attracts tourists contributing to an increase in tourist numbers and destination competitiveness. Providing new ways to connect and communicate	Fritz et al. (2005); Han et al. (2014); Jung and Han (2014); Kennedy-Eden and Gretzel (2012); Lashkari et al. (2010); Tscheu and Buhalis (2016)
<b>Destination enhancement</b>	Enhance destinations through the visualisation of information, without replacing reality	Jung et al. (2014; 2016); Mariman et al. (2014); Palumbo et al. (2013)
<b>Education</b>	AR improves the attainment of learning outcomes, increasing knowledge and interaction at cultural heritage sites	Haugstvedt and Krogstie (2012); Jung and tom Dieck (2017); tom Dieck and Jung (2017); Vlahakis et al. (2002)
<b>Environmental preservation</b>	Offers a way to deliver rich information in environmentally sensitive areas restricted in implementing signage and information boards	Han et al. (2013); Kalay et al. (2007); Jung and Han (2014); Yovcheva et al. (2013); Haugstvedt and Krogstie (2012);
<b>Exploration</b>	Facilitates the exploration of cultural heritage sites in compelling ways	Han et al. (2013); Haugstvedt and Krogstie (2012); Keil et al. (2011); Leue et al. (2015); Portalès et al. (2009); Vlakakis et al. (2002); Van Krevelen and Poelman (2010)
<b>Dwell time</b>	AR has been found to increase visitors dwell time	Scarles et al. (2016b); Jung and tom Dieck (2017)
<b>Historic events</b>	Enable the re-living of historic events and time-travel	Gervautz and Jung and tom Dieck (2017); Keil et al. (2011); Schmalstieg (2012); Vlahakis et al. (2002); Yuen et al. (2011)

<b>Interpretation</b>	AR enhances and improves interpretation, providing a richer experience	<i>Han et al. (2014); Kounavis et al. (2012); Selvam et al. (2016); tom Dieck and Jung (2017)</i>
<b>Language</b>	Offers translation services	<i>Han et al. (2014) Leue et al (2015)</i>
<b>Marketing</b>	AR helps engage and attract wider audiences	<i>Jung and tom Dieck (2017); Kasinathan et al. (2016); Selvam et al. (2016)</i>
<b>Museum enjoyment</b>	Enhance museum interactivity, education and enjoyment.	<i>Ch'ng et al. (2011); Damala et al. (2007) Hume and Mills (2011); Johnson et al. (2010); Palumbo et al. (2013); Weber (2014); Scarles et al. (2016b)</i>
<b>Personalisation</b>	Personalisation of information, tours and experiences	<i>Tom Dieck and Jung (2017); Jung and tom Dieck (2017); Scarles et al. (2016b)</i>
<b>Pre – visit</b>	Can help visitors with en-route and pre-planning decision making	<i>Kennedy-Eden and Gretzel (2012); Mickael (2011); Kennedy-Eden et al. (2008); Kasinathan et al. (2016)</i>
<b>Spending</b>	AR has been found to increase visitors intention and likelihood to spend or purchase	<i>Jung and tom Dieck (2017); tom Dieck and Jung (2017)</i>
<b>Tailored to context</b>	Information can be tailored to towards the use context	<i>Garcia-Crespo et al. (2009); Kounavis et al. (2012)</i>
<b>Tour guides</b>	Can replace the traditional tour guide and brochures, delivering information upon request	<i>Fino et al. (2013); Han et al. (2014); Kounavis et al. (2012); Mariman et al. (2014);</i>
<b>View of surroundings</b>	Potential to change the user's view of their surroundings	<i>Fritz et al. (2005); Leue et al., 2015; Wang et al. (2013); Wasko, (2013); Van Krevelen and Poelman (2010);</i>

Source: Author (2017)

Recently, Jung and tom Dieck (2017) and tom Dieck and Jung (2017) identified the difficulty for smaller cultural heritage organisations to develop effective AR experiences, noting that large investments often present too much risk, without prior proof of concept. In attempt to overcome these problems and risk, Scarles et al. (2016b) developed "Lets Explore" AR application as a low-cost solution for cultural heritage organisations to develop and maintain their own content. They advocated a need to integrate flexibility and control as a solution to overcome the fact smaller organisations often lack resources, capability or technical infrastructure. Scarles et al. (2016b) suggested because of high use and ownership of smartphones, organisations could offer basic applications for visitors to download on their own devices, requiring small investments. Moreover, Jung and tom Dieck (2017) noted future advancements and technological innovation will likely reduce costs of AR integration. Kasinathan et al. (2016) also confirmed that AR implementation was feasible in relation to costs and content creation, but supported the need for further research.

Yet, despite continual technical advancements and improvements it remains that many more rural cultural heritage tourism organisations are restricted by WiFi and 3G connectivity, which are currently hindering the successful implementation and development of AR applications (Kounavis et al., 2012). Scarles et al. (2016b) also supported this, reporting many smaller organisations still face these same challenges when developing creative, innovative experiences and interpretation, in addition to challenges associated with cost and resource efficiency for smaller organisations. One reason for this proposed by Marimon et al. (2014, p.1) was the “development of the needed technology for AR systems, however, is still underway within the research community”.

Therefore, it remains that the potential of smartphone AR for cultural heritage tourism remains to be fully explored and importantly exploration of effective and usable designs of AR applications for tourism remain in their infancy (Yovcheva et al., 2012). AR is still considered a new technology which has not yet been examined to a great extent (Han et al., 2014), and as far back as 2005, Fritz et al. claimed more in-depth research was required to fully understand how AR can be used to enhance the tourist experience. This is still true today and research into the field of employing AR for the enhancement of cultural heritage tourism still remains limited (Jung et al., 2016; Tscheu and Buhalis, 2016). Thus Jung and tom Dieck (2017, p.11) “recommended to explore a suitable business model for the investment and implementation of multiple technologies into cultural heritage places”. Furthermore, in a study exploring the value of AR at cultural heritage sites, Tscheu and Buhalis (2016, p.608) reported that although AR has been claimed to increase competitive advantage, “it is questionable how this advantage is generated. What benefits exactly emerge through AR at CH sites? What stakeholder requirements exist? What needs to be considered in the development process?”. This confirms the need for further research to understand how AR creates value, before tourism organisations can develop and successfully integrate AR.

### **2.5.3 AR in Museums**

According to Johnson et al. (2010) museum educators have always been in the business of AR, creating bridges between objects, ideas and visitors. In most museums, artefacts are accompanied by extra material such as descriptions, pictures, maps and videos, and AR offers a way to make these descriptions more interesting and educating (Haugstvedt and Krogstie, 2012; Jung and tom Dieck et al. 2017). Scarles et al (2016b, p.20) claimed the museum sector has had a surge

of interest and adoption of digital interpretation methods, because “museums and art galleries are coming under increasing pressure, through visitor expectation and direct competition with other institutions, to introduce digital content to enrich user engagement”. This is supported by findings from a study by tom Dieck et al. (2016) of wearable AR in art galleries, that found visitors require in-depth, rich, appropriate and additional information that is easily accessible and provides a personalised experience based on areas of interest. Similarly, Cucchiara and Del Bimbo (2014, p.76) found using MAR applications in art galleries presents a number of benefits, such as “seeing what your eyes cannot reach...seeing what your eyes cannot see...telling you what you are seeing, [and] seeing with more eyes”.

AR applications can provide additional information which cannot be displayed and hence is normally hidden from the visitor (Cucchiara and Del Bimbo, 2014). The use of AR to open up access to archive material was also confirmed more recently by Scarles et al. (2016b). Tourism, and the exploration of museums is largely dominated by visual experiences (Alzua-Sorzabal et al., 2006), but AR creates opportunities to apply to all the senses, as well as creating more interesting, engaging and educational information. Hence, it is considered important that cultural heritage and museum managers recognise AR as a powerful tool to deliver information, based upon the fact that seeing, depicting and picturing are important elements of the process through which tourists learn about the world (Alzua-Sorzabal et al. 2006; Casella and Coelho, 2013). Moreover, researchers such as Ch'ng (2011) maintained that because AR enhances the user's experience and knowledge, it therefore enhances their experience in the environment which ultimately enables them to form a stronger connection and memories associated with a place. The benefits AR presented to the museum sector are outlined in Table 2.3. These benefits are essential, since it has been argued that museums need to create ‘info-cultural-tainment’ experiences; combining elements of leisure, entertainment, cultural, educational and social experience, in order to maintain and sustain competitive advantage (Palumbo et al., 2013).

Studies found AR provided tourists with a dynamic and interactive experience, bringing history and knowledge to life (tom Dieck and Jung, 2015). Offering a different dimension to the museum experience through an alternative perspective of reality, thus presenting a powerful tool for museums to overcome the homogeneity associated with ordinary museum experiences by creating more captivating content (Neuburger and Egger, 2017). Murphy (2015) suggested the use of technologies,

such as AR, will play an important role in museums since visitors now expect interactive and innovative experiences. Likewise, Radsky (2015) recommended museums that create seamless AR applications, merging digital information with museum displays, are more likely to be competitive in the long-term.

**Table 2.3 Uses and benefits of AR for Museums**

Theme	Uses and Benefits	Author/s
<b>Added value</b>	Adds value to the traditional museum experience	<i>Cranmer et al. (2016); tom Dieck and Jung (2015); Neuburger and Egger (2017); tom Dieck and Jung (2016a); Yovcheva et al. (2014)</i>
<b>Apply to all senses</b>	Extend beyond visual experiences, using AR to engage all senses	<i>Alzua-Sorzbabal et al. (2006); Casella and Coelho (2013); Cucchiara and Del Bimbo (2014)</i>
<b>Attract wider markets</b>	Improves attraction appeal, attracting wider and younger markets	<i>Scarles et al. (2016b); tom Dieck and Jung (2016a); Murphy (2015)</i>
<b>Bring to life</b>	Create re-enactments and brings stories to life, improving understanding	<i>Neuburger and Egger (2017); tom Dieck and Jung (2015);</i>
<b>Combines different elements</b>	AR can create 'info-cultural-tainment' experiences combining several experiential elements	<i>Cucchiara and Del Bimbo (2014); Olsson et al. (2012) Palumbo et al. (2013); Selvam et al. (2016)</i>
<b>Competitive advantage</b>	Use of AR increases, sustains and maintains competitive advantage	<i>Palumbo et al. (2013); Selvam et al. (2016); tom Dieck and Jung (2016a); Neuburger and Egger (2017)</i>
<b>Complete experience</b>	AR bridges the gap between objects, ideas and visitors	<i>Johnson et al. (2010); tom Dieck and Jung (2016a); Rhodes and Allen (2014)</i>
<b>Enhanced experience</b>	AR adds value and improves upon traditional museum experiences	<i>Ch'ng (2011); Hume and Mills (2011); Neuburger and Egger (2017); Palumbo et al. (2013); Rhodes and Allen (2014); Selvam et al. (2016); tom Dieck et al. (2016)</i>
<b>Interaction and sharing</b>	Encourages social interaction and sharing	<i>Damala et al. (2007); tom Dieck et al. (2016)</i>
<b>Learning</b>	Provides alternative forms of information, in addition to information boards and guided tours to increase interest and education.	<i>Alzua-Sorzbabal et al. (2006); Casella and Coelho (2013); Ch'ng (2011); Haugstvedt and Krogstie (2012); Neuburger and Egger (2017); tom Dieck et al. (2016); Yoon et al. (2012)</i>
<b>Memories and connection</b>	By enhancing experience and knowledge, it enables visitors to form a stronger memories and connection to attractions	<i>Ch'ng (2011); Selvam et al. (2016)</i>
<b>Opens up access to collections</b>	AR provides increased access to collections and exhibits in addition to those on display	<i>Cucchiara and Del Bimbo (2014); Damala et al. (2007); Leue et al. (2014); Palumbo et al. (2013); Selvam et al. (2016)</i>
<b>Preserve history</b>	Preserve and maintain history for the enjoyment of future generations	<i>Selvam et al. (2016); tom Dieck and Jung (2016a)</i>
<b>Progression</b>	Improves and modernises the visitor offer	<i>Murphy (2015); Neuburger and Egger (2017); tom Dieck and Jung (2016a)</i>
<b>Word-of-mouth</b>	Generate positive word of mouth marketing to increase visitor numbers	<i>tom Dieck and Jung (2016a);</i>

Source: Author (2017)

However, it has been argued the number of museums exploring the use and potential of AR to engage and attract tourists is minimal (Palumbo et al., 2013; tom Dieck and Jung, 2017; Weber, 2014). Despite the fact, AR presents numerous benefits to museums, by, for example, enhancing the visitor-experience, allowing them to become more involved in tours (Hume and Mills, 2011; Palumbo et al., 2013), personalising and integrating collections and exhibitions into a much broader range of case-scenarios (Palumbo et al., 2013). In addition, to the ability of AR applications to enhance the way visitors see, experience and interact with exhibitions, enabling users to interpret pieces in different ways (Damala et al., 2007). Yet, research exploring AR in museum contexts remains limited (tom Dieck and Jung, 2016), largely because of uncertainty and the high-risk associated with technology adoption (Scarles et al. 2016b; tom Dieck and Jung, 2017).

It was suggested certain requirements need to be investigated and resolved before museums and tourist organisations can realise ARs full potential. For instance, Kounavis et al. (2012, p.2) pointed out, that occasionally AR “prohibits the user from developing a relationship with the real world and the surroundings as it demands one’s full immersion within the stimulated environment”. However, tom Dieck and Jung (2016a) explored the use of wearable AR devices to overcome such issues, identifying that wearable devices, such as HMDs allow users to remain fully in an environment, using the device purely to enhance the view of their surroundings. Moreover, Rhodes and Allen (2014) acknowledged that HMDs (e.g. Google Glass) would positively change the way visitors experience museums, by creating unique, unobtrusive and enhanced experiences. Technological advancements have made HMDs non-invasive and unencumbering and in this sense, AR can be used to immerse users in a virtually enhanced real-world (Di Serio et al., 2013), providing them with richer content, whilst displaying visual annotations of artefacts and museum exhibits (Leue et al., 2014). However, it is important to note that handheld devices are the most popular type of AR device, and the benefits associated with HMDs are not the same as handheld devices.

tom Dieck and Jung (2017) identified the need to explore perceived value of AR from multiple stakeholders’ perspectives to increase longevity and viability. Moreover, tom Dieck and Jung (2016b) advocated the need to include school children in the design of AR applications, identifying they were interested in the enjoyment and interactivity of AR, which sparked their imagination and maintained attention. Yet, because AR still has a novelty factor in museum settings, Leue et al.

(2015) recognised a limited amount of research has explored how AR can be introduced to enhance museum learning and experiences.

As discussed in relation to cultural heritage, tom Dieck and Jung (2016a) and Scarles et al. (2016b) identified that larger organisations are often able to implement MAR applications, while smaller organisations or attractions generally have limited resources and funding, and are therefore more hesitant to invest in AR. Irrespective, AR has been found to add value to museums (e.g. Cranmer et al., 2016; Leue et al., 2015; tom Dieck and Jung, 2015; tom Dieck and Jung, 2016; Yovcheva et al., 2014). Furthermore, AR has been recognised as a method to move forward, preserve history, increase visitor-satisfaction, generate positive word-of-mouth, attract new target-markets, increase intention to return create a positive learning experience (tom Dieck and Jung, 2016), and add another element to learning (Yoon et al., 2012). According to Selvam et al. (2016) at present, the majority of museums present information using panels or speech (e.g. audio or guided tours), but AR presents visitors with a way to gather additional, richer information to create an enhanced experience using multimedia and multimodal content. This was supported by, Jung et al. (2015) and Olsson et al. (2012) who praised AR for its ability to enable visitor attractions to create more engaging content, by overlaying digital information onto exhibits, displays and artworks, but the true value of AR in the museum sector remains to be explored.

#### **2.5.4 AR in Tourism Education**

Most uses and applications of AR involve an underlying educational purpose. AR books for example have been developed to help the users bridge the gap between the digital and physical worlds whilst promoting interactive learning (Yuen et al., 2011). Considerable research attention focuses on and explores the potential and use of AR to enhance learning, teaching and educating (Billinghurst and Duenser, 2012; Dede, 2009; Dunleavy et al., 2009; Wu et al., 2013), because AR offers new ways to interact with information (Santos et al., 2014) and presents many merits in comparison to traditional teaching methods (Billinghurst et al., 2001). Ubiquitous and mobile learning has been driven forward by the increase in wireless communications, creating venues for learning outside the traditional classroom (Chen et al., 2013), overcoming time and place limitations by providing mobile AR applications via which users can experience, explore and develop problem-solving skills (Chen and Huang, 2012).

AR allows individuals to experience phenomena not possible in the real-world (Klopfer and Squire, 2008), supporting authentic exploration, providing supplementary materials to help learner's conduct investigations of their physical surroundings (Dede, 2009), interacting with the world in ways never before possible (Kesim and Ozarslam, 2012). Moreover, AR creates practices and literacies that cannot be developed and enacted with other technology-enabled learning environments. Bower et al. (2014) noted one of the main benefits of AR in education is instant access to information, at the exact time and place of need. Johnson et al. (2010) added that AR annotates existing spaces overlaying the real world with additional information. Hwang et al. (2015) added this is particularly beneficial to help users link what they are observing in the real-world with prior knowledge.

In addition, AR can provide cognitive support for difficult tasks (Bower et al., 2014), for example visualising complex spatial relationships and abstract concepts (Arvanitis et al., 2009), or allowing users to experience phenomena that are not possible in the real world, such as chemical reactions (Klopfer and Squire, 2008). Moreover, AR has been found to facilitate users in manipulating virtual materials from a variety of perspectives (Kerawalla et al., 2006). Because of such benefits, mobile AR learning has emerged as a key trend in instruction, providing learning with the convenience to learn anytime or anywhere (Chung and Lee, 2012). Importantly, AR has also been found to increase motivation and strengthen learning outcomes (Billinghurst and Duenser, 2012; Chang et al., 2010a; Chen et al., 2015; Johnson et al., 2010; Hwang and Wu, 2014). Yet, Hwang and Wu (2014) suggested that although the use of AR to improve education has gained much attention in recent years, the impacts of mobile learning on student's performance remains unclear.

Chen et al. (2017) identified that within 55 studies published between 2011 and 2016 that examine AR in education, it has most commonly been used to motivate, explain topics and add information. However, the use of AR in education is still relatively novel and faces several barriers, and importantly does not guarantee success. Bower et al. (2014) pointed out poor use of AR could create inferior learning outcomes, thus the challenge for educators is to implement AR in a way that supports and encourages student learning. Likewise, Wu et al. (2013) identified that although AR creates learning opportunities, it can also contribute to cognitive overload. Moreover, the educational values of AR are not solely based upon the use of technologies, but the way AR is designed, implemented and integrated plays a

key role in its ability to enhance education (Wu et al., 2013). In addition, Dunlevy et al. (2009) noted potential safety hazards if users become completely immersed in AR apps they are oblivious to the environment around them. Yet, despite such challenges, the benefits, use and potential of AR in education are widely recognised (See Table 2.4).

**Table 2.4 Uses and benefits of AR for education**

Theme	Uses and Benefits	Author/s
<b>Accessibility and availability</b>	Immediate access to a wide range of location-specific information in exact time and place of need. Avenues to teach outside traditional classroom environment	Bower et al. (2014); Chen and Huang (2012); Chen et al. (2013); Chung and Lee (2012); Wu et al. (2013); Yuen et al. (2011)
<b>Authenticity</b>	Sense of authenticity offered by AR learning environments promotes learners understanding, suitable to various learning styles	Billinghurst et al. (2001); Cheng and Tsai (2013); Dede (2009); Kerawalla et al. (2006); Wu et al. (2013)
<b>Cognitive support</b>	Provides better support for difficult tasks, such as visualising complex spatial relationships	Arvanitis et al. (2009); Chen et al. (2017); Dunleavy et al (2009); Klopfer and Squire (2008)
<b>Collaboration</b>	Enhances collaboration between students, instructors and among students	Billinghurst et al. (2001); tom Dieck and Jung (2016b); Wu et al. (2013)
<b>Context</b>	Provides contextual on-site learning experiences avoiding cognitive overload	Bower et al. (2014); Chen et al. (2017); Johnson et al (2010); Yuen et al. (2011)
<b>Control</b>	Helps students take control of their learning at their own pace and in their own way, creates student-led learning and avoids cognitive overload	Bower et al. (2014); Chen et al. (2017); Hamilton (2011)
<b>Creativity</b>	Fosters student's creativity and imagination	Klopfer and Sheldon (2010)
<b>Exploration of materials</b>	Engages, stimulates, and motivates students to explore class material from different angles	Kerawalla et al. (2006); Klopfer and Squire (2008); Kesim and Ozarslam (2012); Chen et al. (2017)
<b>Improved interaction</b>	Improves user interface, creating new ways to interact and manipulate information	Billinghurst et al. (2001); Kesim and Ozarslam (2012); Kerawalla et al. (2006); Klopfer and Squire, (2008); Santos et al. (2014); Yuen et al. (2011)
<b>Knowledge acquisition</b>	AR environments can facilitate skill acquisition and skills training	Chen et al. (2017); Wu et al. (2013); Yuen et al. (2011)
<b>Motivation</b>	AR environments can increase student's motivations and interest to gain more accurate knowledge on the topic	Arvanitis et al. (2009); Billinghurst and Duenser (2012); Johnson et al. (2010); Chang et al. (2010a); Chen et al. (2015); Hwang and Wu (2014); Lee (2012); Leue et al. (2014); Wu et al. (2013)
<b>Ubiquity</b>	Creates venues for learning outside traditional learning environments, overcome challenges associated with these traditional environments	Chen et al. (2013); Chen and Huang (2012); Yuen et al. (2011); Wu et al. (2013)
<b>Understanding</b>	Accessing information anytime, anywhere allows users to link what they are seeing with prior knowledge	Hwang et al. (2015); Johnson et al. (2010); Chen et al. (2017); Wu et al. (2013)

Source: Author (2017)

According to Oh et al. (2007) it is common for tourists to participate in activities at tourism destinations, such as cultural heritage attractions and museums, that increase their skills and knowledge. In a tourism context, AR presents much potential to improve and enhance education and learning. The use of AR has been found to positively contribute to the tourist learning experience, increasing both enjoyment and engagement (Leue et al., 2015; tom Dieck et al., 2016). Yet, despite extensive research during the past 20 years, adopting AR in education still remains a challenge, due to issues of integration with traditional learning methods, development costs, maintenance costs and the resistance to adopting new technologies (Lee, 2012). Tourism scholars have only recently begun to explore the use of AR to increase the tourist learning-experience.

### **2.5.5 Other AR applications**

Gamification has emerged as another key avenue for AR, driven by the need to offer new experiences (Viana and Nakamura, 2014), excitement and entertainment (Pucihar and Coulton, 2014). Froschauer et al. (2010) suggested games have become as much a part of our culture as books, films and social media. Games have also been long recognised as powerful mediators of learning (Rieber, 1996), moving beyond entertainment to educate players (Froschauer et al., 2010), creating fun and engaging learning experiences (Mortara et al., 2014). Within tourism, social interaction facilitated within AR gameplay has been found to enhance tourists' sense of presence (Blum et al., 2012).

In a cultural heritage context, AR games have been acknowledged as effective tools to learn in an engaging way (Mortara et al., 2014). Zarzuela et al. (2013) suggested AR games were efficient learning alternatives offering the possibility for users to interact in more attractive and active way through changing their perception of the real environment. In addition to helping tourists develop deeper levels of engagement with destinations, whilst gaining knowledge using fun location-based learning scenarios (Froschauer et al., 2010; Weber, 2014). The number of tourism destinations and organisations that have begun to explore gamification to encourage co-creation and produce 'technology-enhanced tourism experiences' to improve marketing, sales and customer loyalty have increased (Neuhofer et al., 2012).

In 2015, Egger and Bulencea published a book "Gamification in Tourism" exploring how gamification can contribute to memorable tourist experiences. More recently,

Xu et al. (2017) found gamification of tourism contributes to more rewarding interactions and a higher level of satisfaction, as well as increased brand awareness and destination loyalty. Focusing specifically on tourism marketing, they reported AR gamification presents several benefits; raising brand awareness, enhancing the tourist experience, improving engagement, improving customer loyalty, increasing entertainment and as a tool for employee management. However, the use of AR gamification in the tourism sector remains an under researched field, only recently gaining attention.

Besides, tourism, cultural heritage tourism and museums, AR has been used and applied in many other industries. For instance, Yuen et al. (2011, p.124) argued that “in no other field has the AR excitement exploded in such a huge way than in advertising and marketing”. Because AR delivers tailored, context-aware and location-based content (Palumbo et al., 2013), advertising and marketing is considered a key for application for AR (Hassan and Jung, 2016; Nguyen, 2011). It has been found AR offers new ways to engage and attract customers (McQuarter, 2013; Yuen et al., 2011), improve brand-engagement and drive sales (Engine Creative, 2012), broaden appeal to younger and wider audiences (Craig, 2013; Celtek, 2015), and follow users through the whole relationship cycle (Palumbo et al., 2013). Moreover, AR offers the opportunity to apply to all senses, and it has been predicted AR multi-sensory marketing will be the next big thing (Agapito et al., 2012; Krishna and Schwarz, 2014). In addition, more recently companies have begun to explore the use of AR to monitor and quantify the success of their marketing efforts (Liao, 2015).

## **2.6 The Future of Augmented Reality**

Since its conception, the uses, benefits and potentials of AR have continually developed and improved. AR has been described as “one of the most powerful technologies in the field of computer science” and has added a new dimension to the world of computing (Biseria and Rao, 2016, p.2595). In the future, Craig (2013) predicted AR will be developed to appeal to many of our senses, because although currently the visual medium dominates, it is not effective to just watch or listen to AR, users should engage with AR to gain an experience. In this way, “the environment around a person can become much more interactive and digital” (Biseria and Rao, 2016, p.2594), which it is believed would positively affect the everyday lives of users (Kipper and Rampolla, 2015).

Besides advanced technological capabilities, Javornik (2016) identified three additional elements that have facilitated the mass adoption of AR applications; meaningful content, convincing and realistic interaction of the virtual with the real-world physical environment and unique value that goes beyond what other technologies have the capability to offer. The latter is particularly important; however, the true value of AR remains to be explored. Referring to the Human Computer Interaction Theory, Bisaria and Rao (2016) suggested in the future AR systems will be able to interpret human gestures and movements, for example mimicking human brains and complex movements to create deeper learning experiences.

AR is an innovative technology, which is still evolving and developing. Hassan and Rahimi (2016, p.131) argued “innovation is expressed through creativity or excellence and thus the process is simultaneously well-balanced with product or service development”. They believe that in the context of tourism, innovation is expressed through destination-management, service or product development. Therefore, by adopting and implementing AR to develop the products or services offered, or increase the efficiency of destination-management, it can be claimed tourism organisations are innovative. However, currently, AR is still an emerging and potential technology for digital tourism and management (Hassan and Rahimi, 2016). Nevertheless, according to the Digital Marketing Bureau (2016), AR is a multi-million-pound industry, whose growth is a direct result of consumer addiction to smartphone and tablets, with revenue from AR predicted to be £600 billion in 2016, increasing to £5.2 billion in 2017. Moreover, by 2018 it is predicted there will be 200 million MAR users, creating many business opportunities, but it is argued we have only just scratched the surface of ARs potential (Digital Marketing Bureau, 2016).

## **2.7 Benefits of Augmented Reality**

A number of AR benefits have already been discussed (see Tables 2.1 to 2.4) although it is still argued that AR’s true potential remains to be seen. Many sectors are well-placed to benefit from AR, with potential to extend beyond commercial applications, such as increasing organisational efficiency (Hayes, 2009) and improving access to meaningful information (Kleef et al., 2010).

In a study of 262 respondents assessing perception of AR in general, Olsson et al. (2012) concluded results demonstrate an ambivalent attitude towards future AR

services, identifying the increased extent of available information from real-life objects was highly desirable, and AR created new possibilities for services and experiences to increase an individual's understanding of their environment. Respondents agreed the use of AR in everyday life was valuable, facilitating easier information retrieval, making tasks quicker to perform whilst saving time and effort, especially in unfamiliar environments. In addition, AR was acknowledged for its ability to improve interaction possibilities and provide rich and contextually-relevant information for the ad hoc needs in mobile daily life. Finally, they argued the most valuable services facilitated by AR are those that provide or demonstrate pragmatic usefulness for the user, such as saving time or reducing effort. As well as these benefits, Table 2.5 presents some of the main tangible and intangible benefits of AR identified in research

**Table 2.5 Tangible and Intangible benefits of AR**

Benefits of AR	Author/s
<b>Tangible</b>	
Effective sales enabler, improves brand engagement and sales	<i>Engine Creative (2012); Hampp (2009); Hidden Creative (2011); Neagle (2013); Skeldon (2011); Thompson (2010);</i>
Adds value to customers experience increasing custom	<i>Cunningham (2012); Fino et al. (2013); Thomes (2014); Yuen et al. (2012)</i>
Makes everyday tasks easier and quicker to perform	<i>Kamphuis et al. (2014); Olsson et al. (2012); Sangen (2014); Young (2014); Yuen et al. (2011; Van Krevelen and Poelman (2010)</i>
Improves cost effectiveness, supporting business processes	<i>Carmignani and Furht (2011); Rankohi and Waugh (2013)</i>
Provides access to information anytime, anywhere	<i>Chen et al. (2013); Chung and Lee (2012); Lee (2012); Oh et al. (2014); Olsson et al. (2012)</i>
Technology attracts visitors thus increases profits	<i>Engine Creative (2012); Lashkari et al. (2010); Palumbo et al. (2013)</i>
Helps advertisers reach wider audiences and develop stronger relationships with customers	<i>Juniper Research (2013); Nguyen et al. (2015); Yuen et al. (2011)</i>
Benefits of AR	Author/s
<b>Intangible</b>	
Engages and addresses the needs of younger generations	<i>Jung and tom Dieck (2017); tom Dieck and Jung (2017); Weber (2014)</i>
Can personalise and tailor information to an individuals' preferences	<i>Garcia-Crespo et al. (2009); Kounavis et al. (2010); Palumbo et al. (2013)</i>
Enhances perception of the real-world	<i>Exeter University (2012); Kleef et al. (2010); Roesner et al. (2014); Rhodes and Allen (2014); Schmalsteig et al. (2011); Yuen et al. (2011)</i>
Increases availability and accessibility of information	<i>Johnson et al. (2010); Kleef et al. (2010); Kounavis et al. (2012); Olsson et al. (2012); Sparacino (2002); Squire and Klopfer (2007); Yuen et al. (2011)</i>
Increases the possibility of social interaction and connectivity	<i>Kounavis et al. (2012)</i>
Potential of portability, outdoor use and mobility	<i>Han et al. (2014); Van Krevelen and Poelman (2010);</i>

Facilitates the retrieval of rich information in current situations or contexts specific to the users real-world location	<i>Marimon et al. (2014); Olsson et al. (2012); Pokric et al. (2014); Wasko (2013); Wang et al. (2013)</i>
There are a potential variety of ways to present and implement AR	<i>Carmignani and Furht (2011); Cunningham (2012); Dong and Kamat (2013); Livingston et al. (2011); Van Krevelen and Poelman (2010)</i>
Helps with explaining and detailing complex tasks and processes	<i>Alzua-Sorzabal et al. (2006); Arvanitis et al. (2009); Dunleavy and Dede (2014); Dunleavy et al. (2009); Kamphuis et al. (2014); Klopfer and Squire (2008); Marimon et al. (2014); Rankohi and Waugh (2013); Sangen (2014)</i>
Makes the learning experience more interactive, engaging and fun	<i>Jung et al. (2014); Kounavis et al. (2010); Mortara et al. (2014); Wu et al. (2013); Yuen et al. (2011)</i>
Can increase learner motivation and problem-solving skills	<i>Chen and Huang (2012); Chen et al. (2013); Höllerer and Feiner (2004); Schmalsteig et al. (2011); Yuen et al. (2011);</i>
Navigation and location-orientated capabilities	<i>Alzu-Sorzabal et al. (2006); Höllerer and Feiner (2004); Rey-López et al. (2011); Takada et al. (2009); Yovcheva et al. (2012); Yuen et al. (2011)</i>
Potential to help individuals with sight or hearing impairments with everyday tasks	<i>Cellan-Jones (2014); Kiyokawa (2012); Rhodes and Allen (2014a)</i>

Source: Author (2017)

## 2.8 Augmented Reality Barriers

Despite its benefits and potential, AR is constrained by a number of factors. It is still a new market, thus users and developers need to be fully aware of how it works and what customers value (Layar, 2013). As well as this, technical barriers currently hinder AR from reaching its full potential, yet once overcome, it is predicted AR use will increase exponentially (Juniper Research, 2013; Kleef et al, 2010), and despite technical challenges, AR use and adoption over the past few years has continued to increase.

Irrespective that MAR has been used for over 40 years, it has been claimed many potential applications cannot be implemented due to technical limitations and non-technical issues, like user-adoption (Nazri and Rambli, 2014). Marimon et al. (2014, p.122) attributed this partly to the fact AR “objects have to be tracked and information has to be rendered in real time”. Therefore, before AR is widely used and accepted, these fundamental technical issues need to first be addressed and resolved (Van Krevelen and Poelman, 2010).

Before AR becomes an accepted part of everyday life, Van Krevelen and Poelman (2010) argued issues regarding intuitive interfaces, costs, weight, power-usage, ergonomics, and appearance should be addressed. Over the past few years, developments and advancements have progressed, but further research is necessary. Similarly, Taqvi (2013) suggested initial AR application development has been held back by technological constraints such as the speed of operation, need

for large memory, visual data conversion, microminiaturisation, high data rates requiring large bandwidth and transmission. Subsequently, this means often applications crash or provide poor experiences which leads to end-user frustration (Juniper Research, 2013). Therefore, Layar (2013) argued for wide-scale use, mobile networks and 4G technology need updating, as improvements to mobile hardware will enable faster and better processors and sensors. However, they noted this was being made easier by “the cost for mobile internet access is dropping as well, helping bring AR technology to more people than ever before” (Layar, 2013, p.13).

Another factor to consider is whether consumers will actively use and embrace AR once it becomes commonplace (Kleef et al., 2010). Juniper Research (2013) suggested that while awareness among early adopters is good, widespread consumer awareness is still low and often confined to a single class. There remains a high lack of awareness among the general public regarding AR technology, although recent development such as Pokémon Go have increased consumer awareness. Van Krevelen and Poelman (2010, p.15) consider social acceptance as a barrier, stating “getting people to use AR may be more challenging than expected, and many factors play a role in social acceptance ranging from unobtrusive fashionable appearance to privacy concerns”. The development of a successful AR end-user service remains in its infancy as a result of lack of research into potential use, acceptance and expectations (Olsson et al., 2012). The main current constraints of AR technology are summarised in Table 2.6

However more recently, the number of studies exploring use intentions and adoption has increased. In a study of user attitudes to AR applications, Olsson et al. (2012) found the perceived drawbacks or risks mainly manifest in fear of virtual experiences and information completely replacing reality. They also found respondents were worried about requiring an excessive amount of information or being flooded with information. Hereby it is clear users need to be in control of the amount and type of information they receive (Olsson et al., 2012). In a similar way, Van Krevelen and Poelman (2010) identified potential for users to be overloaded and become over reliant on AR technology and applications. It is important that “aside from technical challenges, the user-interface must also follow some guidelines so as to not overload the user with information while also preventing the user to over-rely on the AR system such that cues from the environment are missed” (Van Krevelen and Poelman, 2010, p.15). MARs need to have leveraging functionalities of AR as these

can exploit the unique characteristics of mobile devices and mobility to enhance and enrich interaction among AR users in social contexts and tourism (Kounavis et al., 2012).

**Table 2.6 AR Barriers**

AR Barriers	Author/s
Technological constraints	<i>Höllerer and Feiner (2004); Nazri and Rambli (2014); Olsson et al. (2012); Sung (2011b); Taqvi (2013); Van Krevelen and Poelman (2010)</i>
High development costs	<i>Layar (2013); Taqvi (2013); Thomes (2014)</i>
User adoption, acceptance and suitability	<i>Höllerer and Feiner (2004); Jensen (2014); Kleef et al. (2010); McQuarter (2013); Nazri and Rambli (2014); Szymczyk (2011); tom Dieck et al., (2016); Van Krevelen and Poelman (2010)</i>
Lack of awareness and understanding	<i>Juniper Research (2013); Layar (2013); Nazri and Rambli (2014); Olsson et al. (2013)</i>
Poor appearance, weight and ergonomics of AR devices	<i>Van Krevelen and Poelman (2010)</i>
Information overload	<i>Rey-López et al. (2011); Wu et al. (2013); Van Krevelen and Poelman (2010)</i>
Device constraints	<i>Carpenter (2010); Jung et al. (2013); Nazri and Rambli (2014); Schmalsteig et al. (2011)</i>
Requires further development and exploration	<i>Eyles and Eglin (2008); Han et al. (2014); Jung and tom Dieck (2017); Kerawalla et al. (2006); Lee (2012); Nazri and Rambli (2014); Rankohi and Waugh (2013); Van Krevelen and Poelman (2010); Young (2014)</i>
Usability across multiple platform devices	<i>Young (2014); Yuen et al. (2011)</i>
Device use safety issues	<i>Carpenter (2010); Dunleavy et al. (2009)</i>
Wi-Fi connection and roaming charges	<i>Jung and tom Dieck (2017); Kounavis et al. (2012); Scarles et al. (2016b)</i>
High user expectation	<i>Gherghina et al. (2013); Keil et al. (2011)</i>
Seen as gimmicky	<i>Johnson et al. (2010); Jung et al. (2014); McQuarter (2013); Yuen et al. (2011)</i>
Few business models are successfully exploiting AR	<i>Juniper Research (2010); Kleef et al. (2010); Skeldon (2011); tom Dieck and Jung (2017)</i>
Cost of Use	<i>Jung et al. (2016); tom Dieck and Jung (2015)</i>

Source: Author (2017)

## 2.9 Summary

This chapter has discussed the implementation, application, potential, benefits and constraints of AR technology. AR has emerged as an immensely promising technology, creating opportunities to a range of sectors; however, the true potential of AR remains to be explored. In comparison to other industries, ICT has had a more marked effect on the tourism sector, forcing businesses to adapt and find new ways to survive (Al-Debei and Avison, 2010; Livi, 2008). AR offers a way for tourism to provide value-added services such as interactivity, education and entertainment, into the tourist experience (e.g. Jung et al., 2016). However, despite increased smartphone ownership, mass adoption of AR technology is limited by technological constraints, uncertainty regarding implementation and use, user adoption, and an

overall lack of awareness. There remains a gap between understanding the potential of AR, how to implement it and above all what business model or monetisation strategy to adopt. The fact remains, few business models are successfully exploiting the potential of AR in tourism (Kleef et al., 2010), and hence AR remains widely under-utilised in the tourism sector despite the significant benefits it presents. Therefore, Jung and tom Dieck (2017) established the need to develop a BM to implement technologies in cultural heritage tourism.

Olsson et al. (2012, p.45) argued “it is yet to be seen what will be the true value of AR as an interaction paradigm and what kind of behavioural and societal implications the technology might have on people”. It is considered imperative that prior to implementation a BM is developed to support developers, managers, and practitioners to effectively implement AR, explore and realise its value adding potential. The next chapter will examine the theory of BMs, their use, components and benefits to understand how to most effectively develop a BM for AR and ensure attractions do not lost out on the potential presented by AR.

## **CHAPTER 3 BUSINESS MODELS**

### **3.1 Introduction**

The previous chapter explored the uses, potential, benefits and barriers presented by AR to tourism, specifically cultural heritage tourism; highlighting the lack of a BM, and research into how tourist organisations could adopt AR to benefit from its value-adding potential. Therefore, this chapter will review the theory of BMs to understand their purpose, development, and components. At the same time the chapter will examine the importance of Business Model Innovation (BMI), Sustainable Business Models (SBMs), success factors and barriers. Following this, existing traditional, electronic, mobile, tourism and AR BMs will be reviewed. The chapter will conclude by a discussion and of the justification to use of the V4 BM as a framework to guide research questions and themes during the next phases of the study.

### **3.2 Business Model Origins**

The term BM has been the subject of debate in scientific discussions for over 50 years (Wirtz et al., 2016). According to Gummesson et al. (2010) and Wirtz et al. (2016), BMs were conceptualised by Bellman in 1957. However, Shafer et al. (2005) disagreed, claiming BMs origins can be traced back to the writings of Peter Drucker in 1954. Whereas, in a review of Harvard Business Review archives, Ovans (2015) disputed that Drucker conceptualised the concept, claiming he did not discuss BMs, rather business processes and assumptions, emphasising the ‘theory of business’, rather than BMs. Not until 1960, was the term BM used in the title of an academic journal (Gummesson et al., 2010), and only in the mid-1970’s did BMs become regarded as management tools (Konczal, 1975). Despite some mentions, reference to BMs in publications was rare until the late 1990s (Osterwalder et al., 2005; Saebi and Foss, 2015; Zott et al., 2010) and even when mentioned Wirtz et al. (2016) claimed it was unspecific, and BMs were commonly confused with business modelling or process models.

In the late 1990’s the BM concept gained popularity, as a result of the internet transforming the world of business (Afuah and Tucci, 2001; Osterwalder, 2004). The growth of the internet intensified the need for businesses to innovate, in order to remain profitable in an ever-increasing competitive electronic market (Al-Debei and Avison, 2010; Zott and Amit, 2010), which resulted in a wider application of BMs and usage increased significantly. Only then, Wirtz et al. (2016) argued did BMs become significant and according to Magretta (2001) emerge as a popular buzzword.

However, in line with this increased popularity, criticism of the concept also amplified, as did attention focussing on the absence of a clear BM definition and immaturity of the concept (Wirtz et al., 2016). Porter (2001) for instance, commented that BM definitions were murky at best, generating faulty-thinking and self-delusion among managers who associated BMs with loose conceptions of business operations. Therefore, during 2002, in response to criticism, BM research focused predominantly on developing a clear definition of the concept (Wirtz et al., 2016).

During 2005, Shafer et al. (2005) conducted a study attempting to clarify confusion surrounding BMs and their use, identifying 12 definitions, and 42 BM components, which they combined into four categories: strategic-choices, value creation, value-network, and capture-value and a number of sub-categories containing multiple elements. Based on this, they proposed a BM definition, stating that BMs were “a representation of firm’s underlying core logic and strategic choices for creating and capturing value within a value network” (Shafer et al., 2005, p.202). Their definition proposed BMs as tools to articulate cause-and-effect relationships, ensure consistency of strategic choices and capture returns from that value to generate a profit.

Post-2005, researchers generally accepted that authors talking about the BM concept were referring largely to the same concept, at varying levels. Thus between, 2005 and 2011, research attention shifted from defining the concept, to identifying BM components and exploring the position of BMs in relation to strategy (Casadesus-Masanell and Ricart, 2010; Teece, 2010). These areas are explored in more detail in the next sections:

### **3.3 Business Model Definitions**

The absence of a clear BM definition has been attributed by Zott et al. (2010) to ‘fuzziness’ surrounding the concept, due to the fact literature developed in ‘silos’, specific to the subject of phenomena or interest of the researcher. They argued that this produced conceptual differences among researchers, silos, and even within the same silo. Historically, researchers have approached the subject from different viewpoints and contextual backgrounds (Al-Debei and Avison, 2010; Al-Debei and Fitzgerald, 2010), creating a heterogeneity of approaches, lacking a uniform theoretical foundation (Pateli and Giaglis, 2004; Teece, 2010; Wirtz et al., 2016). Lambert and Davidson (2013, p.3) supported that “conceptualisations, and therefore definitions, vary depending on the purpose for which the concept is being used and

the theoretical perspective of the researchers". Hence, the concept remains 'fuzzy' (AI-Debei and Avison, 2010; Zott et al., 2010), described as an ill-defined buzzword (Seddon et al., 2004), which is murky at best (Porter, 2001), fragmented (Chesbrough and Rosenbloom, 2002; Wirtz et al., 2016), and despite its long history, underdeveloped (Chesbrough and Rosenbloom, 2002; Magretta, 2002).

In 2010 Zott et al. conducted a study of BM origins examining 1,177 journal papers which addressed the notion of BMs between 1995 and 2009. However, from these they failed to identify common agreement among scholars on what a BM is. George and Bock (2011) attempted to address the incoherence of the concept and establish an all-encompassing BM definition (See Appendix 2) but concluded that attempting to establish a convergence of definitions caused divergence rather than convergence, because of the variety of roles BMs fulfill. They suggested authors are often unclear from what perspective they are approaching the concept, and therefore do not consider other perspectives, maintaining belief that theirs is accurate. Thus, it remains that there is still no uniform understanding of BMs because often they are both researched and discussed "without explicitly defining the concept" (Zott et al., 2010, p.5).

Nevertheless, BMs continue to receive much research attention, because of their importance as management tools. To understand the confusion, Table 3.1 presents some BMs definitions, descriptions and components from 1996 to 2015. Examining the table chronologically, the impact external influences have had upon definitions is evident. For example, post-2000 definitions increasingly mention technological factors because of the internet boom and introduction of electronic Business (eBusiness). However, one of the main commonalities between definitions is their reference to value, value proposition, economic value, value network or value exchange, therefore implying the theme of value is an essential BM component. Besides the theme of value, definitions refer to components such as strategy, resources, logic, and collaboration, which relate to operations or processes. An examination and review of these definitions implies BMs are concerned with creating value and distributing value. Yet, it also portrays the variance of different perspectives and suggested BM components.

**Table 3.1 Selected BM definitions and their main components**

Author/s	BM Definition	Main Components
<i>Slywotzky (1996)</i>	BM is the totality of how a business selects their customers, outline the tasks it will perform itself and those best to outsource, organises its resources, takes their product or service to market and also provide utility for their customers and generate profits.	Resources, network, products and services, customers, profits
<i>Timmers (1998, p.4)</i>	Architecture for products, services, and information flows including a description of various business actors and their roles; A description of potential benefits for various business actors and description of sources of revenues	Product architecture, value proposition, revenue sources
<i>Venkatraman and Henderson (1998, p.33-34)</i>	Strategy reflecting the architecture of a virtual organisation along three main vectors; customer interaction, asset configuration and knowledge leverage	Organisation architecture, organisation strategy, assets, customer interactions
<i>Rappa (2000)</i>	A method of doing business by which a company can sustain itself, that generates revenue. BM spells out how a company makes money by specifying where it is positioned in the value chain	Revenue sources, value chain
<i>Linder and Cantrell (2000, p.1-2)</i>	Organisations core logic for creating value. BM for profit-orientated enterprise explains how to make money	Value proposition, revenue sources
<i>Gordijn et al. (2000, p.41)</i>	Answers question to 'who is offering what and to whom and what is expected in return?'. A BM explains the creation and addition of value in a multi-party stakeholder network, as well as the exchange between stakeholders	Value proposition, value exchange, stakeholder network
<i>Petrovic et al. (2001, p.2)</i>	Describes the logic of a 'business system' for creating value that lies beneath the actual processes	Business logic, value proposition
<i>Amit and Zott (2001, p.4)</i>	Depicts the design of transaction content, structure and governance so as to create value through the exploration of new business opportunities	Value proposition, content, structure, governance
<i>Dubosson-Torbay et al. (2002, p.3)</i>	Organisations architecture and its networks or partners for creating, marketing and delivering value and relationship capital to one or several segments of customers in order to generate profitable and sustainable revenue streams	Value proposition, collaborative transactions, networks, revenue
<i>Stähler (2002, p.6)</i>	A model of an existing business or a planned future business. A model is always a simplification of the complex reality. It helps to understand the fundamentals of a business or to plan how a future business should look like	Current and future business reality simplification
<i>Magretta (2002, p.4)</i>	Tells a logical story explaining who your customers are, what they value, and how you will make money in providing them that value	Value proposition, Revenue sources
<i>Bouwman (2002)</i>	A description of roles and relationships of a company, its customers, partners, and suppliers, as well as the flows of goods, information and money between these parties and the main benefits for those involved, in particular, but not exclusively the customer	Collaborative transaction, value proposition

<b>Author/s</b>	<b>BM Definition</b>	<b>Main Components</b>
<i>Chesbrough and Rosenbloom (2002, p.529)</i>	BM presents the heuristic logic that connects technical potential with the realisation of economic value. Connects product development and customer needs.	Economic value, technical value
<i>Camponovo and Pigneur (2003, p.4)</i>	Detailed conceptualisation of an enterprise's strategy at an abstract level, which serves as a base for the implementation of business processes	Intermediate theoretical layer
<i>Hedman and Kalling (2003, p.49)</i>	A term used to describe key components of a given business. Customers, competitors, activities, organisation, resources, supply factors, production inputs and process components to cover the BM over time	Key business components, value proposition, value network, value architecture, structure
<i>Haaker et al. (2004, p.610)</i>	A blueprint of collaborative effort of multiple companies to offer a joint proposition to their customers	Collaborative transaction, value proposition
<i>Leem et al. (2004, p.78)</i>	A set of strategies for corporate establishment and management including a revenue model, high-level business processes and alliances	Organisation strategy, revenue, alliances
<i>Rajala and Westerlund (2005, p.3)</i>	The ways of creating value for customers and the way business turns market opportunities into profit through sets of actors, activities, and collaborations	Value Proposition, collaborative transactions, actors, activities
<i>Osterwalder et al. (2005, p.17-18)</i>	A BM is a conceptual tool that contains a set of elements and their relationships and expresses the business logic of a specific firm. It is a description of the value a company offers to one or several segments of customers and of the architecture of the firm and its network of partners for creating, marketing and delivering this value relationship capital, to generate profitable and sustainable revenue streams	Product, customer interface, infrastructure management, financial aspects
<i>Tikkanen et al. (2005)</i>	BM is the firm's system manifested in the components, related material and cognitive aspects. Key BM components include the network of relationships, operations carried out in business processes, resource base and finance and accounting concepts	Strategy, structure, network, operations, finance and accounting
<i>Voelpel et al. (2005)</i>	The way of doing business is reflected in the businesses core value proposition/s for customers, providing that value, using strategic capabilities and other value networks, and its continued sustainability to reinvent itself and satisfy multiple objectives of various stakeholders	Customer value propositions, value network configuration, sustainable returns for stakeholders
<i>Morris et al. (2005, p.727)</i>	Concise representation of how an interrelated set of decision variables in areas of venture strategy, architecture and economics are addressed to create sustainable competitive advantage	Value proposition, customer, internal processes/competencies, external positioning, economic model, person/investor factors
<i>Shafer et al. (2005, p.202)</i>	Representation of a firm's underlying logic and strategic choices for creating and capturing value within a value network	Business logic, strategy, value proposition, value network
<i>Giaglis et al. (2006, p.282-283)</i>	Means by which a firm can create value by coordinating the flow of information, goods and services among various industry participants including customers, partners within the value chain, competitors and government	Value proposition, industry participants

<b>Author/s</b>	<b>BM Definition</b>	<b>Main Components</b>
<i>Andersson et al. (2006, p.1-2)</i>	BMs are created in order to make clear who the business actors are in a business case and how to make their relationships explicit. Relations in a BM are formulated in terms of value exchange between the actors	Collaborative transactions, value exchange, actors
<i>Johnson et al. (2008, p.52)</i>	BMs involve four interlocking elements, that when taken together create and deliver value	Customer value proposition, profit formula, key resources, key processes
<i>Kamoun (2008, p.638)</i>	BM is a blueprint of the way businesses create and capture value from new services, products or innovations	Value creation, value capture, innovation
<i>Janssen et al. (2008, p.204)</i>	Reflects core business of an organisation, useful to describe the organisation from the perspective of its main mission, and the products or services it provides to its customers	Business logic, value proposition, customers
<i>Pels et al. (2009)</i>	Configurations of interrelated capabilities, governing the content, process, and management of the interaction and exchange in didactic value co-creation	Content exchange and creation, processes, management
<i>Teece (2010, p.179)</i>	Articulate the logic data and other evidence that supports the value proposition for the customer, and a viable structure of revenues and costs for the organisation delivering the value	Value proposition, revenue structure
<i>Saebi and Foss (2015, p.2)</i>	BMs are content, structure, and governance of transactions inside the company and between the company and its external partners in support of the company's creation, delivery and capture of value	Value capture, value delivery, value network

Source: Adapted and extended by author, based upon work of (Al-Debei et al., 2008, p.2-3; Zott et al., 2010, p.6; Gummesson et al., 2010)

Evidently, a plethora of BM terms exist, and are often used interchangeably (Morris et al., 2005), contributing to confusion of BM use and application (Shafer et al., 2005). This problem has been intensified further by scholars such as Afuah, who have used multiple terms to describe BMs; recipe (Afuah, 2015), method (Afuah and Tucci, 2001) and framework (Afuah, 2004). In comparison, more strategically-orientated scholars have used terms such as structural template (Amit and Zott, 2001), totality of business (Slywotzky, 1996), arrangement of activities (Johnson, 2013), mechanism (Andersson et al., 2006), management hypothesis (Teece, 2010) and conceptual tool (Osterwalder, 2004; Osterwalder et al., 2005). Whereas, other scholars used descriptive terms such as, representation (Morris et al., 2005; Shafer et al., 2005) concise representation (Morris et al., 2005; Stewart and Zhao, 2000), logical representation (Magretta, 2002; Panagiotopoulos et al., 2012), abstract representation (Al-Debei and Fitzgerald, 2010), pattern (Brousseau and Penard, 2007), set (Seelos and Mair, 2007), blueprint (Chesbrough and Rosenbloom, 2002; Kamoun, 2008), vehicle (Thompson and Martin, 2010), statement (Stewart and Zhao, 2000), description (Applegate, 2001; Weill and Vitale, 2013) or architecture (Dubosson-Torbay et al., 2002; Timmers, 1998). The variation of terminologies used

has heightened confusion of the concept even more, exasperated further by a lack of consistency or clarity which Zott et al. (2010, p.6) argued created a “dispersion rather than convergence of perspectives”.

However, despite a plethora of definitions existing, it is possible to identify certain similarities among them. For instance, Osterwalder et al. (2005) classified BM literature into three categories: BMs as an abstract and overarching concept describing the real-world business, BMs describing a number of different abstract types of classification schemes, and BMs presenting aspects of a conceptualisation of a real-world BM. Based on this they proposed a descriptive BM definition identifying the most commonly-used BM building blocks and comparing the most frequently mentioned BMs and their components, and as a result developed the BM canvas discussed further in the chapter.

Al-Debei and Avison (2010) also attempted to combat confusion, and argued the “murkiness” of the concept was a result of the use of multiple definitions and terminology attributed to three factors;

- 1) The youthfulness of the concept and its related research (Osterwalder et al., 2005; Zott et al., 2010)
- 2) Concept comes from diverse disciplines such as eBusiness, eCommerce, business management and economics (Pateli and Giaglis, 2004; Shafer et al., 2005)
- 3) Sectors that BMs are being investigated in are new and therefore little is known about them (Al-Debei and Avison, 2010).

This goes some way to understanding the confusion surrounding the concept, and specifically in the context of this study, the latter is particularly true, because AR is a new and emerging field with limited application in the tourism sector.

The absence of clarity has also resulted in the application of the concept to three different areas of scientific discourse: technology, strategy, and organisations (Zott et al., 2011). From an organisational perspective, authors view BMs as a tool for abstraction of an entire company (Wirtz et al., 2016). Strategically, BMs are acknowledged as abstract tools to understand competitive business situations (Hamel, 2000). Whereas, from a technological perspective, managers tend to adopt a detailed viewpoint, viewing the BM as a small part of the company (Wirtz et al., 2016). Since 2002, Wirtz et al. (2016) identified that the boundaries between the three orientations have merged and research tends to focus on aspects of all three,

creating a more uniform understanding of the concept. It has also been accepted that nowadays the construct is applicable to different types of business (Shafer et al., 2005; Teece, 2010), yet it has been argued that managers often confuse and misinterpret their BM as their strategy (Al-Debei and Avison, 2010), fuelling debate regarding a BM's relationship to strategy.

### **3.4 Business Models relationship to Strategy**

It has been claimed that few managers understand their BM and often misinterpret it as strategy (Morris et al., 2005; Newth, 2013), fuelling an ongoing disagreement among scholars which remains unsolved (Pateli and Giaglis, 2004; Porter, 2001; Stähler, 2002). While some scholars view BM and strategy identically and use the terms interchangeably (e.g. Giaglis et al., 2006), others believe the two are related but represent different levels of information used for different purposes (e.g. Al-Debei et al., 2008).

Morris et al. (2005), Osterwalder (2004), Rajala and Westerlund (2005) and Tikkanen et al. (2005) considered BMs as interfaces between strategy and business processes. Likewise, Seidenstricker et al. (2014) claimed BMs refer to the logic of an organisation, how it operates, creates and captures value from stakeholders, whereas, strategy is the plan to create a unique and valuable position involving a distinctive set of activities. Moreover, Fleisher and Bensoussan (2015) and Magretta (2002) argued that business strategy explains how firms hope to do better than their competition, whereas BMs describe how the pieces of a business fit together. Based on this thinking, strategy differs from BMs because it reflects competition and how to outperform competitors, portraying value-creation logic (Osterwalder et al., 2005), which represents the means for a coherent implementation of the strategy (Dahan et al., 2010). Conversely, strategy involves vision, positioning, and competitors, to provide an idea of an organisation's future direction (Ansoff, 1965; Porter, 1996), and medium to long-term objectives and activities (Wirtz et al., 2016).

Many scholars agreed that BMs are separate from the concept of strategy, although the concepts overlap (Al-Debei et al., 2008; Amit and Zott, 2001; Casadesus-Masanell and Ricart, 2010; Magretta, 2002; Osterwalder, 2004; Rajala and Westerlund, 2005; Veit et al., 2014). However, some disagreed, for instance, well-known strategists Arend (2013), Barney (1991), Porter (1996) and Teece (2010) suggested BMs are more generic than strategy, and provide an intermediary between a company's strategy and its business processes (Di Valentin et al., 2012;

Morris et al., 2005). Whereas Thompson and Martin (2010) suggested strategy is a means to an end, thus strategic management involves clarifying the desired ends, mapping out the route to achieve them (creating strategies), putting these strategies into practice (implementation), changing tactics in the face of competition, issues that may arise, and evaluating progress and performance. Based upon this, they suggested strategy can be viewed from three distinct, but linked perspectives: opportunity, capability, and competitiveness, which, in combination with aspirations and values, form the four key drivers of strategy, which affect organisational choice and performance. This was also supported by Porter (1996, p.68) who argued “strategy is the creation of a unique and valuable position, involving a different set of activities”. Thus, from a strategic perspective, strategy refers to the logic of an organisation, how it operates and creates value, whereas BMs reflect an organisation’s realised strategy.

According to Al-Debei et al. (2008), confusion between the concepts emerged as a result of the shift from traditional business to digital business, introducing complexity and rapid change. Alternatively, Markides (2015, p.134) suggested that the “business model field is quite young, so it will take time for it to make an impact”. In a study of 40 strategy academics, asking questions about BMs, Markides (2015) found 100% agreed that BMs are theoretically different from strategy, 95% thought BM literature enriched strategy literature, but only 15% said the enrichment was anything beyond marginal. The study also revealed that the majority (76%) thought the main difference between BM and strategy was that the same strategy can be implemented through different BMs, confirming that the two concepts are often confused. Therefore, Markides (2015) concluded that BM intellectual territory overlaps with strategy, causing a number of problems, because as long as BMs are viewed as a description of how a firm operates, there is significant overlap with the theory of strategy. Whilst acknowledging the range of perspectives, for this study, it has been assumed that BMs are separate from strategy, conforming to the ideas of Hamel (2000) who suggested, adopting a BM approach, helps organisations to better analyse their competitive structures and make more effective strategic decisions.

### **3.5 The Purpose of Business Models**

To progress from the debate surrounding BM definitions and the relationship to strategy, it was considered important to focus on their purpose. A recent IBM study of managing directors identified that financially successful companies place twice

as much importance on consequential and sustainable BM management in comparison to less financially successful companies (Wirtz et al., 2016). This confirms the importance of BMs and supports Magretta's (2002) argument that no business can afford 'fuzzy' thinking about the concept regardless of a lack of coherent definition.

It has been argued that "every company has a business model, whether they articulate it or not" (Chesbrough, 2007, p.12) reiterating the need for managers to understand their model, its components, strengths, and weaknesses. Similarly, Shafer et al. (2005, p.202) claimed that managers should recognise how their BM creates value and captures returns from that value, because "a model is simply a representation of this reality". Teece (2010) supported that organisations need to understand what their customers want, how they want it, and how the firms can organise to best meet those needs, whilst creating value and making profits.

Casadesus-Masanell and Ricart (2010) used the analogy of a machine to describe the purpose of BMs, hypothesising that any given machine has a particular logic of operation and runs in a certain manner to provide value to its user. Cars, for example, have a specific logic, and different models provide different values for the driver. Therefore, to make a judgment about how well a certain car works, you have to consider its components, and how they relate to each other. In this sense, they argued different BMs are like different car models; each contains a different set of components that relate to the specific characteristics of the individual organisation (Casadesus-Masanell and Ricart, 2010).

However, from reviewing literature, a mix of opinions towards the purpose of BMs is clear, and in part can be explained by the fact that every organisation has a different purpose and therefore their BMs and value offering are different. Morris et al. (2006) proposed that BMs have five purposes;

- (1) Ensure logical and internally consistent approach to design and operation
- (2) Provide an architecture for identifying key variables, combined in unique ways to create a platform for innovation
- (3) Demonstrate economic attractiveness of a venture, attracting investors and other resource providers
- (4) Guide ongoing company operations, providing parameters to determine the appropriateness of strategic or tactical actions
- (5) Map and help facilitate modifications in response to changing conditions

Similar to debate between BMs and strategy, researchers possess different perspectives toward the purpose of BMs, often relevant to their specific goals, perspectives, and context (See Table 3.2). Clearly, BMs have various different meanings in academic literature depending on the research context and question (Heimo et al., 2016b; Zott et al., 2011). Therefore, the next section will explore the process of BM design and components.

**Table 3.2 The purpose of Business Models**

BM purpose	Author/s
Articulate how a firm creates value, the internal source of the firm's advantage and how the firm will capture value	<i>Brink and Holmén (2009)</i>
Articulate how an organisation creates and captures returns from value	<i>Shafer et al. (2005)</i>
Articulate the value proposition, identify market segments, define structure of value chain, estimate cost structure and profit potential, describe the position of the firm within the value network, and formulate the competitive strategy	<i>Casadesus-Masanell and Ricart (2010)</i>
Capture the key components of a business plan, including strategic elements, aimed at gaining and maintaining competitive advantage and long-term sustainability	<i>Morris et al. (2005)</i>
Create and offer a focal concept or point for strategy	<i>McGarth (2010)</i>
Emphasise fundamental features of how business activities are organised, whilst describing how a business manages its incomes and costs through its arrangement of activities and resources	<i>Johnson (2013)</i>
Mechanism to make the relationship between business actors clearer	<i>Andersson et al. (2006)</i>
To make strategic decisions, operational choices and investment decisions to support profit-making agendas	<i>Newth (2013)</i>
Tools to formulate and represent firm's logic behind business decisions	<i>Panagiotopoulos et al. (2012)</i>
Understand what their customers want, how they want it and how the firm can organise to best meet those needs, whilst creating value and making a profit	<i>Teece (2010)</i>

Source: Author (2017)

### 3.6 Business Model Design

Developing a BM has been approached in a variety of ways, from asking questions to outlining stages or components. From the consideration of literature, no one 'best' way to develop a BM is apparent. One reason for this could be that BMs are designed in different contexts and therefore have different characteristics. According to Drucker (1954) whom many believe first developed the concept, a good place to start is to answer two questions:

- (1) Who is the customer and what do they value?
- (2) What is the underlying economic logic that explains how we can deliver value to customers and at an appropriate cost?

Magretta (2002, p.3) expanded upon this, adding a third question, based upon the assertion that “a good business model begins with an insight into human motivations and ends in a rich stream of profits”:

(3) How do we make money in this business?

In a similar way, Casadesus-Masanell and Ricart (2010, p.5) suggested “business models are composed of *choices* and the *consequences* derived from those choices”. Based on the logic that every choice has a consequence, which differs dependent on the type of choice made, recommending organisations ask: Is it aligned with company goals? Is it self-sufficient? Is it robust? In answering these, they identified that organisations have to understand how choices made in BM design deliver consequences to meet organisations goals, complement one another, and form consistency. Chesbrough (2007) and Johnson et al. (2008) also supported this process, acknowledging that every organisation has a BM whether they know it or not because every business has to make choices, which produce consequences.

On the other hand, some scholars adopt more of a activity system perspective toward BM development. For instance, Zott and Amit (2010) argued that the objective of a BM is to exploit business opportunities through the creation of value for parties involved, customer's needs, and profit generation. They considered a BM as an activity system, defined as “the engagement of human, physical and/or capital resource of any party to the business model to serve a specific purpose toward the fulfilment of the overall objective” (Zott et al., 2010, p.2). In line with this, they proposed two features of BM design: elements and themes, claiming when organisations adopt this perspective it encourages a “systematic, holistic thinking in business model design, instead of concentrating on isolated choices” (Zott and Amit, 2010, p.223), helping solve BM issues and providing a conceptual toolbox to address and engage BM design (Amit and Zott, 2001) (See Table 3.3).

Similarly to Casadesus-Masanell and Ricart (2010), Drucker (1954) and Margretta (2002), Zott and Amit (2010) approached BM design proposing questions for organisations to answer, despite the fact they approached design from different contextual perspectives. Evidently there are various ways to design BMs, most of which centre around the need to create and capture returns from value, however, it remains difficult to identify characteristics of good BM design.

**Table 3.3 Activity System perspective for Business Model development**

<b>The framework provides insight by:</b>	
Giving Business Model Design a <i>language, concepts, and tools</i>	
Highlighting Business Model Design, as a <i>key managerial/entrepreneurial task</i>	
Emphasising <i>system-level design</i> over partial optimisation	
<b>Design Elements:</b>	
Content	<i>What activities should be performed?</i>
Structure	<i>How should they be linked and sequenced?</i>
Governance	<i>Who should perform them, and where?</i>
<b>Design Themes</b>	
Novelty	Adopt <i>innovative content, structure or governance</i>
Lock-In	Build in elements to <i>retain business model stakeholders e.g. customers</i>
Complementariness	<i>Bundle activities to generate more value</i>
Efficiency	<i>Reorganise activities to reduce transaction costs</i>

Source: Zott and Amit (2010, p.7)

Research exploring how best to balance, and design BMs is missing from literature (Hedman and Kalling, 2003; Seddon et al., 2004), and thus only serves to heighten confusion and increase the difficulty for managers faced with developing new or innovating existing BMs. Despite the fact that “business model design is a key decision for a new firm entrepreneur and a crucial –perhaps more difficult – task for managers charged with rethinking an old model to make their firm fit for the future”. (Zott and Amit, 2010, p.216).

However, what is clear is the need for firms to adopt a holistic approach, considered to increase competitive advantage by reducing imitability, making it more difficult for competitors to isolate and copy individual elements of an integrated holistic BM (Chesbrough, 2007; Kindström and Kowalkowski, 2014). Nonetheless, Morris et al. (2005, p.726) identified “no consensus exists regarding the definition or nature of a model...diversity in the available definitions poses substantive challenges for delivering the nature and components of a model and determining what constitutes a good model”. Therefore, to advance the next section explores research examining BM components, in the hope of identifying key BM components.

### 3.7 Business Model Components

The absence of clarity identifying key BM components has been argued to be one of the most fundamental issues (Dubosson-Torbay et al., 2002; Morris et al., 2006). Giaglis et al. (2006, p.282) stated there is “a lack of consensus regarding how it should be defined or what it should encompass”. However, from reviewing BM literature, a commonality revealed was the need to create and capture value, and how to monetise value.

In recognition of the diversity and inconsistency among proposed BM components, ranging from four ‘pillars’ (Osterwalder et al., 2002), five ‘building blocks’ (Afuaah, 2015), or seven ‘sub-models’ (Petrovic et al., 2001). Gummesson et al. (2010) analysed commonalities within literature to determine key BM components, identifying five common BM elements: customer value creation, financial logic, value network, resources and capabilities and types of strategic decisions, choices or principles such as target market or competitive strategy. They suggested that BM components should support the realisation of how customer value is created, explain how profits are generated, be externally orientated demonstrating relationships with ‘actors’ in the network, illustrate the firm's resource capabilities and explain strategic decisions.

Alternatively, adopting a strategic stance, Morris et al. (2005, 2006) proposed that BM components involve asking and answering questions relating to six key decision areas. Within this they proposed two levels, foundation (generic decisions, such as what is being sold, and to whom) the essence of a BM, and proprietary (related to innovations unique to specific entrepreneurs or projects) involving unique approaches being applied to one or more of the foundation components (See appendix 3). Their ideas are useful to encourage organisations to examine and understand different areas of their business, from the offering, to investor factors.

Porter (1996) proposed that a commonality between all BMs is the value-chain. Morris et al. (2006) supported that all BMs should capture a firm's offering, the activities that produce them, and the associated value-propositions. This thinking supports that of the Resource-Based View (RBV) which assumes organisations are “heterogeneous in terms of their resources and internal capabilities, and the uniqueness of any one firm can be captured in its business model” (Morris et al., 2006, p.38). In this way, it is considered that BMs represent the specific way resources are combined and adopting an RBV effectively enhances the extent by which resources are valuable, rare, inimitable and non-substitutable (Morris et al., 2006). Although many BMs support the RBV, there is still much diversity and variety among suggested BM components as demonstrated in Table 3.4. These descriptions highlight the diversity of perspectives towards the importance of different components. In addition to confirming the divergent nature of perspectives toward essential BM components, which can be attributed in part to the fact that either managers do not understand their BM and therefore cannot describe it, or different BMs have different purposes. It has been argued that when attempting to

deconstruct BM components, researchers commonly detect interdependencies between components, but often fail to distinguish the relationships between them (Afuah and Tucci, 2001; Petrovic et al., 2001), even though understanding BM components and their relationships is a critical part of development (Morris et al., 2006). Nevertheless, there are commonalities among BM components and descriptions presented in Table 3.5, such as the reoccurring mention of value and revenue. Implying BMs main focus revolves around creating value and profiting from that value, but the processes or routes to achieve this vary.

**Table 3.4 Examples of selected BM Components and Descriptions**

Author/s	Components	Description
<i>Al-Debei and Avison (2010, p.365).</i>	<ol style="list-style-type: none"> <li>1. Value Proposition</li> <li>2. Value Network</li> <li>3. Value Finance</li> <li>4. Value Architecture</li> </ol>	Building a BM requires a balance between conflicting elements. “hierarchical taxonomy of the BM defines the concept comprehensively. It does not only highlight the major facets and aspects related to the concept but also it reveals their important inter-relationships
<i>Chesbrough (2007)</i>	<ol style="list-style-type: none"> <li>1. Value creation – set of activities conducted in such a way to produce net value</li> <li>2. Value capture – must earn profit to sustain activities over time</li> </ol>	At the heart of the BM, it is vital these components are delivered and performed
<i>de Reuver and Haaker (2009, p.240)</i>	<ol style="list-style-type: none"> <li>1. Service design – targeting, value creation, branding, customer retention</li> <li>2. Technology Design – Security, quality, system integration, accessibility, management and user profile</li> <li>3. Organisational Domain – partner selection, network openness, governance</li> <li>4. Financial Domain – pricing, division of cost revenues, valuing the contribution and benefits, division of investments</li> </ol>	Design choices in business model components cannot be considered in isolation but should be balanced in order to develop a viable business model.
<i>Johnson et al. (2008, p.60)</i>	<ol style="list-style-type: none"> <li>1. Customer Value Proposition – helps customers perform specific jobs alternative offerings would not address</li> <li>2. Profit formula – blueprint that defines companies value offering</li> <li>3. Key resources/processes Roadmap – compare to existing BM to identify change and areas for new opportunities</li> </ol>	“Every successful company is already fulfilling a real customer need with an effective business model, whether that model is explicitly understood or not”. They claim that each of the four elements interlock, and when combined create and deliver value, any big changes to one element affect the other elements and therefore the BM as a whole.
<i>Newth (2013)</i>	<ol style="list-style-type: none"> <li>1. Value proposition - Offer value</li> <li>2. Dynamic capabilities and competencies - Build barriers to entry through a bundle of resources</li> <li>Financial Viability – Align the internal cost structure to the external revenue stream, to achieve sustainable profits</li> </ol>	A BM is not just about the VP, revenue stream, capability or cost structure, but what makes it a ‘model to do business’ is the correct mixture of these components working together. The more unity among the components the more value created

<b>Author/s</b>	<b>Components</b>	<b>Description</b>
Teece (2010)	<ol style="list-style-type: none"> <li>1. Identify the target market segments</li> <li>2. Understand the benefit the business will provide the customer</li> <li>3. Determine the technologies/features embedded in the product/service</li> <li>4. Understand how the revenue/cost structure of the firm will be designed and restructured to meet customer needs</li> <li>5. Recognise the way in which technologies are assembled and offered to customers</li> <li>6. Identify the mechanisms and manner by which value is captured and competitive advantage sustained</li> </ol>	Each element is interrelated and when combined forms the core of competitive advantage. They are hereby, vital ingredients to outline how to produce a BM.

*Source: Author (2017)*

### **3.8 Business Model Innovation**

Despite lack of clarity defining BMs and outlining the key components, Johnson et al. (2008, p.59) argued that the “secret in maintaining a thriving business is recognising when it needs a fundamental change” achieved through BM Innovation (BMI). The business environment is constantly changing, increasing pressure for firms to keep up and compete with other businesses, fuelling a culture of BMI. Nowadays, more than ever, organisations must be “flexible to respond rapidly to competitive and market changes” (Porter, 2001, p.4). IBM reported that the pressures of increasingly competitive markets have propelled BMI higher than anticipated up the priority lists of CEOs and management (Pohle and Chapman, 2006). When executed successfully, it is believed BMI can spark disruptive change (Cantamessa and Montagna, 2016), reshaping entire industries (Shafer et al., 2005), redefining markets, changing the structure of entire sectors and redistributing billions of pounds in value (Johnson et al., 2008). Therefore, in recent years, BMI has attracted increased attention (Seidenstricker et al., 2014), and is now considered essential to remain competitive, sustainable (Amit and Zott, 2001), and increase business performance (Zott et al., 2010).

In a review of academic research and interviews with managers and entrepreneurs, Amit and Zott (2012) identified a number of reasons why BMI is important, concluding that BMI represents an underutilised source of potential future value because competitors may find it more difficult to imitate or replicate an entire novel system than a single novel process or product, and innovation at BM level can create sustainable performance advantages. In this way, Afuah (2005, p.4) suggested “innovation is about doing things differently from the norm. Therefore, a BMI is a

framework or recipe for creating and capturing value by doing things differently". Newth (2013, p.112) supported that BMI is "the capacity of an organisation to keep its business model relevant and sustainable", focusing on the idea flows across an organisation to find the best solution.

However, despite its importance, BMI is not easy to achieve, and organisations often face a number of hurdles when attempting to innovate (Chesbrough, 2010). One of the most fundamental problems was suggested that many managers do not understand their existing BM and therefore cannot identify which elements need improving (Chesbrough, 2007). Amit and Zott (2001) and Christensen (2004) identified even when managers readily recognise the most suitable BM, often they resist innovating because of conflicts with their existing BM. Because of this, Chesbrough (2007) proposed it was common for organisations to have a "BMI leadership gap" in the sense that there is no one person in the organisation with the power or capability to innovate the BM, therefore it involves collaboration from a range of departments, but often no one is given the power to illicit change.

Thus, managers are often unsure where to start and how to go about innovating their BM. To become innovators, Shafer et al. (2005) claimed that firms must create processes that enable improvement, differentiating themselves to create value, capture returns from that value and turn the value into profit. Whereas, Girotra and Netessine (2014) suggested four ways for firms to innovate and create new BMs by modifying their existing BM, by: changing the mix of products or services, postponing decisions, changing the people who make decisions, or changing incentives within the value chain.

However, Newth (2013) claimed BMI begins with inspiration and the introduction of something new, done differently or removed, this suggests that innovations should be explained from a strategic perspective, to ensure the future performance and well-being of the firm. Newth (2013) believed innovation plays an important role in the successful implementation of a strategy, which influences a firm's ability to effectively compete. Shafer et al. (2005, p.207) argued, "the probability of long-term success increases with the rigour and formality with which an organisation tests its strategic options through business models".

In a survey conducted by the Economist Intelligence Unit (2010) of more than 4,000 senior managers, it was reported that 54% favoured a new BM above new product or service innovation as a source of competitive advantage. This was contrary to

claims by Chesbrough (2007) that because BMI is time-consuming, most managers avoid it on the premise it is easier to operate within the constraints of familiar existing BMs. Teece (2010, p.171) recognised because businesses face a plethora of possibilities, choosing the right options is a highly complex art, and should not be a quick fix because “business models must morph over time as changing markets, technologies and legal structures dictates and/or allow”. Adding that successful BMI “can itself be a pathway to competitive advantage if the model is sufficiently differentiated and hard to replicate for incumbents and new entrants alike...new business models can both facilitate and represent innovation” (Teece, 2010, p.173).

Whilst BMI is often difficult, it is not unachievable, and therefore investing in BMI is worth the money (Amit and Zott, 2012; Chesbrough, 2007). BMI is considered key to unlocking and discovering new areas or opportunities for growth (Johnson, 2010). In line with this, Afuah (2015, p.5) commented “the winner in the face of business model innovation can be the firm that moved first to change the rules of the game or a firm that came in later and pursued a better business model”.

From reviewing literature, it became apparent BMI can occur in a number of ways, for example Amit and Zott (2012, p.48) suggested organisations should add new activities, combine activities or alter the way activities were performed, stating that “without a business model perspective, a company is a mere participant in a dizzying array of networks and passive entanglements”. In this way, they recommended for managers to realise opportunities for BMI by identifying their distinctiveness, analysing their organisations holistically, asking and answering the following questions (Amit and Zott, 2012, p.45).

- (1) What customer needs will the new BM address?
- (2) What novel activities could help satisfy those needs?
- (3) How could activities be linked in novel ways?
- (4) Who should perform the activities? What novel governance arrangements can be found?
- (5) How will value be created for each stakeholder?
- (6) What revenue models can be adopted to complement the BM?

In a similar way, Girotra and Netessine (2014) proposed the path of reinventing a BM lies in changing how decisions are made, because decisions are levers to inventing and reinventing BMs. They added that, to avoid organisations becoming hostages of their own success, by failing to explore the past for keys to future

success, BMI involves “constructive scepticism” questioning old and past BM assumptions. This was supported by Bucherer et al. (2012) and Teece (2010) who agreed BMI elicits a detailed description to realise and absorb logic that adds value.

Organisations failure to create and maintain BMI is regarded as one of the main barriers to BM success. Therefore, much research attention has focused on understanding barriers to BMI. In recognition that not all BMI attempts are successful, Chesbrough (2010) claimed as long as it informed new approaches and created understanding within constraints of affordable loss it was still beneficial. Hayashi (2009) recommend to encourage BMI, organisations should experiment to ‘find’ the right BM, by creating a culture that encourages stakeholders to explore “what if...” questions. In the context of this study, pursuing BMI and exploring options such as ‘what if AR was implemented?’ is considered crucial to understand how AR could add value to cultural heritage tourism and how a BM could be developed to facilitate and support this.

### **3.8.1 Business Model Innovation and Technology**

Technology and BMI are closely related, because BMI often has more significance in fast-moving and dynamic marketplaces, such as technology. Within technology and innovation management fields, the “business model is mainly seen as a mechanism that connects firm’s (innovative) technology to customer needs, and/or to other resources (e.g. technologies)” (Zott et al., 2010, p.22). Thus, organisations commercialise new ideas and technologies through their BMs (Chesbrough, 2010).

It is considered that BMs help capture the value of technology cross-fertilisation (Björkdahl, 2009), the logic and activities that create economic returns (Chesbrough and Rosenbloom, 2002). The role of a BM is important in capturing the value from early stage technology, by unlocking value-potentials embedded in technology and converting it into market outcomes (Zott et al., 2010). At an organisational level, Calia et al. (2007) suggested BMs can help shape technical innovations, in addition to providing the necessary resources for BMI. In comparison, at the industry level, Johnson and Suskewicz (2009) claimed introducing new technologies requires BMs to both create and capture customer-value. In this sense, it has been argued “besides adopting business models to facilitate technological innovation and the management of technology, firms can also view the business model as a source of innovation in and of itself” (Zott et al., 2010, p.19).

However, while technological innovation is considered important, it is not always sufficient to guarantee survival. Chesbrough (2007, p.12) noted that technology per se has no inherent value and thus BMs are critical tools to implement and realise technical innovation, to the extent it was argued “business models matter, a better business model often will beat a better idea or technology”. In this way, BMs are recognised as effective tools to commercialise technologies, transforming the ‘technical potential’ of innovations into economic value (Smith, 2010), whilst also helping unlock potential and create real value (Chesbrough, 2003; Smith, 2010). It has been suggested there are three ways for organisations to convert technological potential into economic value: incorporate the technology into the current business, license the technology to a third party, and launch a new venture exploiting technology in new business arenas (Chesbrough, 2003).

However, Amit and Zott (2012) claimed that technological product innovation does not always create competitive advantage, thus BMI helps organisations stay ahead in the product innovation game. In the case of technology this is considered crucial, because “the same idea or technology taken to market through two different business models will yield two different economic outcomes...technology by itself has no single objective value”, thus the true value of technology remains latent until commercialised through a BM (Chesbrough, 2010, p.354). Although, many potential new technologies have no obvious BM, therefore it is managers are challenged to expand their perspective to find a suitable BM to capture value from the new technology (Chesbrough, 2010). Technological change and the constant introduction of new ICTs in the global marketplace and therefore the blend of technological fields promote BMI and support the use of complementary BMs (Seidenstricker et al., 2014). In this way, BMI has become even more important, especially in the case of ‘disruptive technologies’ such as AR (Christensen, 2004).

### **3.9 Sustainable Business Models**

The concepts of BMI and SBMs are closely related, and both have gained increasing attention in recent years. It was argued that for businesses to be successful they must pay increasing attention to embedding, addressing the challenges and opportunities related to society’s transition towards sustainability (França et al., 2016; Willard, 2012). However, França et al. (2016) believed BMI often fails to sufficiently embrace the sustainability dimension within BM design. Despite this fact, innovation plays an important role in enabling businesses to progress beyond traditional BMs and become more sustainable (Morioka et al., 2016). SBMs are

considered essential to help businesses operate in a way that minimises their negative impact on society and the environment, whilst also promoting social, environmental and economic benefits for both internal and external stakeholders (Bocken et al., 2014).

Traditionally, BM research focussed on cost structures and revenue streams (Bocken et al., 2014; Teece, 2010), however, Bolis et al. (2014) believed that economic results are not enough to ensure sustainable value capture, thus sustainable development should focus on creating collective axiological objectives. In other words, businesses must realise their value for the organisation, internal external stakeholders, as well as consider the short-term and long-term consequences.

Adopting a SBM perspective, firms are encouraged to look beyond their direct stakeholders, to involve additional stakeholders such as customers, employees, trade associations, suppliers, governments, non-governmental organisations and communities (Donaldson and Preston, 1995), as well as the environment and society (Morioka et al., 2016). Schaltegger et al. (2015, p.4) developed a definition of SBM, centred around creating customer Value Propositions (VPs);

*“No sustainable value can be created for customers without creating value to a broader range of stakeholders. A business is carried by a stakeholder network and... particularly a business that contributes to sustainable development needs to create value to the whole range of stakeholders and the natural environment, beyond customers and stakeholders”.*

Hence, SBM perspectives reinforce stakeholder theory, encouraging businesses to recognise that the VP is what the firm has to offer, whereas a sustainable VP is created by satisfying the needs and wants of stakeholders (Morioka et al., 2016). Yet, naturally stakeholder views conflict, hence businesses face the challenge of overcoming these to create mutually-shared benefit delivering values to satisfy them both for the short and long-term future. Although, Boons and Lüdeke-Freund (2013) commented that many businesses fail to resolve stakeholder conflicts, and therefore many BMI attempts fail to embrace sustainability.

The business case for integrating sustainability practices are often not understood profoundly enough by businesses (Stubbs and Cocklin, 2008), because the planning

processes and scope of the businesses are insufficient (Baumgartner and Korhonen, 2010), and the ability for businesses to create a collaborative network bringing people together to achieve sustainability are minimal (Rohrbeck et al., 2013). As a result, França et al. (2016) suggested that many businesses lose out on the opportunity to advance and embed sustainability into their value-creation process. They argued that one of the main barriers to creating SBM innovations is the absence of a systems perspective and the definition or provision of guidelines outlining how businesses can achieve sustainable development and increase competitiveness. However, some attempts have been made to develop frameworks to assist organisations in integrating sustainability into their business, such as the Triple Layered BM canvas developed by Joyce et al. (2016) building upon Osterwalder and Pigneur (2010) BM canvas by introducing an environmental and social layer.

Overall, BMI is identified as a lever for organisational success; therefore, it is important businesses address sustainability and embrace it within their practices (Kiron et al., 2013). It has also been found sustainability increases competitiveness (Baumgartner and Korhonen, 2010; Osterwalder and Pigneur, 2013). Hence, addressing sustainability challenges demands, and also provides an opportunity for innovation within all parts of the business, to create value attributing business success, to product and service delivery (Basile et al., 2011).

### **3.10 Examples of existing Business Models**

So far, this chapter has explored the importance, purpose, design, development and characteristics of BMs. To further understand the impact of BMI and developing SBMs, providing greater context to the study, the next sections examine existing BM examples from traditional business, eBusiness, tourism, and AR to select and justify a BM to scaffold research questions during the next phases of the study.

#### ***Traditional Business Models***

Fleisher and Bensoussan (2015) suggested that BMs have existed since humans first bartered in the trade of goods, and the oldest BM still used today ‘the shopkeeper model’ involves setting up shop where customers are likely to be, and displaying a good or service for sale. Since their conception, BMs have progressed and evolved, becoming compact tools focusing on creating and capturing returns from value, and a number of BMs have been developed. Appendix 4 displays a table

developed by Johnson (2010) presenting some of these examples, all of which focus predominantly on the product and service offering.

To advance from a focus on product-centric thinking toward BM thinking, Osterwalder and Pigneur (2010) developed the BM Canvas, often regarded as one of the most famous and widely used BMs, applied by countless companies, from large organisations such as Nestle and Deloitte to small start-ups. Osterwalder and Pigneur (2010, p.14), define a BM as “the rationale of how an organisation creates, delivers and captures value”. On this premise, they suggested BMs can be described through nine building blocks (See Table 3.5) which demonstrate the logic of how organisations intend to make money.

The canvas has been praised for its ability to help users map, discuss, design and invent new BMs (Ching and Fauvel, 2013). Built on four main areas of business or ‘pillars’: customers, offers, infrastructure and financial viability. Within Figure 3.1 the right-hand side focuses on the market, while the left assesses product with the VP positioned in the middle. A detailed description of each of the canvas’s nine components can be found in Appendix 5.

Osterwalder and Pigneur (2010, p.15) claimed that the canvas has become “a shared language that allows you to easily describe and manipulate business models to create new strategic alternatives. Without such a shared language, it is difficult to systematically challenge assumptions about one's business model and innovate successfully”. Visually, the simplistic structure of the canvas and few descriptions are engaging, and it has been argued that its usefulness for mapping and innovating business systems make it valuable (Ching and Fauvel, 2013), further reiterated by its rapid adoption. Coes (2014) praised the canvas for its centrality of capturing and delivering value when designing a BM, and visual representation.

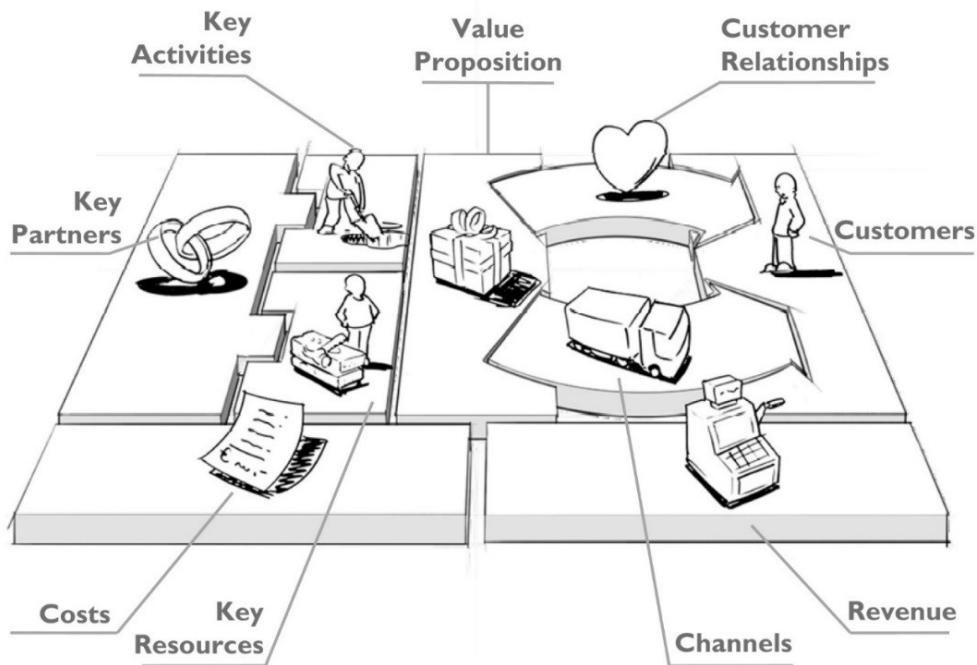
**Table 3.5 BM Canvas Nine Building Blocks**

Pillar	BM Building Block	Description
Product	Value Proposition	Gives an overall view of a company's bundle of products and services
Customer Interface	Target customer	Describes the segments of customers a company wants to offer value to
	Distribution Channel	Describes the various means of the company to get in touch with its customers
	Relationship	Explains the kind of links a company establishes between itself and its different customer segments
Infrastructure Management	Value Configuration	Describes the arrangement of activities and resources
	Core competency	Outlines the competencies necessary to execute the company's business model
	Partner Network	Portrays the network of cooperative agreements with other companies necessary to efficiently offer and commercialise value
Financial Aspects	Cost Structure	Sums up the monetary consequences of the means employed in the business model.
	Revenue Model	Describes the way a company makes money through a variety of revenue flows

Source: Osterwalder et al. (2005, p.10)

However, the canvas was criticised by Kraaijenbrink (2012) and Kraaijenbrink (2013) based on six shortcomings;

- (1) Ignores organisations strategic purpose, mission, vision, and objectives, although making money is important, it is not the ultimate goal for all businesses, which are an indispensable part of a BM that influence and interact with the other components of the canvas
- (2) Excludes the notion of competition, overlooking the fact BMs need to be defined in relation to their competitors
- (3) Mixes levels of abstraction, varying between different stages. Therefore, scholars have developed variations of the canvas in an attempt to overcome this suggested weakness (e.g. Kraaijenbrink, 2012; Maurya, 2012).
- (4) Does not set priorities, while the completeness of the canvas is a strength, it also raises questions about where to start, or which areas should be prioritised. For instance, it does not identify the central role of the VP compared to other elements
- (5) Visualisation is more complicated than necessary, which can overwhelm users
- (6) Use of the term 'strategic values' raises too many questions, because it considers the organisations general theory rather than the most important values. Use of the term 'strategic' is too ambivalent



Source: Osterwalder and Pigneur (2010, p.18-19)

**Figure 3.1 The Business Model Canvas**

In response to the critique that the canvas was too complicated and mixed levels of abstraction, Osterwalder, and Pigneur (2010) argued it helped businesses to “think through” competition. In response to this, Ching and Fauvel (2013) highlighted the canvas in fact provides no broad analysis on competition and does not consider competition structures, help formulate business goals and excludes business purpose. Equally, the canvas does not readily support and permit BMI, or the development of SBMs. Through examining the canvas, it was not clear how it could be applied to support the integration of new technologies, such as AR.

### ***Electronic and Mobile Business Models***

The internet has been attributed as the principle reason for the surge of interest and volume of literature surrounding BMs (Magretta, 2002; Yip, 2004). Out of all BM research streams, Zott et al. (2010) identified eBusiness has received the most attention. Drivers such as globalisation, deregulation and technological change shifted the competitive game, forcing firms to “analyse their competitive environment, define their position, develop competitive and corporate advantages, and understand threats to sustaining advantage in the face of challenging competitive threats” (Casadesus-Masanell and Ricart, 2010, p.1). Ongoing technological advancements and developments, outsourcing and off-shoring of

business activities and restructuring of financial services (Teece, 2010), have created heightened interest in BMs (Al-Debei and Avison, 2010).

The internet transformed traditional business activities, creating new opportunities to engage and communicate with employees, supply chains, and customer interfaces, facilitating innovations, creating cost reductions and increasing revenue opportunities (Kalakota and Robinson, 2002). Organisations have new ways to digitise their business (Arrayent, 2012). A combination of the internet economy and traditional business created a new type of online consumer, operating on both wired and wireless networks, expecting fast delivery, easy transactions, fact-based information (Camponovo and Pigneur, 2003), increased mobility and flexibility (Tsai and Raj, 2005).

In comparison to traditional business, mobile and digital markets possess a number of unique characteristics (see Appendix 6), which created opportunities for the design and development of BMs, revolutionising interactions between suppliers and customers (Zott et al., 2010). However, the increased availability of information placed greater pressure on organisations to succeed and survive. In contrast to the stable and less competitive world of traditional business, digital business is complex, dynamic, faces high levels of uncertainty and high competition and therefore, the use of BMs in the evolving digital world became even more crucial (Al-Debei and Avison, 2010).

Al-Debei and Avison (2010, p. 364) argued “organisations need to adapt in order to survive and succeed as their business domains, processes and technologies change in a world of increasing environmental complexity”. In addition, accompanying increased opportunities was a vast increase and intensification of competition as a result of the accelerated pace of technological change (Veit et al., 2014). Therefore, to remain competitive, BMs became increasingly important (Al-Debei and Avison, 2010; Kindström and Kowalkowski, 2014) and received greater attention.

It has been acknowledged that by making BMs explicit, digital organisations can more easily assess the value of intangibles because the information provided by the BM mobilises knowledge-capital that supports organisational strategic decision-making (Al-Debei and Avison, 2010). As already discussed, there is an underlying argument, that behind the BM concept it is not the technology per se that determines success, but rather the way in which the BM of a technological innovation is

configured, so that strategic objectives are achieved and aligned with the organisations goals (Panagiotopoulos et al., 2012). In a similar way, it has been argued that technology does not succeed by itself, but rather a consistent and effective organisational setting and structure are needed in addition to technological architecture if the technology is to be successful and useful to its intended users (Al-Debei and Avison, 2010).

Camponovo and Pigneur (2003, p.9) supported that BMs “overcome the complexity of providing a complete end-to-end solution, which requires many complementary competencies” through the mapping relationships between all players, partners, and actors. BMs provide an analysis framework for understanding an organisations component parts (Amit and Zott, 2001; Chesbrough and Rosenbloom, 2002). Thus, Al-Debei and Fitzgerald (2010, p. 372) described BMs “explicitly has become a vital necessity and one of the most important organisational assets”. Moreover, Viet et al. (2010, p. 46) suggested “the BM is seen as a tool for depicting, innovating and evaluating business logics in start-ups and existing organisations, especially in IT-enabled or digital industries”, providing a powerful source to realise the power of technology.

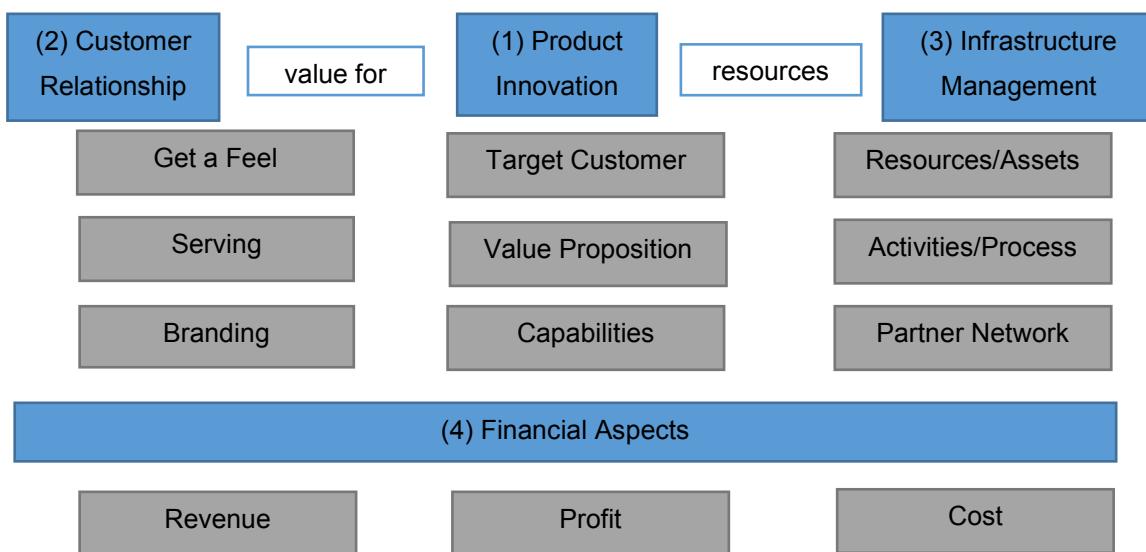
One of the main differences between eBusiness models and traditional BMs, is that “both value-creation and value-capture occur in a value network” (Zott et al., 2010, p.15), which implies suppliers, partners, and distribution channels extend an organisation’s resources. The role of eBusiness models is to help structure organisations to improve efficiency, flexibility, and responsiveness, creating competitive advantage in the new digital market (Dubosson-Torbay et al., 2002).

Pigneur (2002, p.1) suggested eBusiness contains of primary (e.g. device manufacturers, content providers) and secondary (e.g. consumers) stakeholders, but, “no single player can provide its customers with an end-to-end solution on its own”. Hence, fostering and developing efficient and effective collaborations and partnerships between market players is recognised as both significantly important, but also challenging (Camponovo and Pigneur, 2003). Therefore, Faber et al. (2003) recommended eBusiness models are essential tools to encourage organisations to look beyond themselves and view their BM as an enterprise, encompassing collaboration between multiple companies to offer joint VPs to their customers.

Based on a critical review of literature, Dubosson-Torbay et al. (2002, p.2) proposed the eBusiness Model (See Figure 3.2) with the aim to “help a firm to structure its

organisation in a way to become more efficient, more flexible and responsive to customer demand, to forecast possible future scenarios and therefore to stay competitive in the Internet era". The model proposes four key components, crucial for digital BMs: products and services that represent substantial value to targeted customers (VP) for which they are willing to pay; relationship capital, created and maintained by the firm with the customers, to satisfy them and thus generate sustainable revenues; infrastructure and network, or partners that are necessary in order to create value and maintain a good customer relationship; and financial aspects, identified via the three former components, such as revenue and cost structures.

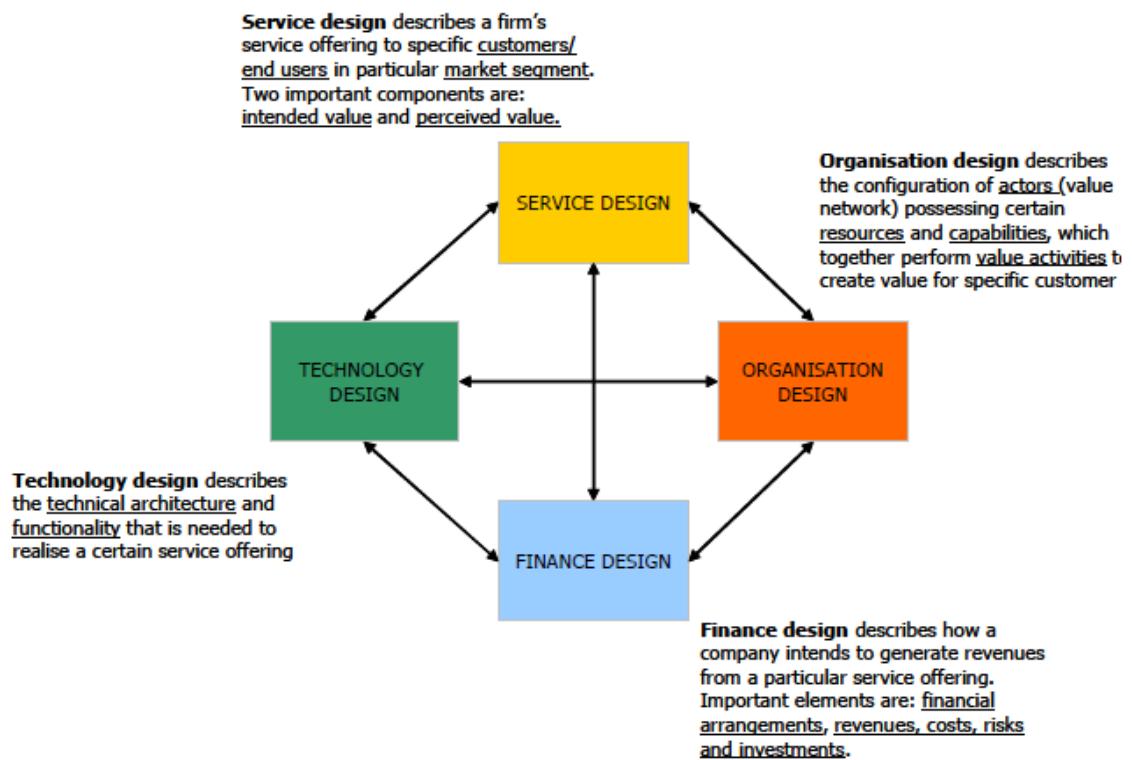
The model was developed underpinned by a belief that business modelling helps organisations develop strategies, redesign and align operations, share knowledge and ensure acceptance of decisions through committed stakeholders. Although outdated, the model provides a useful outline of the key components, their BMs are the architecture of a firm, and its network of partners, for creation, marketing, delivering value and relationship capital to target markets, to generate profitable and sustainable revenue streams. However, it is not clear how to apply the model and approach the integration of technologies, equally the model is visually complex and therefore confusing.



Source: Dubosson-Torbay et al. (2002, p.6)

**Figure 3.2 eBusiness Model**

On the other hand, Faber et al. (2003, p.1) viewed BMs as the way a “network of companies intends to create and capture value from the employment of technological opportunities”. This acknowledges the complex nature of designing a BM because it requires examination of, and balance between different requirements and design choices made in one area, effect choices in another. To help organisations and stakeholders better understand how design choices can affect other choices, Faber et al. (2003) developed the B4U Model (See Figure 3.3), proposing BMs for cross-company enterprises are a set of proposals of ‘blueprints’ for each area (service, organisation, architecture, finance). They believed because of the interrelatedness between blueprints, designing BMs for mobile services was particularly complex, because “what might make sense from a technical perspective (e.g. precise positioning techniques) may make no sense at all from a financial (e.g. too expensive) and user-perspective (e.g. privacy concerns)” (Faber et al., 2003, p.2). In addition to balancing requirements, they recommended the need to balance the interests of stakeholders, an equally important, but difficult task. Appendix 8 presents a deconstruction of the B4U Model and its components.

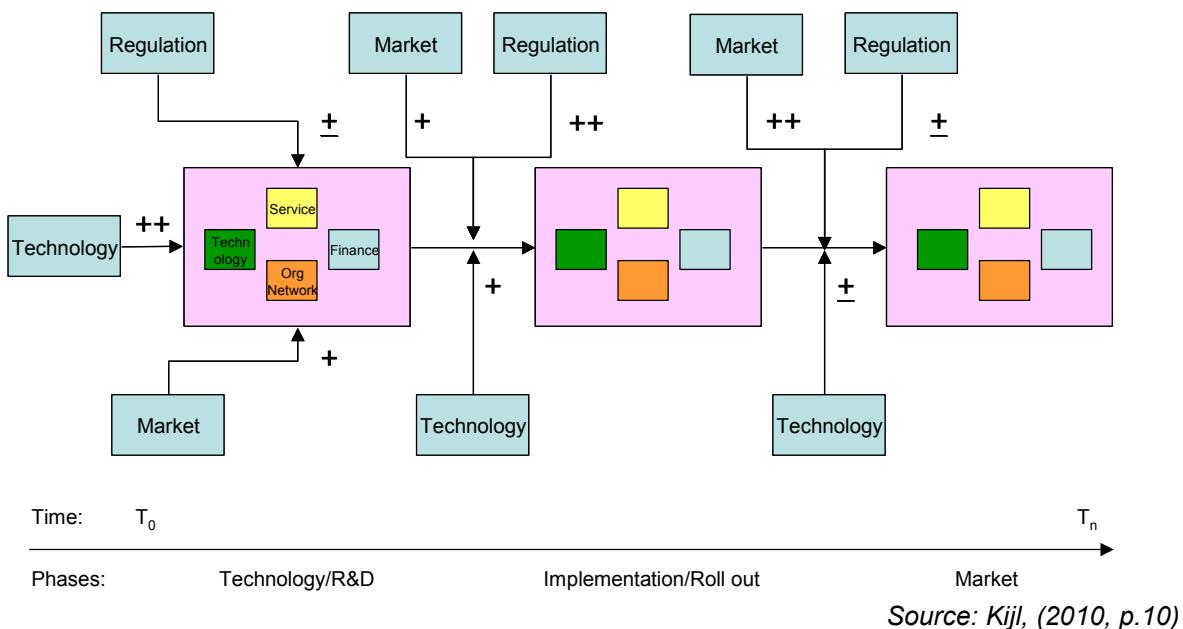


**Figure 3.3 B4U Model**

Source: Faber et al. (2003, p.5).

Faber et al. (2003) suggested that their model demonstrates not only the interrelated nature of the four components, but also the impact of bundling services to understand the impact on viability and sustainability in eBusiness. Although outdated, the B4U highlights important truths still applicable today. Importantly, it differentiates between intended and perceived value within the service design component, highlighting the importance of ensuring intended value translates into perceived value.

Resulting from a comprehensive review of mBusiness models, Kijl (2005) expanded upon the B4U, developing the Dynamic BM Framework (See Figure 3.4), structured to represent a timeline, involving development phases through which BMs can pass several times. The four colored blocks represent the four BM components (service, technical, organisational and financial), whereas the blocks surrounding them signify external influence, such as market opportunities and threats, technological developments and regulatory influences, all of which impact BM evolution.



Source: Kijl, (2010, p.10)

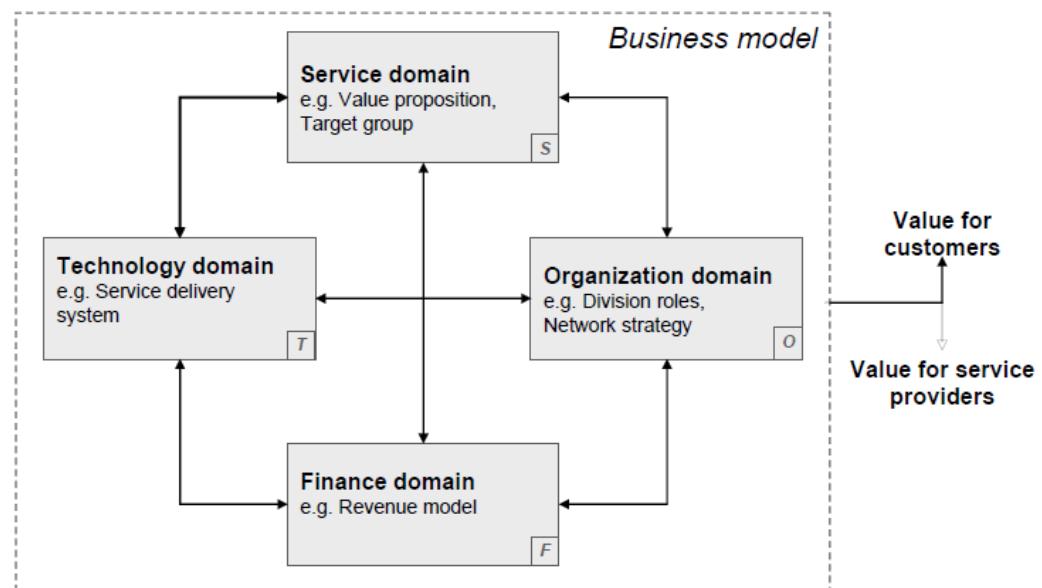
\* to show the expected dynamic importance of the distinguishing factors in and between each phase we use the symbols ++, +, and ± in our framework. The ++ stands for high expected importance, + for medium expected importance, and ± for low expected importance" (Kijl, 2005, p.10)

**Figure 3.4 Dynamic BM Framework**

One of the main strengths of the Dynamic BM Framework is the phasing and timeline structure, which recognises mBusiness is technology driven, and that technology, research, and design phases are the most important. It suggests that

after passing the technology, research and design phases, the importance of technology decreases, and implementation and market offering become more important. Kijl (2005, p.5) upheld that “phasing models help to understand the evolution of the competitive landscape following an innovation or change, as well as the impact of an innovation or change on firm’s strategies and business models”. The framework provides a useful tool to support organisations taking new products to market, as well as assessing options to innovate or redevelop ensuring the ensure the correct BM fit.

In contrast to this, Bouwman et al. (2008) adopted a service perspective when developing the STOF framework (See Figure 3.5), with the aim of providing an evaluative framework for the design of mobile IT services. Although, STOF is used as an acronym for Service, Technology, Organisation and Finance, it adopts the same principles informing both B4U and Dynamic BM framework. According to Bouwman et al. (2008), STOF helps organisations identify and understand service industry characteristics, such as intangibility, non-materiality, inseparability, heterogeneity, and perishability. Interestingly, these characteristics are very similar to those of the tourism sector. Despite being developed for mBusiness, STOF has been also used within tourism, because of its focus on the service industry and differentiation between value for customer and value for providers. However, STOF is simplistic and does not easily identify application options.

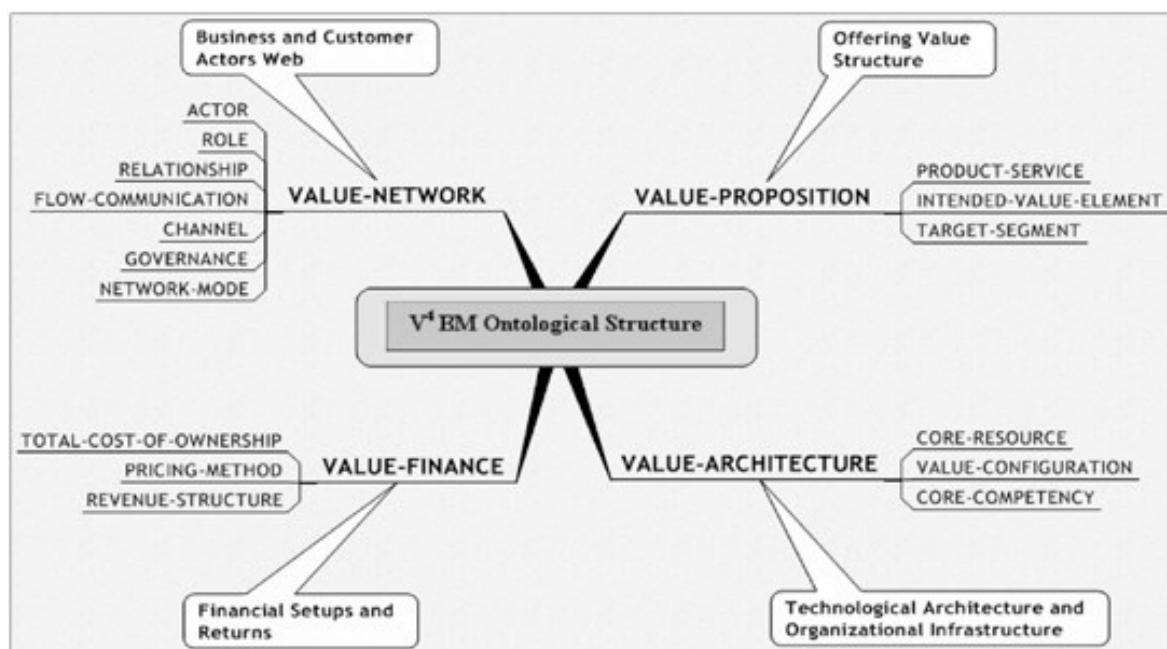


Source: Bouwman et al. (2008, p.36)

**Figure 3.5 STOF Framework**

In comparison to the eBusiness Model, B4U, STOF and Dynamic BM, the Dynamic BM is the most comprehensive and useful, because it not only examines externalities and exterior pressures but also supports change, evolution, and development over time. However, each model shares the same principles, based upon the four proposed BM components of service, organisation, technology, and finance and therefore share many commonalities.

In contrast to these approaches, Al-Debei and Avison (2010) created the V4 (Value Four) BM, developed for generic business modeling, but with specific application to Information Systems (IS). The V4 was developed in an attempt to unify the fragmented, diverse and mixed opinions surrounding the BM concept, in hope of creating “a cohesive understanding of the BM concept...supplying a solid and complete foundation for researchers and practitioners” (Al-Debei and Avison, 2010, p.360). Results of an extensive thematic analysis of existing scholarly descriptions of BMs, ordered in a taxonomy of thirteen mutually-exclusive elements were combined to inform the V4 (See Figure 3.6). Thus, the V4 was influenced by and combines thinking from a wide range of BM scholars. In this way, the V4 is arguably the most comprehensive and inclusive BM.



Source: Al-Debei and Avison (2010, p.368)

**Figure 3.6 The V4 Model**

V4 was designed to represent integral business components and the interrelated, interdependent relationships between them based on Al-Debei and Avison's (2010) argument that developing a BM required a careful balancing act between conflicting elements. Al-Debei et al. (2008, p.8-9) considered BMs are:

*"An abstract representation of an organisation, be it conceptual, textual, and/or graphical, of all core interrelated architectural, co-operational, and financial arrangements designed and developed by an organisation presently and in the future, as well as all core products and/or services the organisation offers, based on these arrangements that are needed to achieve its strategic goals and objectives"*

The of four main V4 components centre around the concept of value (value proposition, value architecture, value network and value finance), and the above definition was rooted within these four principles influencing V4 design. Al-Debi and Avison (2010) proposed BMs should be:

- (1) Comprehensive and general
- (2) Business is a flexible process, therefore it is problematic to define BMs by its components, because there is no single way to describe a BM
- (3) Defined for a single organisation
- (4) Should synthesise different points of view

Informed by these principles, Appendix 9 combined literature examining the four V4 components from a range of authors to provide a detailed deconstruction, examining the purpose and theory behind each of the four V4 components.

In response to the complex, changeable, uncertain and increasingly competitive mobile markets Camponovo and Pigneur (2003) and Hedman and Kalling (2003) recognised the need for BMs to be more flexible and dynamic. In this respect, the V4 is one of the most inclusive and complete BMs, because, in addition to the four components, Al-Debei and Avison (2010) also identified modelling principles, BM reach, and BM functions, reflected in V4 the development process presented in Appendix 10. Significantly, the V4 was developed, unifying previous BM definitions, making it inclusive of several different BM perspectives.

Regev et al. (2012) praised V4 for serving as an interceding framework or mediating construct, between technology and strategic goals. Businesses need to be increasingly flexible to survive in the face of continual change (Hedman and Kailling, 2003), and V4 has been recognised as a tool to support organisations in the face of uncertainty. Kijl (2005, p.2) supported that “the business model concept plays a valuable role when simulating, analysing and understanding current or new business concepts and exploiting these opportunities”.

### ***Tourism Business Models***

As a system, tourism is largely information-intensive and the internet acts as a hub providing information to prospective tourists, containing different components; a tourist, traveller generating region and transit route for traveling between generating regions (Gunn, 1994). However, the industry has undergone extensive transformation with the increase of ICT and digital services, and “online travel has profoundly changed the way travel and tourism organisations interact with their customers” (Eriksson, 2013, p.1). As a product, tourism is multifaceted, involving large partner networks and supply systems (Livi, 2008). The internet introduced rapid change to traditional distribution processes (Eriksson, 2013), giving destinations, suppliers and intermediaries an expansive new range of possibilities to reach and communicate with their customers (Rabanser and Ricci, 2005). This created new ways of doing businesses, but also heightened the importance for businesses to adapt in order to survive (Al-Debei et al., 2008). Increased online travel options transformed the way travel organisations communicated and interacted with customers (Buhalis and Law, 2008). Tourists had the ability to act as their own travel agents, building travel packages and personal trip itineraries online (Werthner and Ricci, 2004; Sigala, 2010), and as a result, the internet became the primary source of travel information (Grønflaten, 2009).

Organisations now offer personalised services, tailored to customer interests, providing increased support to an individual traveller’s style of learning (Eriksson, 2013), producing a shift from mass-market to more individual and personalised products (Holmner, 2011). Yet, this increased tourists’ expectations, growing demand for access to services and information anywhere and at any time (Werthner and Ricci, 2004), before, during and after their trip (Hjalager and Jensen, 2012). As a result, IT presented “unprecedented challenges and opportunities for tourism and

hospitality businesses" (Law et al., 2014, p.727), which it has been argued needed addressing through their BMs.

Electronic Tourism (eTourism) has become increasingly prevalent, reflecting the digitalisation of all processes and value-chains in the travel, tourism, hospitality and catering sectors (Buhalis, 2003). eTourism has changed industry structures, initiating dis-intermediation and re-intermediation (Eriksson, 2013), becoming increasingly important for competitive operations of travel organisations, to manage distribution and market organisations on a global scale (Law et al., 2009). Because of this, Garcia-Crespo et al. (2009) identified that tourism needs a new technology, to provide value-added services. Likewise, Deloitte (2013) recommended that to be successful over the next decade, tourism businesses need to invest in new and emerging technologies, as the use of technology is changing and should be addressed through the visitor experience.

Technology and IT offer unique opportunities to the tourism industry; however, it is often unclear to many tourism organisations how best to implement and benefit from the use of technology. This highlights a need to develop a BM framework to help tourism organisations understand and realise the potential of embracing the opportunities presented by the internet (Kenney and Curry, 2000). In digital markets, it is possible to create value for the consumer differently than in conventional business (Han and Han, 2001). Thus, Carlsson and Walden (2010) argued the future competitive advantages of tourism are most likely to be built around effective mobile value services.

The internet created new opportunities to create tourism VPs. Tourism has been characterised as 'wandering' because often tourists enjoy and chance upon things of interest (Brown and Chalmers, 2003). Mobility has been recognised as a key value-driver in mobile commerce (mCommerce) because mobile technology supports the wandering aspect of tourism (Eriksson, 2013). Since tourists are generally on the go and require services that work effectively in mobile settings, it is important that organisations build tourism BMs that both consider this and offer genuine utility and value to tourists. In this way, Keen and Mackintosh (2001) suggested, the demand element of mCommerce is very much a search for value. Nasution and Mavondo (2008) defined customer-value as a lived experience, generally including a trade-off between benefits and costs. Kotler and Keller (2009) differentiated between customer-value and perceived customer-value, suggesting it

can be described broadly, in relation to total customer costs. To create value, Grönroos and Voima (2013) claimed customers must interact with the service provider.

Smartphones have sensors that can display information on a user's situational context, such as their geographical location to provide context-specific information, (e.g. prices of tourist attractions or recommendation from friends of restaurant nearby) (Veit et al., 2014). This is an example of one useful mobile application that could be used for the purposes of tourism. However, Teece (2010) highlighted the difficulty of developing BMs and capturing values.

There have been various attempts to define and categorise value; for instance, Grönroos and Voima (2013) distinguished between two types; value-in-use created by the user individually and socially; and the value during the use of resources, processes and their outcome. Whereas, Bouwman et al. (2008) proposed four types; intended value, the value a provider proposes to a customer in a service offering VP; delivered value, the value the provider delivers to customers in reality; expected value, refers to the value a customer expects (based on their previous experiences) from the service; and, perceived value, the value customers, in reality, perceive from the service. Whilst, Sheth et al. (1991) suggested there are five value drivers; functional, social, emotional, epistemic and conditional, that help when understanding customer choice. These various forms of value, demonstrate the complexity of tourism, and highlight difficulties for organisations in creating tourism BMs.

Adding further to the complexity, value can also come from the use of services, since specific values are related to specific services (Bouwman et al., 2008). For instance, Buhalis (2003) described that in a planning or booking situation, the key to success for a tourist would be access to timely, precise, and reliable information relevant to their needs. Moreover, Pura (2005) and Neuhofer (2012) identified the value in providing location-based mobile services to tourists. Adding to this, values can also be specific to different types of experiences, for instance, Hyunjeong and Schliesser (2007) pointed out that for a tourist visiting a historical attraction the value may be the satisfaction of educational and entertainment ('edutainment') needs.

Building on the value gained from mobile services, Gummrus and Pihlstrom (2011) found strong evidence distinguishing two values of mobile services; 'context-value', resulting from physical elements and psychological circumstances and 'value-in-

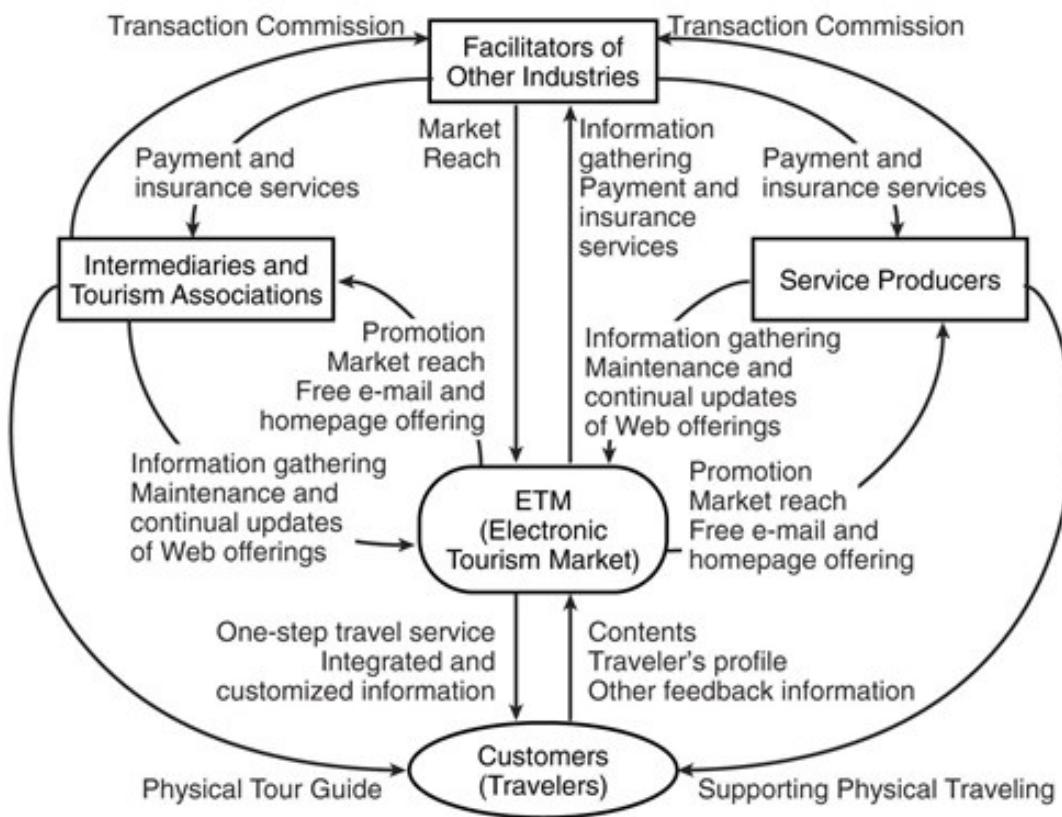
use', arising directly from using the service. Context and location services such as mobile guides have been found to be particularly valuable to tourists (Carlsson and Walden, 2010). However, individuals are very different in their propensity to adopt and use technology-based innovations (Eriksson, 2013). Therefore, when designing new mobile tourism services BMs, it was considered important to look at the organisation from a service provider perspective. Eriksson (2013) suggested MAR applications should support the users' motives or needs, including spontaneous needs, time-crucial arrangements, efficiency ambitions, mobility related needs (location features) and entertainment needs. Therefore, regardless of the type of value, it is obvious the internet has introduced more opportunities for value-creation within tourism, which need to be addressed through BMs, to ensure the value is both created and captured effectively.

Thus, when designing tourism BMs, organisations face a number of important considerations. Perceived usefulness, for example, was found to be an important component in tourist's behavioural intentions towards using mobile electronic tourism services such as mobile tour guides (Peres et al., 2011). Oh et al. (2009) demonstrated that tourist's intention to use mobile technology depends heavily on performance rather than effort expectancy. Additionally, Brown and Chalmers (2003) suggested good tourist technologies should make tourism more enjoyable and efficient. Similarly, Pura (2005) discovered that emotional value such as positive feelings, enjoyment and fun impacted commitment, and that behavioural intention to use location-based mobile services increased intentions to go on holiday. Hence, when developing mobile tourism applications and designing the associated BMs, Fuchs et al. (2011) considered that service providers should focus on both functional performance as well as hedonistic aspects.

In reaction to changes introduced by the internet, Joo (2002, p.58) stated that "to increase transaction effectiveness and efficiency within the tourism market, and provide one-stop services to customers, the electronic tourism market needs a new BM different from that of the industrial economy" to incorporate value-adding services. Reflecting the transition from traditional to eTourism, Joo (2002) developed the Electronic Tourism Model (ETM) presented in Figure 3.7, which highlights relationships between stakeholders from the public and private sectors, including; service producers, end consumers, intermediaries, and facilitators. Using the ETM, Joo (2002) advocated the importance of BM stakeholder's sharing their resources, knowledge, and revenues, in acknowledgement that many tourism

businesses are connected to the internet and cooperate to satisfy entire tourist needs, and therefore their needs must be clearly acknowledged. Thus, ETM was developed to demonstrate a unification between customers, potential travellers and players, communicating, coordinating and mutually cooperating for common benefit.

Applying the ETM, Joo (2002) identified many revenue sources for tourism organisations, both direct and potential (See Appendix 11). The ETM supported that direct revenue allow organisations to directly generate revenue from business activities via transaction and product offerings. Whereas, potential revenues enabled stakeholders within ETM, to reinforce competitiveness. Overall, the ETM provides a useful framework to assist tourist organisations to map, understand and generate revenues, however, it is visually complex and therefore confusing.



Source: Joo (2002, p.62)

**Figure 3.7 ETM BM**

In addition to the ETM, a number of other proven tourism BMs exist, such as those summarised by Rabanser and Ricci (2005) in Table 3.6. These examples include eCommerce models that have been successfully applied to tourism and demonstrate a number of different options to tourism organisations about how to

make money. However, despite these and the ETM few tourism-specific BMs exist, and the area remains under-explored. In recognition of this gap, Tourism Review Special Issue recently put out a call for papers on ‘Business Models in Tourism’, clarifying four areas of research: “(1) what can we learn from taxonomies and typologies of tourism business models? (2) How do tourism-specific contingencies influence business models? (3) How do tourism models support value creation among actors of diverse interests? (4) How can tourism business models support resilience?” (Tourism Review, 2016). This confirms and reiterates a need for further research exploring the use, benefits, and value of business modelling in tourism. In addition, through examining literature it was clear that although tourism BMs exist, mostly they are adaptations of existing traditional, eBusiness or mBusiness models and therefore fail to fully consider tourism’s unique characteristics.

**Table 3.6 Tourism eCommerce Business Models**

eCommerce BM Examples	How it works and application to tourism
<b>Brokerage model</b>	<ul style="list-style-type: none"> <li>- Brokers are market makers that bring buyers and sellers together to facilitate transactions.</li> <li>- Often play a frequent role in B2B, B2C and C2C markets</li> <li>- Usually, charge a fee or commission for each transaction it enables</li> </ul>
<b>Advertising model</b>	<ul style="list-style-type: none"> <li>- The web advertising model is an extension of the traditional media broadcast model in which the broadcaster (website) provides content and services mixed with ad messages (banner advertisements)</li> <li>- Banner advertisements create the main source of revenue for the broadcaster, yet this requires a large volume of traffic</li> </ul>
<b>Infomediary Model</b>	<ul style="list-style-type: none"> <li>- Model is based upon information intermediation to help buyers or sellers understand the market</li> <li>- Data is generated about consumers and their consumption habits are valuable</li> </ul>
<b>Merchant model</b>	<ul style="list-style-type: none"> <li>- Used mainly by wholesalers and retailers of goods and services</li> <li>- Sales are made based on a list of prices</li> </ul>
<b>Manufacturer model</b>	<ul style="list-style-type: none"> <li>- Also known as the ‘direct model’. Based on the power of the web to allow the manufacturer to reach buyers directly</li> <li>- Based on efficiency and improved customer service</li> <li>- Can be achieved through purchase, lease and licensing</li> </ul>
<b>Community model</b>	<ul style="list-style-type: none"> <li>- Based on user loyalty, to remain viable must have a high investment in both time and emotion</li> <li>- Revenue can be based upon the sales of ancillary products or service or voluntary contributions</li> </ul>
<b>Utility model</b>	<ul style="list-style-type: none"> <li>- Also known as ‘on-demand’ model, based on metering usage or pay-as-you-go services. Pay for actual usage rates.</li> </ul>

Source: Rabanser and Ricci (2005, p.5)

### **Augmented Reality Business Models**

As discussed in Chapter 2, AR is an immensely promising technology, presenting many opportunities to a variety of sectors. With specific regard to the context of this study, AR facilitates a way for tourism to provide value-added services such as interactivity and entertainment into the tourist experience (Garcia-Crespo et al.,

2009). However, the mass-adoption of AR technology is currently limited by technological constraints, uncertainty regarding implementation and use, user adoption and an overall lack of awareness. There remains a gap between understating the potential of AR, how to implement it and above all what BM or monetisation-strategy to adopt. Presently, few BMs are successfully exploiting the potential of AR in tourism (Kleef et al., 2010) and AR remains largely under-utilised in the field of tourism. Therefore, prior to the implementation of AR in tourism, it is considered vital that a BM is developed to improve long-term sustainability and profitability. Since it remains that the commercial opportunities for companies embracing AR are vast, but still not obvious (Skeldon, 2011).

Juniper Research (2013) reported that an optimal BM for AR was yet to crystallise, because the technology is continually evolving. In a review of over 400 MAR applications, Bernardos and Casar (2011) identified application providers were not expecting to generate revenues per direct download, regardless of the fact they are producing high-quality applications well rated by users, illustrating the large arena for development, in the design and implementation of AR BMs and revenue-generation.

Limited AR BMs exist, and those that have been developed are often adaptations of existing BMs. For instance, Kleef et al. (2010) applied Osterwlader's BM Canvas to AR (See table 3.7), claiming the canvas provided a detailed outline of business modelling to adapt to AR. Regarding Kleef et al. (2010) recognised value can be both financial and non-financial, concluding that based on the application of AR to the canvas, value is likely to be non-financial, and instead focus predominantly on enhancing experiences.

Kleef et al. (2010) claimed the financial aspects of AR are often associated with the value captured and delivered by applications in relation to costs and revenues, identifying staff and application development as the largest expenditure. Based upon Osterwalder's BM Canvas elements (See Table 3.7). Kleef et al. (2010) attempted to apply them to AR, starting with the VP since BMs revolve around value. In addition, Hayes (2009) defined that VPs offer businesses ways to seek differentiation and build an AR BM that offers value to customers, determining the value of services or products an AR app offers users. Building upon this, Hayes (2009) defined sixteen AR VPs (See Table 3.8), of which Kleef et al. (2010) claimed any AR application could fit into, one of, or a combination of, the proposed AR VPs.

However, they acknowledged that because AR is continually developing, the list was by no means exhaustive. Because AR is still evolving, its true revenue potential remains to be seen. Nevertheless, the proposed AR VPs demonstrate a variety of ways organisations could integrate AR in pursuit of different VPs.

**Table 3.7 Business Model Canvas applied to AR**

Element	Descriptions
<b>Value Proposition</b>	The bundle of services and product the company offers that have value to its customers. In the case of AR, this could involve the integration of virtual information into the real world
<b>Key Partners</b>	Those organisations collaborating with the company to create value for the customer. Key partners for AR applications, split into two groups; technology providers who give the organisation the tools (e.g. software) necessary to create value to intended customers, bring AR to the customers. Secondly, sub-partners, who support key partners deliver the end-product
<b>Key Activities</b>	The activities and processes within the company that create value for the customer. The most important process is software development, of which there are two main processes, firstly creating new software and resolving problems with existing software. Although creating new software value is offered to customers by creating a new functionality. Secondly, resolving issues with existing software can introduce value through upgrades and improvements
<b>Key Resources</b>	The resources the company requires to create value for the customer. A required resource for AR is a device through which AR can be perceived. There are two main types of resource; technology and staff
<b>Customer Segments</b>	The segments of customers the company wants to deliver value to. As the possible applications of AR are broad, any customer segment is applicable
<b>Distribution Channels</b>	The means a company has of getting in touch with and creating value for customers. Since AR applications are likely to be distributed through the internet, this will be the most important distribution channel
<b>Customer Relationships</b>	The type of relationship the company has established with the customer. As AR software is likely to be distributed on-line, the relation to the customer will be indirect and not very intensive. Relationships differ for the type of value proposition offered (e.g. customer acquisition, customer retention and increasing sales per customer) in the context of AR they are unlikely to be direct, as the company itself has no direct contact with customers

Source; Kleef et al. (2010, p.7)

**Table 3.8 AR application Value Propositions**

Value proposition	Description
<b>In Situ</b>	See a product in its environment before it is completed. For example, furniture manufacturers show their product in a potential customer kitchen
<b>Utility</b>	Enhancing life by making things easier. Practically any application that provides information to its users fits this VP, such as an application that shows where mailboxes nearby are located
<b>Training</b>	Improving training by practicing real life situations. AR can be used to create a situation that may be difficult to create in real life, allowing users to practice their skills, such as surgery and bomb disposal
<b>Social gaming</b>	Providing gaming as part of the real world, combining virtual and real worlds for gaming. Examples include paintball like competition with virtual bullets
<b>Location layers</b>	Location based guides and routes, applicable to applications that give information on the most interesting sites in a city or a guide around a museum. VP closely related to utility, but is specifically focused on the value offered by a travel guide
<b>Virtual demo</b>	Seeing and manipulating a product before it is available. For example, customers being able to see a product in a store or catalogue that is not available, or being able to see the product before it has been assembled
<b>Experimental education</b>	Adding a new experience to education. VP covers all applications that add a new virtual dimension to education, for example, a trip to an archaeological site, where the site comes to life in AR
<b>Enhanced classifieds</b>	Seeing a localised directory of products offered. VP is about seeing what products are offered in a consumer's neighbourhood, or guiding a consumer to the product they want
<b>3D virals</b>	Virtual advertising as part of the environment. VP covers advertising in AR with some form of interaction (e.g. virals)
<b>Personalised shopping</b>	Adding suggestions while shopping. VP is another form of advertising, where shops can give customers suggestions on what to buy in AR, based on personal preferences
<b>Cooperation</b>	Improving remote cooperation with virtual services. VP applies to working together by using AR, for example, in meetings where external participants are present through AR
<b>Blended branding</b>	Providing virtual advertising space. This applies to adding advertisements to the virtual domain so that someone using AR would see the advertisement.
<b>Augmented events</b>	Relevant content added to events. VP relates to the experience for example at a pop concert. A user would see the event, plus relevant information, such as how to buy the album
<b>Entertainment</b>	Enhancing entertainment experience. VP is applicable to bringing TV and movies to the spectators through AR, for example, the movie scenes would be playing in the spectators living room
<b>Understanding systems</b>	Increase understanding of complex systems. VP is about using AR to have different views of an object or system and being able to virtually take it apart
<b>Recognition and targeting</b>	Recognising customers and knowing their backgrounds. VP applies to applications that identify customers and display their habits or shopping history

Source: Kleef et al. (2010, p.7-10) and Hayes (2009)

Overall, Kleef et al's (2010) application of the BM Canvas to AR provides organisations with an understanding of the potential value of AR and requirements for implementation. However, it does not consider AR's unique characteristics; therefore, there is a need to develop a more specific AR BM. Inoue and Sato (2010) recommended that every organisation should design their BM to complement their area of expertise, defining six potential ways to gain revenue from AR, utilising examples used by existing companies (See Table 3.9). They believed MAR businesses can generate revenue from a range of sources, specifying that each stakeholder should design their BM to complement their area of expertise while developing unique VPs. Whilst these potential AR revenue models are useful providing practitioners with an understanding of the ways they can implement AR to generate revenues, they failed to identify specific BMs through which practitioners can meaningfully implement AR to add value and generate revenues.

**Table 3.9 Example AR Revenue Models**

Revenue model	Description	Customer Value	Example
<b>Pay per download</b>	Users are charged to download AR browsers to access content	The customer VP is the provision of innovative interfaces	DishPointer Nearest Tube
<b>User subscription</b>	A fee is charged for the download and access to specific features, content, and services. Uses 'freemium' pricing model for advanced features.	Provides innovative interfaces for tasks such as navigation, or access to context-aware information	Bionic Eye
<b>Advertising/affiliate revenue from advertisers</b>	Location-based advertising where revenue is charged to various advertisers based on brand marketing or performance advertising	Value is provided to the customer through offering brands, publishers, and advertisers with new AR interfaces and delivery channels.	AcrossAir AroundMe
<b>Licensing API to content providers</b>	A fee is charged for the provision of the AR platform.	Provides value to consumers through differentiation opportunities and allowing new demand for delivering location-based content	Wikitude API
<b>License/servicing fees from infotainment facilities</b>	License fee charged to commercial complexes, such as museums or theme parks, who provide the facilities for distribution of AR services	Provides value to customers through the creation of new and unintrusive means to deliver navigation and other promotional information directly to the consumers	Koozyt AR Technology
<b>License fees from handset makers</b>	Charge for developing and servicing AR software and services for smartphones	Provides differentiation opportunities for smartphone developers on an open platform.	Layar

Source: adapted from Inoue and Sato (2010, p. 1-2)

It has been argued that the revenue model employed must fit the application purpose and function (Juniper Research, 2013). For example, adverts in a functional application would be intrusive and counter-productive, thus brands would be unlikely to want to advertise their products on such applications. Kleef et al. (2010) described that Layar, one of the most successful designers of commercial AR applications was largely responsible for the public interest in AR monetising their application using a model that provides a content-store for consumers to purchase additional paid layers of information to improve their AR experience. Layar's content store is friendly to both consumers, developers, and businesses, allowing the update and upload of content. For example, using GPS, the application can advertise local food and drink establishments to the user based on their surroundings, helping generate revenue for local businesses. Layar's success in monetising their AR application has been argued to demonstrate promise for the future of AR (Kleef et al., 2010).

Business Development Director at Qualcomm Inc. argued the means for monetising AR applications will not be any different from any other applications, although there will be new players and new platforms, BMs for AR applications will remain the same (Skeldon, 2011). However, the fact remains that few BMs are successfully exploiting and therefore monetising AR technology (Kleef et al., 2010) and an optimal BM for AR is yet to crystallise, because the technology is still evolving (Juniper Research, 2012). Therefore, one of the biggest challenges remains for businesses to convert the AR revolution into rock-solid profits (Skeldon, 2011). Equally, an optimal AR BM to be designed, implemented and tested.

Companies beginning to implement AR have often adapted established mBusiness and eBusiness models, rather than developing new AR BMs. Camponovo and Pigneur (2003, p.3) have argued that "business models that explicitly address mobility, network effects, and natural monopolies issues, and that are profitable to all different players needed to provide and the end-to-end solution will be the most successful and sustainable". In the case of AR, where the provision of enhanced experiences and creation of added-value requires the collaboration of many stakeholders. In this sense, Faber et al. (2003, p.3) advocated that the overriding success of a BM "is thus dependent on the commitment of all parties involved". Expanding upon this, Zott et al. (2010, p.15) claimed that "one of the primary characteristics of new business models is that both value-creation and value-capture occur in a value network" therefore it should include suppliers, partners, distribution channels and coalitions that extend company resources.

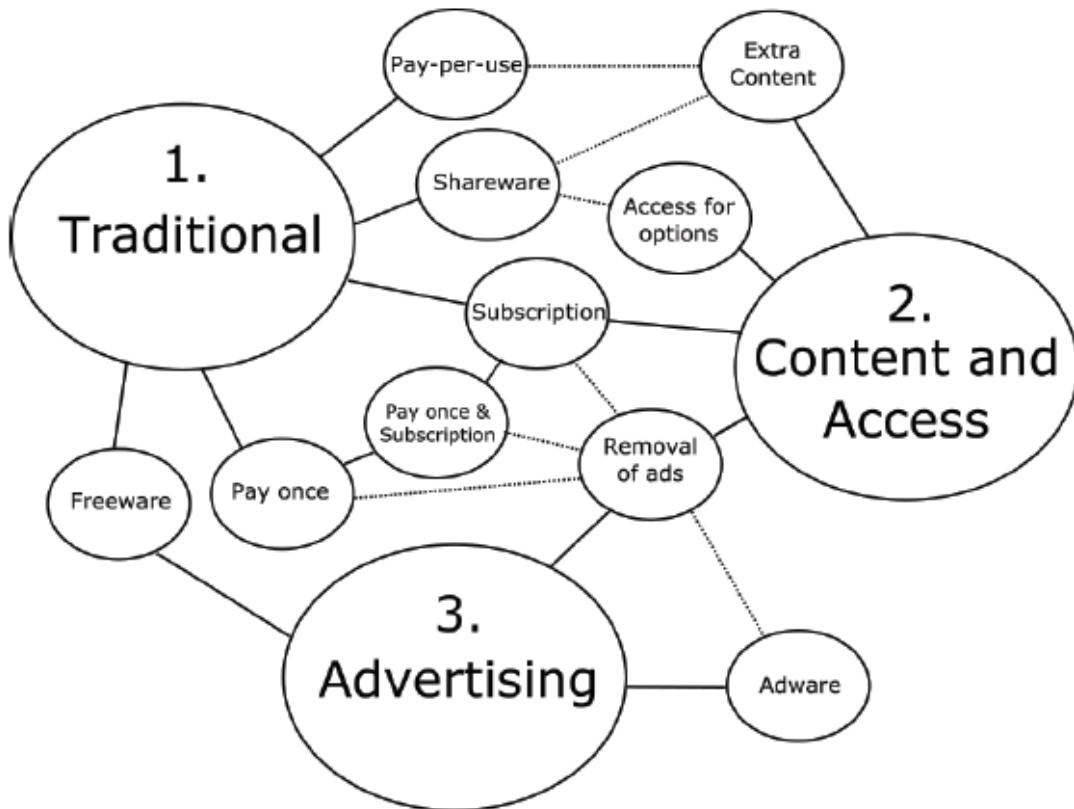
Kleef et al. (2010) examined the success of AR applications, identifying usability, usefulness, fun and productivity as crucial requirements to create successful AR applications, thus, although not directly related to BM success, these factors should also be considered in BM design and as offering genuine value to users. AR is still an emerging and evolving technology, reiterating that an optimal AR BM model is yet to emerge.

Recently, Heimo et al. (2016a) conducted a study using Hyrynsalmi et al. (2012) analysis of revenue models for mobile ecosystems and Heimo et al. (2016b) Video Game Business Logic Model, which classified typologies from an application developer's perspective, producing a synthesis for Mixed Reality (MR) (of which AR is a subcategory) of BMs in museums and cultural travel. They identified that cultural travel, cultural heritage sites, museums, galleries, heritage and tourism organisations possess special characteristics that should be considered when developing BMs, arguing that there are several fundamental similarities and overlaps between both traditional applications of business in mobile ecosystems and video gaming. Figure 3.8 presents the synthesis for Business to Consumer (B2C) BMs for MR in Museums and Cultural Travel and the process for creating the synthesis can be found in Appendix 12.

Based on their synthesis, Heimo et al. (2016a) removed revenue models that were irrelevant to MR, increased importance of others and combined some BMs. Importantly, they recognised that applications can use a variety of BMs, for example, if a museum wanted to integrate a MR experience and they believed visitors should pay an additional price to the entry fee it used the 'pay once' BM. In addition to this, if the museum wished to supplement the experience with advertising for future exhibitions the application would be classified as 'adware'. Heimo et al. (2016a) suggested one of the simplest and most effective ways for museums to monetise MR applications would be to use the 'freeware' model, by adding the approximated value of the application to the entry fee, irrespective of whether the visitor used the application or not.

Whilst, Heimo et al's (2016a) study identified potential ways for museums and cultural travel attractions to monetise MR, and therefore by extension AR, they confirmed the need for further research, to identify which models will prove successful, and to understand the true commercial potential of such technologies. In comparison to audio guides, they claimed that MR solutions have various

possibilities; however, grasping these requires a situational and contextual understanding of the visitors and site itself. Through their analysis they confirmed that there are feasible solutions, BMs, business logic, and revenue models for MR use in museums and cultural travel, minimising and overcoming organisation's fear of taking risks.



Source: Heimo et al. (2016a, p.7)

**Figure 3.8 B2C BMs for MR in Museums and Cultural Travel**

### 3.11 Business Model Success

It has been suggested “organisations that take leadership positions in their industries, succeed by having an outstanding business model and executing it masterfully” (Fleisher and Bensoussan, 2015, p.159). Despite this, the BM concept remains vague, although there have been attempts to determine the factors that contribute to success. SBMs and BMI are considered critical to BM success, encouraging organisations to explicitly outline and align the strategic objectives to their BM. Johnson et al. (2008) and Thompson and Martin (2010) recommended organisations that do this generally perform better than those who do not, because a good BM clearly identifies products and services, for whom they are intended, and why these targeted customers have a compelling reason to do business with them.

In this way, good BMs should precisely fill the customer VP, which is difficult to achieve, but the more precise, the more successful the BM.

From a strategic perspective, Smith (2010) suggested successful BMs are an enabling device, that allow organisations to profit from ideas or developments. In the same way, Magretta (2002, p.6) claimed successful BMs highlight areas of value and turn it into profit, thus “a business model’s great strength as a planning tool is that it focuses attention on how all elements of the system fit into a working whole”. Shafer et al. (2005) added that good BMs provide a way for organisations to analyse and communicate its objectives, and therefore a tool to measure success. In this way BMs are considered tools for alignment, harmonising elements between organisational layers (Al-Debei and Avison, 2010).

### ***Mobile and Electronic Business Model Success***

When it first emerged, the digital economy gave organisations the “potential to experiment with novel forms of value-creation mechanisms, networked in the sense that value is created in concrete by a firm and a plethora of partners, for multiple users” (Zott et al., 2010, p.14). However, as it has progressed, mBusiness became increasingly interrelated, involving a variety of stakeholders and value-networks (Faber et al., 2003). Despite mBusiness offering unique, valuable characteristics such as mobility and portability, giving organisations the opportunity to improve or revolutionise services, operations, and products, it also created a highly saturated competitive market, increasing the need for businesses to develop, redesign and establish a BM. As a result, BMs have been employed as disciplining and structuring powers in the realisation of ICT (Veit et al., 2014). To be successful Teece (2007) suggested BMs must be dynamic and change over time. Therefore, mBusiness and eBusiness models require a higher degree of flexibility and should be reviewed frequently to ensure their fit with the “complex uncertain and rapidly changing external environment” (Al-Debei and Avison, 2010, p.374).

It has been argued that mBusiness models help organisations develop vision, strategy, assess business opportunities, realign business operations and share knowledge among their network, which, combined, increase efficiency and success (Dubosson-Torbay et al., 2002; Pigneur, 2002). In the same way, Zott et al. (2010) suggested that business modelling, especially in competitive markets, allowed organisations to understand sources of competitive advantage and differentiate from competition. Therefore, becoming more efficient, responsive and flexible

(Dubosson-Torbay et al., 2002; Pigneur, 2002). Whilst it is recognised that mBusinesses and eBusinesses will face many barriers, however BMs provide a tool to overcome such challenges by “enhancing their competitive positions, by improving their ability to respond quickly to rapid environmental changes with high-quality business decisions that can be supported by adopting suitable BMs for this new world of digital business” (Al-Debei and Avison, 2010, p.364).

### **Tourism Business Model Success**

Tourism is a multi-faceted product, requiring large partner-networks and supply systems (Livi, 2008). Stakeholder and resident support for tourism influences decisions, management options and sustainable growth (Lindberg and Johnson, 1997). Thus, tourism BMs are considered important to synchronise and understand the relationships between different stakeholders within the complex tourism network. Therefore, BMs have been employed as useful planning tools, focusing attention and helping organisations understand how all elements of a system fit into a working whole (Magretta, 2002).

When developing the ETM BM, Joo (2002) identified a number of success factors crucial to successfully develop and implement a BM, that were essential to develop and create optimal customer-service experiences, supporting the integration of service delivery in a convenient, customised way. These included; contents, integrated services, convenient and customised services, dynamic services and the community. In a study of existing tourism BMs in high-performing organisations, Little (2009) attempted to identify commonalities between their elements to understand what sustains their success. The research centred on the concept that success factors can help tourism businesses survive economic uncertainty, but also helped to understand successful competitive advantage and long-term tourism BM success. Little (2009) proposed four ways for tourism organisations to build successful BMs, ensure competitiveness, gain long-term sustainability and overcome economic uncertainty:

- (1) Positioning and differentiation: focussing on product/service differentiation.
- (2) Intelligent pricing: the tourism market is highly saturated and thus has high levels of competition.

(3) Innovative cost-cutting measures: although cost-cutting measures are crucial, it is recommended these should be coupled with innovation, for example technology and customer service innovation.

(4) Cooperation: through horizontal integration of tourism companies, the industry has consolidated, using intelligent selection of product bundles, and forming partnerships in the value chain.

However, there remains no clear guidelines identifying elements that improve tourism BM success.

### ***Augmented Reality Business Model Success***

AR is still an evolving and emerging technology, and, as identified throughout this chapter, lacking an optimal AR BM. Therefore, identifying AR BM success was problematic, because there are no existing AR BMs to test or examine, to identify success factors. Nonetheless, it was possible to determine requirements for future AR BMs and therefore facilitators of success. For instance, Kleef et al. (2010) discussed the necessity for AR to add value, implying AR BMs should be designed with a predominate focus on the creation and capture of value, which does not necessarily have to be financial. Alternatively, Hayes (2009) discussed the need for AR VPs, to seek differentiation to increase competitiveness, this suggested that an AR BM should be innovative and focus on building different ways to offer value to the customer. Whereas, Inoue and Sato (2010) explored how future AR BMs should build their design to support and complement existing areas of expertise and stakeholder roles. Heimo et al. (2016a, p.150) highlighted the need to adopt a consumer-led perspective, developing AR to provide what visitors want, thus fulfilling a genuine want, but identified “the delivery method for acquiring the best cost-benefit ratio is yet under research and thus the business model is important in finding the optimal method”. Hence, although no apparent AR BM exists, it was possible to identify determinates or stimuli of success within existing research. But the true AR BM success remain to be identified.

### **3.12 Barriers to Business Model Success**

On the other hand, numerous barriers to BM success have been identified within previous research. Although, it is widely recognised that “scholars in different fields use the same label to explain very different things” (Zott et al., 2010, p. 24) to progress, it has been suggested scholars must accept the heterogeneity

surrounding the BM concept; otherwise, it often becomes a barrier to effective BM use (Zott et al., 2010).

When assessing problems with BMs, Margretta (2002, p.5) assimilated BMs to stories, stating “when business models don’t work, it is because they fail either the narrative test (the story does not make sense) or the numbers test (the profit and loss doesn’t add up)”. Expanding upon this, Shafer et al. (2005) identified four barriers related to BM development;

- (1) Flawed assumptions underlying the core logic,
- (2) Limitations in the strategic choices considered,
- (3) Misunderstandings about the value-creation and value-capture,
- (4) Flawed assumptions about the value network.

Arguing that “while there are certainly no guarantees, we contend that the probability of long-term success increases with the rigor and formality with which an organisation tests its strategic options through business models” (Shafer et al., 2005, p.207). Many of the barriers hindering businesses are associated with an inability to innovate or develop sustainable BMs (See sections 3.8 and 3.9). When businesses shifted from traditional to eBusiness and mBusiness BMs, the transition identified a number of barriers to BM success.

### ***Barriers to Mobile and Electronic Business Model Success***

Transitioning to eBusiness and mBusiness presented a challenge to many organisations and has been described as one of the main reasons for the failure of internet businesses. During the transition, it was argued many organisations did not address how to make money, therefore instead of focusing on revenues created products and services using technologies customers were not willing to pay for, failing to “blend business and technology innovation” (Thompson and Marin, 2010, p.21). During the transition, Gleeson (2013) and Porter (2000) exaggerated an increased need for renewal and innovation, placing greater emphasis on defining how value will be captured and being flexible to respond to market changes. Johnson et al. (2008, p.59) reinforced that “one secret in maintaining a thriving business is recognising when it needs a fundamental change” sought through BMI. Hence, BMI has emerged as a method to overcome barriers to BM success.

It has been argued “a better business model often will beat a better idea or technology” (Chesbrough, 2007, p.12). In this way BMs are essential to guide the implementation and realisation of technical innovation, offering tools to effectively commercialise ideas or technologies transforming ‘technical potential’ into economic value (Chesbrough, 2003; Smith, 2010). Al-Debei and Avison (2010) supported that BMs also help align functions, leverage technical potential and aid decision-making processes. mBusiness and eBusiness BMs are characterised by large stakeholder networks, which can be difficult to manage, however, Camponovo and Pigneur (2003, p.9) suggested mBusiness models help “overcome the complexity of providing a complete end-to-end solution, which requires many complementary competencies” encouraging organisations to map relationships between all stakeholders, players, partners and other actors. In this way, to be successful, it has been suggested organisations should involve the network of stakeholders, ensuring all have an incentive to participate (Gordijn, 2002). Within the network, Leem et al. (2004, p.80) highlighted that “the ‘customer’ has an immense influence on the mobile business model”, thus organisations should consider each distinctive stakeholder characteristic to build a successful BM.

Klein-Woolthuis (1999) reiterated the need to balance the interests of the actors involved, as they may originate from different industries with a different business logic, therefore each decision has to be jointly discussed and agreed upon. According to the ACMA (2011, p.1) “the mobile apps market is characterised by extended value-chains and multiple players”. Designing any BM is a difficult task, but, the characteristics of the mobile and electronic markets add to the complexity because of the need to accommodate and balance different requirements (Faber et al., 2003). Hence, Arrayent (2012) recommended that businesses remain flexible and agile during the initial development stages of building a BM.

Large networks have been identified as barrier to BM success, thus eBusiness models should support the structuring of organisations in a way it that it becomes more efficient, flexible and responsive to customer demand, to forecast possible future scenarios, and remain competitive (Dubosson-Torbay et al., 2002). Faber et al. (2003) advised businesses should use BMs to help plan how such networks can operate successfully and sustainably. The economic characteristics underlying mBusiness have a huge influence upon the adopted BM and the economic contribution of each stakeholder elicits careful consideration (Kijl, 2005). BMs play

a central role in explaining an organisation's performance, which can lead to competitiveness and competitive advantage (Zott et al., 2010).

It has been suggested that many businesses fail to look at cross-company collaboration, instead, they see BMs as way a network of companies intends to create and capture value from the employment of technological opportunities. Faber et al. (2003) advised that organisations should look beyond an individual firm and see BMs as an enterprise, a collaborative effort of multiple companies to offer a joint proposition to their customers. "In spite of the widespread use of mobile services, previous research on BM based mobile classification has hardly been found" (Leem et al., 2004, p.78). Similarly, Kijl (2005, p.1) suggested "despite the promising opportunities and huge investments in 3G technology and networks it is still unclear how sustainable business models of emerging mobile services will look like". Faber et al. (2003) deemed that when designing or developing an mBusiness model, the following need to be considered;

- (1) Balance the different requirements and interrelatedness of the different domains (organisational, service, technical and financial design)
- (2) Understand and cater for the fact that choices made in one domain may affect those of another domain
- (3) Accommodate the requirements of all players involved in the value-chain
- (4) Balance the interests of different actors involved, they may originate from different backgrounds with different ideas

Limitations stemming from previous research have also been identified, for example, classifications predominantly focus on mobile services and not mobile BMs (Kijl, 2005). Previous research often deals with services in B2C (Business to Consumer) BMs, meaning B2B (Business to Business) and B2E (Business to Employee) perspectives have been neglected. In addition, it is considered problematic to use existing eBusiness model classification schemes in mBusiness, because wireless channels are different from wired internet business, in terms of usage patterns and industry maturity (Kim, 2001; Lee et al., 2001). Therefore, Thompson and Martin (2010) suggested it was important that organisations were aware technologies, fashions, and competitors change all the time.

### **Barriers to Tourism Business Model Success**

In the context of tourism BMs, the internet has grown at an unprecedented rate and continues to flourish, therefore continual new technologies and innovations such as AR emerge. Hence tourist organisations face continual pressure to stay ahead of the game. It has been argued that travel related business information is complicated due to its complex and dynamic characteristics, therefore, issues such as polarisation of demand, the creation of new services and emerging technologies are complex and difficult to understand, especially for SMEs in the tourism market (Joo, 2002).

In both tourism and digital BMs, market dynamics are important (Zott et al., 2010). The value for customers, such as going beyond the product or service offered should always be reflected in the BM and value-network of an organisation. However, fashions, customers priorities, and technologies regularly change and therefore it is important for BMs to be dynamic and flexible. As discussed, there are many factors that influence BM success which should be considered in the design stage, and continually reviewed throughout the BM life cycle to ensure opportunities for innovation do not pass and overall the organisation remains as competitive and sustainable as it can.

Zott et al. (2010) pointed out that customer priorities beyond the product or service offered should always be reflected in the BM and value network of an organisation. Equally, Little (2009, p.1) claimed that because of “customer’s financial inability, job uncertainty and companies’ cost-saving measures on business travel, many traditional business models in all industry segments are put under pressure”, which is threatening many tourism businesses. It is also important to note, that from a destination perspective the development of services not only depends on individual tourism service providers but on all local stakeholders and their willingness to support and develop tourism within the destination area (Wilson et al., 2001). This again highlights the importance of BMs to map out and identify the contribution and benefits of a multi-stakeholder approach.

Importantly, Zott et al. (2010) highlighted that customer priorities have a regular tendency to change and therefore BMs need to be dynamic and flexible. This is particularly important for the tourism sector; a highly saturated and increasingly competitive market, where fashions and consumer expectations constantly change. Increased access to, and the rich variety of information available to tourists is

positive but can also create problems stemming from its quantity with tourists finding it time-consuming and complicated accessing specific information (Rabanser and Ricci, 2005). This confirmed the need for organisations to consider this in BM development, to ensure they remain competitive and attractive to customers through delivering accurate, up-to-date, and informative information and avoiding overload.

Social influence has been found to have a significant and positive impact on the intended use of mobile information services in tourism, and intention to use mobile tourism services (Bader et al., 2012; Fuchs et al., 2011). Eriksson (2013) identified the complexity of designing tourism MAR applications, suggesting organisations should carefully examine and balance different elements. Service innovation is directly related to BM development that includes interrelated elements in the service domain, technology domain, organisational domain and financial domain. Research suggested tourist's intention to use mobile technologies depend heavily on the performance expectancy rather than the effort expectancy (Oh et al., 2009). This implies to build a successful tourism BM, services need to be clear, accurate and easy to use, whilst offering genuine value to the user.

Similarly, it has been found that perceived usefulness was important in tourist's behavioural intentions towards using mobile tourism services such as electronic tourist guides (Brown and Chalmers, 2003; Peres et al., 2011; Pura, 2005). Therefore, as Fuchs et al. (2011) emphasised, it is important that service providers focus attention on not only functional performance, but also hedonic aspects when designing mobile apps in tourism. The same can be said for the process of developing BMs for mobile tourism services.

### ***Barriers to Augmented Reality Business Model Success***

This chapter confirmed a gap identifying AR BMs, therefore a full understanding of the barriers to their success remain to be understood. However, in section 3.11 it was possible to identify potential barriers to AR BM success from previous research, based on the opposite factors identified as enablers of AR BM success. For instance, within section 3.11 Kleef et al. (2010) identified that AR should add value, creating an enhanced experience, therefore it is logical to assume if an AR BM does not support implementation of AR that adds value to, or enhances the user's experience it will unlikely be a success, because it would not create value and therefore there would be no value for a BM to capture. In the same way, Heimo et al. (2016a) advocated the need for organisations to adopt a consumer-led

perspective when developing AR applications, therefore adopting a developer-led perspective, for example, could be perceived as a barrier to AR BM success.

In the specific context of cultural heritage and museums, Heimo et al. (2016b) explored the process of AR adoption within museums and small organisations. It was identified that reduced public funding has propelled museums and cultural travel to become more commercially involved, but also more unwilling to take risks (Coupland and Coupland, 2014; tom Dieck and Jung, 2017). Heimo et al. (2016, p.148) suggested that whilst attractions recognised the need to adopt new technologies “adapting too novel technologies or business models not tested elsewhere might seem like waste of already scarce resources...possibilities of activating new visitor groups or gaining more income are not viewed as results alluring enough or worth the risk”. This implies the fact there is no optimal AR BM, is in itself one of the main barriers preventing wide-scale adoption and exploration of AR by museums and cultural tourism, by virtue of the fact that it presents too much uncertainty, and therefore financial risk.

In addition, Heimo et al. (2016) found that commercialisation of the visitor experience adopting technologies is controversial because many non-profit organisations have only begun to accept that to remain profitable, they have to increase their activity, but even so, many still consider this activity as a ‘necessary evil’, rather than an opportunity. Thus, it could be considered that although AR can generate additional visitors, “the delivery method for acquiring the best cost-benefit ratio is yet under research and thus the business model is important in finding the optimal method” (Heimo et al., 2016b, p.150). Finally, Heimo et al. (2016a) claimed that asking the right questions was critical to success, such as “how does the customer feel about paying for the experience?”. They pointed out that BMs requires revenue and revenue requires users to be willing to pay. However, because MR (and AR) are still emerging Heimo et al. (2016b) questioned whether people would be willing to pay more if they do not know what they are paying more for. Based on this, it can be assumed that an AR BM without flexibility, adaptability, and agility will be less likely to adapt to changes, therefore be less successful. In this way, Jung and tom Dieck (2017, p.11) highlighted the need for “a suitable business model for the investment and implementation of multiple technologies into cultural heritage places”.

### **3.13 Research Problem**

The widespread digitisation of business and society at large means logic inherent in a BM has become critical for business success and thus a focus for academic inquiry. Veit et al. (2014, p.45) argued that “the business model concept is identified as the missing link between business strategy, processes, and information technology”. It is considered that is it not the implementation of the technology itself, but the BM supporting the technology that leads to success and allows organisations to reach their strategic goals and objectives (Yuan and Zhang, 2003). In this way, Chesbrough and Rosenbloom (2002, p.529) suggested “a successful business model creates a heuristic logic that connects technical potential with the realisation of economic value [and that] the business model unlocks latent value from a technology”. This presents a general acknowledgement of the importance of BMs for the digital market, especially to facilitate collaboration and cooperation (Al-Debei et al., 2014). Yet, ACMA (2011) claimed because of ongoing development, there are no industry standards or protocol, and Camponovo and Pigneur (2003, p.2) added that there are ‘no rules of the game’ meaning, “actors must experiment with a variety of strategic approaches and constantly reposition themselves in order to find the most favourable competitive position in the industry”. Hence, Kijl (2005) identified that experimental, innovative and adaptive BMs are the most likely to prosper.

It is often argued that technological constraints (Taqvi, 2013), costs (Layar, 2013), user-adoption (Kleef et al., 2010), and a lack of awareness (Juniper Research, 2013) are delaying widespread implementation of AR. Different meanings have been attributed by different researchers, thus AR does not have a universally-agreed definition (Wu et al., 2013). But, only in the past few years has technology caught up with the idea of AR, as devices have become cheaper, smaller and more powerful to support and run AR applications (Salmon and Nyhan, 2013). Despite the recent surge in interest and sales of AR capable devices, the research and development necessary to implement AR spans four decades (Billinghurst and Henrysson, 2009). For reasons such as this, and the fact the technology is still evolving (Juniper Research, 2013), there is no solid BM or framework that exists to guide organisations on how best to implement and exploit the potential of AR to generate revenue. Therefore Olsson et al. (2012, p.45) argued that “it is yet to be seen what will be the true value of AR as an interaction paradigm and what kind of behavioural and societal implications the technology might have on people”. Despite

this there have been cases where AR has already been implemented, proving itself as an effective sales-enabler tool, revolutionising the way products are sold or as a tool to complement and enhance business processes, workflows and employee-training (Juniper Research, 2016). Likewise, Heimo et al. (2016b) identified a number of potential AR BMs, revenue models, and business logic, but also confirmed the need for future research.

One of the main benefits of AR, is the increase in the availability of information and additional content, which has been explored in various sectors (Kleef et al., 2010), but it has been revealed that many organisations are unaware of how best to harness the potential of AR to reap the most benefit and value to their business. Again, this highlights the need for an AR BM. AR is still a new market, and therefore users and developers need to first fully understand how the technology works and what customers value the most (Layar, 2013). However, before this Van Krevelen and Poelman (2010) suggested fundamental issues such as technology acceptance, need to be addressed and satisfied before AR is widely accepted. Yet, Nazri and Rambli (2014) believed AR is under-utilised because of technological and non-technical issues and Skeldon (2011) proposed the commercial opportunities for companies embracing AR are vast, but still not immensely obvious.

Nevertheless, Taqvi (2013, p.11) suggested “technology has propelled AR systems from experimental laboratories to market places demonstrating great promise”. There is evidence of the implementation of AR in a number of sectors, and its uses and potential are widely acknowledged, but there is a research gap identifying how to effectively monetise and implement the technology to generate value for both the user and business organisation. Therefore, AR remains widely underutilised in many sectors, such as tourism, despite the significant benefits it offers. “Each successful new model has found a way to deliver greater value to customers and, equally important, successful capture value for the firm” (Fleisher and Bensoussan, 2015, p. 161). Despite the fact AR is still an evolving technology, research demonstrates an overall positive attitude towards its use. But, to exploit its potential and harness its benefits, an AR BM needs to be developed to provide a framework for organisations wishing to introduce AR.

### **3.14 Justification of selected Business Model: V4**

This chapter has explored existing BMs, in the context of traditional, mBusiness, eBusiness, tourism and AR, identifying the process of development, strengths, and weaknesses of each. To progress this study, a BM has been chosen to act as a framework to structure and scaffold the development of an AR BM, during data collection phases.

Table 3.10 identifies the authors opinion of the strengths and drawbacks of the main BMs examined through this chapter. In comparison, to the other BMs examined, the author considered the V4 developed by Al-Debei and Avison (2010) to be the most comprehensive, complete, and inclusive BM to guide the structure of research themes and questions. Therefore, the four V4 themes were used to inform questions in interview data-collection. The V4 was regarded as the most complete BM, and its main strength was recognised as its development process which involved the examination and unification of BM thinking, definitions and components from a number of BM scholars. Moreover, the V4 focus on interdependence and interrelatedness, is especially important to the study context, because MAR is characterised by large partner networks and stakeholder collaboration, as is tourism (e.g. Livi, 2008; Zott et al., 2010).

Dubosson-Torbay et al. (2002) and Teece (2007) suggested to be successful, BMs should be dynamic, flexible, responsive and change overtime. Importantly, the V4 embraces these principles, and its design was influenced by such modelling principles. Another strength of the V4 is that it considers the external environment and its influence on the BM operating environment, focusing heavily upon being dynamic, to respond to change and granular allowing flexibility within its functions.

The author agreed with developers Al-Debei and Avison's (2010) argument that the V4 represents an intermediate layer between business strategy and business processes, providing the organisation's strategic-oriented choices for business and management, and its intersection with processes signify a set of business implementation practices and functions. In this way, it was considered the V4 provided a tool for alignment, to effectively and efficiently manage and harmonise among layers of business. Supporting the principle that for businesses to survive and succeed, business strategy, BMs and business processes should be thought of as a harmonised package but subject to continual review to ensure its fit with

external environments and stakeholder interests (Dubosson-Torbay et al., 2002; Faber et al., 2003; Joo, 2002).

In comparison to some of the other BMs examined during the chapter, V4 was developed specifically with technical innovation in mind. Creators Al-Debei and Avison (2010) viewed BMs as a translating method essential to obtain and capture value from proposed digital innovations. Highlighting technology is only beneficial if it addresses user requirements effectively and efficiently. “The BM has been perceived as the primary reason behind technologies’ success or failure” (Al-Debei and Avison, 2010, p.371), based upon this BM function it was argued BMs can be viewed as a backbone providing a consistent and systematic approach, to design, evaluate, and manage different technologies and their associated products or services. Zott et al. (2010) also noted the need for BMs to support and encourage differentiation as key to BM success.

Compared to other BMs examined, and based upon the aforementioned reasons, the V4 was used as a framework to scaffold interview themes and questions during the interview data collection phase. However, it should be noted, few applications of the V4 could be identified within literature. But, this was not considered to be a problem, because it was only used to support data-collection, and the study did not seek to validate, apply, expand, or extend the V4. Instead it was employed as a framework to scaffold themes and inform research questions, based upon its four components; value proposition, value finance, value architecture, and value network.

**Table 3.10 Strengths and Drawbacks of examined BMs**

BM	Strengths	Drawbacks
B2C BM for MR	<ul style="list-style-type: none"> <li>- Focuses on revenue potentials for MR in museums and cultural travel</li> <li>- Identifies business logic for MR adoption</li> </ul>	<ul style="list-style-type: none"> <li>- Specific to MR</li> <li>- Adaptation of existing video and mobile BMs</li> <li>- Not specific to AR</li> </ul>
B4U Model	<ul style="list-style-type: none"> <li>- Cross-company focus</li> <li>- Helps set ‘blueprints’ or standards for each component</li> <li>- Supports bundling of resources</li> </ul>	<ul style="list-style-type: none"> <li>- Basic and outdated</li> <li>- Does not consider the impact of externalities</li> </ul>
BM Canvas	<ul style="list-style-type: none"> <li>- Demonstrates logic of how a firm wish to make money</li> <li>- Widely used and applied</li> <li>- Help ‘think through’ competition</li> <li>- Centrally captures and delivers value</li> </ul>	<ul style="list-style-type: none"> <li>- Ignores strategic purpose</li> <li>- Excludes motion of competition</li> <li>- Mixes levels of abstraction</li> <li>- Does not set priorities</li> <li>- Complicated visualisation</li> <li>- Raises too many questions</li> </ul>

<b>BM</b>	<b>Strengths</b>	<b>Drawbacks</b>
Dynamic BM Framework	<ul style="list-style-type: none"> <li>- Includes impact of externalities</li> <li>- Outlines development phases and cycles</li> <li>- Emphasises phasing and progression</li> </ul>	<ul style="list-style-type: none"> <li>- Complicated</li> <li>- Difficult to apply</li> <li>- Does not identify how organisations know when they have found the right BM 'fit'</li> </ul>
eBusiness Model	<ul style="list-style-type: none"> <li>- Helps forecast scenarios and increase competitiveness</li> <li>- Support redesign and alignment of operations</li> </ul>	<ul style="list-style-type: none"> <li>- Does not consider revenue model or cost structure</li> <li>- Outdated</li> <li>- Complicated and unclear how to apply</li> </ul>
ETM	<ul style="list-style-type: none"> <li>- Tourism-specific</li> <li>- Considers relationships between parties, internally and externally</li> <li>- Supports knowledge sharing</li> <li>- Facilitates unification of stakeholders</li> </ul>	<ul style="list-style-type: none"> <li>- Complicated and complex</li> <li>- Hard to apply</li> <li>- eTourism specific</li> </ul>
STOF	<ul style="list-style-type: none"> <li>- Helps organisations understand service characteristics</li> <li>- Applicable to tourism</li> </ul>	<ul style="list-style-type: none"> <li>- Does not support organisations innovating existing BM</li> <li>- Unclear how to apply</li> </ul>
V4	<ul style="list-style-type: none"> <li>- Comprehensive and complete</li> <li>- Development process unifies a range of BM thinking, components and knowledge</li> <li>- Interrelated and considers interdependence between components</li> <li>- Identifies modelling principles, reach and functions</li> <li>- Detailed decomposition of components, questions, and considerations for each</li> </ul>	<ul style="list-style-type: none"> <li>- Developed for IS</li> <li>- Has not been widely applied</li> </ul>

Source: Author (2017)

### 3.15 Summary

This chapter identified that to date there would appear to be no existing BM for the implementation of AR in the tourism context. Furthermore, the chapter explained the importance, need, and benefits of BMs, despite the lack of clarity surrounding the concept. Through an examination of BM components, design, success factors, influences and barriers, it is clear they are highly complex. This complexity is further increased and dependent upon the BM's operating environment, such as mobile business. Each operating environment, traditional, mobile, tourism, and AR, have unique characteristics, which require careful consideration during design and implementation. Despite the maturity of the concept, it is still underdeveloped and fuzzy, creating confusion and uncertainty. Nevertheless, the importance of developing an AR BM has been recognised within research; however, an effective AR BM remains to be developed to support cultural heritage tourism organisations in the realisation of ARs true value. To develop an AR BM a case study approach was adopted. Thus, the following chapter will explain the context of the study: Geevor Tin Mine Museum.

## **CHAPTER 4 CASE STUDY CONTEXT**

### **4.1 Introduction**

Building on from the previous chapters that identified the benefits AR presents to cultural heritage, and explored the importance of BMs, this chapter will outline the study context: The case of Geevor Tin Mine Museum. Heimo et al. (2016, p.3) suggested the “field of cultural travel, including cultural heritage sites, museums, galleries as well as heritage and tourism organisations, has its special characteristics which must be taken into account when considering business models”. Geevor was used as a case-study to develop a BM to implement AR in cultural heritage tourism. This chapter will examine the research setting and context, outlining Geevor’s unique characteristics, and the broader context of cultural heritage tourism in rural destinations. In addition, the chapter details the stakeholder approach adopted and identifies which stakeholders involvement in data collection phases.

### **4.2 Geevor Tin Mine Museum**

Geevor is a UNESCO, multi-award winning cultural heritage attraction positioned on the westerly Cornish coastline, an Area of Outstanding Natural Beauty (Geevor, 2015). Geevor is a popular attraction, the largest preserved mining site in the country and the centre for Cornish Mining World Heritage, offering a range of activities, ranging from underground tours in a real 18<sup>th</sup>-century mine to learning with interactives in the museum. Moreover, Geevor provides an authentic experience allowing visitors to ‘experience the past’ going underground with ‘real’ miners and engaging with ‘real’ mining artefacts instead of just observing (Coupland and Coupland, 2014). Because of this, and its fundamental role in mining, Geevor has gained international recognition (Jung et al., 2016).

After its closure as a working mine in 1991, and under the ownership of Cornwall County Council Geevor quickly transitioned into a cultural heritage attraction in 1993. Many of the existing staff are ex-miners and were involved in the transformation from tin mine to tourist attraction. Pendeen Community Heritage, on behalf of Cornwall Council, manage the site; thus, crucially, as a council-owned publicly-funded venture, Geevor have to ensure it remains economically viable as a tourist attraction (Coupland and Coupland, 2014).

Geevor’s significance and cultural heritage importance has established it as one of ten sites that form the Cornwall and West Devon Mining Landscape created by

UNESCO. The ten sites offer outstanding universal value and contain extensive authentically and historically important components (UNESCO, 2016). UNESCO (2016) strives to preserve the integrity, authenticity, protection and management of such properties to ensure “the ability of features within the property to continue to express its outstanding universal value”. Through this, Geevor is promoted and has won awards for its authentic values, commemorating a culturally-defining industrial past (Coupland and Coupland, 2014).

Geevor charges an admission fee and opens 6 days a week, except Saturdays (Geevor, 2015). However, on both TripAdvisor and Geevor website, visitors have questioned this decision, expressing confusion. Yet, Geevor management cite Saturdays are their quietest days expressing that their main markets are educational groups, concluding it does not make commercial sense to open on Saturdays (See Appendix 13).

On TripAdvisor (2017), Geevor is rated number one out of things to do in the local area, earning an Award of Excellence, and out of 743 reviews, 529 are ‘Excellent’, 159 ‘Very Good’, 23 ‘Average’ and only 7 ‘Poor’ or ‘Terrible’ (See appendix 14). Reviews have described Geevor as “Cornish mining brought to life brilliantly”, “great underground experience, like a time capsule to Cornwall’s past”, “an attraction not to be missed”, and “great local experience and fantastic attraction”. These visitor testimonials demonstrate a high level of visitor satisfaction. However, whilst ensuring the preservation of authenticity, Geevor management are keen to explore new ways to add value to the visitor experience and secure additional sources of revenue by adopting and introducing modern technologies such as AR. As identified by Heimo et al. (2016), Geevor as well as many other museum and cultural heritage organisations are under increased pressure to survive in face of decreased public funding and therefore have begun to explore ways to generate additional income, from a range of sources including commercial activities.

Geevor has UNESCO, World Mining Heritage, and Protected Monument status, which importantly protects and preserves the site, but also imposes some restrictions upon the provision of certain features to help tourists explore and interpret the site, such as signage and navigation aids. Currently, much of Geevor remains uninterpreted and visitors do not know what they are looking at (See Figure 4.1 and 4.2). The layout and buildings cannot be changed and because of the size of the site visitors have difficulty navigating and orientating themselves (See Figure

4.3 and 4.4). Geevor management recognise technological innovations can provide a solution to potentially overcome a number of these challenges.



**Figure 4.1 Machinery at Geevor**



**Figure 4.2 The Mill**



**Figure 4.3 Geevor Site**



**Figure 4.4 Geevor onsite Map**

As can be seen in Table 4.1 August is Geevors busiest month, and January the quietest, mirroring school holidays. Although visitor numbers have continued to increase each year, management are keen to try to establish a more balanced spread of visitor numbers throughout the year, seeking to exploit potentials presented by innovative technologies to attract more visitors.

To provide a more comprehensive understanding of the research context, the next section examines tourism in the local area, Cornwall.

**Table 4.1 Geevor Visitor numbers 2014 - 2016**

	<b>2014</b>	<b>2015</b>	<b>2016</b>
<b>Jan</b>	513	426	439
<b>Feb</b>	1030	979	1025
<b>Mar</b>	1711	2042	2430
<b>Apr</b>	3447	3247	2516
<b>May</b>	3955	4740	3258
<b>Jun</b>	3076	3652	4921
<b>Jul</b>	5031	7814	6428
<b>Aug</b>	9142	11142	10503
<b>Sep</b>	2916	4371	4564
<b>Oct</b>	3552	3393	-
<b>Nov</b>	596	812	-
<b>Dec</b>	502	635	-
<b>Total</b>	<b>35471</b>	<b>43253</b>	<b>36084</b>

Source: Geevor Management, October 2016

### 4.3 Tourism in Cornwall

According to Visit Cornwall (2014, p.4) the regions “strengths lie in landscape, coasts, beaches, heritage and culture, built on our distinctiveness”. Despite attracting 4.5 million staying-visitors spending a total of £1.86 billion per annum (VisitCornwall, 2014).

Cornwall is associated with beautiful beaches and heritage coasts. Hence, the 2014 to 2020 Tourism Strategy acknowledged a need to develop and build upon Cornwall’s cultural and heritage assets to broaden and strengthen their tourism offering (VisitCornwall, 2014) outlining the following as important;

- Protection and enhancement of the natural and built environment, including heritage museums and cultural assets
- Development of the cultural product through cultural tourism development, arts, museums, World Heritage Sites, festivals and events
- Enhance research and market intelligence including new market research and competitor analysis
- Innovative destination marketing and communications, including the effective and innovative use of digital and social media channels

This demonstrates a recognition of the need to develop and build upon the cultural and heritage assets available in Cornwall, as outlined in the report, to achieve this the need to use and adopt innovative and effective technologies was proposed (VisitCornwall, 2014). Lauren Hogan, Visit Cornwall’s (2015) Digital Marketing

Manager, highlighted, “the world has completely changed in terms of how customers interact with technology and how they use it to research and book travel, holidays and leisure”. This acknowledges the changing nature of the tourism sector as a result of technologies and the need to explore their benefits. However, it remains to be seen how Cornish attractions will embrace and implement new technologies

The most recent report by VisitCornwall (2014, p.4) indicated that tourism accounts for 4.5 million staying visitors, 25 million bed-nights, £1.86 billion visitor-spends, 17% employment, supporting 42,300 jobs and a tourist visitor impact equivalent to 70,000 extra permanent residents per annum. Tourism is an important part of the socio-economic wellbeing of Cornwall, and in a recent survey, 89% of residents agreed that “tourism is good for the area”, with 30% stating it has a “positive impact” on their lives (VisitCornwall, 2015), demonstrating strong support for tourism among local residents. Moreover, the most recent statistics on tourism in Cornwall published by Beaufort Research (2013) commissioned by Visit Cornwall identified the following characteristics of tourists visiting the region:

- Visitor origin: 94% from UK, 4% Europe, 2% further afield
- Day visitors origin: 91% from neighbouring Devon
- Visitor profile: 66% ‘older dependents’ (aged 35+ with no children)
- Socio-economic profile: attracts higher proportion of upper social grades (ABC social grade)
- Visitation: 91% visitors on repeat visits, 9% first-time visit. Summer has highest (14%) first-time visits. Half of repeat visitors return within 12 months
- Motivations for visit: 83% leisure/holiday, 15% visiting friends and family, 1% shopping, 1% business reasons
- Trip profile: predominance of staying visitors (96%), not surprising considering the geographical location of Cornwall within the country, 4%-day trips, Visitors mostly on short breaks or secondary/supplementary holidays
- Nights stayed: Average 6.9 (2012) increase from 6.3 (2011)
- Motivations for repeat visit: 67% enjoyed past experience
- Intention to visit heritage attractions: 47% first-time visitors, 37% of AB social grade, 89% believed Cornwall possessed a heritage coastline

Interestingly, the above statistics are synonymous with findings by ATLAS (2007) who identified cultural heritage tourists are mostly domestic visitors, younger and middle aged and 70% were in higher occupations (managerial/professionals).

Therefore, these statistics develop a clear demographic and market profile of Cornish tourists. It is clear Cornwall has built upon and effectively utilised their cultural heritage as a tool for tourism diversification and economic development (Smith, 2009). However, it also identified room for improvement, indicating potential to increase the appeal and attractiveness of Cornwall's cultural heritage tourism resources. This implies that presently the use of technology is limited, representing an opportunity to integrate technologies to increase the attractiveness and competitiveness of Cornwall's tourist attractions. Increasingly, the internet has been used as a source of pre- and during-trip planning; for example, Beaufort Research (2013) found between 2006-2007 only 21% of visitors to Cornwall used the internet for pre- and during-trip planning, however, this increased to 45% in 2012. During visits, they identified that visitors used the internet to search for information about attractions (23%), things to do (30%), places to go (30%) and maps (15%). This presents a need to develop an application or website that can deliver on-request, up-to-date information on such elements.

The next sections explore rural and cultural heritage tourism, to frame Geevor as a case study and understand the context and characteristics of cultural heritage tourist attraction's rural settings, as well as identify the importance of sustainable tourism development.

#### **4.4 Rural Tourism**

Rural tourism emerged during the 18<sup>th</sup> century, and became popular in the late 20<sup>th</sup> century, as a result of a perceived need to escape 'urban' environments, to reaffirm identity (Smith, 2009). Visit England (2014) reported that domestic tourists make over 17.08 million trips to the British countryside, spending over £3.1 billion, and 340 million-day trips with an £8.4 billion associated spend. However, based on such statistics, it has been argued rural tourism is more a domestic pursuit motivated by national tourists seeking out their roots or indulging in nostalgia, rather than an international movement (Smith, 2009; Holloway and Humphreys, 2012). Different tourists have different interests; therefore, a number of typologies have been developed attempting to classify tourists and tourist products (Huang et al. 2016; McKercher and Du Cros 2003). McAreavey and McDonagh (2011) proposed that it was useful to appreciate rural areas for their complex multifaceted capacities, and wide-ranging offerings, appealing to different interest groups, who claim their right to, and use of, different rural spaces. Huang et al. (2016) noted rural cultural heritage sites are not just visited by 'history buffs', thus rural areas that do not have enough

of one type of attraction to act as primary draw, should explore the relationship between different types of tourism, and bundle activities or attractions together with the aim of attracting more visitors to the area.

However, the growth and increasing popularity of rural tourism has placed many pressures on both the local community, businesses and the environment and countryside has been challenged like never before (McAreavey and McDonagh, 2011). Nonetheless, the benefits of rural tourism can be considerable, and many rural populations depend upon income generated through tourism (Smith, 2009). Often, rural communities seek to diversify their economic base through tourism, in a bid to become more sustainable (Roberts and Hall, 2001). When faced with declining traditional primary industries, such as fishing or farming, tourism has been used as a tool to create jobs and raise the standard of living (Fleischer and Felsenstein, 2000; Sharpley and Sharpley, 1997).

There is evidence of many rural areas, such as Cornwall, realising their tourism potential by developing local resources such as culture and heritage, integrating and diversifying resources to sustain economies and encourage local development (MacDonald and Jolliffe, 2003). Cook et al. (2014) identified examples where tourism becomes more than just another industry, and tourism development becomes part of the economic fabric of rural communities, regions and countries creating a number of benefits, such as those identified in Table 4.2.

Importantly, cultural heritage is often well preserved in rural areas, particularly during economic decline, when according to MacDonald and Jolliffe (2003) people turn to heritage to reminisce about “the good old days”, and cultural heritage becomes an attractor and resource for socioeconomic development. It has been identified that because of a lack of other possibilities and opportunities, policies in rural regions such as Cornwall, often emphasise tourism (Fonseca and Ramos, 2011). Therefore, it is common for cultural heritage tourism to be considered the most valuable activity to launch sustainable development processes in rural regions. It was identified as a strength that environmental and cultural heritage can be conserved for future use while benefitting the present (MacDonald and Jolliffe, 2003; WTO, 1994).

**Table 4.2 Benefits of Rural Tourism Development**

Benefits of Rural Tourism	Author/s
Becomes part of community fabric	Cook et al. (2014)
Business growth and new opportunities	McAreavey and McDonagh (2011); Irshad (2010); Huang et al. (2016); Fleischer and Felsenstein (2000)
Celebrates and preserves cultural and heritage assets	McAreavey and McDonagh (2011); Huang et al. (2016); MacDonald and Jolliffe (2003)
Creates a multifunctional countryside	Sharpley (2000); Garrod et al. (2006); Huang et al. (2016)
Creates employment opportunities	McAreavey and McDonagh (2011); Irshad (2010)
Develops existing, new resources and infrastructure	Smith (2009); Irshad (2010); Huang et al. (2016); MacDonald and Jolliffe (2003); Huang et al. (2016); Sharpley and Sharpley (1997); Huang et al. (2016)
Encourages Diversification	Hubbard and Ward (2008); Irshad (2010)
Improves rural image and therefore attractiveness to tourists	Countryside Agency (2001); Huang et al. (2016); Irshad (2010); Sharpley and Sharpley (1997);
Improves sustainability	Roberts and Hall (2001); Huang et al. (2016)
Increased community involvement	Smith (2009); Swarbrooke (1999)
Increased income opportunities	Smith (2009); Huang et al. (2016); MacDonald and Jolliffe (2003)
Increased rural standard of living	Sharpley and Sharpley (1997); Fleischer and Felsenstein (2000); Huang et al. (2016)
Increases conservation and sustainability of the environment	Sharpley and Sharpley (1997); McAreavey and McDonagh (2011); Irshad (2010)
Increases opportunities for the rural youth	Irshad (2010)
Increases value-added products and services	McAreavey and McDonagh (2011); Smith (2009)

Source: Author (2017)

Equally, in many cases globally rural communities, traditions, and lifestyles are in fact the main attracting feature for tourists keen to experience ethnic and indigenous cultures and some cultural heritage tourists consider themselves explorers and possess a keen interest in visiting indigenous cultures in their natural rural environment, homes and partaking in their traditions and cultural practices (Smith, 2009). This highlights an interdependency and compatibility between the conservation of cultural heritage and its economic enhancement (Alberti and Giusti, 2012). Therefore, an increasing number of rural areas are being recognised in terms of the diversity of opportunities they present (McAreavey and McDonagh, 2011).

Diversification and development are closely related to sustainable tourism development and the drive towards a multifunctional countryside, which has become more prevalent, and the integral role of sustainable rural tourism has become more significant (Garrod et al. 2006; Saxena and Ilbery, 2008; Sharpley, 2000;). Lane (1994) identified that as far back as 1970s, the need to preserve and conserve rural

areas, defining rural tourism in connection with its relationship with the environment was acknowledged. After all, the special attracting-feature of the countryside is rurality, therefore great care should be taken to maintain, sustain and preserve it (Lane, 1994).

#### **4.5 Sustainable Rural Tourism Development**

It has been argued that “sustainable tourism emphasises the fluid relationship between the human and physical environment” (McAreavey and McDonagh, 2011 p. 178). Based upon this, it is considered to be a social construct, reflecting a set of idealised aspirations, that are continuously changed by stakeholders to align to their organisational goals. There is often conflict between interest groups in rural environments and those involved in tourism (McAreavey and McDonagh, 2011). Rural image is a very important tool in attracting overseas visitors (Countryside Agency, 2001). The local community plays an important role in providing the rural tourism product (Smith, 2009). Therefore, there is a growing emphasis being placed on local and regional development policies (Sharpley and Sharpley, 1997).

A study by Gallardo and Stein (2007) exploring perceptions from locals toward cultural heritage tourism in rural South America, found the community supported the development of attractions, because it created an opportunity to share local stories, and as part of this local food was identified as an important component of rural cultural heritage. Similarly, Sidali et al. (2015) identified that the promotion of rural regions and that locally-grown and produced food should be promoted to represent and reinforce a region's culinary traditions. Furthermore, in a study of Cornwall, Everett and Aitchison (2008) identified a relationship between, food consumption, retention, regional identity, environmental awareness, sustainability, and increased social and cultural benefits which celebrate the production of local food and help conserve traditional heritage, skills, and ways of life. They continued that a greater focus by rural tourist attractions on local gastronomy had the potential to increase tourist spending, extend the tourist season and increase sustainability, concluding that food has an important role in “strengthening a region's identity, sustaining cultural heritage...and facilitating the regeneration of an area sociocultural fabric” (Everett and Aitchison, 2008, p.150). These studies demonstrate the potential for rural cultural heritage attractions to focus on and develop their gastronomic offering, using technologies, as an alternative tool to realise tourism benefits and enhance regional identity, as well as sustain and preserve traditions.

Sustainable tourism is a much debated and controversial topic, but nonetheless it presents many benefits to rural areas; for example, farmers profit from supplementary income, business growth, employment opportunities, increased local propensity, conservation and maintenance of the environment, celebrated cultural assets and a greater spread in terms of who can benefit economically, socially and culturally (McAreavey and McDonagh, 2011). Although, Reeder and Brown (2005) argued in many cases that the quality and quantity of the jobs created was low. Likewise, tensions often emerge between interest groups, since tourism development affects rural well-being. Therefore, it is not unproblematic and has a plethora of meanings depending on its context (McAreavey and McDonagh, 2011). Rural areas face a continuous challenge of economic development (MacDonald and Jolliffe, 2003), in a constant battle to remain competitive and attractive to tourists (Han et al., 2014).

It is often difficult to undertake research to establish the economic and market value of rural tourism (Page et al., 2001), since its ambiguous nature makes it hard to delineate between rural and other forms of tourism (Sharpley and Sharpley, 1997). Nevertheless, tourism is one of the world's largest and fastest growing industries, facing the constant battle of managing industry pressures from increased visitor numbers, and negative impacts on the community or environment (McAreavey and McDonagh, 2011). To remain successful, these pressures must be sustainably and effectively managed and addressed, especially in rural areas.

Despite this fact, attractions, particularly in rural settings, face an added pressure to cater to a range of motivations, thus investing in cultural heritage tourism development is considered crucial to regional development, job creation, and an effective way to address socio-economic problems and minimise degradation of rural peripheral areas (Fonseca and Ramos, 2011). Many rural cultural heritage attractions are built on natural features, landscapes, built heritage, events and sites of historic interest (Prideaux, 2002), which help reiterate the importance of conservation and sustainability. Technologies, such as AR, are proposed as a tool to increase sustainability within the tourism sector; however, the use of such technologies is much overlooked (Ali and Frew, 2014).

#### **4.6 Cultural Heritage Tourism**

To place these findings into a broader context, the next sections examine cultural heritage tourism, combining research exploring culture, heritage and cultural heritage to provide further depth to the study and understand its characteristics. After years of neglect, cultural heritage tourism has gained increased importance at different levels of the economy (Florida, 2004). The relationship between culture and the economy has shifted, focusing more predominantly on the conservation of culture for economic enhancement (Alberti and Giusti, 2012).

Eponymously the terms ‘cultural heritage’ and ‘cultural heritage tourism’ combine the words ‘culture’, ‘heritage’ and ‘tourism’ (Kaminski et al., 2014). The term cultural heritage tourism is used interchangeably with ‘heritage tourism’ or ‘ethnic tourism’, often used to describe attractions which present cultural traditions such as places and values, religious practices, folklore traditions, and the social customs of certain communities (Rodzi et al., 2013). The concept of cultural heritage has evolved over time. Originally, it was used to refer to masterpieces of artistic and historic value, but nowadays it encompasses anything that has a particular significance to people (UNESCO, 2009). However, the concept is plagued with confusion, fuelled by the different perspectives from which it is approached, including academic, public, scientific, official, governmental, legal and individual. Even within each field, there is rarely a standard definition. Kaminski et al. (2014, p.4), considered “the combination of these value-laden words and the different perspectives goes some way to explaining why ‘cultural heritage tourism’ has generated such a plethora of definitions”.

Cultural heritage tourism is often understood as a form of tourism where tourists see themselves as adventurers or explorers (Smith, 2009) and visit cultural heritage sites to learn about the culture, experience heritage, folklore, customs, natural landscapes and historical landmarks (MacDonald and Jolliffe, 2003). Past studies have attempted to understand tourist motivations, exploring heritage, or cultural tourists, but rarely ‘cultural heritage tourists’. For example, heritage tourism studies acknowledged heritage, specifically religious pilgrimage, as one of the earliest forms of tourism during the 1600s (Jolliffe and Smith, 2001) and nowadays it is suggested that heritage properties and living cultures are amongst some of the most prevalent attractions anywhere (Timothy, 2011).

In recent years, heritage tourism has become increasingly popular, because of increased leisure time, desire to travel, disposable income (Smith, 2009), education, mobility and access to information, reflecting broader societal change (Fonseca and Ramos, 2011). In addition, there has been heightened political focus on heritage resulting from increased public interest and recognition that heritage is an effective tool to stimulate economic activity (Bowitz and Ibenholt, 2009). However, there is a debate about what precisely heritage tourism entails, and, as a result, a number of different attraction typologies have been suggested (See appendix 15). Hardy (1988) and Millar (1989) defined that traditionally heritage tourism involved cultural traditions, places and values that groups preserve when selling and retelling the past. Graham et al. (2000) suggested heritage is the contemporary use of the past, involving both interpretation and representation. Whereas, Smith (2009, p.94) claimed "heritage tourism focuses on historic attractions, buildings, and objects as well as intangible people in their homes and to partake of their traditions and cultural practices". This is true for Geevor since its success is largely based on the intangible traditions and cultures of mining, in addition to the building and objects across the site.

On the other hand, it was proposed cultural tourism gained recognition and has been important since the popularity of the Grand Tour during the 16<sup>th</sup> century (Richards, 2001). Urry (1990) claimed that since the 20<sup>th</sup> century, culture has ceased to be the objective of tourism, and in fact tourism is culture. Nowadays, cultural attractions have become global icons (Richards, 2001), and countries such as the UK have been successfully using culture and heritage as a key offering in its tourism portfolio for decades (Kaminski et al., 2014). Cultural attractions are considered to play an important role in tourism of all levels, representing national identity and consciousness, from global highlights to small attractions, such as local identity (Richards, 2001).

There are similarities and overlaps between the concepts of heritage tourism and cultural tourism and often it is difficult to distinguish between the two. Cultural heritage tourism is often considered a subset of cultural tourism; however, researchers have had difficulty establishing its size and contribution. Arnold and Geser (2008) argued that it is common for countries to have different classification and definitions for the concept, thus no operational framework for international comparative measurement of the cultural heritage sector exists. Hence, there is limited data determining the scope of cultural heritage tourism worldwide (Kaminski

et al., 2014). Although, the UNWTO (World Tourism Organisation) estimated cultural heritage tourism accounted for 40% (359 million) of all international trips in 2009, an increase from 199 million in 1995 (OECD, 2009).

Moreover, the ATLAS survey 1995-2007 indicated growth from 17% to 32% of tourists on cultural holidays (OECD., 2009). Kaminski et al. (2014) argued such growth mirrored a growing sophistication among tourists who have developed more cultural travel tastes. Similarly, the OECD (2009) suggested it represents a shift from 'sightseeing' to 'life-seeing' tourists, mirroring the move from a focus on tangible to intangible cultural heritage. It was suggested cultural heritage tourists seek authenticity (Brown, 2000), and desire to explore native culture (Sharpley, 2002).

The convergence between cultural and heritage tourism equals profound changes to both the production and consumption patterns of cultural heritage tourism (Jolliffe and Smith, 2001; Silberberg, 1995; Urry, 1990), increasing the need for attractions to find a new way to engage and attract tourists. The penetration of technology, places even more pressure on attractions finding new ways to engage tourists. (Tscheu and Buhalis, 2016). However, the relationship between cultural heritage tourism and competitiveness remains largely unexplored (Alberti and Giusti, 2012).

Nevertheless, cultural heritage tourism has been found to introduce a number of benefits, for example it is recognised that the act of presenting one's culture to visitors introduces many benefits, strengthening community identity, cohesion, renewing local knowledge (Besculides et al., 2002), increasing community pride, promoting tolerance of tourists, creating a stronger sense of ethnic identity and increasing knowledge of their heritage and cultural traditions (Andereck et al., 2007). Table 4.3 presents some of the benefits of cultural and heritage tourism. Based on these many regions build their competitiveness leveraging their cultural heritage (Alberti and Giusti, 2012).

**Table 4.3 Benefits of Cultural and Heritage Tourism**

<b>Benefits of Cultural Tourism</b>	<b>Author/s</b>
Creation of international icons	<i>Richards (2001)</i>
Brings fresh resources to a destination	<i>Alberti and Giusti (2012)</i>
Strengthens national identity	<i>Bowitz and Ibenholt (2009); Chhabra et al. (2003)</i>
Increases community pride	<i>Besculides et al. (2002); Chhabra et al. (2003); Timothy and Boyd (2002)</i>
Renews local knowledge and cultural traditions	<i>Andereck et al. (2007); Besculides et al. (2002); Bowitz and Ibenholt (2009)</i>
Increases destination competitiveness	<i>Alberti and Giusti (2012); Bowitz and Ibenholt (2009); MacDonald and Jolliffe (2003);</i>
Increases the attractiveness of an area	<i>Bowitz and Ibenholt (2009); OECD (2009)</i>
Increases conservation of culture	<i>Puczko and Ratz (2007)</i>
Creation of jobs	<i>Bowitz and Ibenholt (2009)</i>
Increased sales of local arts and crafts	<i>Irshad (2010)</i>
<b>Benefits of Heritage Tourism</b>	
Employment opportunities	<i>Bowitz and Ibenholt (2009); Bryd and Bosley (2009); Greffe (2004)</i>
Heritage satisfies a variety of needs	<i>Fonseca and Ramos (2011); Greffe (2004)</i>
Increased interest in conservation and preservation between generations	<i>Fonseca and Ramos (2011); Greffe (2004); Jolliffe (2003); MacDonald and Smith (2003); Orbasli and NetLibrary (2000)</i>
Increases local revenue and profits, benefiting local economy	<i>Bryd and Bosley (2009); Bowitz and Ibenholt (2009); Greffe (2004); Fonseca and Ramos, (2011); Orbasli and NetLibrary (2000)</i>
Increases political focus on heritage	<i>Bowitz and Ibenholt (2009)</i>
Increases local initiatives such as festivals, thus increasing visits to the area	<i>Bowitz and Ibenholt (2009)</i>
Creates a positive image for the area	<i>Fonseca and Ramos (2011)</i>
Creates alternative ways for innovation and entrepreneurship	<i>Bryd and Bosley (2009)</i>
Encourages growth of supporting services such as transport	<i>Bryd and Bosley (2009); Fleischer and Pizam (1997)</i>
Encourages diversification	<i>Caffyn and Dahlstrom (2005)</i>
Adds value to existing channels	<i>Fonseca and Ramos (2011)</i>
Tool for socio-economic development	<i>Buhalis (1999); Castellani and Sala (2010)</i>

Source: Author (2017)

However, cultural heritage assets are not only important for attracting tourists and bringing fresh resources to destinations (Alberti and Giusti, 2012), but they have also played a key role in legislation and policy development. For instance, UNESCO 1988-1997 changed their policy to include the benefits of using cultural assets to stimulate economic development, promoting local identity and diversity while emphasising the importance of conservation (Richards, 2001). The distinctive characteristics of cultural resources help them play a significant role in tourism and policy development (Puczko and Ratz, 2007), motivating destinations to increase their attractiveness and the cultural supply offered by local communities (OECD, 2009).

#### **4.6.1 Cultural Heritage Tourists**

Much research attention focuses on understanding cultural heritage visitor demographics and several patterns have emerged over the last 30 years (Timothy, 2011). Although Timothy (2011, p. 21) identified the primary reason cultural tourism is hard to measure or differentiate from other forms of tourism is because “while cultural heritage is an important part of the tourism product throughout the world, most countries do not keep, or tabulate data specifically related to heritage tourism”. Conceptual clarity is lacking to define the difference between cultural or heritage tourists and what constitutes cultural tourism. Equally, when travellers indulge in many activities during a single trip, such as visiting a museum, shopping or sunbathing on a beach, it is challenging to classify and define their motivations and reasons for travel (Timothy, 2011).

However, research by the UNWTO (2006) predicted approximately half of all international trips annually involve visits to cultural heritage sites. Therefore, the cultural heritage proportion of Britain’s tourism industry was estimated to be worth approximately £4.5 billion a year, directly supporting 100,000 full-time jobs (VisitBritain, 2010). Hence, the British tourism industry is heavily dependent on heritage sites and cultural events, enthusiastic about understanding the demand for its heritage products (Timothy, 2011). The WTO (1994) differentiated between ‘excursionists’ (who travel for less than 24 hours) and ‘tourists’ (who stay at least 24 hours at their destination). Despite the fact that domestic day-trippers are an extremely important part of heritage demand (Timothy, 2011), strictly they are not tourists. Regardless of this fact, approximately 40% of visitors to cultural sites are local residents (Richards, 2007). Likewise, apart from a select few events and sites, less than 20% of visitors at cultural attractions were foreign tourists (ATLAS, 2007). This emphasises the importance of focusing on marketing to attract and ensure return visitation of domestic tourists.

Past studies have identified common characteristics of cultural heritage tourists to help attractions understand the target market and their preferences. Generally in the UK cultural tourists are younger to middle-aged (between 30-50 years old), however, this differs from place to place (e.g. in the USA they tend to be older and retired) (Timothy, 2011). Richards (2007) attributed a growing connection between cultural consumption and education ascribing it to the high number of young travellers, outlining the importance of connecting with younger tourists to ensure

they visit attractions in their youth to influence their future travel behaviour and likelihood to engage with culture.

Therefore, in contrast to traditional views, younger people are a very important market within cultural heritage. In the only study of its kind examining cultural tourists, ATLAS (2007) collected data from 6 European countries, 20 sites gaining 4600 responses, results demonstrate the largest single age group was 20-29 (30%), ‘discovering other cultures’ was the most important motivator among young travellers (Richards, 2007). ATLAS (2007) reported 70% of participants were well educated, with a degree or higher, reflecting increased levels of education in society and a tendency for those people to visit cultural attractions. Richards (2007, p.15) confirmed, agreeing that “highly educated people tend to consume more culture – not just high culture, but popular culture as well”.

Similarly, Timothy (2011) argued that education is a prominent characteristic of cultural heritage tourists. As far back as 1996, Richards discussed the benefits of educated tourists, suggesting they are more sensitive to the impacts of tourism on locals, the environment, and cultures, in comparison to the average tourist. Timothy (2011, p.27) stated “education can be seen as a stimulus for opening people’s eyes to various elements of the past and increasing a desire to experience historic places and cultural events”.

Hand in hand with high levels of education, it is generally assumed cultural heritage tourists have higher level occupations, with 70% being managers and professionals (ATLAS, 2007). This was supported by findings from Timothy (2011). Thus, Richards (2007) ascribed one of the main reasons for the growth of cultural tourism to an increase in higher education, which generally leads to higher jobs and therefore increased affluence. Interestingly, however, with regard to motivations for cultural heritage tourism, ‘learning’ was relegated in the 2007 survey and replaced by ‘lots of interesting things to see’ as a top motivator (ATLAS, 2007). Although it was pointed out that this merely reflected the growth of postmodern consumption styles (Richards, 2007).

These findings confirm the importance of cultural heritage attractions making an effort to understand their visitors, motivations and characteristics. As the findings suggest the higher majority of visitors are from the younger, more educated domestic market. This highlights an interesting point with regard to the use technologies and the internet in the modern era. To remain competitive, it is vital for

attractions to offer value-added services through the use of technologies and the internet (Garcia-Crespo et al., 2009). There is already some evidence of technologies being used in cultural heritage tourism (Salmon and Nyhan, 2013) which reiterates the importance for tourism businesses to not overlook the influence and power of implementing modern technologies.

#### **4.6.2 Cultural Heritage Tourist Attractions**

The most-visited cultural attractions are museums, heritage sites and monuments (ATLAS, 2007). Another interesting finding is the way tourists access information prior to, and during, their trips. It was identified that most often individuals take recommendations from family and friends (43%), and secondly consult the internet (37%) (ATLAS, 2007). The use of guidebooks (22%) has continued to rise, despite the increasingly widespread availability of information on the internet. At destinations, the most used source of information was found to be information centres (28%), secondly, recommendations from family and friends (28%), thirdly, guide books (22%) closely followed by brochures (21%) (ATLAS, 2007). Timothy (2011) argued that many devoted cultural tourists prepare for their visits ahead of time by reading about, and researching, places they plan to visit. By understanding that, the most popular information sources used by individuals can help site-managers and marketers target and adapt marketing campaigns accordingly. These figures highlight some interesting areas for further research and development, although slightly outdated. Although there are examples of technology being used in cultural tourism, there remains many potential uses which are largely unexplored and the opportunities of which remain to be fully appreciated.

Although, it has been criticised cultural heritage tourism has become too associated with the commercialisation or commodification of the past, and tension has risen toward the extent to which the past and history should be exploited or distorted as a resource for entertainment (Smith, 2009). As far back as 1993, Prentice criticised that heritage is often viewed as commercial product. Burnett (2001) supported that this has encouraged organisations to emphasise play and competitive advantage such as “our site has more attractions” instead of authentically representing heritage. But, Timothy and Boyd (2002) attribute this partly to the fact attractions have to increasingly cater to wider interests, repackaging their experiences or products in the right to remain competitive.

Samuel (1994) suggested heritage tends to reflect the ruling aesthetics of the day, mirroring public taste and what society values at the time. Inherently this is biased and elitist, traditionally reflecting the tastes of white, middle class, male Europeans (Samuel, 1994). It has only been since the influence of postmodern thinking and politics that efforts have been made to value the heritage of the minority and ethnic groups of society. In a similar vein, Swarbrooke (2000) advocated many museums tend to focus on ‘soft’ heritage in a deliberate attempt to avoid conflict and controversy. It has been criticised heritage tends to sanitise, glorify and soften the past, as many tourists want to be entertained rather than shocked or horrified in their leisure time, and seek an experience rather than hard facts or reality (Smith, 2009). But, Tilden (1977) argued that interpretations of heritage should aim to provoke, shock and move people. In which case, Smith (2009) recommended actors should be used to re-create and re-enact the past, and ‘living heritage’ in a truthful and thought-provoking manner.

Telling the story and interpreting the past are part of the challenge associated with heritage attractions (Timothy, 2011). It has been suggested people visit cultural places as an opportunity to learn something new, to be edified or to spend quality time enjoying someone else’s company. Interpretation forms an important part of that experience and the act of revealing the significance of a place, person, artefact or event. Yet Timothy (2011) pointed out that telling the story in such a way that people will want to learn, and return is a constant challenge, although high-quality interpretation can add considerable value to an attraction, giving it competitive advantage over other heritage offerings in an area.

#### **4.7 Technology and Visitor Attractions**

As discussed in Chapters 2 and 3, technology has had a profound effect on tourism over the last few years, revolutionising traditional practices, creating new ways to do business and driving a shift away from mass-market to more tailored, individualistic, and personalised products and services. The ubiquity and pervasiveness of modern technologies have become part of our everyday lives, and things we thought impossible are becoming commonplace (Kaminski et al., 2014). As a result, technology has had a significant impact on tourism supply and demand, creating a new type of consumer, demanding more sophisticated, varied and personalised travel options (Buhalis, 2003). It is believed that technology can meet these demands, by providing personalised content and services tailored to specific needs (Kounavis et al., 2012).

The frequently referenced ‘Moores Law’ predicts that computing power doubles every eighteen months to two years, reiterating the need for innovative applications to be developed and implemented as soon as technically possible (Kaminski et al., 2014). As an industry, it is recognised that tourism is in need of new technologies, to provide value-added services, such as interactivity and entertainment, to improve the tourist experience (Garcia-Crespo et al., 2009). Deloitte (2013) identified that to be successful over the next decade, tourism businesses need to invest in new and emerging devices to address increased use of technologies though the visitor experience. Similarly, although outdated, Stipanuk (1993) outlined the role of technology in tourism which is still prevalent today, supporting that technology contributes to tourism growth, creates, protects and enhances the tourist experience, provides a focal point for the tourist experience and a tool for the tourism industry. But, he pointed out, unless implemented carefully, technology can become a destroyer of the tourist experience, alternatively introduced effectively, it can expand and develop tourist products.

More recently, Kaminski et al. (2014) discussed at length the benefits and importance of using technology at cultural heritage tourism attractions, identifying that technology introduced the following benefits;

- Increased available applications and channels
- Enhanced the onsite experience of tourists
- Helped tourists access the inaccessible
- Provided digital models of objects
- Provided access by making it easier to view details to items that are physically inaccessible
- Provided insights and interpretations of the previous condition or state of a site or object
- Placed content in other location-based AR, including so-called ‘digital repatriation’ and contextualised artefacts
- Presented representations of tangible heritage as part of the narrative of intangible heritage with digital storytelling
- Provided tourists with detailed and accurate documentation

It was suggested that technology “can enhance the visitors experience by providing access at a level of detail that cannot be achieved either through the real object or site or through physical replica” (Kaminski et al., 2014, p.264). The V&A (2013)

estimated that in 2012 it had 60,039 collection items on display, out of a total 221,829 in objects in display condition. Including items in reference collections, less than 3% of the overall collections were on view to the public. For reasons such as this, the use of technology to improve accessibility is of key significance.

Yet the use of technology at cultural heritage attractions can also create a paradox, because although tourists are in the presence of the original artefact, it has been identified that visitors often pay more attention to digital surrogates (Kaminski et al., 2014). There is also a current debate in research about the use of technology, whether the public is comfortable with technology and ready to adopt innovations. Overall the opportunities presented by technology and the need for tourism organisations to embrace technology are clear, but it remains to be understood how organisations should implement and adopt technology to create value for its visitors.

#### **4.8 Stakeholder Analysis: Geevor**

The previous sections have explored the characteristics and understood the benefits and problems associated with cultural heritage tourism in rural settings, in addition to identifying opportunities and areas for improvement. It is common for tourism to be used as a tool for development, stimulating growth, increasing income, and creating benefits for the community (Gursoy et al., 2002; Ko and Stewart, 2002). Economic potential is recognised as a driver for tourism development (Mansfeld and Ginosar, 1994). However, without effective planning and community support, it often leads to unplanned and unmanaged development. Plog (2001) argued that tourism carries the seeds of its own destruction; if not managed effectively, the negative impacts can outweigh the benefits. In addition to this, tourism is understood as an expression of human behaviour, and therefore it is considered crucial that planners and stakeholders understand this behaviour to provide the right services and experiences to the tourist (Kim and Uysal, 2013). To achieve this, is it essential to gain stakeholder and resident support for tourism, because of their influence on decisions, management options, and sustainable growth options (Lindberg and Johnson, 1997).

The purpose of the study is to develop an AR BM, using Geevor as a case study. Prior to data collection, it was considered crucial to identify and understand Geevor's stakeholder network. In a tourism context, a stakeholder is considered to be "any group or individual who can affect or is affected by the achievement of the organisations objectives" (Sautter and Leisen, 1999, p.313). Tourism is a complex

and dynamic industry (Robson and Robson, 1996), and tourism literature has increasingly acknowledged the need for collaboration in the planning process of tourist activities (Sautter and Leisen, 1999). Thus, stakeholder analysis or stakeholder mapping are commonly used to identify stakeholders, understand their motives and influence, minimise potential issues, and improve cooperation.

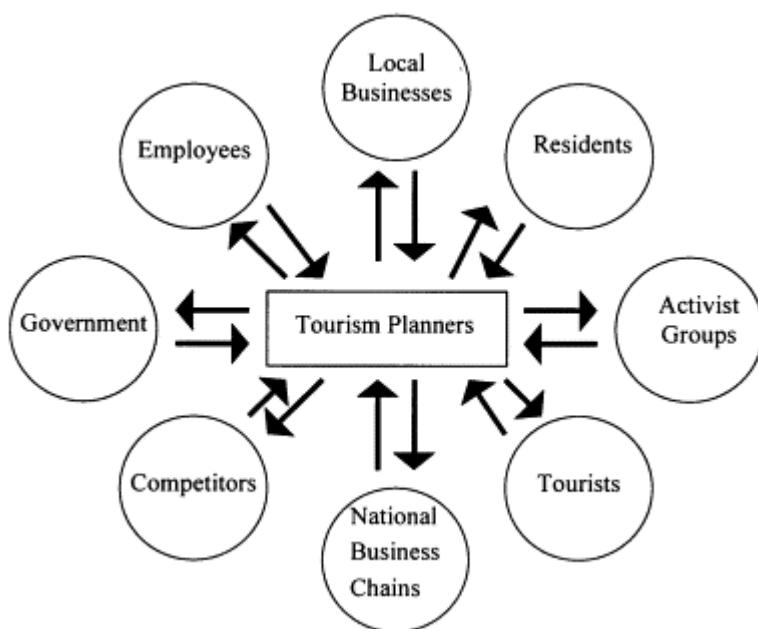
The stakeholder approach developed by Freeman (2010) in 1984, proposed organisations are characterised by their relationships with various groups and individuals (e.g. employees, customers, suppliers, governments and members of communities). Freeman (1983, p.46) defined that “[a] stakeholder in an organisation is (by definition) any group or individual who can affect or is affected by the achievement of the organisation's objectives”. Within the more specific context of museums, Legget (2009, p.214) adapted Freeman's definition claiming, “museum stakeholders are individuals or organisations who have an interest in, or influence on, a museum's ability to achieve its objectives”. Moreover, Kotler et al. (2008) recognised within museums, external stakeholders were the individuals or groups with the ability to impose rules on the organisation, whereas internal stakeholders had a keen interest to satisfy these rules.

Museum dynamics are recognised to be equally as complex as tourism. Museums are typically involved in a wide range of relationships, which are often more heterogeneous and demanding than the typical relationships in the business world (Kotler et al., 2008). For that reason, understanding and defining stakeholders is a fundamentally important task for museum managers (Legget, 2009). As well as this, it was important to determine the level of power or influence of different stakeholders. In this way, Legget (2012) reinforced a need to identify to whom might the museum matter? For example, Kotler et al. (2008, p.60) claimed “some stakeholders are active or important to an organisation, and others less so. Nevertheless, all stakeholders must be considered”.

Although, because of the complexity of both the tourism sectors and museums, it has been argued that it is almost impossible to develop a complete list of stakeholders for any given organisation. Robson and Robson (1996) suggested that the list would be almost endless, to the point that it would be virtually impossible to see how corporate objectives can be derived from such an analysis. Sautter and Leisen (1999) supported that the physical act of identifying stakeholders is very

complicated. However, despite this, it is important that organisations attempt to identify as many stakeholders as possible, to ensure the effectiveness and efficiency within their value network. It is just as important to recognise who is directly or indirectly affected.

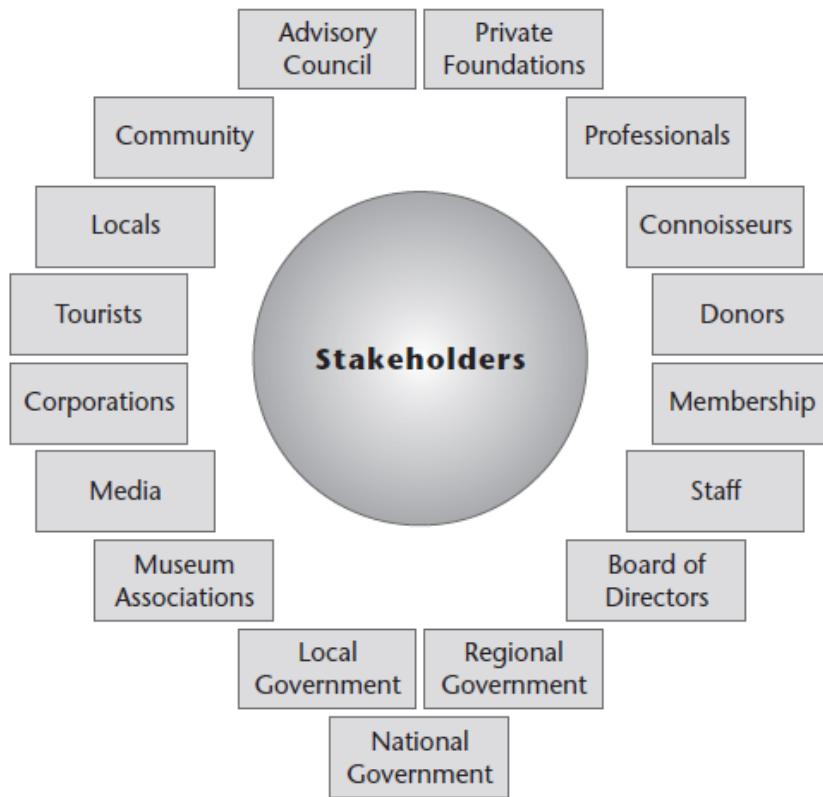
For this study, adopting a stakeholder approach was essential to understand Geevor stakeholder's perceptions towards the implementation of an AR in order to develop an effective business model. A range of stakeholder analysis methods have been proposed, for a variety of different disciplines, most of which are underpinned by Freeman's stakeholder theory. For instance, Sautter and Leisen (1999) developed the Tourism Stakeholder Map (See Figure 4.5) which identified different stakeholder groups involved in tourism initiatives. In the museum context, Kotler et al. (2008) developed the Museum Stakeholder Map (See Figure 4.6) which has been applied by a number of museums to understand their stakeholder network. Yigitcanlar (2009) supported that the museum stakeholder map, has helped with many stakeholder community-orientated decisions for tourism planning to introduce technologies in cultural tourism to increase the competitiveness of cities. A stakeholder approach has been recognised as crucial to "address the concerns of a wide range of stakeholders" when implementing new technologies (Hall and Martin, 2005, p.281).



Source: Sautter and Leisen (1999, p. 315)

### **Figure 4.5 Tourism Stakeholder Map**

There are some commonalities between the two maps (e.g. residents/locals and employees/professionals) however, the museum stakeholder map identified more stakeholder groups in comparison to the tourism map. The differences between the two reiterate the complexity and difficulty faced by many organisations when attempting to analyse their stakeholders.



Source: Kotler et al. (2008, p.60)

**Figure 4.6 Museum Stakeholder Map**

To determine Geevor stakeholders, a similar approach to that used by Legget (2012) to explore stakeholder's perspectives on museum performance in Canterbury, New Zealand, was used. Legget (2009) conducted a brainstorm with key internal stakeholders, identifying 28 stakeholder categories, reducing them to ten 'must include' groups (See Table 4.4), by determining which stakeholders had the most interest in, or influence on the museum's ability to achieve its objectives (Freeman, 1984; Legget, 2009). However, "the more complex the museum, the more diverse its range of stakeholders" (Legget, 2012, p.68).

**Table 4.4 Museum Stakeholder Groups**

Stakeholder Group	Description
Museum Workforce	Paid employees and volunteers
Board Members	Representatives of Governing body such as Trustees
Local Media	Print and radio
School Users	Regular educational visitors
Local Residents	Regular visitors from the local area
Donors of objects	Individuals who have donated to the museum collections
Tertiary users	Teachers and leaders from universities, colleges and schools
Special interest groups	Subject and community groups
Local Authority	Elected members of local government
Other museums	Colleagues from the local museum community

*Source: Adapted from Legget (2009)*

Geevor is complex, both as a tourist attraction and museum, which presented a number of conflicts of interest. For example, certain activities aimed at attracting tourists may not be in the best interests of those who view Geevor as a museum, such as maintaining authenticity. A brainstorm session was held with Geevor managers to identify stakeholder groups. In addition, internal stakeholders were asked to identify any external relationships with stakeholders during interviews. As a result, five stakeholder groups were identified; internal stakeholders, consisting of Geevor staff, and external stakeholders including tourist bodies, tertiary groups, local businesses, and visitors. However, to understand the perception of the use of an AR application at Geevor, some external stakeholders were not relevant, since developing an application would not directly affect or impact their relationship with Geevor and therefore it was not necessary to include them within the study (Kotler et al., 2008). On the other hand, some stakeholder groups possessed more of a direct effect on the achievement of organisational objectives (Freeman, 1983), and therefore had a stronger influence and were an important consideration within this study. Thus, stakeholders were selected, because their influence, expertise and support were integral to the successful implementation of AR at Geevor.

Yang et al. (2009) identified the need to involve stakeholders from the start, highlighting the importance of their perception within decision-making. Moreover, Kamal et al. (2011) advocated the importance of adopting a stakeholder approach to provide a holistic overview, combining both internal and external stakeholder perceptions when introducing new technologies. In addition, Kamal et al. (2011) identified three significant reasons to adopt a stakeholder approach; to select relevant stakeholders, to investigate stakeholders perception towards technology

adoption, and ensure stakeholder involvement at the implementation stage. Based on this thinking, below is a discussion of the five main Geevor stakeholder groups considered to have a “legitimate interest” in the achievement of objectives (Yuksel, et al., 1999), and therefore involved in the research process;

**Internal Stakeholders:** are experts, individuals who were directly within the organisation and therefore possessed the best knowledge, understanding and expertise. Geevor is a small organisation, with no more than 15 full-time staff.

**External Stakeholders:** are individuals or groups that had the ability to impose rules of conduct on museum organisations; therefore, internally museums often have a keen interest in satisfying these rules to maintain their integrity and legitimacy (Kotler et al., 2008). They are outside the organisation, or do not work directly within the organisation, but are affected in some way by the organisation's decisions. External stakeholders are recognised for their interdependency and ability to impact development processes within tourist organisations (Jamal and Getz, 1995). Geevor has a number of external stakeholders, but those directly affected, or possessing the power to influence Geevor, and therefore involved in this study were tourist bodies, tertiary groups, local businesses and visitors.

### ***Tourist Bodies***

Tourist bodies help maintain the quality of tourism services, coordinate support, provide training and communicate with tourist organisations, to ensure tourist developments fit into the destinations tourism strategy. Importantly, they also have access to funding, run marketing initiatives and encourage local tourist organisations to collaborate and support each other to improve the tourist offering in the local area. As a result, they play an integral role, possessing the power to affect decisions and processes, such as the implementation of AR. Their support was crucial to ensure introducing AR complimented the larger tourism strategy for Cornwall. Below is a detailed description of each of the six tourist bodies involved in data collection, their aims, focus, and relationship to Geevor:

The Cornwall Museums Partnership (CMP) (2015, p.1) is a charity, aiming to “develop and manage collaborative programmes of work designed to help museums raise standards, engage with more people and to be sustainable and resilient”. CMP encourage collaboration between museums for marketing, fundraising, educational programmes and online retail, whilst providing advice and guidance to enable

improvements, the expansion of target audiences and maintenance of industry standards. They promote innovative sustainable learning programmes, training to use digital tools to share Cornwall's rich heritage, engaging children and young people, working with tertiary groups, caring for collections and developing the offer for local communities.

Museum marketing experts play a crucial role in shaping public perceptions. Kotler et al. (2008, p.61) pointed out that "museums, in particular, rely on media to publicise exhibitions, programmes and special events" and have the power to "kindle or dampen audience interest" through reviews. Hence, the museum marketing expert played an integral role in helping organisations develop their social media presence and improve their cultural heritage offering, to ensure it is accessible to all. Having consulted in both urban and rural cultural heritage attractions the expert was able to provide Geevor with a thorough understanding of both industry and visitor's expectations. As well as possessing a passionate interest in AR, consulting, hosting workshops and conferences discussing its benefits and application in museums, in addition to championing the use of wearable technologies in museums, through exploring the potential benefits and barriers.

Cornwall Council own Geevor and lease it to Pendeen Community Heritage who operate Geevor as a tourist attraction on their behalf. The council brought the site to "conserve an important part of Cornwall's mining heritage and help keep alive further employment opportunities for local people" (Cornwall Council, 2016, p.1). They therefore possess the power to grant planning, funding, and tourism initiative and their webpage links directly to Visit Cornwall, under their 'Leisure and Tourism' page.

Visit Cornwall, is the Cornish Tourist Board, responsible for delivering marketing and communications to over 3.5 million customers globally, and up to 10,000 visitors a day researching what to do in Cornwall (Visit Cornwall, 2016b). Cornwall has been consistently voted one of the country's best tourist destinations. Therefore, their mission is to build on successes and seize all opportunities to ensure Cornwall is a quality destination (Visit Cornwall, 2016a).

The National Trust are a charity, committed to increasing sustainability, preserving and protecting people and places, and helping children reconnect with nature (Cornwall National Trust, 2016). Moreover, Cornwall National Trust own much of the land and attractions surrounding Geevor, thus work closely with Geevor to provide

benefits for visitors in the local area, such as discounted ticket prices for local attractions.

### ***Tertiary Groups***

Are the segment of the economy that provide services to customers, such as schools, restaurants, transport and finance. The tertiary industry is often divided into two: firstly, organisations that are in the business of making money and secondly, non-profit segments, such as education. The tertiary groups involved in this study belonged to the second group, educational establishments such as universities, colleges, secondary schools and primary schools.

### ***Local Businesses***

Geevor is a small organisation with only two businesses onsite; the café and shop. There are accommodations, retail, food and beverage and some transport businesses in the local area. However, implementing AR would not have a direct effect upon their business; hence, they have not been included in the study. Yet, it is acknowledged that AR may introduce secondary benefits, which could impact them such as increasing visitors staying, eating in the local area, or using public transport facilitates. Even so, understanding their perception to AR implementation would not directly affect Geevor, whereas the support and cooperation of the site café and shop managers would, and therefore they were included in data collection.

Geevor shop is run as a subsidiary of Pendeen Community Heritage, the charity who run Geevor. Any profits generated at the end of the year are donated to the charity, Pendeen Community. The café is franchised by Geevor, and any profits go directly to Geevor. The café provides the food and beverage service to visitors on the site, including many regular locals.

### ***Visitors:***

During the implementation of new technologies, McCabe et al. (2012) highlighted the importance of including a tourists' perspective, to maintain focus on creating valuable experiences. Visitors play an integral role in the success of Geevor and therefore it was deemed crucial to understand their perception towards AR. If visitors did not identify any value in implementing AR at Geevor, there would be no motive to introduce it and most importantly, understanding their perception of AR was crucial to develop enhanced experiences.

## **4.9 Summary**

Throughout this chapter, the basic concepts and benefits of cultural, heritage and rural tourism have been identified and it is perceived if managed sustainably, tourism development creates many benefits for destinations, which often outweigh the negatives. Tourist organisations face a continuous battle to survive, remain competitive and attractive to modern tourists, increasing pressure for them to adopt modern technologies. In destinations such as Cornwall, this is even more important because of its remote geographical peripheral location in the country.

The former three chapters examined and explored different AR uses, BM theories, and defined the study context. Together these provide foundation to the study, examining appropriate and relevant theories. The uses and potential of AR are clear, however there are currently no BMs identifying to cultural heritage organisations how to integrate and benefit from this potential. This chapter provided the important contextual background of the study, identifying its unique characteristics and exploring the challenges faced by cultural heritage attractions in rural locations. In addition to confirming the need for cultural heritage attractions, such as Geevor to embrace the potential presented by technologies such as AR by adopting a stakeholder approach. Finally, the chapter concluded by identifying the five stakeholder groups to be involved in data collection. The next chapter, will progress the study discussing the methodology and processes employed during data collection to develop an AR BM.

## **CHAPTER 5 METHODOLOGY**

### **5.1 Introduction**

Methodology concerns all elements used by the researcher in conducting the research. This chapter explains and justifies the research methods employed throughout the study. It starts with a discussion on the philosophy underpinning the study and its implications for the research approach and strategy. Methodology involves formulating research objectives, establishing research participants, collecting, analysing, and interpreting data, and above all disseminating findings (Bryman and Bell, 2015). Thus, a description of the research design follows, detailing the use of case study and mixed methods, sampling strategy, size, and selection. This includes a breakdown of the different phases of research involved in the study. The chapter concludes by considering time horizon and research rigour.

### **5.2. Research Philosophy**

Philosophy underpins and influences all other methodological choices and should therefore be the starting point in the design of research (Clark, 1998). Establishing a researcher's philosophical perspective requires them to make core assumptions regarding the nature of society and the nature of science (Burrell and Morgan, 1979), differentiating between ontology and epistemology. Ontology concerns philosophical assumptions about the nature of reality; what is considered to exist or not exist in the environment being studied (Maylor and Blackmon, 2005). Whereas epistemology concerns the relationship between the research and subject of study (Veal, 2006), and how the researcher enquires about the nature of the world (Easterby-Smith et al., 2015; Guba and Lincoln, 1994; Maylor and Blackmon, 2005).

Understanding research ontologies presents a number of challenges, because of a plethora of different perspectives. For example, Maylor and Blackmon (2005) and Saunders et al. (2012) defined two main ontologies; objectivism and subjectivism. Saunders et al. (2016) described that objectivists view the culture of an organisation as something it 'has', whereas, subjectivists believe it is something an organisation 'is'. However, Monette et al. (2005) proposed the addition of two more ontologies; positivism and constructionism. Yet, Easterby-Smith (2012) claimed there are four ontologies; realism, internal realism, relativism, and nominalism. Whereas Ritchie et al. (2013) proposed that there are five ontologies; realism, materialism, critical realism, idealism, and relativism. Saunders et al. (2016) disagreed with such classifications, categorising realism as an epistemology, not an ontology. With such

a variety of opinion, it is no surprise that there is much confusion surrounding the concept. Cotty (1998, p.1) claimed confusion arose because “terminology is far from consistent in the research literature and social science texts”, and it is common for the same terms to be used in different and contradictory ways.

Regardless of confusion, choice of philosophy is important because it influences and dictates how research is conducted (Collis and Hussey, 2014; Creswell, 2014), and how results should be interpreted (Bryman and Bell, 2007). Different philosophies involve different assumptions about the nature of reality and how individuals understand reality (Smith, 2010), or what constitutes ‘valid’ research and what research methods are most suitable (Yin, 2003). Therefore, identifying a philosophical stance is crucial because it implies how researchers view the world, and therefore underpins their selection of strategy and methods (Easterby-Smith et al., 2015; Guba and Lincoln, 1994; Saunders et al., 2012; Veal, 2011). Assumptions created by a research philosophy can help justify how the research will be conducted (Flick, 2011). However, research philosophies can differ based upon the goal of research and the best way to achieve these goals (Goddard and Melville, 2004).

Saunders et al. (2012) defined four philosophies; positivism, realism, interpretivism and pragmatism. Whereas, Maylor and Blakmon (2005) differentiated between philosophers of science who hold the epistemological perspectives of positivism, realism or empiricism; and philosophers of social sciences who hold epistemological perspectives of interpretivism, constructivism or subjectivism. Bryman and Bell (2015) argued empiricism and interpretivism have similar underlying assumptions, despite being described differently, whereas, Guba and Lincoln (1994) and Saunders et al. (2012) suggested philosophical perspectives (e.g. positivism, realism, interpretivism, and pragmatism) are viewed from an ontological, epistemological or, less commonly, axiological stance. Therefore, whilst these views share critical assumptions, they emphasise different implications and assumptions, adopting different classifications and categorisations (Mkansi and Acheampong, 2012).

Mkansi and Acheampong (2012) suggested such confusion has created ‘tautological confusion’ of what is rooted where, and according to whom, as a result of the debate between ‘quantitative-qualitative’ researchers. They proposed that

'tautological confusion' makes it difficult for researchers to understand the relevance of philosophies in different subject areas and disciplines. The author assumed the perspective advocated by Saunders et al. (2016) that the most common philosophies in business research are positivism, interpretivism, critical realism, post-modernism, and pragmatism. In line with this thinking, the main differences between ontological, epistemological, axiological assumptions and typical methods of these philosophies are presented in Table 5.1.

**Table 5.1 Comparison of main business and management philosophies**

<u>Ontology</u> (nature of reality of being)	<u>Epistemology</u> (what constitutes acceptable knowledge)	<u>Axiology</u> (role of values)	<u>Typical methods</u>
<b>Positivism</b>			
Real, external, independent. One true reality (universalism) Granular (things) ordered	Scientific method Observable and measurable facts Law-like generalisations Numbers Casual explanation and prediction as contribution	Value-free research Researcher detached, neutral and interdependent of what is researched Research maintains objective stance	Typically, deductive, highly structured, large samples, measurement, typically quantitative methods of analysis, but a range of data can be analysed
<b>Critical realism</b>			
Stratified/layered (the empirical, the actual and the real) External, independent Intransient Objective structures Casual mechanisms	Epistemological relativism Knowledge historically situated and transient Facts are social constructions Historical causal explanation as contribution	Value-laden research Researchers acknowledges bias by world views, cultural experience, and upbringing Researcher tries to minimise bias and errors Researcher is as objective as possible	Reproductive, in-depth historically situated analysis of pre-existing structures and emerging agency. Range of methods and data types to fit subject matter
<b>Interpretivism</b>			
Complex, rich Socially constructed through culture and language Multiple meanings, interpretations, realities Flux of processes, experiences, practices	Theories and concepts too simplistic Focus on narratives, stories, perceptions and interpretations New understandings and worldviews as contribution	Value-bound research Researchers are part of what is researched, subjective Researchers interpretations key to contribution Researcher reflexive	Typically, inductive. Small samples, in-depth investigations, qualitative methods of analysis, but a range of data can be interpreted
<b>Postmodernism</b>			
Nominal Complex, rich Socially constructed through power relations Some meanings, interpretations realities are dominated and silenced by others Flux of processes, experiences, practices	What counts as 'truth' and 'knowledge' is decided by dominant ideologies Focus on absences, silences and oppressed/repressed meanings, interpretations and voices Exposure of power relations and challenge of dominant view as contribution	Value-constituted research Researchers and research embedded in power relations Some research narratives are repressed and silence at the expense of others Researcher radically reflexive	Typically, deconstructive – reading texts and realities against themselves In-depth investigations of anomalies, silences, and absences Range of data types, typically qualitative methods of analysis

*Continued...*

<u>Ontology</u> <i>(nature of reality of being)</i>	<u>Epistemology</u> <i>(what constitutes acceptable knowledge)</i>	<u>Axiology</u> <i>(role of values)</i>	<u>Typical methods</u>
<b>Pragmatism</b>			
Complex, rich, external 'Reality' is the practical consequences of ideas Flux of processes, experiences, and practices	Practical meaning of knowledge in specific contexts 'True' theories and knowledge are those that enable successful action Focus on problems, practices, and relevance Problem-solving and informed future practice as contribution	Value-driven research Research initiated and sustained by researchers doubts and beliefs Research reflexive	Following research problem and research question Range of methods: mixed, multiple, qualitative, quantitative, action research Emphasis on practical solutions and outcomes

Source: Saunders et al. (2016, p.136-137)

This study lends itself to both interpretivist philosophy and positivist philosophy, however, the two philosophies cannot be reconciled (Migiro and Magangi, 2011). Although the philosophies are not necessarily at 'odds' with one another, the choice of philosophy depends on the type of knowledge being investigated (May, 2011) and although one philosophy is not inherently better in comparison to the other, researchers tend to favour just one (Podsakoff et al., 2012). Pragmatism offers a synthesis between features identified as irreconcilable, such as positivism and anti-positivism. It does not accept that there are predetermined theories or frameworks that shape knowledge or truth, or that people can construct their own truths out of nothing (Easterby-Smith et al., 2015). Instead, reality is only considered relevant when it supports action (Kelemen and Rumens, 2008). Thus, knowledge is important because of the practical impact of ideas, to ensure actions are carried out successfully (Saunders et al., 2016).

Pragmatists start with a problem and aim to create practical solutions to inform future practice and produce practical outcomes (Saunders et al., 2016). This study assumed the same approach, identifying potential benefits of implementing AR in cultural heritage tourism (such as increasing competitiveness), highlighting a problem or gap in research (lack of an AR BM), therefore developing and validating the ARBM to guide implementation (practical outcome). Although pragmatism has been criticised as an escape route from other philosophies (Saunders et al., 2016), it was considered the most suitable, since this study aimed to create a practical outcome; the ARBM. Rather than an escape route, Hammond and Wellington (2012, p.126) claimed "pragmatism offers a distinctive approach not a cosy middle in which we can all feel comfortable". Pragmatism supports the use of critical, rather than

instrumental approaches, adopting a value-laden approach to research (Johnson and Onwuegbuzie, 2004).

Positivists aim to generate valid and reliable ‘law-like’ generalisations (Silverman, 2014), whereas interpretivists take an active part in research, attaching meaning to events and actively engaging with participants (Saunders et al., 2012). However, Pragmatists assume meaning comes from the lived-experience of individuals and therefore has a significant role in organisational learning (Easterby-Smith, et al., 2015), and making a difference to organisational practice (Saunders et al., 2016). In line with a pragmatic way of thinking, one of the main practical contributions of this study was the development of the ARBM to guide practitioners and managers in the effective implementation of AR, to add value, improve competitiveness, visitor numbers and sustainability.

One of the main principles of pragmatism suggests that to know the meaning of a concept, one should consider its practical consequences rather than preconceived ideas, and therefore adopt a practical stance to find solutions that fit the context (Hammond and Wellington, 2012). Classical pragmatist Dewey (1948, p.132) argued “in order to discover the meaning of the idea [we must] ask for its consequences”. Similarly, Baert (2005) suggested the pragmatist way of thinking supports ‘anti-foundational’ ontology, rejecting that there is an objective basis to make judgements applicable to different cultures and times. Therefore, when judging ideas, pragmatists consider the practical consequences and, in this way, create solutions which are “fit for purpose” (Hammond and Wellington, 2012, p.125). Such a process is evident throughout the study, for example in recognition of the absence of a BM to integrate AR in cultural heritage tourism to produce a practical outcome, the researcher adopted a practical stance, examining consequences to create a solution “fit for purpose”, in the form of the validated ARBM, to support Geevor with the implementation of AR.

Onwuegbuzie and Leech (2005) proposed after the decline of dominant paradigms such as positivism and hypothetico-deductive approaches, it could be argued that all researchers are pragmatists. Hammond and Wellington (2012) supported that, increasingly it has been accepted that there is more than one way to interpret events, because all methodologies have strengths and weaknesses. Likewise, Hoshmand (2003) commented pragmatism helps shed light on how research

approaches can be mixed and used in combination. Pragmatism has been argued to be mixed methods philosophical partner (Johnson and Onwuegbuzie, 2004). Mixed methods have been adopted throughout this study, to create a practical solution to achieve the research aims and objectives.

In the same way, Hammond and Wellington (2012, p.125) suggested traditionally pragmatists consider theory and practice as interrelated, believing theory emerges from practice and can therefore be applied back into practice, producing “intelligent practice”. This approach has also been described as an abductive research approach, which has been employed throughout this study to develop and validate the ARBM. In this way, pragmatism supports a practical, outcome-orientated method of inquiry, “based on action and leads, iteratively, to further action and the elimination of doubt; and it offers a method for selecting methodological mixes that can help researchers better answer many of their research questions” (Johnson and Onwuegbuzie, 2004, p.17). Bearing this in mind, the following sections discuss the research approach and strategy employed throughout the study, which were underpinned by a pragmatist philosophy.

### **5.3 Research Approach**

Often, but not always, the intention of researching is to test or develop a theory (Saunders et al., 2012; 2016). The most common and contrasting methodologies to approach research are deductive and inductive. Deductive (top-down) reasoning is theory-driven, whereby a theoretical position is tested through the collection of data (Ketokivi and Mantere, 2010; Saunders et al., 2012) and then narrowed down to more specific hypothesis or research problems (Feeney and Heit, 2007), using a highly-structured methodology, to facilitate replication and reliability and confirm or propose alternative theories (Gill and Johnson, 2010). On the other hand, inductive reasoning (bottom-up) employs this process in reverse, developing conceptual frameworks or theories by moving from data to theory (Bryman and Bell, 2015; Maylor and Blackmon, 2005; Saunders et al., 2012; Suddaby, 2006). Induction is typically associated with exploratory research (Glaser and Strauss, 1967; Yin, 2009), common to qualitative research (Bryman and Bell, 2015), using a range of (Easterby-Smith et al., 2015), or multiple methods (Robson, 2002; Creswell, 1998; Hakim, 2000).

Inductive reasoning is often approached as an unrestricted and exploratory method, although it is suggested that no amount of empirical data permits theory-building (Bryman and Bell, 2015). Deductive reasoning is described as ‘narrow’, relying on strict logic to falsify hypothesis, which, it has been argued, makes it unclear how to select the theory to be tested (Bryman and Bell, 2015). However, research is not restricted to a single method of reasoning, and it is possible to combine the two processes (Feeney and Heit, 2007). Therefore, “Deductive and inductive strategies are better thought of as tendencies rather than hard-and-fast distinction” (Bryman and Bell, 2015, p.25).

In recent years, abduction, a third approach which exchanges between induction and deduction, combining principles of both has grown in popularity (Saunders et al., 2012) especially among qualitative researchers. Saunders et al. (2016, p.145) explained “where you are collecting data to explore a phenomenon, identify themes and explain patterns, to generate a new, or modify an existing theory which you subsequently test through additional data collection, you are using an abductive approach”. To understand the differences of each theory in relation to logic, generalisability and use of data, Table 5.2 compares the three approaches.

The process of abduction involves the researcher selecting the ‘best’ explanation from competing explanations or interpretations of the data (Ketokivi and Mantere, 2010). Often, this warrants the use of cognitive reasoning in theory building, which it has been argued is crucial to allow the researcher to remain open to the possibility of being surprised by the data, rather than using it to confirm their preunderstandings (Alvesson and Kärreman, 2007). Throughout this study, abductive reasoning was used to explore phenomena with the purpose of generating new theory. Initially, the study explored existing AR, BM and tourism theories, identifying the V4BM as a framework to guide research themes and questions. Following this, the ARBM was developed based on literature and interview findings and subsequently validated through questionnaires. This process started with deductive reasoning (identifying the V4 as a framework to guide research) then employed inductive reasoning (using findings to develop a theory in the form of the ARBM) and finally, returned to deductive logic to validate the ARBM.

**Table 5.2 Deduction, Induction and Abduction**

	Deduction	Induction	Abduction
<b>Logic</b>	In a deductive inference, when the premises are true, the conclusion must also be true	In an inductive inference, known premises are used to generate untested conclusions	In an abductive inference known premise are used to generate testable conclusions
<b>Generalisability</b>	Generalising from the general to the specific	Generalising from the specific to the general	Generalising from the interactions between the specific and the general
<b>Use of data</b>	Data collection is used to evaluate propositions or hypotheses related to an existing theory	Data collection is used to explore a phenomenon, identify themes and patterns and create a conceptual framework	Data collection is used to explore a phenomenon, identify themes and patterns, locate these in a conceptual framework and test this through subsequent data collection
<b>Theory</b>	Theory falsification or verification	Theory generation and building	Theory generation or modification; incorporating existing theory where appropriate, to build new theory or modify existing theory

Source: Saunders et al. (2016, p.145)

Abductive reasoning has been commended as being particularly effective in business because it mirrors what business and management researchers do in reality (Saunders et al., 2012), by exchanging between deduction and induction (Suddaby, 2006). The process of abduction is beneficial based on the argument that it overcomes the challenges associated with inductive and deductive approaches, contributing to increased validity and reliability. Tourism researchers such as Bhat (2012), Everett and Aitchison (2008) and Källström et al. (2016) have employed abductive reasoning in case-study research, extending existing theories by moving between empirical and theoretical levels (Alvesson and Kärreman, 2007). Bryman and Bell (2015, p.25) pointed out that “in everyday contexts we think of theories as things that are quite illuminating but that need to be tested before they can be considered valid or useful”. Therefore, by using abductive reasoning, problems associated with each theory in isolation were minimised, and the theory (development of the ARBM) was validated increasing its practical and theoretical contribution. Significantly, this abductive approach was also supported by the pragmatic philosophy, because it is assumed theory emerges from practice and can therefore be applied back into practice (Hammond and Wellington, 2012).

## **5.4 Research Strategy**

Researchers use different strategies to achieve different research aims or objectives. Research strategies provide a methodological link between philosophy and subsequent choice of methods of data collection and analysis (Denzin and Lincoln, 2000). Saunders et al. (2016) differentiated between eight research strategies: experimental, survey, archival research, case study, ethnography, action research, grounded theory and narrative enquiry. In addition to these, Holden and Lynch (2004) identified game or role-play, participant observation, simulation modelling, laboratory experiments, and scenario research, as possible research strategies.

### **5.4.1 Case Study Research**

Within pragmatism, the choice of research strategy is influenced by the research problem (Saunders et al., 2016). This research used a case study – Geevor Tin Mine Museum - a research strategy commonly used in exploratory research (Boes et al., 2015; Collis and Hussey, 2014; Everett and Aitchison, 2008). AR is still a new evolving technology, characterised by constant change and innovation, in situations such as this Saunders et al. (2012) advised case studies are often the most appropriate research strategy. In addition, context is critical to research and case studies have been proven to gain a rich understanding of the research context (Eisenhardt and Graebner, 2007), through the exploration of a single phenomenon in a natural setting (Collis and Hussey, 2009). Furthermore, case studies are especially useful when exploring new phenomenon, because they encourage a holistic outlook, which has been identified as particularly important in providing a complete understanding of the situation (Kumar, 2011). Hence, case studies are acknowledged to be effective strategies to gain unique and revelatory insights (Yin, 2009), providing answers to ‘why’, ‘what’ and ‘how’ questions (Saunders et al., 2012). In addition to facilitating a way to both build and test theories (Eisenhardt and Graebner, 2007; Glaser and Strauss, 1967; Maylor and Blackmon, 2005), and create opportunities to explore issues in-depth in context (Xiao and Smith, 2006).

According to Eisenhardt (1989) case studies present three main benefits when building theory: likelihood for generating novel theories, testability of emergent theories, and the likelihood of empirical valuations of theories. Therefore, case studies have been used extensively within the social sciences, such as business, organisational research, innovation and technological change (Ghauri and Grønhaug, 2005; Gilgun, 1994; Yin, 2003). Case studies are considered to be

pervasive research strategies in tourism studies (Beeton, 2005), frequently used to address themes such as cultural heritage tourism, perceptions, impacts, planning, and development (Xiao and Smith, 2006). Their wide application has been attributed to the flexibility they provide (Jennings, 2001). In a study similar to this, Panagiotopoulos et al. (2012) used a case study to illustrate the importance of taking a holistic overview when considering BM development and developing a BM for public engagement in ICT. Moreover, the case study approach has been adopted within a number of recent studies exploring AR use and implementation in cultural heritage tourism (e.g. Jung and tom Dieck, 2017; Jung et al., 2015; Jung et al., 2016; Leue et al., 2015; Neuburger and Egger, 2017)

However, in the past, the use of case studies as research strategies has had a bad reputation within sciences, argued to produce only exploratory studies, generating un-confirmable conclusions making it difficult to generalise findings (Xiao and Smith, 2006). Some philosophies have criticised them as speculative, unreliable and too specific to be replicated or applied generally (Beeton, 2005). However, within social sciences, there is higher acceptance and support for case studies when other strategies are not possible (e.g. physical or psychological constraints) (Hall and Jenkins, 2004). Stoecker (1991, p.109) argued the use of case studies in social sciences “[is] the best way by which we can refine general theory and apply effective interventions in complex situations”. Because the context of this study is both complex and exploratory, a case study methodology was considered most appropriate, and presented a number of benefits outlined in Table 5.3.

As discussed in chapter four, Geevor Tin Mine Museum was the selected case for this study. Geevor provided a unique and revelatory case and, which Yin (2009) advised was suitable to build theory. When used in this manner Maylor and Blackmon (2005) identified case studies as one of the most powerful, yet equally most challenging research strategies because they come closer than most other methods to the complexity of real organisational settings and occurrences. This is both an advantage by virtue that understanding the complex nature of Geevor as an organisation was paramount to building an effective AR BM, but equally a disadvantage as it made the research process more difficult, complex, and time-consuming. Therefore, Yin (2003) proposed that good case studies take careful planning and execution. Thus, the researcher took time to adequately prepare, plan and understand the case study before collecting data.

**Table 5.3 Benefits of case study methodology**

Benefits of case studies
Can explain why an innovation worked or failed to work
Has the advantage of hindsight, yet can be relevant in the present and to the future
Can illustrate the complexities of a situation by recognising more than one contributing factor
Shows the influence of personalities and politics on an issue
Can show the influence of the passage of time through longitudinal studies
The reader may be able to apply it to his/her situation
Can evaluate alternatives not chosen
Can utilise information from a wide variety of sources
Can present information in a wide variety of ways
Can illuminate a general problem through examination of a specific instance

Source: Beeton (2005, p. 38) adapted from; Hoaglin et al. (1982)

#### **5.4.1.1 Selection of a Case Study**

Geevor was chosen as the case for this study because it possessed a number of unique characteristics (See Section 4.2), in addition to facing a range of challenges, such as remaining economically viable as a tourist attraction. When exploring potential case studies for this project, the researcher examined a number of options such as 'urban cultural heritage tourism: the case of Manchester', however it quickly became apparent this would have exceeded the boundaries of this PhD project, being too broad and unspecific creating challenges concerning data collection, analysis, stakeholder communication etc. As a result, the author identified the need for a specific, contextually-rich and complete case study focus. When examining potential options and comparing the advantages and disadvantages of each, Geevor was selected. Crucially, Geevor stakeholders and management expressed a desire and interest to adopt innovative technologies to improve their existing offer. Moreover, secondary research (Chapters 2,3,4) corroborated and supported the value of selecting Geevor as a case study. For instance, much research has identified the potential AR presents to the cultural heritage sector and more specifically museums (e.g. Jung and tom Dieck, 2017; Scarles et al., 2016b).

A Professor at Manchester Metropolitan University, (and Geevor Trustee) first initiated contact recognising potential collaboration between the Creative Augmented Virtual Realities Hub (CAVRH) a research group at the Manchester Metropolitan University and Geevor. This led into discussions to understand why Geevor were interested in exploring the use of technologies, and it became apparent Geevor management were exploring how technology implementation could improve their offer, increase visitor numbers, and potentially create additional revenue streams. They were also keen to understand if technologies could help them to

overcome some of their challenges (e.g. Seasonality, attracting younger audiences).

Prior to these discussions, although some of the stakeholders (e.g. Trustees, Mine Manager and IT Manager), were aware of innovative technologies such as AR and VR, the CAVRH developed a proposal outlining how Geevor how these technologies could be used, potential benefits and constraints. As a result, CAVRH collaborated with Geevor, running a successful AR and VR project (see <https://www2.mmu.ac.uk/creativear/projects/>). Building upon and exploiting this relationship, and the insights gained from working with Geevor, as well as stakeholders' engagement and eagerness, Geevor was selected as the case study focus for this project. Without this positive relationship, it would have been difficult to complete the research.

In addition, Geevor presented a number of other characteristics that made it particularly appropriate as a case study; for example, because the mine only ceased working in the 1990s, it offered insight into a modern 'living' historical site. Its geographical location, in a remote part of Cornwall, made it especially interesting because of the complex nature this introduced to operate as a tourist attraction. The researcher identified that the implementation, benefits and challenges of adopting AR at Geevor could also create knowledge for other similar attractions, facing the same challenges. In comparison to larger organisations, with regular funding and investment, smaller SME tourist attractions demand much more support to remain economically viable and sustainable. Thus, the researcher identified that by focusing on a case of this nature, such as Geevor, presented opportunities to share outcomes to also benefit other similar attractions, facing the same challenges requiring support to remain sustainable and viable in the longer-term.

Ritchie et al. (2013) pointed out that case studies encourage a multiplicity of perspectives rooted in a specific context, particularly important for this study because of the range of stakeholders involved. Moreover, because of Geevor's small scope, it offered a truly rich and insightful case study, allowing the researcher to gain a comprehensive understanding of the entirety of the organisation its, operations, networks and relationships. Moreover, Everett and Aitchison (2008) argued this also increases the validity of generalising findings into theoretical frameworks to apply to other situations, by providing an effective tool to link theory

and practice. Thus, the study mirrored this process; developing an AR BM to be put into practice.

#### **5.4.2 Mixed Methods**

In addition to case study strategy, the study also employed a mixed-methods approach. Maylor and Backmon (2005) pointed out that a case study is a unit of analysis, rather than a technique for collecting data. Thus, Geevor provided the context to build theory, but the strategy to generate theory used mixed methods - interviews and questionnaire surveys, combining both qualitative and quantitative data. Combining qualitative and quantitative data has been given many names, such as multi-method, blended research, triangulated studies, and mixed research, however, multi-method or mixed method are the most commonly used (Harrison and Reilly, 2011; Johnson and Onwuegbuzie, 2004). Qualitative data aims to explore and understand the meanings of individuals or groups (Creswell, 2014), whereas quantitative data was used to test objectivist theories by examining the relationship between variables to produce closed data (Creswell, 2014). However, the two approaches are not rigid and distinct (Newman and Benz, 1998), mixed methods combine the two and thus reinforce strengths and overcome weaknesses of using either method in isolation, to develop a stronger understanding (Creswell, 2014; Harrison and Reilly, 2011; Johnson and Onwuegbuzie, 2004). Table 5.4 identifies the reasons why mixed methods have become popular and why they have been used in this study.

Mixed methods is recognised as a strategy to strengthen the reliability of research because it employs different sources, collection tools and analysis methods (Collis and Hussey, 2009). In addition, each method supports the other, adding greater breadth and depth to the other (Veal, 2006), creating opportunity to generate more robust and precise analysis (Collis and Hussey, 2009). Easterby-Smith et al. (2015) summarised the advantages and disadvantages of mixed methods, based on the works of Bryman and Bell (2007), Jick (1979) and Tashakkori and Teddlie (2010), presented in Table 5.5.

**Table 5.4 Reasons for using a mixed method approach**

Reason	Explanation
Initiation	Initial use of a qualitative or quantitative methodology may be used to define the nature and scope of sequential qualitative or quantitative research. May also be used to provide contextual background and better understanding of the research problem. Helps in the formulation or redesigning of research questions, interview questions and questionnaire items and the selection of samples, cases, and participants.
Facilitation	During the course of the research, one method may lead to the discovery of new insights which inform and are followed up through the use of the other method
Complementarity	Use of mixed methods may allow meaning and findings to be elaborated, enhanced, clarified, confirmed, illustrated or linked
Interpretation	One method (e.g. qualitative) may be used to help explain relationships between variables emerging from the other (e.g. quantitative)
Generalisability	Use of mixed methods may help to establish the generalisability of a study or its relative importance. In a similar way, the use of mixed methods may help to establish the credibility of a study or produce complete knowledge
Diversity	Use of mixed methods may allow for greater diversity of views to inform and be reflected in the study
Problem solving	Use of an alternative method may help when the initial method reveals unexplainable results or insufficient data
Focus	One method may be used to focus on one attribute (e.g. quantitative on macro aspect), while the other method may be used to focus on another aspect (e.g. qualitative on micro aspects)
Triangulation	Mixed methods may be used in order to combine data to ascertain if the findings from one method mutually corroborate the findings from the other method
Confidence	Findings may be affected by the method used. Use of a single method will make it possible to ascertain the nature of that effect. To seek to cancel out this 'method effect', it is advisable to use mixed methods. This should lead to greater confidence in the conclusions

Source: Saunders et al. (2016, p. 173), developed from Bryman (2007) and Greene et al. (1989)

Case studies are renowned for using mixed methods in data collection and analysis, where one method is used to support or shape the next research stage (Maylor and Blackmon, 2005). The same process was used in this study, which remained true to the methodology. However, when adopting mixed methods, it is of paramount importance to consider the contradictions and implications on the research philosophy and process. This study adopts a pragmatic view, whereby the focus of research was to create practical solutions to inform future practice. The use of mixed methods is common in such strategies, because of the use of different types of knowledge (Saunders et al., 2016).

**Table 5.5 Advantages and disadvantages of mixed method research**

Advantages	Disadvantages
Increase confidence and credibility of results	Replication is difficult
Increase validity	Research design must be relevant to research question
Stimulate creative and inventive methods	Provide no help in asking the wrong questions
Can uncover deviant dimensions	Use more resources than single methods studies
Can help synthesis and integration of theories	Case study use requires competent overall research design
May serve as a critical test of competing theories	Researcher needs to be skilled in the use of both methods
Can combine confirmatory and exploratory research simultaneously	Not useful if one method simply provides a window dressing for the other
Present greater diversity of views	Time and resource intensive
Provide better and stronger inferences	Different methods do not guarantee additional information

Source: Easterby-Smith et al., (2015, p.97), Developed from Bryman and Bell (2007) Jick (1979) and Tashakkori and Teddie (2010)

## 5.5 Research Design

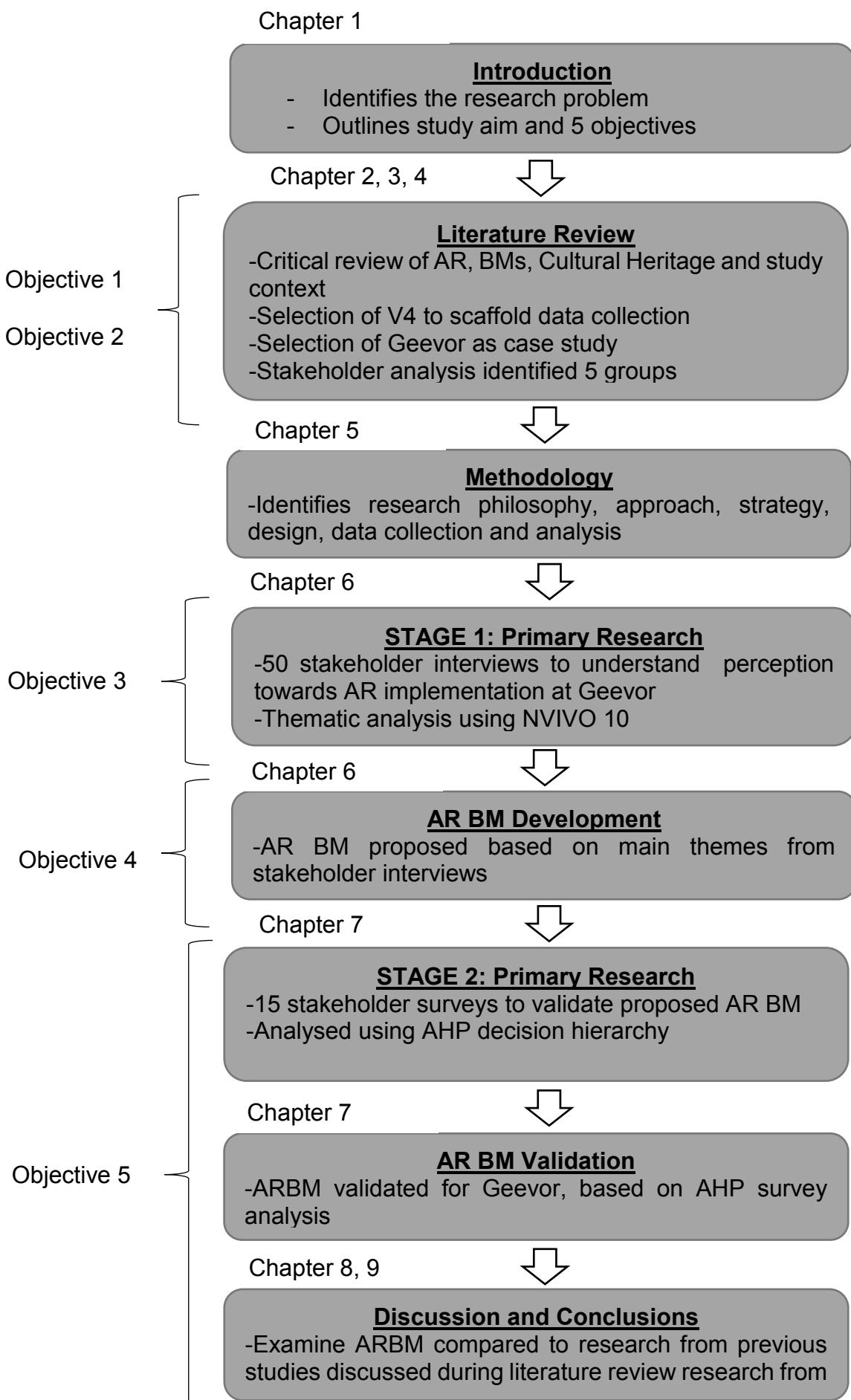
The research design provides a general plan of how research questions were answered, outlining the sample size, data collection, and analysis techniques used (Creswell, 2014). The research design of this study occurred in phases, each relating to a different research objective (See Figure 5.1). These phases, their sampling methods, data collection and analysis techniques are explained in more detail throughout this section.

There are different mixed-methods designs depending on the use and order of qualitative and quantitative data; concurrent, sequential exploratory, sequential explanatory and sequential multi-phase (Saunders et al., 2016). This study used an exploratory sequential design, starting with qualitative data which was used to inform quantitative design and content (Creswell, 2012; Creswell, 2014; Gray, 2014). It has been argued that combining methods produces the best outcome (Kumar, 2011). A study of mixed methods in papers in the Journal of Sustainable Tourism (2005-2014) revealed that sequential designs were most common within qualitative research proceeding quantitative (Molina-Azorín and Font, 2015). Likewise, Gray (2014) argued it best to start with qualitative data before moving onto quantitative phases because it can be used to inform questionnaire design and clarify measures for quantitative data collection. Within this study, interviews were used to establish a theoretical understanding to develop the ARBM which was then verified through questionnaire surveys.

## **5.6 Secondary Research**

The literature review (chapters, 2, 3 and 4) provides a critical review of secondary research. Existing studies, research and literature on AR, BMs, and cultural heritage tourism were examined. The search process relied mostly on the use of online resources such as Science Direct, Google Scholar, and Springer. Keywords such as ‘augmented reality’, ‘business models’, ‘eBusiness models’, ‘mobile business modelling’, ‘augmented reality in tourism’, ‘cultural tourism’ and ‘heritage tourism’ were used in the search process. The search boundaries were deliberately open to facilitate access to a broad range of materials and sources. As suggested by Collis and Hussey (2009) results were explored and where possible categorised into themes of relevant literature. Using the identified themes, several tables were developed to group, compare, and contrast existing literature (e.g. Table 2.1 to 2.5 in Chapter 2).

Secondary research served three purposes: to provide a framework for the research questions, provide context and theoretical frameworks, and help place findings within the wider body of knowledge (Creswell, 2014), whilst also providing a theoretical background to increase understanding of the topic area, theories and findings (Saunders et al., 2012). Examination of literature highlighted a gap in existing research and the lack of AR BMs in the context of cultural heritage tourism. As a result of a review of existing BMs, the V4 was selected to provide a theoretical guide for interview questions and themes, thus fulfilling objectives 1 and 2.



**Figure 5.1 Research Design**

## **5.7 Primary Research: Stage One**

To achieve objective 3 and assess the understanding of stakeholders towards the implementation of AR, the first phase of primary research involved interviews with 50 Geevor stakeholders from the five Geevor stakeholder groups identified in chapter 4. Stakeholders were interviewed to understand their perception toward AR implementation at Geevor, identify potential opportunities, added-value, uses, benefits, and problems. Using a case study imposes a degree of complexity regarding sampling methods, size, interview mode and data collection instruments. Because of the range of different stakeholder groups and variety of interests, different interview questions were designed to ensure relevance of results. Different sampling methods were considered more appropriate to engage different stakeholder groups.

### **5.7.1 Sampling Methods**

Sampling methods are an important consideration (Creswell, 2012). Pragmatism supports a range of data collection methods, recognising the best-method as the one that will gain the best results to solve the research question. Purposive sampling is common in qualitative research (Elo et al., 2014). Thus, a range of purposive sampling techniques were used, on the basis that they provided the best fit and would gather the richest data to answer interview questions (Bryman and Bell, 2015). Sampling methods were chosen to ensure that samples were “appropriate and comprise participants who best represent or have knowledge of the research topic” (Elo et al., 2014, p.4). The different methods employed are explained below;

#### ***Non-probability purposive sampling***

It is common to use non-probability sampling for practical and resource reasons, and to ensure that the most knowledgeable and well-informed people in the organisation are selected (Greenfield, 2002), and possess the highest ability to provide the richest data (Garrod et al., 2006; Patton, 2002). Non-probability sampling is common in exploratory studies because of its flexibility to adapt and change (Saunders et al., 2012). Geevor staff, the internal stakeholders involved in Geevor’s value network, were selected for interview using non-probability sampling, justified on the assumption that each respondent was not only important as an individual, but also as part of a set of relationships, or in this case a value-network (Galaskiewicz and Wasserman, 1993). Use of such a method, also helped reduce the risk of bias, allowing the researcher to recognise variation in the study population

and use selective judgement to pick a sample that was representative of the overall population (Greenfield, 2002).

### ***Purposive sampling***

Purposive sampling was employed to make use of initial contacts (e.g. internal stakeholders) to identify external stakeholders (Bryman and Bell, 2015). A “sample must be appropriate and comprise participants who best represent or have knowledge of the research topic” (Elo et al., 2014, p.4). Employing purposive sampling in this way, Marzano and Scott (2009) effectively used this technique, interviewing initial stakeholders and using them to identify other key stakeholders to be included in the research, the same process was used in this study.

### ***Convenience sampling***

Although often criticised for introducing bias, Saunders et al. (2012) argued that convenience sampling, a form of purposive sampling, enabled researchers to select a population that is relevant to the research aim by using a population that is ‘typical’ to a case. Visitors were approached to partake in interviews midway through exploring Geevor, to ensure they had a good understanding of the types of displays and use of information across the site. Visitor interviews were allocated to a two-day period during Geevor’s busiest month, August. Data collection was restricted to these two days due to time, money and resource limitations. However, Geevor received the second highest number of visitors on record during this period and therefore, although data collection depended upon who visited on those days, the sample can be argued to be representative of the visitor population.

This was the most suitable sampling method to interview visitors by virtue of accessibility and convenience (Bryman and Bell, 2015; Easterby-Smith et al., 2015). It has been described to represent the antithesis of purposive sampling methods and has been used successfully in many other studies such as by Xue et al. (2015) and Omar et al. (2015). Moreover, it is common in business and management studies and used more frequently than probability sampling (Bryman and Bell, 2015). Studies employing convenience sampling have become the norm in consumer behaviour research based on the strength offered by their convenience (Easterby-Smith et al., 2015).

### **5.7.2 Sample size**

There is a debate with regard to the appropriate sample size for qualitative research. For instance, Bryman and Bell (2015) claimed it impossible to know how many people need to be interviewed before data saturation was reached. Likewise, Elo et al. (2014, p.4) suggested “there is no commonly accepted sample size for qualitative studies because the optimal sample depends on the purpose of the study, research questions, and richness of data”.

A common method to determine sample size is data saturation, which ensures replication of categories to verify and ensure comprehension and completeness of data collection (Morse et al., 2008). However, it has been argued that reaching saturation is often claimed, but not justified or explained (Bowen, 2008; Guest et al., 2006; Mason, 2010). There is also inconsistency regarding the minimum number of interviews required for a study to be academically credible. For instance, Warren (2002) argued that, for a qualitative study to be published, a minimum of 20 to 30 interviews was required. Whereas, Gerson and Horowitz (2002) proposed a minimum of 60, but no more than 150 interviews were acceptable. This demonstrates variation, also evident in Mason’s (2010) study examining 560 Doctoral theses employing qualitative interviews, which present a variation of 1 to 95, calculating a mean of 31 interviews. Such variation of opinion creates difficulty when trying to determine minimum acceptable sample size (Guest et al., 2006; Mason, 2010).

Thereby, the methods used in this study determined sample size by focusing on their suitability to accomplish different research phases (Maylor and Blackmon, 2005). Such an approach is also supported by pragmatism. Bryman and Bell (2015) proposed that instead of relying on impressions of suitable sample size, it was more important to focus on the appropriateness of the sampling methods used, why they were used, and why the sample size achieved was appropriate. Thus, it was more important and “preferable to have a sample that properly represents the population even if the precision is lower because of a small sample” (Easterby-Smith et al., 2015, p.79).

Sample size is often considered study-specific, because there is not a one-size-fits-all template for determining appropriate sample size. Geevor is a small organisation, with a small stakeholder network, this inherently limits the sample population. Within this study, the purpose of data collection was to collect rich and relevant data, thus

interviewing nine internal stakeholders was justified on the basis that Geevor is a small organisation. This also proved to be beneficial, since having a small staff-base meant it was possible to gain insight from a variety of perspectives, which helped generate a complete overview involving the entirety of the organisation.

Stakeholder's roles varied, from management to IT, to Mine Guide, helping to capture and understand the complexity of elements that combine to produce a tourist product. The majority of internal stakeholders, particularly the Trustees and management had a prior understanding of AR and recognised its potential use at Geevor. In the initial stages, this level of technological literacy was crucial to ensure understanding and elicit buy-in for this research study. Equally, internal stakeholder support and a deep understanding of the totality of the organisation was crucial when developing a Geevor prototype AR application development as part of a wider research project. Although it should be pointed out, that whilst key influential (e.g. Management and Trustees) were AR literate, their understanding of its uses, potential and benefits was limited to a basic level, improving and increasing throughout the duration of this research project. By comparison, other stakeholders' technological literacy was often limited, with some (although few) possessing no prior understanding of AR technology. As illustrated in Table 6.1, over half of internal stakeholders identified they had a high to moderate prior understanding of AR, whilst the remaining stated they had a low-level prior knowledge of AR. The implications of prior internal stakeholders AR literacy are briefly discussed in section 6.2.

Tertiary groups were identified as one of Geevor's most important year-round visitors. However, whilst accepting that interviewing school children would have been an option, the approach adopted was to target the adults (e.g. tertiary groups) that represent the 'voice' their pupils. Moreover, due to ethical restrictions, interviewing under 18-year-olds was not possible. Therefore, teachers and education leaders were interviewed because of their expertise in leading trips to Geevor and knowledge of what children enjoyed the most, responded to best, and understanding of how AR could add-value to and enhance these experiences. Three tertiary interviews were held, with leaders from secondary and university education levels.

Again, because Geevor was a small organisation it had a small external stakeholder network. Six interviews with representatives from different tourist bodies were held, justified on the basis that the stakeholders were experts in their field, and therefore

had the ability to provide the richest data. Neuman (2005) supported that one representative from each body was adequate when those interviewed were particularly informative and insightful. Moreover, the stakeholders held influential and powerful positions, possessing the ability to make decisions and introduce change.

Two local businesses were interviewed. This was justified on the basis that Geevor has only two onsite businesses, the café, and shop, therefore a representative from each was sufficient to understand the perspective of local businesses toward AR implementation. It is important to note that, although there are other businesses in the local area, they do not have a direct impact on the achievement of Geevor's goals and therefore were not considered directly necessary to interview. However, their views were indirectly reflected in the opinion of internal stakeholders and local businesses who live and work in the area.

A sample of 30 visitors were interviewed during August 2015, which happened to be a wet day, thus Geevor received the second highest number of visitors in a day on record. Interviews were face-to-face, before which visitors answered demographic questions, read an AR information sheet, and tried the Geevor AR application prototype (See Section 5.7.3 for further discussion). Table 5.6 presents the breakdown of the sampling methods, stakeholders and interview methods used in stage one of data collection.

**Table 5.6 Stage one: Primary Research Design**

Stakeholder group		Date	Sampling method	Sample size	Interview mode
Internal Stakeholders					
Geevor staff		March 2015	Non-probability purposive	9	Face to face
External Stakeholders					
Tertiary Groups	University lecturers	December 2015	Purposive	2	Telephone
	Secondary school teachers	January 2016	Purposive	1	Telephone
Local businesses	Count House Café	January 2016	Non-probability purposive	1	Telephone
	Geevor shop	January 2016	Non-probability purposive	1	Telephone
Tourist Bodies	Cornwall Council	January 2016	Purposive	1	Telephone
	Visit Cornwall	January 2016	Purposive	1	Telephone
	Museums marketing expert	February 2016	Purposive	1	Telephone
	Cornwall Museums Partnership	March 2016	Purposive	2	Telephone
	Cornwall National Trust	March 2016	Purposive	1	Telephone
Visitors		August 2016	Convenience	30	Face to face

Source: Author (2017)

### 5.7.3 Interview Design

Although there are other qualitative data collection techniques (e.g. focus groups, observations) interviews were considered most appropriate to gain a detailed understanding of stakeholder's perceptions towards the implementation of AR. Hammond and Wellington (2012, p.91) outlined "the value of the interview is that it allows the researcher to probe an interviewee's account of an event as well as their thoughts, values, feelings, and perspectives". As mentioned, the V4 identified in Chapter 3, was used to inform the design of interview questions and scaffold analysis of themes. Panagiotopoulos et al. (2012) employed a similar approach when developing a BM for ICT in public engagement. Yet, the V4 BM was only used to inform themes for interview questions and structure interview analysis, this study did not seek to extend or verify the V4.

Interviews were semi-structured allowing freedom to add to, and extend questions to gather enriched data (Gillham, 2005; Saunders et al., 2012; Veal, 2006). This design permitted greater flexibility increasing data quality (Gillham, 2005). Interview questions contained a variety of prompts, topics and open-ended questions as

suggested by Harding (2013) to yield the richest data and provide a comprehensive understanding of the context. Open questions allowed stakeholders to expand, with prompts and follow-up questions to refine areas if confusion arose (Harding, 2013; Wisker, 2007) as well as explore and gather broader information (Collis and Hussey, 2014). Used in this way, interviews helped promote discussion. The use of leading questions was avoided to minimise influencing responses (Patton, 2002). In addition, sensitive language and clear terminology was used (Ritchie et al., 2013). Language and terminology was identified during the pilot interview and wording was changed as a result to ensure clarity and ease of understanding (See Appendix 16).

All respondents had different characteristics, experience, expertise, and knowledge, therefore interviews were conducted making continual choices about what to ask, how and which answers to follow-up. Different questions were asked to different stakeholder groups to gather the richest, most reliable data. A copy of interview questions for each of the five stakeholder groups is presented in Appendix 17.

Prior to interviews, respondents were provided with an introductory letter, AR information sheet and consent form (see Appendix 18). To ensure all shared the same level of understanding of AR to sufficiently answer interview questions. A decision was made to demonstrate the use of AR in a museum context. All stakeholders (except visitors) were shown a short video clip example of a Natural History museum AR application (See Figure 5.3), which demonstrated from the users' perspective the use of AR in a museum context (e.g. image recognition, overlay, videos, avatars, audio, animations). The video was carefully selected because it demonstrated the same features that Geevor were keen to develop in their own AR prototype application, exhibiting the same type of technology and contextual similarity.

Visitors were the last of the stakeholder groups to be interviewed (See Table 5.6), and interviews were held in August 2016. The first stakeholder interviews were held in March 2015. As part of an external Geevor AR project, The Manchester Metropolitan University's Creative Augmented Virtual Realities Hub developed a prototype Geevor AR application (completed in July, 2016). Therefore, instead of showing the visitors the AR video demonstration, it was decided to allow them to trial the Geevor AR prototype application (See Figure 5.3). The rationale for this was justified on the fact that it contained the same features as shown in the video and

importantly it would provide incentive for visitors to participate in interviews. However, it is recognised in doing so, it introduced a number of implications, for example trying an AR application could provide a more engaging, complete and comprehensive understanding of AR, in contrast to watching a video demonstration. It could have also introduced an element of bias, influencing visitors' perceptions of the ways in which AR could be implemented at Geevor, yet it should be noted the video demonstrated the same features as the application. It would have been the preference for all respondents to trial the AR prototype application, but this was not possible because it was only developed in time for the final stakeholder group (visitors) interviews.

Furthermore, only internal stakeholders and visitor interviews were conducted face-to-face, all other external interviews were held via telephone, and therefore it would not have been possible (had the prototype been developed by that stage) to facilitate application demonstrations without being in the same location, with required equipment, such as markers to trigger AR. Whilst, the author recognises the influence of bias this may have introduced, it was considered the best option. Ideally, all stakeholder groups would have tried the AR application, but this was not possible. Instead, using both the application or viewing the video, the author took great care in remaining neutral, limiting researcher bias or influence, as well as limiting explanation and demonstration, to promote discussion during interview, and allow stakeholders to form and interpret AR on their own. Yet, without first viewing either option, it was believed that stakeholders would not share the same foundational understanding of AR, thus the options were provided to ensure all had a sufficient understanding of AR to adequately answer questions and participate in interview.

Before trying the AR prototype, visitors were given a brief explanation of the application functionalities, such as the need to ensure the AR marker was in view of the device camera. Visitors were then free to try the application and get familiar with its functions. The trail was limited to a small section of the museum because of time, and resource limitations. The Geevor AR prototype application was created to enable visitors to control their experience, and explore information using the different AR functions (e.g. Avatar, animation, video, audio and images). Visitors were free to explore the room and AR markers placed around the room. The length of AR trails ranged from 5 to 15 minutes, and visitors were allowed to enjoy the application at their leisure before participating in an interview (which ranged from 8 to 27 minutes). Visitor interviews were semi-structured containing questions

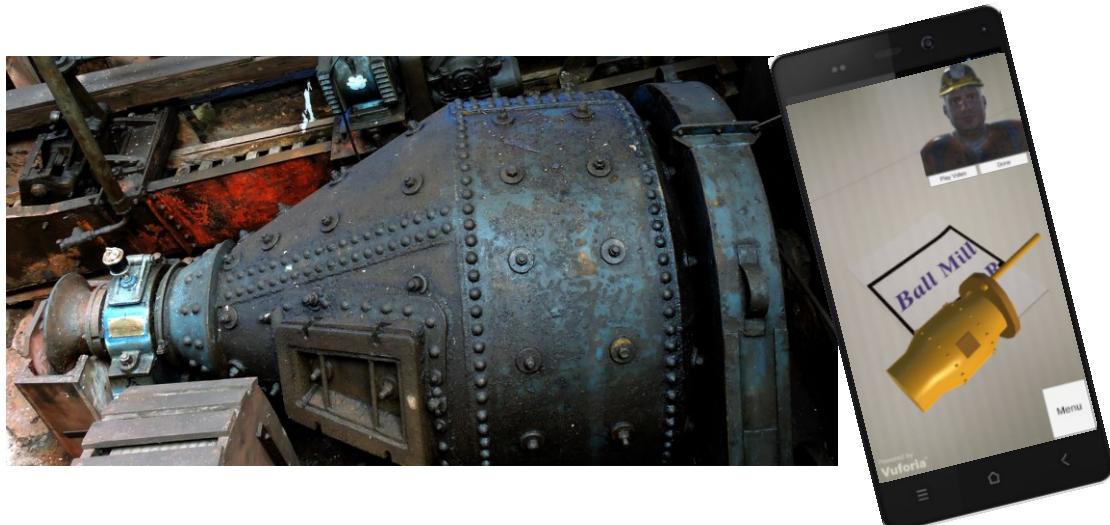
designed to promote discussion, allowing freedom to add to, and extend to gather rich and insightful data (Saunders et al., 2012; Veal, 2006).



Source:

<https://www.youtube.com/watch?v=nWGffYtmODo&list=PLYIrtwwSOjgZI1SlvRa1VO31nUieJlwXD>

**Figure 5.2 AR application video examples**



**Figure 5.3 Prototype Geevor AR application**

Viewing either video demonstrations or AR application created a number of opportunities, as well as introducing challenges. As discussed, the decision was made that it was important for all stakeholders to share the same basic level of understanding of AR to adequately and sufficiently participate in data collection. A number of previous studies (e.g. Leue et al. 2015) have adopted the same approach, allowing visitors the chance to try prototype applications. Chang et al. (2014, p. 186) recognised “AR not only promotes participation and motivation, but also creates a realistic and novel learning environment via the combination of the real and the virtual”. Other studies suggest trying AR provided a rich sensory environment, and the novelty factor positively influenced attitude (Wojciechowski and Cellary, 2013) and equally provided incentive to participate in interviews.

This approach is often described as “user-centred” and has been widely applied within an AR tourism context, for example, Williams et al. (2017) adopted a user-centred approach to AR tourism application development integrating user-centred design, tourist observation (application trials) and semi-structured interviews. They argued that adopting such an approach was crucial to develop novel, usable and functional tourism AR applications that fulfil genuine tourist’s needs. Similarly, Yovcheva (2015) adopted a user-centred approach, differentiating between mobile usability and the context of use and their parameters, of which tourists characteristics, knowledge and abilities, the social, temporal, physical, task, technical and information context played a role in the tourists experience (or HCI) with an application. More specifically, Yovcheva (2015) acknowledged different parameters that influenced tourists HCI and the use of mobile information systems including AR applications; tourist’s individual characteristics such as demographics, interests, preferences, cognitive and physical abilities, existing knowledge and experience.

Whilst such an approach creates a number of opportunities, such as the development of usable, and functional applications to fulfil genuine needs and therefore by extension create value. Use of such an approach introduced a number of challenges, such as influence and bias. The application trailed by visitors, remained a prototype, therefore the graphics, usability and HCI were not as effective as those of a commercial AR application, to some extent this would have influenced visitors perception of AR, and could have inhibited their understanding of its full capabilities and possibilities. This would have impacted the visitor experience, either positively or negatively, and whilst the prototype application functioned sufficiently,

on two occasions it was often slow, and some visitors expressed dissatisfaction with this, potentially creating a bad perception of AR applications.

#### **5.7.4 Pilot Interview**

Prior to interviews, a pilot was conducted as a small-scale trial run (Veal, 2011), to detect errors or weakness in the research instrument. Pilot interviews are considered vital to ensure the effectiveness of the research instrument (Bell, 2010), enabling modification to questions, wording, and sequencing (Gray, 2014; Veal, 2006). Conducting a pilot interview helped ensure the maximum validity, interpretation, and reliability of data collected (DeVaus, 2002; Saunders et al., 2012). A pilot interview was held with a university professor and qualitative data lecturer, the aim being to ensure questions were structured and worded to promote the most effective and rich data. As a result of the pilot interview, minor changes were made to question structures and wording (See Appendix 16).

#### **5.7.5 Data Analysis**

Thematic analysis is one of the most common and widely used approaches to qualitative analysis, yet remains poorly defined (Boyatzis, 1998; Braun and Clarke, 2006; Bryman and Bell, 2015; Roulston, 2001). Identifying themes has been described as one of the most fundamental but mysterious tasks of qualitative analysis, however, without themes, researchers would have nothing to describe, compare and explain (Ryan and Bernard, 2003). Therefore, identifying and refining important concepts, such as themes, is a key part of the iterative process of qualitative research (Schutt, 2011).

There are a variety of ways to approach qualitative analysis, that are both complex and diverse. However, “thematising meanings” has been argued by Holloway and Todres (2003, p.347) as one of the few shared generic skills used by across all qualitative analysis techniques. Yet, it has been criticised, that thematising is not a specific method but rather an analytic approach and synthesising strategy (Lapadat, 2010), a tool used to make meaning from data across a variety of methods (Boyatzis, 1998). Ryan and Bernard (2003) claimed thematic analysis was not a specific approach by its own right, but rather the coding of data thematically is a process performed within ‘major’ analytic traditions. On the other hand, Braun and Clark (2006) disagreed suggesting thematic analysis is an analysis method in its own right, recognising there is a gap outlining theory, application, and evaluation of

thematic analysis. However, because its criteria are widely applied it should be viewed as a foundational method for qualitative analysis. Moreover, within the Encyclopaedia of Case Study Research, Lapadat (2010, p.926) defined that:

*“Thematic analysis is a systematic approach to the analysis of qualitative data that involves identifying themes or patterns of cultural meaning; coding and classifying data, usually textual, according to themes; and interpreting the resulting thematic structures by seeking commonalities, relationships, overarching patterns, theoretical constructs, or explanatory principles. Thematic analysis is not particular to any one research method but is used by scholars across many fields and disciplines”*

Hereby thematic analysis or the process of ‘thematising’ data is a widely applied process of qualitative analysis regardless of the fact no clear definition or procedure has emerged. Boyatzis (1998) distinguished five purposes of thematic analysis: a means of seeing, finding relationships, analysing, systematically observing a case, and quantifying qualitative data. Based upon these purposes, Lapadat (2010) acknowledged thematic analysis as a tactic to reduce and manage high volumes of data without losing context, in addition to organising and summarising providing focus for interpretation. Yet, it remains that although “there are few generally agreed principles for defining core themes in data” (Bryman and Bell, 2015, p.729), developing categories enables data to be organised, comparisons identified and arranged into sub-categories (Dey, 1993).

In recent years, one of the most important movements in qualitative research has been the introduction and use of CAQDAS (Computer Assisted Qualitative Data Analysis Software) (Bryman and Bell, 2015). The majority of mainstream CAQDAS programmes such as NVIVO, ATLAS, and MAXQDA (Seale, 2010), are based upon the principle of code-and-retrieve thematic analysis (Bryman and Bell, 2015; Seale, 2010; Welsh, 2002). CAQDAS are used to enhance the efficiency and speed by which large volumes of data can be analysed, allowing the researcher to retrieve text to which a certain code has been attached, thus, the computer takes over the manual task associated with the coding process. Seale (2010) identified three advantages of using CAQDAS: speed of handling large volumes of data, improved rigour and facilitation of team research and developing consistent coding schemes.

Based on these advantages, Welsh (2002) argued CAQDAS facilitates accurate and transparent data analysis whilst providing a reliable and holistic understanding of data. However, concern has been raised that using computers in qualitative analysis may ‘guide’ researchers in a particular direction (Seidel, 1991). But, because the researcher still has to interpret the data, code and retrieve it, the computer only supports the manual labour of performing these tasks (Bryman and Bell, 2015), the benefits of using CAQDAS outweighed associated criticism.

This study used NVIVO, a widely used CAQDAS, designed especially for rigorous thematic analysis, facilitating theory-building capabilities such as coding, linking, searching and model-building (Lapadat, 2010). One of the main benefits of using NVIVO was that it supported the facilitation of theory-building, employing abductive logic (Seale, 2010). Ezzy (2013) argued using CAQDAS ensures research is more rigorous because the process of coding-and-retrieving data for thematic analysis is highly efficient. This encouraged a holistic approach, absorbing themes as a whole rather than analysis line-by-line (Bryman and Bell, 2015).

There are many ways to approach the identification and development of themes or categories within data, making it a topic of much discussion. Developing categories allows data to be organised by distinctions, allowing each category to be compared and divided into sub-categories (Dey, 1993). Creating categories is both a conceptual and empirical challenge and should be empirically grounded to an appropriate analytic context, rooted in relevant empirical material (Dey, 1993). As discussed, the V4’s four key-components and sub-components were used to scaffold research questions, themes, and analysis. Although it is not possible to determine all categories prior to analysis, categories require confirmation in the data, while others are derived from distinctions in data which can “generate new categories or contribute significantly to refining or modifying the original categories” (Dey, 1993, p.98).

As discussed in section 5.7.3 all stakeholders were shown an AR video demonstration, expect visitors who tried the Geevor AR prototype application. It should be noted the researcher recognises the potential influence or bias this could have had on data, and in light of this, during analysis the researcher refers to this.

## **5.8 Primary Research: Stage Two**

Stage one interview findings were used to develop the ARBM. Whereas, the purpose of stage two data collection was to validate the proposed ARBM (objective 5), using stakeholder questionnaires. Validating the ARBM made a significant contribution to theoretical, practical and managerial understanding, bridging the gap between the potential of AR and realisation of actual value-adding benefits. The same process as applied in this study, it is common to use interviews in the preliminary stages of research, providing a foundation to build upon and develop subsequent research instruments such as questionnaires (Gillham, 2005). The benefits and affordances of other methods were examined, prior to deciding to employ the Analytic Hierarchy Process (AHP). AHP is a quantitative, proven Multi-Criteria Decision-Making Method (MCDM), which employs statistical analysis to produce strong proof of concept, organising group decisions into a hierarchy of importance (see Section 5.8.5 for further discussion). Fifteen stakeholders completed questionnaires.

Upon examination of alternative data collections methods, stage two adopted a quantitative approach on the premise that employing mixed-methods overcame criticism of using either qualitative or quantitative methods in isolation (Collis and Hussey, 2009; Veal, 2006) (See Table 5.4, 5.5). Much research discusses the merits of qualitative data to yield trustworthy, coherent, transferable and applicable data (Sousa, 2014). “Qualitative approaches to research take a less structured approach with more of an inclination towards judgemental and expert knowledge rather than hard data” (Eldabi et al., 2002, p.64). Qualitative methods offer advantages to test objectivist theories, examining relationships between variables (Creswell, 2014). Whilst, the researcher explored the potential of taking a qualitative approach (e.g. focus groups, interviews) to validate the proposed AR BM, few previous studies have employed qualitative methods in a decision-making context. Thereby, the characteristics of quantitative methods were considered more appropriate to achieve objective five and were also more suitable in the context of the boundaries of the study (e.g. time and resources).

AHP was employed to reduce subjectivity, by applying statistical analysis to produce a unified and verifiable outcome. AHP facilitated rigorous data analysis, combining conflicting stakeholders’ perceptions into a unified, group hierarchy of preference to validate the proposed AR BM. This type of analysis offered advantages over

qualitative methods within the appropriate timeframe of the study. Whilst it was recognised qualitative methods would have yielded rich, in-depth and insightful data, it would have been challenging to determine a unified stakeholder preference from such data, without the use of some form of statistical analysis.

### **5.8.1 Sampling Methods**

Non-probability purposive sampling was used during questionnaire data collection, to achieve objective five and validate the ARBM. Stakeholders involved in phase one interviews were invited to complete a questionnaire, based upon their comprehensive knowledge and understanding of the research topic (Elo et al., 2014). Use of the same sample was advised by Easterby-Smith et al. (2015) in multiple stage research design. Therefore, as far as possible, the same stakeholders involved in interviews also completed a questionnaire, since they were the most knowledgeable and well-informed and, therefore most able to provide the richest data (Garrod et al., 2006; Greenfield, 2002; Patton, 2002). Twenty stakeholders were contacted and asked to complete a questionnaire, out of which fifteen responded. Visitors were not included in this part of data collection, because questions relating to the validation and importance of sub-criteria were not considered applicable to them.

### **5.8.2 Sample Size**

The author identified no optimal or suggested AHP sample-size. Instead, the ideal sample-size depended upon the research question and whether it was representative. For instance, Qureshi and Harrison (2003) used a sample of 15 to rank riparian revegetation policy options in a small catchment in north Queensland, Australia. They collected surveys from stakeholders or experts in their field, arguing sample size depended on the judgment of experts. This study is similar in scope and size, and also used a sample of 15 stakeholders, or experts, to represent the different areas of Geevor. The sample size of 15 is justified based on the fact Geevor had a small stakeholder network and a representative from each area was sufficient to answer the research question and achieve objective 5.

### **5.8.3 Questionnaire Design**

Questionnaire content was developed based upon the proposed ARBM and themes identified from interview analysis presented in chapter 6. Question types varied depending upon responses required. The wording, scales, and layout were

designed to be simple and precise, maximise response rate and minimise respondent confusion (Dillman et al., 2014). Questionnaires were administered to stakeholders via email, to save time and money.

When designing questionnaire surveys, Sato (2009, p.16) identified that researchers often face problems “because how respondents are asked questions can have a great effect on results”, thus different question formats yield different results despite the fact they ask the same thing. However, formatting AHP questionnaires was simple, and easily facilitated decision-making analysis. BPMSG AHP Microsoft Excel template developed by Goepel (2013), a free tool for educational use which has been widely used and highly praised by researchers, was used to facilitate AHP analysis. Although other AHP software are available (e.g. Expert choice, PriEst, Decision Lens), BPMSG was chosen because it was easy to use, free, and highly commended. To make comparisons, when alternatives for each criterion were input into the BPMSG AHP Excel spreadsheet it automatically produced pair-wise comparisons, see Figure 5.4 for an example.

Uniqueness	Range of activities Education Staff Heritage significance
Range of activities	Education Staff Heritage significance
Education	Staff Heritage significance
Staff	Heritage significance

Source: Author (2017). Using Gopel (2013) BPMSG AHP Excel tool

**Figure 5.4 Resources: creation of pairwise comparisons**

Goepel (2013) recommended each category should have a minimum of four, and a maximum of seven to ten, sub-categories. Although Vaidya and Kumar (2006) claimed AHP could be used to evaluate as many as eighteen alternatives. The questionnaire had between five and eight sub-categories and split into five sections,

based on the five criteria in the AR BM. For each section, sub-criteria were input and pairwise comparisons determined (See Table 5.7).

For each section, a description box including a brief explanation of the criteria was included to ensure stakeholders had a similar understanding to elicit judgement and comparisons. Appendix 19 presents the questionnaire research instrument. It is important to note that the V4 BM was not used to scaffold the design of questionnaires. The V4 themes were only used to inform interview questions during stage 1 to support the development of an appropriate AR BM.

**Table 5.7 Questionnaire sections, criteria, pair-wise comparisons**

Section	Criteria	No.	Sub-Criteria / Alternatives	Pairwise comparisons
1	Resources	1	Uniqueness	10
		2	Range of activities	
		3	Education	
		4	Staff	
		5	Heritage significance	
2	AR Value	1	Monetary benefits	21
		2	Interpretation	
		3	Education	
		4	Sustainability	
		5	Marketing	
		6	Games	
		7	Navigation	
3	Stakeholder Benefits	1	Secure jobs	10
		2	Preserve knowledge	
		3	Improve efficiency	
		4	Community Pride	
		5	Attract Investment	
4	Responsibilities	1	Support	15
		2	Development	
		3	Promoting	
		4	Maintenance	
		5	Funding	
		6	Launching	
5	Revenue	1	Secondary revenue	28
		2	Flexible costs	
		3	In-app purchasing	
		4	Increased entry price	
		5	Pay to use AR	
		6	AR free	
		7	Visitors bring devices	
		8	Pay to hire devices	

Source: Author (2017)

#### 5.8.4 Pilot Questionnaires

Three pilot questionnaires were conducted, with the aim of ensuring real data collection yielded the best possible results, was easy to understand and complete. Table 5.8 displays feedback from the pilots and actions taken in response.

**Table 5.8 Questionnaire Pilot feedback**

	Feedback and comments	Action taken
Pilot 1	<ul style="list-style-type: none"><li>• Simplification of format (AHP) to ease completion</li><li>• More introductory explanation about the purpose and importance of questionnaire to encourage buy-in</li><li>• Description boxes before each question instead of separate page</li></ul>	<ul style="list-style-type: none"><li>• Changed format</li><li>• More explanation added to introduction</li><li>• Description boxes moved</li></ul>
Pilot 2	<ul style="list-style-type: none"><li>• Changes and amendments to wording in introductory script</li><li>• Clearer instructions explaining how to complete the questionnaire</li><li>• Clearer examples</li></ul>	<ul style="list-style-type: none"><li>• Wording amended</li><li>• Instructions added</li><li>• Examples made simpler and easier to understand</li></ul>
Pilot 3	<ul style="list-style-type: none"><li>• Shorter descriptions of criteria as to not influence respondents understanding</li><li>• Mix up criteria so comparison questions do not appear monotonous</li></ul>	<ul style="list-style-type: none"><li>• Descriptions shortened and reduced</li><li>• Criteria mixed up</li></ul>

*Source: Author (2017)*

#### 5.8.5 Data Analysis

Group decision-making can be split into two categories: expert judgment (making a decision by inventing a new alternative, using forecasting), and group participation, which involves groups with common interests, such as a community or organisation making a decision (Hwang and Lin, 2012), in this case Geevor. Making group decisions faces two problems: how to combine individual judgements from an entire group and how to determine group choice from individual choice (Saaty, 2008). To overcome these issues, decision-making has become a mathematical science (Figueira et al., 2005). It has gained much attention, sparking the development of methods such as Multi-Criteria Decision-Making (MCDM) which has become increasingly popular over the past 20 years largely driven by changing business structures; once single person decisions now involve multiple decision makers (Triantaphyllou, 2013). Its increased popularity also mirrors an increase in the occurrence of conflicts between stakeholders with different priorities (Saaty, 2008).

MCDM plays a key role in many real-life situations, Triantaphyllou and Mann (1995) argued that local, government, industry or business activity involves the evaluation of alternatives in some form when making decisions, but often conflicts among criteria arise. Montibeller and Franco (2010, p.25) defined MCDMs as a:

*“Process for creating, evaluating and implementing strategic decisions is typically characterised by the consideration of high levels of uncertainty, potential synergies between different opinions, long-term consequences and the need for key stakeholders to engage in significant psychological and social negotiation about the strategic decision under consideration”*

Many methods have been developed to solve problems, and MCMDs are now frequently used in a variety of industries, to aid decision theory and analysis, and help make critical decisions with varying types of application (Al-Rafati, 2008; Velasquez and Hester, 2013). To determine which MCDM methods should be used in specific situations, Velasquez and Hester (2013) analysed 12 existing methods, identifying their advantages, disadvantages, and areas of application (See Table 5.9). They identified from a decision-making perspective two of the main challenges faced are the inescapable presence of high levels of uncertainty (e.g. in this case, AR implementation) and decision complexity (e.g. the ARBM). For example, if an organisation was considering whether to launch a new innovative product, it is hard to assess if the new product will be successful or not since it has not been launched before. Montibeller and Franco (2010) referred to this type of uncertainty as ‘epistemic’ in that there is incomplete knowledge. The implementation of AR at Geevor also dealt with epistemic knowledge, because it has not been done before. Therefore, a highly structured decision-making tool was necessary.

The Analytic Hierarchy Process (AHP) is one of the most popular MCDMs and has been widely used in a range of decision problems and areas of application (Ahmad and Laplante, 2006; Velasquez and Hester, 2013). Developed by Saaty in 1971 to allocate and identify scarce resources in the Military (Saaty, 1980; Pongpanich et al., 2015), it is one of the best, most popular and proven MDCM methods, because of its ease of use, and high acceptance (Alrouh et al., 2010; Montibeller and Franco, 2010). Equally its ability to effectively solve conflicting objectives and arrive at a group decision involving multiple stakeholders (Ozceylan, 2010; Saaty, 2008).

In a study of MCDM methods, Velasquez and Hester (2013) identified AHP as the most effective, because of its ease of use, scalability, facility to adjust, ability to handle large problems, compare alternatives and wide application demonstrating its effectiveness. Moreover, Tsai et al. (2010) added AHP allowed for dependence and

included interdependence, providing the ability to prioritise. In addition to these benefits, Saaty (2008, p.85) pointed out that by combining science, maths, and psychology AHP can effectively “validate the idea that we can use judgments to derive tangible values to provide greater credence for using judgments when intangibles are involved”. In this study, AHP was used to determine the importance of criteria to validate the proposed ARBM, which involved decision problems such as prioritisation, resource allocation, delivery and strategic planning.

**Table 5.9 Advantages, Disadvantages and Application of MCDM Methods**

Method	Advantages	Disadvantages	Areas of application
<b>Analytic Hierarchy Process (AHP)</b>	Easy to use; scalable; hierarchy structure can easily adjust to fit many sized problems; not data intensive.	Problems due to the interdependence between criteria and alternatives; can lead to inconsistencies between judgment and ranking criteria; rank reversal.	Performance-type problems, resource management, corporate policy and strategy, public policy, political strategy, and planning.
<b>Case-Based Reasoning (CBR)</b>	Not data intensive; requires little maintenance; can improve over time; can adapt to changes in the environment.	Sensitive to inconsistent data; requires many cases.	Businesses, vehicle insurance, medicine, and engineering design.
<b>Data Envelopment Analysis (DEA)</b>	Capable of handling multiple inputs and outputs; efficiency can be analysed and quantified.	Does not deal with imprecise data; assumes that all input and output are exactly known.	Economics, medicine, utilities, road safety, agriculture, retail, and business problems.
<b>ELECTRE</b>	Takes uncertainty and vagueness into account.	Its process and outcome can be difficult to explain in ‘layman’s terms’; outranking causes the strengths and weaknesses of the alternatives to not be directly identified.	Energy, economics, environmental, water management, and transportation problems.
<b>Fuzzy Set Theory</b>	Allows for imprecise input; takes into account insufficient information.	Difficult to develop; can require numerous simulations before use.	Engineering, economics, environmental, social, medical, and management.
<b>Goal Programming (GP)</b>	Capable of handling large-scale problems; can produce infinite alternatives.	It’s ability to weight coefficients; typically needs to be used in combination with other MCDM methods to weight coefficients.	Production planning, scheduling, healthcare, portfolio selection, distribution systems, energy planning, water reservoir management, scheduling, wildlife management.
<b>Multi-Attribute Utility Theory (MAUT)</b>	Takes uncertainty into account; can incorporate preferences.	Needs a lot of input; preferences need to be precise.	Economics, finance, actuarial, water management, energy management, agriculture

<b>Method</b>	<b>Advantages</b>	<b>Disadvantages</b>	<b>Areas of application</b>
<b>PROMETHEE</b>	Easy to use; does not require the assumption that criteria are proportionate.	Does not provide a clear method by which to assign weights.	Water management, business and finance, chemistry, logistics and transportation, manufacturing and assembly, energy, agriculture.
<b>Simple Additive Weighting (SAW)</b>	Ability to compensate among criteria; intuitive to decision makers; the calculation is simple does not require complex computer programs.	Estimates revealed do not always reflect the real situation; result obtained may not be logical.	Water management, business, and financial management.
<b>Simple Multi-Attribute Rating Technique (SMART)</b>	Simple; allows for any type of weight assignment technique; less effort by decision makers.	The procedure may not be convenient considering the framework.	Environmental, construction, transportation and logistics, military, manufacturing and assembly problems.
<b>Technique for Order Preferences by Similarity to Ideal Solutions (TOPSIS)</b>	Has a simple process; easy to use and program; the number of steps remains the same regardless of the number of attributes.	Its use of Euclidean Distance does not consider the correlation of attributes; difficult to weight and keep the consistency of judgment.	Supply chain management and logistics, engineering, manufacturing systems, business and marketing, environmental, human resources, and water resources management.

Source: Velasquez and Hester (2013, p.63-64)

Alrouh et al. (2010) praised AHP, identifying a number of benefits based upon its process and the fact it is: analytic, assisting with logical analysis of the problem by establishing judgments based upon decision maker's intuition, uses a hierarchy structure, reducing problems into sub-problems making them easier to tackle and adopts a methodical step-by-step process for decision-making. As well as these, the benefits and practicability of AHP are widely discussed within research, for example, Forman and Gass (2001, p.471) stated in "any situation that requires structuring, measurement, and/or synthesis is a good candidate for the AHP". Validating the ARBM involved synthesis of conflicting stakeholder preference, in a structured way, therefore AHP emerged as a good candidate to validate the ARBM.

However, despite its wide use and application, AHP was criticised by Konidari and Mavrakis (2007, p.6238) for enabling inconsistencies in judgment and ranking criteria because it "does not allow [individuals] to grade one instrument in isolation, but in comparison with the rest, without identifying weaknesses and strengths". One of the main processes in AHP is the use of pairwise comparisons "used both to compare the alternatives with respect to the various criteria and to estimate criteria

weights” (Løken, 2007, p.1587). However, it has been argued that pairwise comparisons are susceptible to rank reversal. During the process of making comparisons for rankings, adding alternatives at the end of the process could cause final ranking to flip or reverse (Velasquez and Hester, 2013). Although this can be prevented, as in the case of this study, by using AHP software, or having a limited number of alternatives (Velasquez and Hester, 2013).

Another criticism of AHP is the use of the fundamental scale of absolute numbers (See Table 5.10), which is used to convert pairwise comparisons into quantitative measures, such as how much more important Criteria A is relative to Criteria B, to form the comparison matrices (Alexander, 2012; Saaty, 2008;). Despite the fact the scale is widely recognised for its effectiveness, based upon its number of applications and merit over other scales (Saaty, 1980; Saaty 2008), it has been proven in practice and is validated by physical and decision problem experiments, whilst capturing individual's preference (Kumar et al., 2009).

Despite criticisms of AHP, it is still recognised as one of the most superior, popular and widely applied MCDM methods (Ahmad and Laplante, 2006; Velasquez and Hester, 2013). Saaty (2008, p.84) argued “decision-making involves many criteria and subcriteria used to rank the alternatives of a decision”. AHP supports complex decision-making whilst considering environmental uncertainty, organisational values and decision complexity (Montibeller and Franco, 2010), to produce an end-decision by evaluating alternative criteria (Triantaphyllou and Mann, 1995). Hence, AHP helped to solve complex decision problems, such as which revenue model should Geevor adopt when implementing AR. To produce a group decision, decision-makers (in this case Geevor stakeholders) made judgments (or pairwise comparisons), which were aggregated and the degree of importance for each alternative quantified (Sato, 2009). The process not only identified the most important alternative, but also preferences of all stakeholders, producing precise clarification of stakeholder preferences for alternatives (Sato, 2009). Table 5.11 summarises the main strengths and criticisms of AHP.

**Table 5.10 The fundamental scale of absolute numbers**

Intensity of Importance	Definition	Explanation
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1	Equal importance	Two activities contribute equally to the objective
2	Weak or slight	
3	Moderate importance	Experience and judgment slightly favour one activity over another
4	Moderate plus	
5	Strong importance	Experience and judgment strongly favour one activity over another
6	Strong plus	
7	Very strong or demonstrated importance	An activity is favoured very strongly over another; its dominance demonstrated in practice
8	Very, very strong	
9	Extreme importance	The evidence favouring one activity over another is of the highest possible order of affirmation
Reciprocals of above	If activity i has one of the above non-zero numbers assigned to it when compared with activity j, then j has the reciprocal value when compared with i	A reasonable assumption
1.1 – 1.9	If the activities are very close	May be difficult to assign the best value but when compared with other contrasting activities the size of the small numbers would not be too noticeable, yet they can still indicate the relative importance of the activities.

Source: Saaty (2008, p. 86).

**Table 5.11 Strengths and criticisms of AHP**

Strengths of AHP	
<b>Formal structuring of problem</b>	AHP provides a formal structure to problems, allowing complex problems to be decomposed into sets of simpler judgements and provides a documented rationale for the choice of a particular option
<b>Simplicity of pairwise comparisons</b>	Using pairwise comparisons means a decision-maker can focus on each small part of the problem, because only two problems/attributes have to be considered at one time, simplifying the process
<b>Redundancy allows consistency to be checked</b>	Requires more comparisons to be made by the decision maker than are needed to establish a set of weights, making it possible to check the consistency of weights. In decision analysis it is good practice to ask a question in several ways and then asking the decision maker to reflect any inconsistencies – AHP does this automatically
<b>Versatility</b>	Wide range of use and application of AHP supports its versatility
Criticisms of AHP	
<b>Meaningfulness of responses to questions</b>	Weights are elicited in the AHP without reference to the scales on which attributes are measured. Therefore, questions simply ask for the relative importance of attributes without reference to their scales, which implies weights that reflect the relative value of the average score of the options on the different criteria which is a difficult concept for decisions-makers to conceive and questions could be interpreted in different ways and possibly inaccurate ways

**Criticisms of AHP**

<b>New alternatives can reverse the rank of existing alternatives</b>	This is considered one of the main criticisms of AHP and has gained much attention because AHP normalises weights to a sum of 1 and can reverse rankings
<b>Number of comparisons required may be large</b>	Redundancy built into the AHP method is an advantage, but it may also require a large number of judgements for the decision maker. For example, if you have 7 alternatives and 7 attributes, this creates a total of 168 pairwise comparisons
<b>Axioms of the method</b>	It has been argued axioms of AHP are not founded on testable descriptions of rational behaviour
<b>Problems of 1 to 9 scale</b>	If the decision maker wishes to incorporate extreme ratios into the decision model the restriction of pairwise comparisons to a 1 to 9 scale is bound to create inconsistencies.

Source: Goodwin and Wright (2004, p.420-422)

In consideration of criticisms of AHP proposed by Goodwin and Wright (2004) care was taken during data collection and analysis to minimise potential drawbacks of AHP. To overcome issues associated with meaningfulness of attributes, and ensure stakeholders shared the same understanding of attributes, short descriptions were included prior to pairwise comparisons in each section of the questionnaire. In addition, no new alternatives were added and to avoid rank reversal, themes were identified from interview data, prior to developing the questionnaire. Moreover, the maximum number of pairwise comparisons made for one section was 28 (See Table 5.7). To ensure respondents completed the whole questionnaire, prior to completion, the introductory letter reiterated the importance of comparing each criterion against one another and identified the importance of this. With regard to criticism of the 1-9 scale and axioms of AHP, the researcher chose AHP because of its associated strengths, and although aware of these criticisms no actions could be taken to avoid this. Further discussion of MCDM and AHP process can be found in Chapter 7.

One of the overall purposes of the study was to produce and disseminate new knowledge and understanding (Walliman, 2011). Developing a validated BM contributes significantly to theoretical understanding, managerial decision-making and the implementation of AR in tourism. Moreover, in a comparison of other MDCM methods, AHP was considered superior at providing precise clarification of the preference of alternatives and the measurement of human perception (Sato, 2009). Furthermore, it was recognised as the most practical and flexible, and in comparison to other techniques such as DELPHI, AHP was more beneficial and powerful in group decision-making and presented a wide range of possibilities (Vaidya and Kumar, 2006).

## **5.9 Time Horizon**

Research studies can adopt either a longitudinal or cross-sectional time horizon. Longitudinal studies investigate variables, subjects or phenomena over a period of time; on the other hand, cross-sectional reflect a ‘snapshot’ of individual’s opinions, observations in different contexts at a specific point in time (Collis and Hussey, 2014; Gray, 2014; Saunders et al., 2012). Cross-sectional studies, also known as a one-shot, status studies (Kumar, 2011) or survey design (Bryman and Bell, 2015), are best suited to situations imposed with time constraints or limited resources since data collection occurs once, in a short time span to provide a ‘snapshot’ of a research phenomenon. Cross-sectional studies are most frequently used by social scientists, applied to studies aiming to find out the “prevalence of a phenomenon, situations, problem, attitude or issue, by taking a cross-section of the population” (Kumar, 2011, p.134). Therefore, they are most useful to provide an overall picture as it stands at the time of the study (Stebbins, 1992).

This study used a cross-sectional time horizon, although data was obtained from different stakeholders over a period of time, data collection occurred in snap-shots on planned and specific occasions. Collis and Hussey (2014) suggested cross-sectional studies sometimes face challenges regarding sample size selection because a sample has to be large enough to be representative of the population. However, Geevor was a small organisation, and thus a smaller sample was accepted, and discussion previously justified the sample size selection.

## **5.10 Ethical Considerations**

Manchester Metropolitan University has rigorous ethical and data protection guidelines. To comply with these and ensure best practice, a number of steps were taken. For both interviews and questionnaires, an information sheet and consent form were given to participants beforehand, to make sure they understood the research purpose, the anonymity of data and right to withdraw from the study at any given time, confidentiality and privacy of responses.

Stakeholders raised some concerns during questionnaire completion, about the ability to trace who said what, as they did not want to be seen to prioritise one criterion over the other. However, after assurance that responses would be combined to produce a group outcome and therefore there would be no way to trace individual pairwise comparison, and that the profile of respondents would be coded to ensure confidentiality, they agreed to participate. No personal information was

stored, and the only information presented in the study (such as position and organisation) was provided at the discretion of the respondent (See appendix 18 for information sheet and consent from).

## **5.11 Quality of Research Design**

Research rigour refers to the validity and reliability of the whole research process. Two judgements of research rigour are commonly based upon validity and reliability. In addition, generalisability is a common challenge associated with case studies the implications of this were examined at length. The use of a case study and mixed methods introduced important characteristics and thus considerations regarding the study's validity and reliability. To justify the significance and applicability of this research these criteria have been examined in detail:

### **5.11.1 Validity and Reliability**

According to Smith (1991, p.106) "validity is defined as the degree to which the researcher has measured what he has set out to measure". Babbie (1990, p.133) supported that "validity refers to the extent to which an empirical measure adequately reflects the real meaning of the concept under consideration". Validity has different implications for both qualitative and quantitative research in social sciences. Within quantitative research, the aim of validity is to produce and use statistical procedures to provide hard evidence by way of calculating the correlations between questions and outcome variables. Whereas, in qualitative research validity through logic implies justification of each question in relation to the objectives of the study. Since this study uses mixed methods, it was important to understand the measures of validity for both qualitative and quantitative methods.

Validity in quantitative research is the extent to which a concept is accurately measured, whereas reliability is the extent to which a research instrument would yield constancy, producing the same results if used in the same situation repeatedly (Heale and Twycross, 2015). Quantitative research concerns three types of validity: face/content, concurrent/predictive, and construct (Kumar, 2011), which examine how accurately research has been conducted (Maylor and Blackmon, 2005). Face and content validity judge that an instrument measures what it is supposed to, based upon logical links between questions and study objectives (Kumar, 2011). Hammond and Wellington (2012, p.150) claimed "a valid argument is a strong one and supported with convincing evidence" thus validity can be used to discuss the fit, or lack of, between interpretation of results, and results themselves.

This study used AHP to determine the validity of the proposed ARBM, to achieve research objective five. The instruments used - AHP questionnaires - are considered valid. Concurrent or predictive validity compares findings to observable criteria, and the greater the comparability, the greater the validity (Kumar, 2011). However, since AR is a new technology, there was no observable criteria to compare it with, therefore comparisons were supported by existing literature. Predominantly, the study created new knowledge and filled a gap in research, therefore it may be considered invalid in terms of concurrent or predictive validity.

Construct validity assesses whether the quality of a research instrument measures what it is supposed to, using statistical procedures. These measurements use numerical data to test validity. The use of AHP produced a group outcome, combining the perspectives of stakeholders. AHP does not have specific statistical procedures to test the quality of research instruments, and therefore could also be argued invalid in relation to construct validity, although, it has been questioned whether validity in qualitative research is an appropriate measure. Yet, during analysis, AHP calculates Consistency Ratios (CR), which determine consistency among respondents' responses. A higher than average CR could be conceived to decrease validity and reliability of respondents' individual judgements (See section 7.5 for further discussion). However, within this study, no stakeholder judgements exceeded the accepted CR of >20% and therefore did not impact validity and reliability of data.

Qualitative research attempts to answer research questions, often using multiple methods and procedures that are flexible and changeable over time to ensure standardisation of research tools. However, not all qualitative research uses structured or standardised frameworks. Kumar (2011) suggested it was possible, to a relative extent, to establish validity and reliability of findings in qualitative research using adaptations of the above quantitative measures, however, success depends more predominantly upon the affordance of identical replication of the process and methods for data collection. Thus, Guba and Lincoln (1994) produced criteria attempting to establish validity and reliability in qualitative research, arguing the 'goodness' or quality of an inquiry can be judged on trustworthiness and authenticity, which is determined by four indicators; credibility, transferability, dependability and confirmability. Building upon these criteria, Trochim and Donnelley (2007) compared them to those used to judge quantitative research (see Table 5.12).

Reliability examines whether the same researcher would get the same results if they replicated a study, however situations, people and dynamics change over time, so this is considered more of a theoretical consideration than a measure of quality (Maylor and Blackmon, 2005). In qualitative studies it is assumed unlikely results would be exactly the same, but it is important that the main conclusions are robust. Kumar (2011) acknowledged that researchers often use the word ‘reliability’ to represent dependability, consistency, predictability, stability and honesty. These meanings should translate in relation to the design of the research instrument. Thus, the greater level of consistency and stability in an instrument the greater reliability. Although within social sciences it was deemed impossible to have a 100 percent accurate research tool, because it is impossible to control factors that influence it such as; question-wording, physical setting, respondent’s mood, interviewer’s mood, nature of the interaction and the regression effect of an instrument (Kumar, 2011).

**Table 5.12 Criteria for Judging Research**

Traditional criteria for judging; quantitative research		Alternative criteria for judging; qualitative research	
<b>Internal validity</b>	Relates to issue of causality, whether a conclusion that incorporates causal relationships are valid	<b>Credibility</b>	Results are believable, agreeable and reflective from perspective of research participant
<b>External validity</b>	Can results be extended beyond the specific research context	<b>Transferability</b>	Degree to which results can be transferred or generalised to other contextual settings
<b>Reliability</b>	Are the results of the study repeatable, are the concepts consistent	<b>Dependability</b>	Would be found if studied the same thing found
<b>Objectivity</b>	Relates the reality of truth	<b>Confirmability</b>	Degree to which results could be confirmed or corroborated by others

Source: Extended and adapted from Trochim and Donnelly (2007, p.149). Collaborating ideas of Bryman and Bell (2015); Kumar (2011); Tsang (2014)

Ensuring reliability within quantitative research involves external consistency and internal consistency procedures as shown in Table 5.13. Ensuring both reliability and internal validity are difficult and Saunders et al. (2016) identified a number of threats. To overcome and minimise the influence of these threats they recommended research should be methodologically rigorous in the way it was designed and collected to avoid threatening results and discussion. Therefore, Table 5.13 explains the measures taken in this study to minimise the threats to reliability and internal validity.

**Table 5.13 Measures to minimise threats to Reliability and internal Validity**

Threat	Definition and explanation	Measures taken in study
<b>Threats to reliability</b>		
Participant error	Any factor which adversely alters the way in which a participant performs. For example asking a participant to complete a questionnaire just before a lunch break may affect the way they respond compared to choosing a less sensitive time	<u>Interviews:</u> Stakeholders were free to choose a time suitable and easy for them to be interviewed
		<u>Questionnaires:</u> stakeholders took the questionnaires away and completed in their own time, either posting or emailing once completed
Participant bias	Any factor which induces a false response, e.g. conducting an interview in an open space may lead participants to provide falsely positive answers where they fear that are being overheard, rather than retaining their anonymity	<u>Interviews:</u> were held in private office, with only the researcher and participant present
		<u>Questionnaires:</u> were completed in private at the respondents leisure
Researcher error	Any factor which alters the researcher's interpretation. For example, a researcher may be tired or not sufficiently prepared and misunderstand some of the more subtle meanings of his or her interview questions	<u>Interviews:</u> AR Information sheets were provided prior to interviews and stakeholders were shown a short AR video clip/prototype. Before and during stakeholders were asked if they had any questions or required further clarification, but there was always unavoidable potential for misunderstanding and interpretation of questions
		<u>Questionnaires:</u> stakeholders were asked to read through questionnaires, ask questions or for clarification before taking away questionnaires to complete, to decrease the likelihood of error or misinterpretation
Researcher bias	Any factor which includes bias in the researcher's recordings of responses. For example, a researcher may allow her or his own subjective view or disposition to get in the way of fairly and accurately recording and interpreting participants responses	<u>Interviews:</u> complete interviews were recorded and transcribed word-for-word to reduce the risk of bias. The analysis used direct stakeholder quotes to back up interpretation and claims. However, to some degree researchers have to make judgements about data, so there is to some degree an unavoidable degree of bias
		<u>Questionnaires:</u> AHP does not allow for researcher bias because of the use of quantitative data and final outcomes ranked in order of importance mathematically
Past or recent events	An event which changes participant's perceptions. For example, a vehicle maker recalling its cars for safety modifications may affect its customer's views about product quality and have an unforeseen effect on a planned study	<u>Interviews:</u> There were no events between phase 1 and 2 of data collection (to researchers knowledge) that would have changed stakeholders perceptions
		<u>Questionnaires:</u> Same as above

<b>Threat</b>	<b>Definition and explanation</b>	<b>Measures taken in study</b>
<b>Threats to Internal Validity</b>		
Testing	The impact of testing on participant's views or actions. For example, informing participant's about a research project may alter their work behaviour or responses during the research if they believe it might lead to future consequences for them	<p><u>Interviews:</u> Future consequences would be the implementation of AR at Geevor. Some stakeholders demonstrated uncertainty towards AR because they did not know what it was. But, once explained it would add to, not detract from Geevor there was overwhelming positive support. Yet, testing may have changed stakeholder responses</p> <p><u>Questionnaires:</u> Same as above</p>
Instrumentation	The impact of the change in a research instrument between different stages of a research project affecting the comparability of results. For example, in structure observational research on call centre operations, the definitions of behaviours being observed may be changed between stages of the research, making comparison difficult	<p><u>Interviews:</u> as discussed interview questions varied slightly between stakeholder groups, however stakeholders belonging to the same groups were asked the same questions and no changes were made. Interview format was semi-structured, so although stakeholder groups were asked the same general questions, there was room for flexibility and further discussion</p> <p><u>Questionnaires:</u> no changes were made to questionnaires during data collection</p>
Mortality	The impact of participants withdrawing from studies. Often participants leave their job or gain a promotion during a study	<p><u>Interviews:</u> Interviews were held once, and although stakeholders had the right to withdraw at any given time, none chose to do so</p> <p><u>Questionnaires:</u> The same stakeholders (except visitors) were asked to complete a questionnaire, however, some did not respond. But the majority of interview participants also completed a questionnaire</p>
Maturation	The impact of the change in participants outside of the influence of the study that affects their attitudes or behaviours etc. For example, management training may make participants revise their responses during a subsequent research stage	<p><u>Interviews:</u> stage one interviews were held on the same day, so there was no influence or change</p> <p><u>Questionnaires:</u> stakeholders may have become more aware of AR since the interview and contact with Geevor which may have impacted their attitude or behaviour towards it over which the researcher had no control</p>
Ambiguity about causal direction	Lack of clarity about cause and effect. For example, during a study, it was difficult to say if poor performance ratings were caused by negative attitudes to appraisal or if negative attitudes to appraisal were caused by poor performance ratings	<p><u>Interviews:</u> stakeholders were asked about their perception towards AR implementation, but this was hypothetically speaking, therefore there was not cause and effect because AR has not yet been implemented</p> <p><u>Questionnaires:</u> Same as above</p>

Source: Adapted from: Saunders et al. (2016, p. 204 – 206)

### 5.11.2 Generalisability and other Measures of Quality

However, internal validity is not enough to ensure good-quality research by itself (Saunders et al. 2016). Therefore, it was important to also assess external validity or generalisability, questioning whether findings could be generalised to other

relevant contexts or groups. In case study research, research is commonly criticised for not being generalisable in comparison to quantitatively focused studies with large sample sizes (Tsang, 2014). Generalisability is one of the most commonly discussed tests of research quality and methodological rigour (Gibbert and Ruigrok, 2010), with a predominant discussion with regard to case studies because making generalisations from case study research, is considered to be a major shortcoming.

Debate surrounding generalisation of case study research underlies a deeper debate regarding the value of both social and scientific research. Schatzman (1991, p.304) suggested we all use common interpretive acts to help us understand the world “we see links, discover patterns, make generalisations, create explanatory propositions...all of the time, emerging out of our experience – all of it is involved in the interpretation of a ‘case’”. Thomas (2011) recognised the value of a case study is the context for establishing a theory, and theory becomes the vehicle by which you test a case's validity. This process is largely the same in natural science, where observations are used to confirm or reject theory (Eisenhart, 2009; Thomas, 2011). Based upon this, Thomas (2011, p.21) claimed “case study's conspicuous shortcomings in generalisability, far from minimising case study's offer, in fact, free it to offer something different and distinctive in social scientific enquiry it, in fact, creates exemplary knowledge”. In this study, Geevor was used as a case study to develop the ARBM, to implement AR, but also create exemplary knowledge demonstrating to other cultural heritage attractions how to integrate AR.

Eisenhardt and Graebner (2007, p.30) pointed out theoretical generalisations or theory building from a case study is an “increasingly popular and relevant research strategy that forms the basis of a disproportionately large number of influential studies”. Bryman and Bell (2015, p.69) asked the question “how can a single case possibly be representative so that it might yield findings that can be applied more generally to other cases?”, but confirm case studies merit a degree of theoretical generalisability. For instance, Kochan and Rubinstein (2000, p.1535) argued “our study is the case on one case. Although some may view this as a limitation impending generalisability, it should be noted that naturalistic cases studies should be judged not on the basis of generalisability, but on the basis of transferability and comparability”. As identified in Table 5.12, transferability is the degree to which results can be transferred or generalised to other contexts (Tochim and Donnelly (2007). The author proposed the ARBM could provide exemplary knowledge to organisations and other similar contexts

Likewise, Kanter (1987) claimed single case studies elicit the generation of concepts and give meaning to abstract propositions, which can be tested in other cases, therefore seeking a degree of theoretical generalisability. However, Lee et al. (2007) suggested it is more useful to focus on particularisation rather than generalisation as the main strength of case studies, thus the goal of case study analysis should be to concentrate on the uniqueness of the case to develop a deep understanding of its complexity.

To develop the ARBM, empirical data was required to identify themes that contribute to BM development. It would be contradictory to philosophical assumptions to have developed an ARBM without empirical evidence. All BMs are unique, developed to identify and translate value for the specific organisation. However, due to their flexibility in design, existing BMs can successfully be tweaked and moulded to fit other businesses, based upon the argument that although you cannot generalise Geevor as a case representing all cultural heritage attractions, it is typical of, and faces many of the same challenges as other cultural heritage attractions. Therefore, the ARBM developed for the case of Geevor can be generalised through tweaking and refinement of exemplary knowledge to suit other cultural heritage attractions. And importantly, as pointed out by Thomas (2011) generalisations use heuristic logic to make them valuable in the social sciences. Thus, this study focused on Geevor as a case, but developing the ARBM has implications and generalisations that extend beyond the particular organisation. Furthermore, although findings from a single case are rarely generalisable to other situations, they have significant value in revealing insights which create understanding (Yin, 1994).

Importantly, pragmatists also support the use of methods that enable credible, well-founded, reliable and relevant data (Kelemen and Rumens, 2008). The use of mixed methods overcame shortcomings associated with each in isolation and therefore, as Easterby-Smith et al. (2015) argued, increased the validity and generalisability of results, heightening their theoretical contribution.

## 5.12 Summary

In summary, this study was underpinned by a pragmatic philosophy, and adopted an abductive approach to research, employing an exploratory mixed-method case study strategy involving two data collection stages; interviews, and questionnaires. The chapter discussed ethical and data protection issues and the measures taken to ensure rigour and quality. The chapter explained how the study's five research

objectives were achieved, outlining the research philosophy, approach, purpose, possible data collection methods, sampling technique, sample size and analysis techniques, selecting methods most appropriate to achieve the aim and objectives. Moreover, the chapter identified the time-horizon and methods taken to ensure and maximise rigor and validity of data, examining quality, validity, reliability and generalisability, explaining the methods and measures taken to ensure study quality. Progressing the study, the next chapter will present findings from stage one data collection, stakeholder interviews.

## **CHAPTER 6 STAKEHOLDER ANALYSIS**

### **6.1 Introduction**

This chapter presents an analysis and discussion of the first stage of data collection, fifty stakeholder interviews. The purpose of the chapter was to achieve objective four, identifying key themes to develop a BM to implement AR in the cultural heritage tourism sector. The chapter discusses stakeholder profiles, similarities and differences of their perspectives as well as the impact of their characteristics. The V4 was used as a template assisting the exploration and examination of relevant components to develop an AR BM. Therefore, as far as relevant, interview findings were analysed according to the V4s four components and sixteen sub-components. As a result of analysis five key themes were identified which influenced the development of the ARBM. Business Modelling guidelines were developed based on Geevor stakeholder recommendations. The chapter concludes by presenting the “ARBM”, discussing its components and their purpose, thus achieving objective four.

### **6.2 Stakeholder profiles**

As discussed previously, stakeholder analysis identified five stakeholder groups relevant to the study, comprising of both internal and external stakeholders. The nine internal stakeholders were those directly within the organisation, able to provide a holistic understanding of the organisational structure, operations, interests, challenges and strategy. As presented in Table 6.1 internal stakeholders (G1-G9) had between 2.5 to 20 or more years' experience at Geevor. Many stakeholders had the added knowledge of Geevor both as a working mine and tourist attraction, holding a variety of positions from Manager to Guide. This was beneficial in providing an inclusive perspective of the whole organisation. However, it was clear every department, had a different focus, for instance, the curator (G7) approached AR adoption from a curatorial perspective, whereas the IT manager (G8) considered the technical infrastructure.

Internal stakeholders' prior knowledge of AR varied; some had a good understanding, whilst others had very little prior knowledge. As discussed in the methodology, all stakeholders were given an AR information sheet and shown a AR Video clip to ensure their understanding of AR was sufficient to adequately participate in interviews. After viewing the video and having an opportunity to ask questions or seek clarification, all stakeholders understood the principles of AR and could thus recognise its benefits and potential for Geevor.

**Table 6.1 Profile of Internal Stakeholders**

Code	Years at Geevor	Position	Prior understanding of AR
G1	3	Trustee	Moderate
G2	2.5	Chair of Trustees	Moderate
G3	3	Marketing Officer	Low
G4	8	Learning Officer	Moderate
G5	20 +	Mine development Officer	Low
G6	10+	Guide	Low
G7	8	Curator	Low
G8	10	IT Manager	High
G9	11	Mine Manger	Moderate

External stakeholders were those outside the organisation, who did not work directly within Geevor but were affected in some way by decisions made by Geevor. A total of 41 external stakeholders, from four groups, Tourist Bodies (B1-B6), Tertiary Groups (T1-T3), Local Businesses (LB1-LB2) and Visitors (V1-V30) were interviewed (See Table 6.2 and 6.3). Each group had a different interest or stake in Geevor, thus perspectives towards AR implementation varied depending on the role and responsibilities of the stakeholders. Key differences and similarities among stakeholder perspectives will be identified throughout the chapter.

Tertiary groups prior understanding of AR was moderate to high, which could be explained by the fact Cornwall as a tourist destination has pushed schools to engage with and adopt technologies. Therefore, those in tertiary educational roles had increased awareness of technical innovations. Likewise, Tourist Bodies, had a moderate to high prior understanding of AR. On a speculative level, this could have been because many of them were involved in organisations where technology use, such as digital marketing, was integral to success and their jobs were directly linked to tourism, meaning they continually seek ways to improve Cornwall's tourist offering and visitor experience by employing innovative technologies. In comparison, Local Businesses, in particular LB2, had a limited understanding of AR prior to interview, and relied predominantly on the AR information sheet and video provided.

**Table 6.2 Profile of External Stakeholders**

Code	Organisation	Position	Prior knowledge of AR
B1	Cornwall Council	Cultural Programme Officer	Moderate
B2	Visit Cornwall	Chief Executive Officer	Moderate
B3	Cornwall Museum Partnership	Chief Executive Officer	Moderate
B4	Cornwall Museum Partnership	Development Officer	Moderate
B5	(Freelance)	Museum Marketing Expert	High
B6	Cornwall National Trust	General Manager	Moderate
T1	University of Falmouth	University lecturer	High
T2	University of Falmouth	University Professor	Moderate
T3	St Ives Secondary School	Secondary school teacher	Moderate
LB1	Count House café	Assistant Manager	Moderate
LB2	Geevor Shop	General Manager	Low

Table 6.3 presents a profile of visitors including; gender, age, who they visited with, where they came from, if they owned a smartphone and their self-perceived level of technical savviness. It was important to separate visitors from other external stakeholders because factors such as their age, and if they were regional, national or international generated useful discussion. For example, previous studies have identified strong gender differences in technology adoption. Within this study a higher proportion (63%) of visitors were female. Although this would be an area for future research, the focus of this study was to explore perceptions towards AR implementation and did not permit further exploration between AR perception and gender.

Interestingly, 30% of visitors were international, revealing several factors to consider during AR application development, such as including translation options. The remaining 70% of domestic visitors came from all over the country, but interestingly none had travelled less than 3 hours to Geevor. This highlighted a lack of local and regional visitors because most visitors had travelled over 5 hours to Geevor. This could in part influenced by the timings of interviews, held in August, peak summer holiday time popular for families and tourists. Further it was suggested locals and regional visitors avoid peak season and preferred to visit in low season.

**Table 6.3 Profile of Visitors**

Code	Gender	Age group	Visiting with...	Visiting From...	Smartphone ownership	Tech savviness
V1	Female	18-24	Family	USA	Yes	Very much
V2	Male	18-24	Family	USA	Yes	Not sure
V3	Male	45-54	Family	USA	Yes	Much
V4	Female	45-54	Family	USA	No	Much
V5	Female	18-24	Family	Nottinghamshire	Yes	Very much
V6	Female	45-54	Family	Nottinghamshire	Yes	Little
V7	Female	25-34	Partner	Hull	No	Little
V8	Male	35-44	Partner	Hull	Yes	Very much
V9	Female	45-54	Family	Birmingham	Yes	Much
V10	Male	35-44	Family	Solihull	Yes	Very little
V11	Female	55-64	Friends	London	No	Much
V12	Female	55-64	Friends	France	No	Not sure
V13	Male	35-44	Family	Weston-Super-Mare	Yes	Much
V14	Female	35-44	Family	Weston-Super-Mare	Yes	Very little
V15	Male	45-54	Partner	Netherlands	Yes	Much
V16	Female	45-54	Family	Netherlands	Yes	Not sure
V17	Female	55-64	Friends	Staffordshire	Yes	Little
V18	Female	18-24	Family	Bolton	Yes	Very much
V19	Female	35-44	Family	Bolton	Yes	Much
V20	Female	35-44	Partner	Canada	Yes	Much
V21	Male	45-54	Partner	Canada	Yes	Very much
V22	Female	45-54	Family	Hertfordshire	No	Not sure
V23	Female	45-54	Family	Essex	Yes	Little
V24	Male	45-54	Family	Hertfordshire	Yes	Not sure
V25	Female	45-54	Family	Reading	Yes	Much
V26	Male	45-54	Family	Reading	Yes	Little
V27	Female	25-34	Family	Cheltenham	Yes	Much
V28	Male	45-54	Family	Cambridge	Yes	Much
V29	Male	55-64	Partner	Milton Keynes	Yes	Much
V30	Female	55-64	Partner	Milton Keynes	Yes	Much

The majority (60%) of visitors identified themselves as ‘very much’ or ‘much’ with regard to their technical savviness, suggesting they were regular users of

technologies such as smartphones and tablets. This was confirmed by the fact 83% stated they owned a smartphone (and those who did not often said they had a tablet). All visitors were shown the Geevor AR application prototype; therefore, ensuring the remaining 40% ('not sure', 'little' and 'very little') had a proficient understanding of AR to participate in the interview.

The majority (43%) of visitors were aged between 45-54, followed by 20% aged 35-44, and the third largest proportion 17% (aged 55-64). A large proportion of visitors were middle aged to mature, whereas the remaining visitors represented younger segments, with 7%, (25-34) and 13%, (18-24). This mirrors that predominantly, visitors visited Geevor in family groups (67%) and it could be presumed many of the under 24-year-olds visiting with their families may have not chosen to visit Geevor alone. Other visitors, visited with their partners (23%) and friends (10%).

Differences and similarities between stakeholders perceptions are discussed where relevant. In some cases, it became apparent different stakeholder groups held different views influenced by their 'stake' or interest with Geevor. Similarly, it was possible to draw comparisons between stakeholders perceptions influenced by their role and responsibilities, for example the internal stakeholder IT Manager (G8) expressed more support for AR based on prior knowledge of AR and its potential, in comparison to Mine Guide (G6) who had little prior understanding of AR. In general external stakeholders expressed support for AR, recognising its potential not only to add value to Geevor but also Cornwall. They expressed support for AR, however retained realistic expectations. Where possible and relevant, such similarities and differences among stakeholders and stakeholder groups are identified and discussed throughout the chapter. Yet, it is important to note the purpose of interviews was to understand stakeholders perceptions towards AR implementation at Geevor, rather than draw comparisons on the complexities of stakeholder perceptions.

### **6.3 Analysis Framework: V4**

As discussed in section 3.14 and throughout Chapter 5, the V4 BM was employed as a template to assist in, and facilitate exploration and examination of relevant themes to develop an AR BM. The V4 provided a template to scaffold and structure the design of interview questions (See Appendix 17) and therefore has also been used to structure interview analysis. As far as applicable interview findings were analysed and grouped according to the V4 BM components and sub components

(See Appendix 9). Throughout the chapter, each section starts with a summary of the main interview findings, identification of key themes, quotes and key points raised during interviews.

## **6.4 Value Proposition**

Stakeholders are individuals with an “interest in, or influence on, a museum’s ability to achieve its objectives” (Legget, 2009, p.214). Therefore, any observable differences between stakeholder groups regarding Geevor’s strengths or values have been discussed in relation to their affiliation or interest with Geevor. The V4 VP describes the products or services offered, or those an organisation intends to offer, including a description of the features that will add value to the offer.

### **6.4.1 Product Service**

In relation to implementing AR in cultural heritage tourism, the product or service concerns the visitor experience, offering and its perceived value. For Geevor, this related to existing products, services and resources. However, because most tourism products or services are intangible involving experiences, stakeholders were first asked to identify Geevor’s existing offer, and then the ways in which AR could add value. Based on this, the following section was split into two: existing offer and AR offer.

#### **6.4.1.1 Existing offer**

All stakeholders were asked to identify Geevor’s main strength and the value incorporated into the existing visitor offer. Analysis revealed five key themes; heritage significance, education, staff, uniqueness, and range of activities. Below is a discussion of each theme and presented in summary in Table 6.4.

**Table 6.4 Summary: Resources**

Theme	Key Points
<b>Heritage significance</b>	<ul style="list-style-type: none"> <li>- Resource to learn about Cornish heritage, enriching understanding of the area</li> <li>- Helps preserve and reinforce community and ancestral roots</li> <li>- Living history resource, still a large part of local identity, historical value is unparalleled</li> <li>- Tells the story of how mining shaped the local landscape</li> <li>- Creates an immersive, in-depth, emotive, raw, interesting visitor experience</li> <li>- Visitors can relate to the past, understand how it was for the miners</li> <li>- Great for educational groups, evocation of the past, emotive and raw</li> </ul>
<b>Staff</b>	<ul style="list-style-type: none"> <li>- Staff are an asset</li> <li>- Staff able to share first hand original knowledge and experiences</li> <li>- Provide interpretation through the eyes of someone who worked there</li> <li>- Offer a link to the past</li> <li>- Facilitate personal interaction, an extra value</li> </ul>
<b>Education</b>	<ul style="list-style-type: none"> <li>- Offers a different learning environment, both immersive and hands-on</li> <li>- Good place to educate and entertain children</li> <li>- Provides different forms of interpretation,</li> <li>- Facilitates different types of learning to appeal to every learning style</li> <li>- Entertaining as well as factually educational</li> </ul>
<b>Range of activities</b>	<ul style="list-style-type: none"> <li>- Comprehensive offering</li> <li>- Wide range of facilities and activities</li> <li>- Something to appeal to everyone in a group of mixed ages</li> <li>- Provides both an educational and interesting day out</li> <li>- Change from the ‘usual’ attractions</li> <li>- No other mine in country or Europe with the same level of attractions</li> </ul>
<b>Uniqueness</b>	<ul style="list-style-type: none"> <li>- Fully preserved mine is valuable</li> <li>- Underground tour is a pull factor</li> <li>- Houses over 300 years of Cornish history, links dating back 3000 years</li> <li>- Provides a throwback to the past, and untouched piece of history</li> <li>- Stature, multi-award winning demonstrates value and significance</li> <li>- World heritage status, Geevor miners took their trade to 53 other countries</li> <li>- Award for excellence on Trip Advisor, 97% good to excellent score</li> <li>- Rated highly by peers and competitors</li> </ul>

Source: Author (2017)

### **Heritage Significance**

Heritage significance was noted as important by a number of visitors, who highlighted the importance of Geevor to educate individuals about Cornish history (V9, V5, V3, V23, V21, V11), providing a “snapshot” into the past (V3) and helping the community understand and appreciate their ancestral roots (V5). Visitors recognised because Geevor only ceased as a working mine in 1991, it was an important “living history” resource, which made heritage more relatable (V11, V16, V17). A similar view to that of visitors was identified by B1, who commented:

*“It closed within living memory, so you have a lot of people that are still living in the community that sort of lived and worked there, and even if they didn’t work directly with Geevor they probably worked in an associated business [...] that is probably sort of its USP”*

Both, visitors (V21) and Tourist Body (B1) thought Geevor was important because it supported local communities economically and was a substantial employer in the area. This was supported by other stakeholder groups who identified Geevor's closure had a devastating impact thus acknowledged the importance of Geevor as a heritage resource to keep the story alive (B2, B6, T1 and LB1). Tourist Body (B2) added that Geevor was not only important to the local area, but also globally, because Geevor miners pioneered new technologies and exported worldwide, stating "it is those stories about relevance and what we can learn from it, what we can take from it today are important, so I think Geevor plays an important role in that". Tourist Bodies confirmed the significance of Geevor, claiming it was one of the most important heritage attractions in Cornwall (B1, B3, B6) and B1 felt Geevor's "historical value is un-paralleled...it is an untouched piece of history".

In the same way, Geevor stakeholder G9 identified Geevor played a significant role in shaping the surrounding area, creating local identity and cultural pride. This view was also shared by some visitors who considered Geevor as a highly valuable heritage resource, to maintain history and enrich appreciation and understanding of the local area, in addition to sharing an often-untold story of Cornish history (V2, V4, V6, V20). International visitor V15 compared Geevor to coal mining in Holland, claiming it was a fantastic resource to learn something different and historically significant. In reflection of this, G1 highlighted it would be sad "if it closed and went to ruin" because it was a significant part of social history, representing the way of life of people for hundreds of years.

### ***Education***

Most stakeholder groups, but predominantly visitors rated Geevor highly in terms of its educational offering, referring to Geevor as an educational resource. Whereas, internal stakeholders defined its more specific educational benefits, such as social history (G7, LB2) local heritage and Cornish culture (LB1, T1, G7). G4 identified Geevor offered a different type of learning environment, an "immersive learning environment you can't get in a school {..} hands-on". Visitors shared this perspective, revealing Geevor was a good place to educate children and learn more about Cornish history and mining (V7, V8, V13, V14, V23, V24, V27, V28, V29).

Education motivated a number of visitors to visit Geevor. One visitor (V13) commented the educational environment Geevor created was an advantage, in contrast to usual tourist attractions, because it engaged and maintained children's

children interest for longer. Although, V24 disagreed, recognising whilst Geevor had been educational, they were unsure how much their children had learnt, or taken away from the experience. Considering the fact every visitor is different, internal stakeholder G5 commented:

*“Everyone you speak to gets something different out of their visit  
{...} talking to a couple yesterday who were almost in tears in the dry because they sensed the sort of camaraderie of what the place was like. But others will come in and say oh well what a ride, people react very differently”*

This highlights the need to provide interpretation suitable to different ages, knowledge levels and interests to ensure every visitor learns and takes something away from their experience. On site business, LB2 agreed Geevor could do more to improve their educational impact, placing more emphasis on marketing and promoting Geevors educational resources. G4 agreed adding “we are seen as a place for tourists to come and find out about Cornish history, but actually we are about science and engineering, we are about women’s history and we are about children”. This identifies a recognition among some stakeholders that more could be done to sell Geevors educational assets, although education was still identified as one of Geevors best resources.

### **Staff**

Geevor staff are considered a valuable asset by most stakeholder groups because they provide original authentic experiences, are dedicated and committed (G3, G6, B2, V15). Many staff worked at Geevor during its former mining days and stakeholders acknowledged their ability to provide personal experiences and authentic stories though the eyes of someone who was actually there. G3 identified:

*“For the time being the main strength here is that we have still got ex-miners here on site who can tell all sorts of really interesting stories. People are interested in this side of the pitch, the human experience as it is a more personal interaction”*

G6 confirmed staff provided visitors with a link to the past. Visitors also identified the value of staff, identifying they were able to make the visitor experience more interesting, by sharing authentic stories and experiences (V15). V25 added staff provided real insight into the past. Overall, all stakeholder groups recognised the

value on the visitor experience created by staff, for example describing it as “immersive”, “fantastic” (B4), “in-depth” (B6), “emotive”, “raw” (LB1), “evocative” (T1), and “interesting” (V24). Internal stakeholders G9 added that staff helped make Geevor as “accessible to as many people as possible”, and G7 supported visitors become completely immersed in the experience.

Importantly, it was apparent internal stakeholders considered themselves an asset, for instance, G8 stated “everything is here, including the people, I mean I used to work here myself too as a miner, we have all that extra value, of real people”. The value of staff was also evident from visitors who appreciated the chance to interact with staff, claiming it helped them understand what it would have been like to be a miner (V22), relate to and understand the conditions they worked in (V26), gave deeper insight into the past, creating a personal experience (V25). Tertiary group (T1) supported that for educational groups this helped create “a really nice kind of evocation of the awful circumstances”. Overall, it is clear that the staff provide the ability for visitors to “look through the eyes of someone who worked there {...} that is quite evocative and brings out those kind of personal, human stories” (B3). In this way, LB1 claimed the emotive element was always at the forefront from speaking to visitors.

### ***Uniqueness***

It was suggested, Geevors preserved state, completeness and points-of-interest add considerable value to the visitor experience. The opportunity to go underground was perceived as a “pull-factor”, motivating visits and providing an experiential element (G7). The fact the site remains complete, and unaltered since closure, many stakeholders considered a strength, asset and contributor to success. Although it was predominantly internal stakeholders who identified Geevors ‘completeness’ as a strength. For example G4 exclaimed the site was the strength “it is a delight, it is amazing, it is completely unique and everybody who comes here comes with low expectations and just leaves going wow”. G2 and G7 pointed out there is not another site in the country, or Europe offering the same levels of attractions, features, and points-of-interest. G6 added, Geevor provides 300 years of Cornish history, preserving and presenting information dating as far back as 3000 years ago. Similarly, G5 stated:

*“It has a throwback to the past in many ways, it is almost an entire site which its history is maintained and it hasn’t altered or moved so*

*people just find it fascinating just to look at an old cigarette packet, or a coat hanging up that has been there for 40 years”*

Similarly, LB1 also commented that Geevor is an “untouched piece of history” where everything has remained as it once was. Based on this, B2 suggested it helped visitors imagine what Geevor was like in its mining heyday. Interestingly, B6 from the National Trust, a competitor to Geevor considered Geevors completeness a unique benefit:

*“Geevor is one of the best bits of interpretation within the whole Cornish World Heritage site. Because it just evokes that feeling of you are back in 1990, and what it would have been like to be in the guy’s shoes. Who were facing the closure of the mine and the end of an industry and that area that would have supported them for years and the whole culture and the whole community”*

In this way, Geevor is unique, because of its completeness, which enables visitors to really appreciate and understand what it used to be like (B4). Yet, Tourist Body (B4) suggested Geevors unique offering also created challenges in terms of marketing and promotion, which resulted in visitors often underestimating the range of activities available, because the uniqueness of the site were not obvious prior to visiting. This was echoed internally by G1, G7, G8 and LB2 exclaimed visitors were often surprised when they spend the whole day at Geevor and often visitors found it hard to comprehend the extent of the offer before visiting.

Geevors status, stature and awards are considered a reflection of success, demonstrating its value, unique offering and significance. G9 pointed out Geevor has Listed Monument Status and International Status through World Heritage, explaining “6 million people in the world who have Cornish connections, to do with when miners took their trade elsewhere”. However, tourist body B2, suggested more marketing efforts should focus on the fact miners from Geevor visited 53 other countries, sharing their skills and pioneering mining technologies, because it is a unique offering visitors are often not aware of. Geevor has won a number of other awards, recognising the value of the existing offer, awarded for Tourism Excellence and Education, in addition to an Award for Excellence on TripAdvisor (B1). Based on this, Geevor Manager G9 stated we must be doing something right, because it was their “peers that have rated us so highly”.

### **Range of activities**

The range of activities and experiences offered at Geevor was identified as a strength. From an external tourist body perspective, B4 claimed Geevor has a “comprehensive offer”, including a shop, café and wide range of activities. B3 further supported this commenting:

*“If you were on holiday and you had a group with various aged children, there is potentially something at Geevor to appeal to a range of different people within your group”*

Visitors also appreciated the range of things to do, for instance, V13 commented that the activities offered were both educational and interesting, a positive change compared to usual attractions. This perspective was also mirrored internally and G7 felt the range of activities available also helped to engross audiences who would not normally engage with, or visit attraction types such as Geevor:

*“Kids seems to love it and also people who you wouldn’t necessarily expect to be so engaged by it, say mums or whatever, young people teenagers, do seem to get very engaged and going underground is very fun!”*

However, not all visitors agreed, and both V22 and V24 thought their children had not managed to grasp or taken away much from the experience, demonstrating an area for improvement.

#### **6.4.1.2 AR Offer**

In terms of the value AR could add to the existing experience, initial interview analysis revealed seventeen themes, which were subsequently grouped and condensed into seven key areas presented in Table 6.5. Stakeholders recognised many opportunities for, and potential uses of AR at Geevor, to add to and enhance the exiting offer.

**Table 6.5 Summary: AR Value**

Theme	Key points
<b>Sustainability</b>	<ul style="list-style-type: none"> <li>- Increase appreciation and behaviour towards heritage, protection and conservation</li> <li>- Attracting funding and investment, by increasing Geevor's credibility</li> <li>- Capitalise upon the Poldark connection, increasing interest in Cornish post-industrial stories</li> <li>- AR would preserve knowledge for future generations</li> <li>- Continuing the legacy of technical innovation</li> <li>- Helps create a more authentic, sustainable and realistic visitor experience</li> <li>- Preserve the environment, avoiding 'littering' the site with interpretation boards</li> <li>- Maintain protected monument status using AR 'virtual' signage</li> </ul>
<b>Education</b>	<ul style="list-style-type: none"> <li>- Appeal to different learning styles 'filling in the gaps'</li> <li>- Create more content to engage children, such as 'seeing' history</li> <li>- Improve effectiveness and efficiency such as saving time to explain complex processes and terminology</li> <li>- Provide different forms of interpretation as everybody relates to different formats and further information to that displayed on information boards</li> <li>- Facilitate social and situated learning, different to the classroom</li> <li>- Provide different forms of interpretation for different learners to relate to</li> <li>- Incorporate elements of fun, entertainment and excitement into learning, creating a multisensory experience</li> </ul>
<b>Monetary benefits</b>	<ul style="list-style-type: none"> <li>- Increase visitor numbers and spend in local businesses</li> <li>- Support Cornish regional development plan for Tin Coast</li> <li>- Make Geevor and the surrounding villages a place to stay, rather than drive through</li> <li>- Create a link between museum experience and café/shop</li> <li>- Drive traffic and sales to café/shop</li> <li>- AR would increase time spent on site, by improving learning and entertainment</li> </ul>
<b>Interpretation</b>	<ul style="list-style-type: none"> <li>- Bring the site to life, contrasting and understand the bigger picture</li> <li>- Cater content to different knowledge levels, interest, groups and ages</li> <li>- Provide AR language options to cater to foreign visitors</li> <li>- Display more of the collections, using AR to overcome storage issues</li> <li>- Open parts of the site with AR, that are inaccessible to the public</li> <li>- Improve access for individuals with disabilities, impairments or who do not wish to participate</li> <li>- What you do for younger generations also benefits older visitors as they share the same 'barriers'</li> <li>- Create AR self-guided tours to supplement existing tours, avoiding pre-planning and challenges faced by existing guides</li> </ul>
<b>Marketing</b>	<ul style="list-style-type: none"> <li>- Raise the profile of the site and Cornwall creating a perception change</li> <li>- Offers something different, new, innovative and exciting to promote and attract wider audiences, increasing Geevor's appeal</li> <li>- Will encourage social media sharing</li> <li>- Increase word of mouth and recommendations</li> <li>- Introduce a pre, during and post visitor experience to enhance engagement with the site before, during and after visiting</li> </ul>
<b>Navigation</b>	<ul style="list-style-type: none"> <li>- AR can be used as a crowd and site management tool</li> <li>- Improve efficiency of site exploration by providing an AR interactive map - Navigation and orientation tool</li> <li>- Increase and link experience to site facilities, improving engagement with all areas on site</li> </ul>
<b>Gamification</b>	<ul style="list-style-type: none"> <li>- AR gamification to complement education, adding excitement</li> <li>- Encourage visitors to take control of their own experience and learning</li> <li>- Test knowledge to improve learning</li> <li>- Potential to create group learning exercises with gamification</li> <li>- Advances from typical museum-y experience</li> <li>- Potential to create AR games, such as; treasure trails, memory challenges, quizzes</li> </ul>

Source: Author (2017)

## **Sustainability**

Sustainability involves protecting the environment, preserving knowledge and increasing Geevors competitiveness to ensure success and longevity. Stakeholders identified a number of ways AR could be introduced to increase sustainability. Using AR to create a self-guided tour to both enhance the visitor experience and preserve the knowledge of ex-miners. Implemented in this way, stakeholders believed AR would help Geevor overcome some of its challenges – because presently during busy periods, specifically during peak season, staffing the entire site to provide interpretation to visitors is a problem, finically and practically. IT Manager (G8) thought an AR self-guided tour “would add value, you would get a lot more out of it”. Mine Guide (G6) supported AR would help visitors understand more about what they were seeing. B3 and G2 reinforced it would open up a new dimension to the site, not currently interpreted for visitors without a guide. This was also reflected by visitors who felt AR would bring the site to life (V16), create a more personal, memorable and interesting experience (V18, V25, V16), adding a personal touch and increase understanding (V23, V4, V18).

Interestingly, whilst internal stakeholders recognised the value in their authentic knowledge, they acknowledge the challenge of tailoring tours to the needs of mixed audiences. Trustee (G1) commented as a result “some people [guides] don’t put it over very well”, recognising the ability for an AR tour to allow visitors an opportunity to return and repeat information. Mine Guide (G6) discussed the difficulty communicating to large groups of visitors, particularly mixed interests and ages. Thus, supporting AR would be a useful tool to complement guided tours to “help keep their attention and enhance what they understand”. Other internal stakeholders G8 thought AR would ensure “visitors will be looked after a bit better” and G7 reinforced “there is stuff that isn’t interpreted, so that [AR] would be good” to reduce visitors knowledge gap. In a similar sense, Tertiary Group T2 commented “tours are great but it’s quite a commitment to take tours” suggesting AR could supplement or offer a different version of the tours, ensuring visitors who just turn up the same level of experience. AR tours would enable visitors to explore at their own leisurely pace. Yet, concern was raised by T2 and G8 that AR implementation should not compete with existing tours, but offered as an alternative, eliminating time constraints, staffing issues and ensuring all visitors share the same level experience. Although some uncertainty was expressed, the overwhelming stakeholder consensus, echoed by G8 was that “AR is the perfect substitute for real people”.

Tourist Bodies (B3, B6) suggested AR should allow visitors to occupy the headspace of someone who worked at Geevor, facilitating a compelling, deeper, authentic and higher quality experience. Visitors also expressed a need to ensure AR experiences remained authentic, contributing to a sustainable visitor experience. For instance V4, V18, V23 and V25 suggested real voices of miners should be incorporated, and AR ‘digital’ people should be modelled to look like the existing miners. In this way, it was perceived AR would help sustain the value in the existing tours, ensuring future generations enjoyed the same level of experience facilitated by AR. This was supported by internal stakeholders (G2, G6, G8) and Tourist Body (B3) who considered introducing AR tours would create a sustainable alternative, preserving knowledge and avoiding the costs of hiring additional staff, whilst ensuring visitors were looked after better.

AR was also proposed as a tool to overcome Geevors challenges, by introducing ‘virtual signage’ increasing navigation, accessibility and interpretation of the site. Because, Geevor has protected monument status, its physical appearance cannot change (G5, G9, B6),. Hence, AR could “improve by bringing the site to life” (G5). Similarly, B2 recognised:

*“You don’t want to intrude on the current landscape by putting up great boards {...} the beauty of AR is that you can leave it in its preserved state and let people see it, without interrupting its preserved state”*

Tourist Bodies demonstrated support for AR ‘virtual signage’ for example B1 commented AR would avoid having to “litter the site {...} with big interpretation panels”. B2 and B6 confirmed using AR “virtual signage” would be a solution to many of Geevors problems, such as opening up the site allowing visitors to explore different elements of heritage or interpreting the landscape more effectively.

Adopting a broader perspective, many Tourist Bodies recognised AR could also benefit the local area and Cornish tourism. For instance, B2 and B6 suggested AR would complement Cornwall’s regional development plans, Tin Coast initiative designed to link mining areas across Cornwall, to encourage tourists to visit the area, grow the economy and generate more money to invest back into conservation of the area. B2 considered Geevor should be right at the heart of the project acting as a hub, using AR to create a cutting edge, quality and authentic visitor experience.

In addition, it was perceived AR would help increase visitors understanding and appreciation of Cornish heritage, making decisions to protect and conserve heritage investing in learning using tools such as AR, B4 suggested was:

*“fundamentally important to influencing people’s behaviour {...} and their attitude towards heritage, and unless we do that the stuff won’t exist in future generations. So there are very important connections with attitudes and behaviour”*

In addition, B6 considered implementing AR would also create business opportunities for local business and other attractions to increase the quality of the overall local visitor experience, using AR to from more valuable connections between local mining properties.

### ***Education***

Internal stakeholders identified the benefits of AR are widely associated with enhancing education and stakeholders suggested a number of ways AR could be used to improve education, such as providing different forms of interpretation (G1, G6) and incorporating a fun element into education (G3, G6). Tourist Body (B4) felt AR would create a more exciting and therefore engaging learning environment, appealing to different learning styles like “non-traditional museum audiences”. A number of visitors (V18, V23, V25 V26 and V29) suggested using AR to engage different learners.

Currently most museum information boards are very unengaging, thus B4, G1 and G6 felt AR would facilitate access to extra information to supplement information boards, helping fill in the gaps. “It would be a way of getting a bit more information over than you currently can through the guides or through the information boards” (G6).

G4 commented that AR would improve the efficiency of educating, by using AR to demonstrate complex processes, adding another level of understanding and improve engagement would have a “huge educational impact”. Likewise, T2 believed AR would improve visitors situated and social leaning experiences. G3 felt AR would introduce an element of fun, making learning experiences more enjoyable by giving visitors “something entertaining, but also something interesting to learn about”.

During educational group visits, schoolchildren are grouped by ability, hence Tertiary Group (T3) recognised the value of using AR to cater to children with different learning styles, knowledge levels and engage students in different ways. It was believed AR would provide “resources that enable further research”, allowing students to find learn by themselves (T3). Similarly, Internal stakeholder G4 pointed out that school children often “are completely absorbed in learning” at Geevor, because it is a different type of learning environment, which appeals to different style learners. Tourist Body (B3) strengthened that people like to learn in different ways and providing different forms of learning may be more “impactful”.

Most stakeholders identified AR as an authentic tool to bring Geevor back to life, animating it (B1, B3) and enlivening it (T1), suggesting instead of looking at static machinery. Many commented that AR would enhance the experience allowing visitors to actually see things moving, making it come alive (G8, B1, B6, V2, V5, V6, V7, V9, V10, V24, V28). Both V7 and V28 thought AR would make Geevor more accessible and easier to visualise how it once was, creating a contrast between now and then. Similarly, B2 felt AR would recreate the experience demonstrating to visitors how Geevor once was, creating an immersive experience. V7 suggested this would be particularly beneficial for children who often do not read the information plaques; therefore, AR would provide a visual experience. G8 supported this, stating it would be better to see things moving.

Tertiary Group (T3) thought AR would be an invaluable tool to help “see history”, contrasting to classroom experiences to show what it being taught. As well as making the machinery come to life, it is suggested AR could populate the site with people (B3, B6, G5), and in doing so it was believed it would help visitors understand the working conditions of miners (B4). In this manner, international visitors (V2) noted the value in using AR to provide an extra dimension, thus rather than just reading it you would “get to see it and really experience it”. Cornwall National Trust (B6) supported that AR could add to and supplement the existing experience “bringing to life an industry that effectively doesn’t work anymore, but making it work in the eyes of the visitors so they can understand it”.

In addition, 3D modelling was recognised for its potential to allow people to explore objects from different angles, improving understanding through the ability to explore more detail (B1, T2). On this note, Mine Manager (G9) identified a wealth of audio

history recordings from people who worked in the mine, not currently accessible to visitors, but using AR these could be incorporated into the existing experience.

B3 described the potential of using AR to populate the site with “AR people”, making it come back to life. Moreover, the Mine Development Officer (G5) identified AR could be used in specific area such as the minders dry, to help share personal stories of individual miners, or make machinery come back to life. Returning to the idea of an AR self-guided tour, Visit Cornwall (B2) stated “you can relate to one person, you can’t relate to thousands”, it would be more compelling to actually see it as it once was, in its prime, in contrast to an empty, still and quiet mine, because “that was never the way it was”. On a similar note, T2 suggested it would be good to have an “AR character” accompany you explaining what it was like and what things were. Thus, in an educational sense this would make history more interesting and encourage visitors to explore more of the site (B6, T3).

Educational leader, T3 identified one of the things that sold Geevor to them as an educational visit, was that they provide loan boxes of artefacts pre-visit, which “gets them hooked from my perspective {...} we could really scaffold the learning, they know lots about the mine already”. T3 recognised AR would be a valuable tool to help educate and excite students before visiting. Moreover, during visits, T3 identified difficulties in providing the best experience, maintaining interest and maximising learning appropriate to large groups of mixed ability and aged school groups, stating “it is a very tricky thing to get right”. Although recognising guides do an excellent job, T3 suggested AR could add to, and the experience, offering information in different formats “in a mine, in a classroom, at home”.

### ***Monetary Benefits***

Local Businesses to Geevor recognised AR presents opportunities besides marketing and increasing visitor numbers, suggesting it could create a link between the museum experience and onsite businesses (café and shop). For example, LB1 highlighted that Cornish pasties are engrained in the history of Cornish mining, therefore there should be more of a link:

*“a display or something, a video of a pasty or something in the mine, that could link it directly to us. So instead of bypassing us or just coming in and getting a sandwich people might think oh wow they are actually making pasties like they did 100 years ago”*

Likewise, LB2 recognised the potential to link the museum experience to the shop, commenting;

*"There are things that would tie up with the museum and the tour, obviously the books and then the Cornish minerals and rocks {...} if you go into our museum and you see the big mineral, I sell smaller pieces of that in the shop"*

However, LB2 identified challenges that not all products in the shop were directly related to the mine "because I can't get that kind of thing". But, suggested some connections such as Tin Jewellery could be introduced into the museum experience after the processing plants where concentrate is sent to be smelted, and "it could come back as jewellery or ringlets, that sort of thing" (LB2). Therefore, maybe the focus would lie on advertising products from not just Geevor but the local area, and communities. Linking the visitor experience not just directly to Geevor, but also the surrounding area and traditions that shaped Cornwall. Otherwise, with clever marketing, or further research into products that link the museum experience, such as products from Mexico that represent Geevors worldwide connections. LB1 felt AR could be used to help advertise these connections, driving sales and generating interest

*"There is a village in Mexico where it was basically Cornish men and women, and they took the pasty over there and the Mexicans have their own slant on the pasty {...} whether there was a piece about it in the museum displayed, you know that could link in nicely to what we offer in terms of food"*

Nonetheless, opportunities in linking the museum experience to the shop or café were identified, suggesting AR could help drive traffic through and retain customers, increasing spend and time spent on site. LB1 identified that in low season this would be particularly beneficial when the site was quietest. Both LB1 and LB2 identified AR could help overcome issues because of seasonality. For instance, LB1 commented "customer retention if that was a thing that AR could help with."

In addition, to Local Businesses, few other stakeholder noted monetary benefits of AR implementation. But, it was suggested AR would increase visitors likelihood to stay longer and spend more, because often visitors underestimated the scope and variety of activities offered at Geevor and often spent longer on site than anticipated.

Thus, using AR, Geevor IT Manager (G8) felt people would be more likely to stay even longer because they would appreciate the scale of the attraction. This was also noted by Visit Cornwall (B2) supporting that AR would encourage visitors to spend longer on site, which would also benefit the local areas;

*“The longer they stay there, the more likely they are to stay for food.*

*You extend the dwell time, you extend the ability for people to, it is about eating more, drinking more and spending more”*

Further, some Tourist Bodies identified monetary benefits of AR, for instance, B4 pointed out that AR would extend the visitor offer, and likelihood for visitors to spend longer on site, which increases the perception of value for money. If visitors spend longer at Geevor, they would feel they got better value for money from the ticket price. Thus, B2 and B4 suggested visitors would be more likely to spend more in the café and shop. Only one domestic visitor (V22) mirrored these ideas suggesting as a visitor, if the experience was more engaging it would increase the likelihood of spending longer on site.

Interestingly, few internal, tertiary or visitor groups recognised monetary benefits of AR implementation. One reason for this could be the role from which each stakeholder approached AR implementation - monetary benefits may not have been a priority for their focus. In comparison, for Local Business stakeholders generating revenues from AR is a priority. This would be an interesting area for further research.

### ***Interpretation***

All stakeholder groups recognised AR would be a useful tool to help visitors see the ‘bigger picture’ when interpreting the site, by linking different elements together. However, Tourist Bodies in particular focused on the potential of AR to improve interpretation, perhaps because of their roles and responsibilities to maintain the quality of tourism services and provide support to tourist organisations to fit tourism strategies (See Section 4.7). Tertiary Groups and Internal Stakeholders also discussed the ability for AR to improve interpretation, which could be closely related to their role as educators and providers of interpretation.

It is accepted because Geevor is big and complex, it is challenging for visitors to link different elements; for example imagining how the mill related to machinery outside. To overcome this, University Lecturer T1 proposed AR would effectively enhance visitors appreciation of the working whole making it more “digestible”. B1 added AR

would “tie it together”, which G8 felt would enable visitors to appreciate the bigger picture and “twig” getting more from the experience. Similarly G9 commented:

*“if you have AR it actually shows the relationship between all of those things, and {...} all of a sudden people understand what is going on {...} that is where this sort of technology would be really really useful”*

Building upon this idea, B2, B4 G2, G5, G7, T1 and T2 suggested AR could also open up more of the site which visitors currently cannot see, access or comprehend, such as the underground tunnels, using AR to enhance and extend the existing underground experience. Yet, T1 claimed currently Geevor are good at interpretation, by “allowing the structures and objects and machinery to speak for itself” therefore AR would have to be “complementary to the site interpreter’s, it has got to be different”. Likewise, B1 identified benefits in allowing visitors to view, interact with and spin 3D models, overcoming limitations of describing things via information panels, providing visual interpretation, increasing visitors appreciation and comprehension.

Tourist Bodies agreed AR would need to introduce something different, adding an extra dimension, for example allowing visitors to visualise an overlay on top of the sea to understand the extent of underground mining works (B1, B3, B6). T1 and B6 identified ARs benefit at creating a sense of depth, and B2 added that it helped place things in context. Similarly, B4 suggested AR would be an effective tool to show changes to the landscape as a result of mining, which “could really extend the visitor offering {...} it could really extend the stay”. Moreover, B2 identified AR would be effective to demonstrate contrast between Geevor now, and Geevor back in its mining heyday.

AR could be used to open up more of the site, which would overcome some of Geevors challenges whilst complementing their aspirations and saving costs associated with excavation, maintenance and building costs (B1, B6, LB2).

Moreover, improved accessibility was identified as a benefit of AR, used to facilitate virtual access to visitors, and visual overlays to areas visitors cannot physically, or do not want to access (B1, B3, B6). Stakeholders recognised a place for AR to support and enhance the experience of visitors with impediments or disabilities. For instance, V11 confessed having poor eyesight, recognising the use of AR “it is like

an audio and description, but also the visual”, that was also identified by Geevors Curator (G7). Cornwall Council (B1) responsible for ensuring accessible tourism supported:

*“One of the great benefits of augmented reality is that you could actually help a lot of people with learning disability or a lot of other disabilities, they would be able to access information and the site far more easily”*

In a similar way, Tourist Body (B4) noted ARs potential to provide language options and interpretation to improve visual learning. This was also confirmed by visitors (V12, V15, V18, V28), for instance French visitor V12 suggested although many foreign visitors have a good level of English, an AR application could provide subtitle and translation options. Dutch visitor V16 believed language options would be more useful than subtitles, otherwise you can only “understand bits, and fill in the gaps, make your own story”. As identified in Table 6.3, 30% of visitors interviews were international, confirming the important and need to improve the visitor experience increase accessibility and interpretation in different languages and equally for those with impediments.

AR was also suggested as a tool to increase access to collections and archive materials. B1 explained for the past decade Geevor collected oral history recordings, noting how AR “is a really good way of making that accessible”. Furthermore, B5 identified AR could increase accessibility, providing a symbolic recreation of items, whilst also overcoming one of Geevors challenges relating to storage issues faced by many cultural heritage attractions.

In this way, stakeholders also acknowledged AR could be used to create content tailored to different knowledge levels. Geevor attracts visitors of all ages; pre-school to post-graduate (G9), families to older people (G7), because of this, creating tailored content was recognised as hugely beneficial. This was also recognised by visitors, such as V11 who said an AR applications should include a menu with different content options for age groups, interests etc. Likewise, V15 argued an application could start with basic information and provide options to access more difficult, in-depth levels relative to the users’ interests. Moreover, providing visitors with a choice to select their level of content was seen as important, as was making the application was easy to use and self-explanatory to both children and adults (V15, V28). In this way, stakeholders suggested the options of AR are unlimited,

creating possibilities to provide tailored content to suit all types of visitors such as specialist visitors who desire detailed specific information, to the more casual visitor who wants a ‘flavour’ of what it is all about (B1, B4, T1, T3, G4, G5, G6, G7). T1 felt this would combat “museum fatigue”, but providing short, snappy, simple goblets of information.

Educationally, and from an internal stakeholder perceptive it was recognised using AR to tailor information would be hugely beneficial. G7 suggested content could be developed to maximise learning for the users, such as interactive engaging materials for children and more academic information to cater to more specialist audiences. G4, part of Geevor’s educational team pointed out there are different styles of learners and AR would create the opportunity to develop content to appeal to everyone and help visitors interpret the site. Similarly, Mine guide, G6 confirmed the challenge of sharing as much information as possible to a guided tour group with mixed ages as difficult, acknowledging the potential to integrate AR to increase engagement and attention. On this note, University Lecturer (T2) also pointed out the benefit that AR would allow “individual pupils can go at their own pace and they are not governed by the tour leader and that pace that maybe they would enjoy it more”.

### ***Marketing***

The benefits of AR for advertising, marketing and promoting Geevor were considered very important and most stakeholders identified ARs potential such as raising the profile of the site and Cornwall as tourist region, attracting wider audiences by offering something innovative and different. Visit Cornwall (B2) believed AR would give Geevor “edge” provided it was implemented effectively, which would in turn attract less specialist and more generalist visitors. This was supported by many internal stakeholders (G1, G2, G3, G4, G5, G6, G7, G9) as well as B3 and LB2 who commented AR would provide something “new” to promote, appealing to visitors interested purely in trying the new technology. The Cornwall Museums Partnership (B3) identified AR would create benefits: increasing the visibility of Geevor, creating new products or services to encourage more people to consider visiting and inspires visitors to recommend Geevor, or share their experiences on social media, or introducing an AR online experience. Mine Manager (G9) suggested implementing AR would continue to demonstrate a legacy of technical innovation for the benefit of visitors.

Educational leader T2 added that AR would increase Geevors profile and the reputation of Cornwall as a rural tourist destination stating, “it is the kind of thing Cornwall needs more of”. Geevors Learning Officer (G4) supported that visitors do not expect innovative technologies in places like Cornwall. In a similar way, Cornwall Museums Partnership (B3) and Geevor Shop (LB2) thought AR could be an effective way to attract funding and investment, by increasing credibility and thus investors likelihood to invest by showing Geevor were “committed to innovation, research, development, that is a good story to tell potential funders and investors” (B3).

It was perceived introducing AR would have a significant impact on word-of-mouth marketing and recommendations, in turn attracting more visitors (B1, G2, G1). This was supported by visitors (V3, V4, V25 , V28) who claimed they would recommend Geevor, if the AR application provided an enhanced experience. Geevor Marketing Officer (G3) and Museum Marketing Expert (B5) thought AR would increase visitors' likelihood to share their experiences on social media platforms. T2 noted society is used to instant sharing, and AR would inspire photo sharing or commenting, generating higher visitor's numbers “based on new visits rather than repeat visits”. Simply by introducing AR, G1 felt there is an “avid advantage to encourage people to come in”. G8 stated “we may get people coming solely as we have something like that [AR]” and B3 added if it was advertised and promoted properly it would encourage people to visit.

Stakeholders considered implementing AR would help broaden Geevors appeal increasing engagement by raising the profile of the site and modernising the offer (G1, G3, G4, B4, T2). G4 felt AR would create a perception change about the type of museum Geevor was. B2 suggested AR would be a positive tool to help sustain and increase an all year around visitor flow. Crucially, Mine Manager (G9) felt AR would help “involve just about every customer that we are looking for” appealing to all visitor demographics. In particular stakeholders expressed that AR would help engage and attract younger audiences and allow them to take more from the experience (LB2, G2, G3, G9, B3, B6). Secondary School leader (T3) identified the significance and importance of this, claiming Geevor is not currently very accessible or attractive to younger audiences. In the same way, the Museums Marketing Expert (B5) identified if you are doing something for younger markets, you are also doing something to benefit older markets, because they “share the same barriers”.

On the contrary, University Lecturer (T2) and Geevor Learning Officer (G4) felt AR may not appeal to younger audiences, but instead would be a useful tool to help parents understand and therefore explain things better to their children. Likewise, B4 remained unsure of the reaction to AR implementation, but identified it would be interesting to see if AR actually attracts younger audiences or whether it is likely, they “still wouldn’t be bothered to visit a place like this”. Contrastingly, many visitors (V6, V7, V8, V9, V12, V18, V24, V27) believed AR would help engage and attract younger audiences, and crucially, G4 felt AR would engage children, to increase their likelihood and interest in continuing to visit museums in the future.

There was a general consensus among stakeholders acknowledging more could be done to engage visitors before and after their visit to Geevor, such as per-visit helping them understand what to expect allowing people to “do their research” and increase intention to visit. For instance, LB1 identified that pre-visit AR would be beneficial to Geevor, stating:

*“If you go to Alton Towers you know what is at Alton Towers, if you go to Disney Land you know what to expect. If you come here, you would be like well what is Geevor? If you have got something almost tangible and you can say well check this out, I think that would sway people”*

When choosing attractions to take educational groups T1 identified the need to offer something unique and entice people, but also leave them wanting to find out more, by identifying some experiences are only available on site. In a similar way, Cornwall National Trust Manager (B6) highlighted the potential of using AR pre-visit to engage wider audiences, such as those with links or association to mining, but not necessarily able to visit Geevor, identifying potential for overseas visitors to access part of Geevors experience “remotely, from their own country”. Further, post experience, B6 identified that especially for international visitors, AR would allow visitors to relive or recreate their experience “from hundreds of thousands of miles away and you want to follow that up and repeat the experience”. However, T2 raised concern that if some sort of AR experience was available pre-visit, it may have a negative impact and discourage people from visiting, because they would feel they had seen it all.

## ***Navigation***

Within literature, the use of AR for navigation and orientation purposes has been widely praised. Stakeholders also recognised the benefits of implementing AR to improve visitors' navigation and efficiency in exploring the site (B1, B4 T2, T3, G1). For example, Tertiary Groups, T2 and T3 identified benefits introducing AR annotated maps. It was supported by B1 that AR would enable visitors to explore the site much more efficiently, whilst enhancing their understanding and comprehension of the site as a working whole:

*"You can get lost on sites like Geevor and you can spend some of your time sort of thinking have I seen everything, do I need to go back on myself, what is the most efficient route around the site, have I seen this before, I don't want to see that part of it, but I want to go directly to this part"*

As well as navigation and orientation, G1 highlighted the potential for AR maps to increase visitors' awareness of the site facilities, such as "a café that does food" but also link the museum experience to the site facilities. Which would potentially drive more customers to the facilities, to increase revenues. This was echoed by V24 who identified AR would help increase engagement with the whole site, while helping visitors orientate and navigate.

The Cornwall Museums Partnership Manager (B4) commented that Geevor could improve their crowd management and recognised AR as a tool to achieve this. In addition to this it was proposed AR would help improve the efficiency of visitors participating in tours sticking to specified routes. Equally, it could help educational group visits;

*"They could do a lot better visitor site management, in terms of encouraging people to go, how long to spend in different areas [...] there is definite crowd management thing going on, but it would also help people on an organised visit stay in time, it would be a lot less wandering off"*

## ***Gamification***

Tertiary stakeholders in particular discussed the benefit of introducing AR games, to entertain and enhance educational value. One reason for Tertiary stakeholders focus on ARs gamification potential could be because of their role as facilitators of

learning and knowledge of methods to engage and encourage learning. For instance, T3 suggested AR games would be an asset and useful tool to engage and educate children, for example dress the miner, quizzes, hangman with mining vocabulary, who wants to be a millionaire-mining questions. Likewise, T2 recognised the potential of introducing AR gamification for children, groups and educational visitors in an attempt to engage younger audiences. In addition, T2 identified potential to create AR games aimed at activity leaders, teachers or parents to help them explore the site more effectively with their children or groups.

T3 strengthened that introducing an AR gaming element would encourage individual and group learning, whilst providing a more personal touch, progressing from the typical “museum-y experience”. Also encouraging visitors not to focus purely on their devices, but to engage and interact with the environment (T2). In this way, T3 felt AR would encourage visitors to take control, create and own their experiences. In addition to adding a fun and excitement (B1, B2), as the perfect complement to the existing experience (T1).

T2 identified numerous crossovers with the existing experience and AR gamification, recognising strength offered by Geevors location and suggesting AR could incorporate the landscape into a gamification element, like building a scrapbook of photographs or introducing challenges to get visitors to engage more with certain areas across site. T3 believed AR games could also be used to test knowledge and learning;

*“Testing their knowledge, giving them knowledge, allows them to the test what they have done and revisit it. If they get it wrong, it will supply the right answer {...} they can own their learning and you only really get that when they are given a job and they can go off and explore and find out what they want”*

### ***Additional AR benefits***

In addition to the AR values discussed, visitors were asked a number of questions relating to pricing and affordability. The large majority (82%) of visitors claimed they would use AR if it were available, for many of the benefits discussed throughout the chapter, such as enhancing (V2) and improving the visit (V11). Visitors also said they would be more likely to use AR if they were with children. Although some identified use would depend on Wi-Fi and connectivity, due to high roaming costs for foreign visitors (V2, V20, V29).

However, 4% claimed they would not use AR, but this was not down to its potential, but the fact they were not a user of technology, for instance V10 commented, “I am happy to just read and poke my head into things”. The remaining 14% of visitors thought they may be inclined to use AR, but were largely unsure, for example V17 stated, “I am more of a wanderer, reading the odd snippets...but yeah I wouldn’t rule it out”. Further, while V9 understood ARs benefit for children, they felt they would not use it themselves, as they were happy to read information boards. Only one visitor disagreed that AR would enhance or improve their visit. Stating “personally not, but that is because I am a bit of a luddite apart from anything else, but I am sure it would for other people” (V10). All other visitors felt AR would improve or enhance their visit.

Over half (54%) of visitors felt AR would encourage them to visit Geevor again, suggesting it would add another dimension (V7), create an updated, different experience (V1, V6), provide extra activity (V2) and added incentive (V11). V5 believed it would encourage repeat visits, but only if it provided updated tours, and added attractions. V3, V4 and V11 commented it would also increase likelihood to recommend Geevor. However, a small minority (8%) believed AR would not inspire them to return to Geevor, for instance American visitor V3 commented it was not a place most people visit multiple times, partly because of location and likelihood to visit Cornwall again. The remaining visitors (38%) felt AR would “probably not” motivate them to return to Geevor, “but...” maybe in a few years (V15, V16, V18, V23, V25), and AR may increase their likelihood to look up information once at home (V18), or Canadian visitors (V20, V21) said it may encourage them to return with a different group of people. V20 stated, “I don’t know if I would return {...} it has nothing to do with the application {...} I have been here once, would I want to come again”. V7 and V24 suggested that even for adults it is a great tool “you can see it simplified, and the read it more complicated” (V24).

Over half (55%) of visitors claimed they would chose to visit an attraction offering AR, over a similar attraction without AR. They recognised AR would create a better overall package (V22), a better experience for children (V6, V9, V24, V25), variety through offering information in different ways, improving understanding (V28), and facilitating a more interesting experience (V5). Interestingly, all these visitors were domestic, which demonstrates the importance of ensuring Geevor offer a unique and valuable visitor experience to increase their competitive advantage.

Just under a quarter (24%) suggested it might have an influence, for example Canadian visitors (V20) stated, “it is something that is nice to have, but not necessarily something that would sway my decision”. However, perhaps this could be in part influenced by the heritage significance of Geevor that has more of a pull to international visitors interested in learning about Cornish history. V4, V8, V29 and V30 said they would base their decision on other factors, such as location, attractions, convenience and interests, but if there were no other difference they would chose AR. The remaining visitors (21%) thought AR would have no influence on their attraction choice, for example Dutch Visitor (V16) thought AR was more of an added extra. Equally, domestic visitor V17 and American visitor V3 commented the decision would be based more on the museum than technology. These results are interesting, given the mix of visitors interviewed. Considering where visitors travelled from, it can be suggested domestic visitors expressed more interest in AR as a tool to engage them, giving Geevor competitive edge. Whereas by comparison, whilst international visitors recognised the ARs value, they would have been likely to visit regardless because of Geevors significance.

#### **6.4.2 Intended Value**

The V4 intended value element includes a description of the value incorporated into the offering. However, much of ARs value overlaps with AR VPs discussed in section 6.4.1.2. There was difficulty differentiating between the product service and intended value element because of the interrelated and close relationship between the two. In relation to Geevors visitor offering, the offer concerns value since the two complement one another and are inherently connected. For instance, stakeholders discuss potential to create AR games, (the product/service) then defined its potential benefits (the value). Thereby, analysis of the V4 intended value element instead focused on the two approaches outlined in the description of the VP; (1) how an organisation and suppliers create value for customers, (2) how an organisation and stakeholders create value for all parties involved. In other words, distinguishing between the benefit or reason for why visitors chose to visit Geevor, or the benefit and motivation for stakeholders to support the implementation of AR at Geevor.

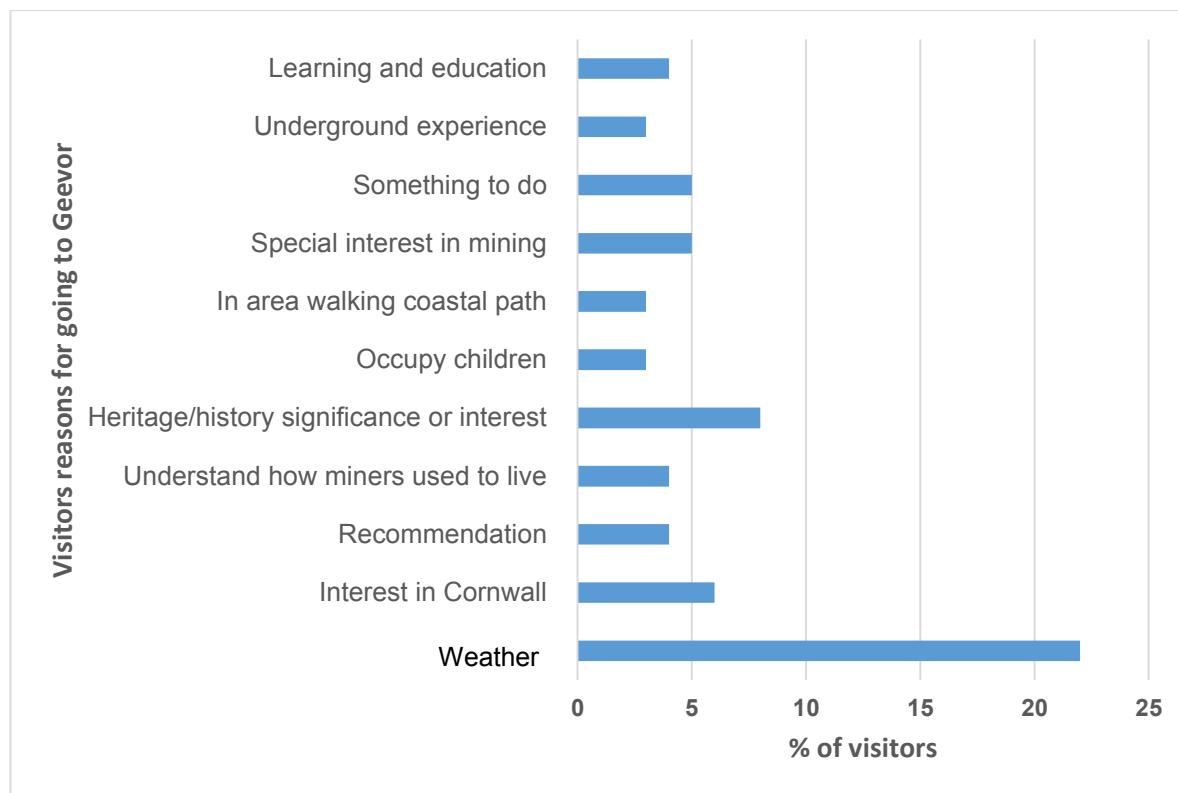
##### **6.4.2.1 Customer Benefits**

Intended value describes the value incorporated in the visitor offer therefore visitors were asked to identify their reason for choosing to visit Geevor (See Figure 6.1). Weather was the most commonly provided reason, however this is not a “value” by itself. However, it can be argued visitors were motivated because Geevor provide a

range of activities, most of which are indoors or underground and can thus escape poor weather. Although weather may have encouraged visitors to make the decision to actually visit Geevor, many visitors identified more than one reason for visiting, demonstrating that they already had an interest in visiting, and bad weather confirmed or swayed their decision. For instance, V1 stated, "it was raining and I thought it was really interesting too". Similarly, V18 said "we were recommended by somebody, and just because the weather as well, we thought it was a day to come, because of the rain". Likewise, V21 confirmed;

*"It is raining, but also I was interested in it, I have heard about it before and I thought it would be interesting to learn about how the miners lived. So maybe it was totally sunny, we wouldn't have come but I have enjoyed coming anyway"*

Equally, V23 supported that the poor weather confirmed their decision to visit "we thought that we should come to a mine in Cornwall, and because of the weather we thought that it was the best opportunity"



Source: Author (2017)

**Figure 6.1 Visitors' reasons for visiting Geevor**

Although bad weather is not an intended value, Geevor focus heavily on their underground experience in marketing and promotion, to sell their value offering and

appeal. As a result, stakeholders recognised that rain, and the prospect of going underground were hand in hand. For example, Cornwall Museums Partnership Manager (B4) identified Geevor is educational and interesting, but also a good “undercover wet day holiday activity”. The opportunity to go underground confirms the appropriateness of Geevor as a rainy day attraction to potential visitors. Poor weather was recognised by stakeholders as a reason why many visitors go to Geevor. For instance, Mine Guide (G6) claimed rain during summer holidays drove visits “people come in on a rainy day and it is too wet to go on the beach”.

Besides poor weather, other motivations to visit Geevor included; learning, something to do, recommendation, experience the underground, to learn about local history and heritage significance. Visitors often described more than one reason for visiting confirming Geevor's diverse offer and range of activities as one of its existing strengths (See Section 6.4.1.1). For example, V10 visited with her family, stating Geevor was recommended, they wanted to learn about mining heritage, understand how miners lived, occupy and educate their children. The variety of reasons why visitors visited Geevor reiterate the importance of introducing AR targeted to different knowledge levels, ages, interests and as suggested by stakeholders create a pre-experience to engage and encourage visitors, regardless of the weather conditions.

#### **6.4.2.2 Stakeholder Benefits**

Five benefits or AR values for stakeholders were identified, these are summarised in Table 6.6 and discussed in more detail below. Because this section focuses on the value of introducing AR for stakeholders, visitors were not included in analysis. However, the perception of visitors was included and discussed at length previously in section 6.4.2.2.

**Table 6.6 Summary: Stakeholder Benefits**

Theme	Key points
<b>Preserve Knowledge</b>	<ul style="list-style-type: none"> <li>- Staff and ex-miners create authentic experience through personal stories, storytelling and first-hand knowledge of Geevor</li> <li>- Staff will not be around forever, so AR can be used to preserve their knowledge and capture an essence of the visitor experience for future</li> <li>- AR would ensure the legacy of staff continues to be enjoyed by generations to come</li> </ul>
<b>Secure Jobs</b>	<ul style="list-style-type: none"> <li>- Many of the uses and benefits of AR implementation at Geevor focus on increasing visitors numbers and ticket sales</li> <li>- The more money on site, the more secure jobs are, and the more money to invest into improving Geevor</li> </ul>
<b>Attract Investment</b>	<ul style="list-style-type: none"> <li>- Implementing AR demonstrates site advancement and innovation increasing the profile of Geevor</li> <li>- Increased likelihood to attract investment and funding</li> <li>- Ensuring and improving longevity and sustainability of Geevor</li> <li>- More money to invest into conservation, protection and development of the local area</li> </ul>
<b>Community Pride</b>	<ul style="list-style-type: none"> <li>- AR would enhance and improve appreciation of Cornish heritage</li> <li>- Improving efforts and changing behaviours to protect heritage</li> <li>- Strengthening community pride and sense of identity</li> <li>- Increase awareness of Geevor's significance among local and younger generations</li> </ul>
<b>Improve efficiency</b>	<ul style="list-style-type: none"> <li>- More quickly and effectively explain complex processes</li> <li>- Demonstrate to the staff Geevor was advancing</li> <li>- AR could provide interpretation to visitors when staff are unavailable to enhance the visitor experience</li> </ul>

### **Preserve knowledge**

Most stakeholders recognised the existing staff; ex-miners as an asset to Geevor, noted for their value in creating an authentic visitor experience, based on their first-hand knowledge (B2, T2). Internal stakeholder G3 commented, “for the time being the main strength here is that we have got ex-miners...who can tell all sorts of interesting stories”. Likewise, internal stakeholder G8, suggested “we have all that extra value, of real people”. Because ex-miners still work at Geevor it attracts many people to visit the site. The importance of preserving this knowledge was recognised as a key value of AR and pressing issue. T2 identified “I don’t know how long a window there is, but I know some of the guys are getting older now. It’s a great part of the history”. Likewise, the Mine Development Officer (G5) identified “as the place evolves, our older members of staff, who have knowledge of the place will not be here. So it [AR] can preserve the knowledge”.

Maintaining the authenticity of the visitor experience provided by this first-hand knowledge was a key concern among stakeholders. Thus, B2 suggested “augmented reality can kick in” to create “digital people” helping maintain the authenticity of the experience whilst preserving knowledge. Visitors such as V7, also identified this, highlighting “first-hand knowledge, that is key”. Using AR to protect

the intangibility of the experience created by ex-miners by preserving their knowledge would ensure future generations can enjoy the same level of experience as provided by the guides today. This would help increasing sustainability by conserving and protecting the experience for the future. Equally, guides are important storytellers, relaying information that visitors can relate to, therefore stakeholders identify the importance of their role, in comparison to the museum tradition of reading static information from plaques. Using AR stakeholders felt their legacy and stories would live on, to be enjoyed for generations, maintaining the integrity and authenticity of the current visitor experience.

### ***Secure Jobs***

As discussed throughout section 6.4.1.2 much of the VP for AR relates to increasing visitor numbers, sustainability and attracting wider audiences. Stakeholders considered AR would generate more money for Geevor, creating more to invest back into improving. Hand in hand with increased revenues, stakeholders suggested AR would increase job security, because the more successful the site, and the more money it was generating, the more profits to invest into staffing the site. For instance, Geevors Chair of Trustees (G2) perceived AR would make the site more successful, helping staff “secure their job, the more money we have on site the more secure their jobs are”.

In addition, it was considered that introducing AR could help also create a number of jobs, involved in developing the application, creating and curating the content, implementing across site, training staff, maintaining and upkeep. Most operations at Geevor are performed internally, and stakeholders recognised with some additional support the process of developing and implementing AR could mostly be performed in house, again securing jobs, in addition to creating new roles and responsibilities.

### ***Attract Investment***

As discussed previously, stakeholders identified numerous ways implementing AR would help attract investment and funding. Geevor Marketing Officer (G3) commented that AR was a tool to advance the site, shifting focus from being a mine, to being a tourist attraction. However, argued that “some staff are ‘stuck in the past’ and need to jump over their shadow to sometimes do things we have to do to attract people and not necessarily things we think we would like to do”. This was also noted by LB2 who acknowledged “we seem to have gone on as far as we can at the moment, so we need to think of something else, just to keep it fresh and interesting”.

Therefore, was seen as a tool to advance the site, and in doing so attract investors and funders to improve Geevors offer.

It was perceived implementing AR would demonstrate efforts were being made to secure the future and longevity of the site in a sustainable innovate way. For instance, Cornwall National Trust (B6) commented;

*“the better the experience we can give people in the whole area, the more people will visit, and the more the economy will grow and the more money you will have to invest back into conservation of those areas”*

Likewise, T2 suggested AR would better the visitor experience, demonstrating efforts were being made to improve the site to potential investors. Moreover, it was perceived if people had a better experience using AR, it would encourage longer visits, increasing visitors likelihood to spend more money in the local area, such as pubs and cafes, generating more money to invest back into the area. External Stakeholder, Visit Cornwall (B2) suggested “It [AR] would make it a place to go and stay and not just drive through. Such benefits demonstrate Geevor are serious about enhancing and adding value to their visitor offer, increasing the likelihood of attracting investment.

### ***Community Pride***

Geevors uniqueness has already been identified as one of its key existing resources. Implementing AR, some stakeholders such as Geevors Learning Officer (G4) suggested would enhance understanding and appreciation of Geevors history and heritage. It was considered this would increase accessibility and engagement with families and younger generations, promoting for them to “come to Geevor and do something different” (G4).

Stakeholders felt AR would help confirm and maintain a sense of community pride. For example, Cornwall Museum Partnerships Development Officer (B4) perceived AR would increase visitor’s understanding and appreciation of Cornish heritage, creating a behavioural change, increasing awareness of the need to protect and conserve heritage sites. Similarly, external stakeholder, B1 thought AR would improve the local sense of identity, reiterating the significance of Geevor, its impact and influence on the local areas to current generations;

*"it is, our heritage, our culture is immensely important to identify who we are [...] without things like Geevor you wouldn't understand the significance of what the past generations have done"*

### **Improve efficiency**

In addition to many of the benefits discussed, such as attracting wider audiences, providing interpretation for informal visitors, persevering knowledge and attracting funding, internal stakeholders agreed AR would improve their role as a member of staff. Predominantly internal Geevor stakeholder's recognised ARs potential to improve efficiency of their day-to-day tasks. For instance, G1 stated "yes, definitely no question" and G2 commented "without doubt, 100% percent". Moreover, Geevor Mines Development Officer (G5) felt introducing AR would add value by increasing staff engagement. Whereas, Geevor Learning Officer (G4) thought AR would raise the profile of the site and Mine Manager, G9 suggested "it [AR] would certainly raise the morale [...] we would feel as though the site was advancing".

As previously mentioned AR was recognised for its potential to appeal to and engage different learning styles (B4) adding an element of fun as well as educating (G3, G6), increasing engagement. Stakeholders perceived AR could aid staff in explaining complex processes, using AR diagrams or animations so speed up the process and enhance understanding (G4, B1). In addition, it was suggested AR could be used to supplement existing tours and provide interpretation when staff are unavailable to improve visitors efficiency exploring the site.

#### **6.4.3 Target Segment**

Within the V4, the purpose of the target segment component is to identify and evaluate the nature of each target segment and their preferences. However, Geevor stakeholders presented uncertainty and confusion when attempting to define Geevors main target segments, suggesting Geevors target segments were difficult to define because focus changes between seasons and because of the diverse offer, it appeals to a broad range of segments. This highlights an area to improve, by aligning stakeholders understanding of target segments with Geevors organisational strategy, such as which segments Geevor want to focus on engaging and attracting. Despite uncertainty, the following range of segments were identified;

- Special interest visitors
- Couples
- Families
- Locals
- Day trippers
- Older / Retired individuals
- Educational Groups
- Tourists

- People from industry
- Poldark Fans
- Tourists
- Foreign Visitors
- “Rainy day” visitors

There is much variation among Geevor's target segments, and stakeholders recognised different times of year are more popular with different segments. Such as G8 who defined “holidaymakers in the main season, that is who will ultimately pay the bills, the tourists, families”. Similarly, G7 stated, “I would predominately say it is British families on holiday in Cornwall, not necessarily coming because they are interested in mining”. These statements mirror the profile of visitors who participated in interviews, during August 2016 (See Table 6.3) the majority of whom were young families.

Summer has been identified as Geevors most profitable and important time of the year for attracting visitors and earning enough to ensure sustainability throughout the quieter winter months. However, during this time engaging and attracting younger audiences, more specially children to ensure they continue to visit attractions like Geevor in the future was recognised as a challenge and therefore an area for improvement.

Tourism is a predominant and fundamentally important industry for Cornwall, supporting and creating many jobs, generating revenue and sustaining local businesses. In line with this, Mine Manager, G9 commented “school holidays, that pays the bills, I mean that really pays the bills in Cornwall”. It is clear that tourism plays an integral role in sustaining Cornwall, because of its economic benefits. G9 confirmed this, and recognised the need for Geevor to focus on engaging and attracting younger audiences to ensure they continue to visit cultural heritage attractions and museums in the future:

*“if we don't engage with the youngsters as they grown up they aren't going to engage with a site like this, they will lose the concept. So it very important for school children to come to a place like this, because they, when they have kids are the future of visitors to a place like this”*

Yet, during the low season and winter months, Geevors focus shifts from tourists, onto educational groups who visit during term time and quieter low season periods. Internal stakeholders agreed educational groups were an important all year-round market and because of a heavy focus on their educational offering, G8 claimed

Geevor “excel” at attracting and creating valuable experiences for educational groups. G5 identified there will always be a market for schools and colleges, therefore attracting them was not as important as ensuring there were a wide range of packages to offer them. Over the past few years, G5 noted Geevor’s educational offer has improved and increased, but also identified room to develop:

*“Our educational side has grown {...} offering the site to interpret a whole range of subjects on the curriculum is going to be a bigger and bigger part of our businesses”*

Within educational groups, there are also different target segments. For instance, G4 highlighted because mining has so many aspects, it appeals to a wide range of groups interested in different elements, such as local history, rocks or archaeology. Because of its broad offer, Geevor attracts diverse target segments and has been argued to outperform many of its competitors. But, stakeholders still acknowledged room to improve, for example the Cornwall Museums Partnership officer (B3) noted:

*“In comparison to other museums they [Geevor] get a relatively high number of schools, but I think there is potential to access many more. We know that only about 40% of schools in Cornwall are visiting museums, so there is a big gap there and potential to expand that market”*

The Café manager (LB1) highlighted another way to expand would be to increase focus on attracting locals and older visitors, especially during quieter tourism periods. B3 confirmed many local people who go to use the café regularly, without participating in the rest of the visit, because of its good reputation locally.

Museums Marketing Expert (B5) proposed that people go to a museum three times in their life, “one time as a student, one time as a parent, and one time as a grandparent”. However, other stakeholders disagreed, and thought different groups of people visited for different reasons (G3, G6). Such as day-trippers (B1, G3, G5) or people who “drive by and go, oh what’s in here” (G5), or people who plan and want to learn, or have a genuine interest (G3, G6). Rainy Day visitors that want something to do (LB2, G6), and to entertain their children for a day (G3). Foreign visitors that want to learn about Cornwall (G7), or people walking the coastal footpath route that goes through Geevor (B1). Identified as a more substantial market were special interest visitors (B2, B4, B6, G1, G2, G5, G6) or people that

have worked in industry (G1, LB1, G7, B6), but nonetheless, Mine Development Officer (G5) acknowledged they still “tend to be sort of quite a niche market”.

From a destination marketing perspective, Visit Cornwall stakeholder (B2) defined different market segments, rating Geevor in terms of its appeal to specific target groups;

*“we can segment people based on what their interests are, so I would still give it 9/10 for people interested in industrial archaeology. I would probably say as far as gender splits [...] the average male, whatever they are, I would give it about a 7/10, but for the average female I would probably give it a 2 or 3/10, and those last two are average visitors who do not have a specific interest towards mining or industrial heritage.”*

Building upon this, B2 continued that Geevor does a great job in attracting people with specialist interests, which tend to be males, but highlighted a need to focus on the more human and social offering to appeal more to a generalist visitor. Adding that Geevor attracts many older visitors, but that this “could and should change” by focusing on the broader appeal, particularly engaging younger visitors. Older visitors are also mentioned by B3, LB1, G1 and G3 as a key target segment.

To attract broader segments, B2 argued Geevor needed to improve their overall offer, including food, beverage and retail, with the aim to deter the veto and avoid losing out on potential visitors as a result:

*“getting a gender balance. I always say very few people, but there are some, travel on their own. But you have often got a party, and the party are obviously mixed gender, so if one person doesn’t want to go, you have got to be careful that you aren’t losing the other visitor because of the veto being applied. You know “we are not going there” [...] sometimes you have got to think what you add to the plus one, not what you add to the enthusiast [...] include the plus one, so the veto is not powerful [...] the same goes to say for children, you know”*

Tourist Bodies and Internal stakeholders (B1, B3, B4, G1, G2, G3) agreed more should be done to appeal to and cater to children, and thus attract more families. For instance, G4 suggested Geevor were not making the most of families, and AR

would be a great tool to engage and attract family groups. G3 acknowledged that in recent years, Geevor has improved from a “stuffy” attraction to a more family friendly attraction, by pushing different aspects and activities with the aim of integrating more families rather than just appealing to the “average” museum goers. Whereas, B4 suggested that Geevor was already family friendly, but do not “sell themselves enough” on that part of the offer. Nevertheless, it is clear that more could be done using AR to help extend the appeal of Geevor to attract younger visitors and thus families and G1 pointed out, not many young people visit Geevor alone, without friends or family members, therefore maybe technology would attract them.

On the other hand, some stakeholders commented Geevor should focus on being a tourist attraction that engages all visitors. For example, G4 stated, “we are basically a tourist attraction, so people visit who want a little bit of Cornwall”. However, G5 highlighted the challenge in defining who tourists are and what attracts them to visit attractions such as Geevor, suggesting management should think outside the box, to explore opportunities to engage wider audiences. Although some clear target segments have been identified, stakeholders acknowledged difficulty in defining clear segments. While some stakeholders identify the main groups as tourists, families, educational groups, older people and enthusiasts. Others disagreed suggesting there is scope to improve by focusing on attracting broader markets, such as younger visitors.

G5 suggested Geevor has the potential to appeal to diverse segments because apart from the educational appeal “it is still a niche that people tend to have interest in industrial heritage or the past, to make the decision to come here initially”. Although, some stakeholders recognised AR as a means to appeal to a broader range of visitors, including the general tourist. Overall, there is clearly confusion among stakeholders towards Geevors market segments, defined as “tricky” (B4) and “difficult” (LB2) to distinguish. Moreover, B3 claimed they would be “guessing”, equally, G6 stated “I don’t think there is actually a main {...} I haven’t actually identified that. There seems to be a mix of different groups coming for different reasons”. To a certain extent, stakeholders attribute the difficulty in distinguishing target segments to the fact many different visitors visit for different reasons because Geevor has a diverse appeal and offering. Based on this, G3 argued:

*“They should all be targeted {...} we should create Geevor as a location for everybody not just for a small circle of people who are*

*interested in technology of things, because then we can no longer afford to call ourselves a tourist attraction”*

There appeared to be a lack of clarity among internal stakeholder's regarding Geevors target market, because whilst some stakeholders suggested Geevor offered something for everyone, others disagreed and felt Geevor attracted niche segments. This represents a disconnect internally, highlighting an area for focus prior to developing an AR application to ensure alignment with Geevors strategic objectives.

## **6.5 Value Network**

The value network outlines stakeholder roles and responsibilities, identifying their value and purpose. V4 encourages collaboration, cross-company and inter-organisational perspectives, to be effective in capturing and creating value from innovations.

### **6.5.1 Actor, Role and Relationship**

To understand Geevors value network, interviews asked stakeholders to define their role, responsibilities and relationships. Table. 6.7 presents stakeholders (except visitors) roles and relationships with other stakeholders.

The V4 suggested collaboration and cooperation are crucial to successfully engineer, launch and deliver services. In addition, V4 defined that strategic outcomes and value capture should be united and consistent. In relation to this study, this concerned AR implementation and although some stakeholders identified potential barriers to implementation, overall there was a positive and supportive attitude towards AR adoption.

Tertiary Leader T1 proposed AR could help improve sustainability of local attractions associated to Geevor. Based on this T3 commented “you're on to a winner, it is a great idea” and T2 added “Cornwall needs more of these things especially in the tourist industry”.

With regard to relationships, internally stakeholders confirmed most operations were performed in-house, and external collaborations are often for mutual benefit, such as working with the National Trust offering visitors a reduced ticket price to both attractions. Similarly, T3 discussed that they recently set up a new scheme with Geevor to ensure both get the most from annual student visits. In terms of relationships, many stakeholders acknowledged Geevor are great to work with, T1

stated Geevor “has been lovely to work with” offering to host workshops and meetings.

Internally, besides collaboration for mutual benefit, most operations are performed in-house. G8 explained “we don’t actually have any monies, so it all has to be done in house”. Likewise, G5 supported that working at Geevor was “a job that you can sort of get on with”. Moreover, Mine Manager, G9 exclaimed everyone on site works closely together, because it is “a very very relatively small unit, you know if one person isn’t here {...} then the place doesn’t function properly because we all fit together”.

**Table 6.7 Stakeholders: roles, responsibilities and relationships**

	<b>Role</b>	<b>Responsibilities</b>	<b>Relationship/s</b>
G1	Trustee	<ul style="list-style-type: none"> <li>- Fulfil any roles assigned</li> <li>- Discuss projects, strategy, goals</li> <li>- Attend meetings</li> </ul>	<ul style="list-style-type: none"> <li>- Work closely with trustees</li> <li>- Assist the chair doing research</li> </ul>
G2	Chair of Trustees	<ul style="list-style-type: none"> <li>- Chair meetings once a month</li> <li>- Disseminate information from external sources to present to boards of trustees at monthly meeting</li> </ul>	<ul style="list-style-type: none"> <li>-Trustees</li> <li>- Mine Manager</li> <li>- Mostly communicate with manager and anyone that can input on subject at hand</li> </ul>
G3	Marketing Officer	<ul style="list-style-type: none"> <li>- Advertising, promoting and marketing Geevor, locally, nationally and internationally</li> <li>- Responsible for drawing people in, bring people to Geevor</li> <li>- Trying to get locals involved a bit more</li> </ul>	<ul style="list-style-type: none"> <li>- Overseas travel agencies</li> <li>- Local tourist agencies</li> </ul>
G4	Learning Officer	<ul style="list-style-type: none"> <li>- Works with visiting school groups</li> <li>- Developing and delivering new educational initiatives</li> <li>- Creating workshops and educational materials</li> </ul>	<ul style="list-style-type: none"> <li>- Other learning development officers</li> <li>-Guides, reception.</li> <li>- Learning Development officers at other museums, local attractions, events</li> </ul>
G5	Mine Development Officer	<ul style="list-style-type: none"> <li>- Set up Trustee process after financial difficulties</li> <li>- Developing themes and exhibits</li> </ul>	<ul style="list-style-type: none"> <li>- Internal stakeholders</li> <li>- Liaise with all colleagues daily</li> <li>- Externally has done consultancy work</li> </ul>
G6	Guide	<ul style="list-style-type: none"> <li>- Interpret site for different audiences</li> <li>- Site maintenance</li> <li>- Involved in committees overseeing the development of the tourist offering</li> </ul>	<ul style="list-style-type: none"> <li>- Internal stakeholders</li> <li>- Occasionally works with schools</li> <li>- Development committees</li> </ul>
G7	Curator	<ul style="list-style-type: none"> <li>- Curator, archivist, interpretation, care, documentation of collections</li> <li>- Organise temporary exhibits</li> <li>- Disposals, acquisitions and loans to and from museums</li> </ul>	<ul style="list-style-type: none"> <li>- Manages volunteers</li> <li>- Mostly in-house, whoever is most relevant at the time</li> </ul>

Source: Author (2017)

	<b>Role</b>	<b>Responsibilities</b>	<b>Relationship/s</b>
G8	IT Manager	- Responsible for technical offering - Network infrastructure, maintenance of technical exhibits and anything technical	- All in-house
G9	Mine Manager	- Manages the site as a tourist attraction -Statutory position, even though not working mine, regulations apply because visitors go underground - Draw people in, bring people to Geevor	- Work with everyone on site, small team. All work together - Outside organisation: Cornwall Association of Tourist Attractions, Cornish Mining Attractions marketing association, National Trust and other bodies for mutual benefit
B1	Cultural Programme Officer at Cornwall Council	- Brought Geevor to safeguard its industrial heritage significance - Stimulate there must be a qualified person operating site, due to health and safety regulations - Ensures Geevor helps create employment opportunities for locals and the community	- Cornwall council owns the site and then we have a lease and management agreement with Pendeen Community Heritage who then operate it on our behalf
B2	Chief Executive at Visit Cornwall	- Member of Pendeen Community Heritage - Attend trade shows, lead trips (e.g. politicians) to Geevor, present awards	- Work with Geevor management
B3	Chief Executive Officer at Cornwall Museums Partnership	- Provide activities and support services for Cornish museums; training and mentoring - Raise money and invest in special projects - Help identify and reach strategic decisions, provided expert support - Part of business planning process - Involved in projects and services - Raised money (heritage lottery fund) to test ways to develop learning programmes	- Internal Geevor Stakeholders - Other local stakeholders such as bodies and businesses - Cornish museums
B4	Development Officer at Cornwall Museums Partnership	- Develop and work with Cornish museums to support and expand their offering - Museums mentor, providing guidance and best practice and planning	- Local Cornish Museums
B5	Freelance Museum Marketing Expert	-Cornish social media and marketing expert - Specialist in cultural heritage	- Worked with everything from small, to national cultural heritage museums - Involved in consultancy projects, managing change and helping museums implement technologies - Works with a company that creates AR
B6	General Manager at Cornwall National Trust	- Manager of land, National Trust Properties and marketing in Cornwall - Share school group visits with Geevor - Offer discount tickets with Geevor - Collaborating on Tin Coast project, a destination management partnership	- Close relationship, neighbouring attraction, own land around Geevor (Levant mine).

	<b>Role</b>	<b>Responsibilities</b>	<b>Relationship/s</b>
LB1	Manager at Count House Cafe	- Provide catering facilities, service public, local people and tourists	- Ownership: Café is franchised by Geevor - Geevor internal stakeholders
LB2	Manager at Geevor Shop	- Run and manage the site shop - Do not own the trading company, so any profits at end of year are donated to the charity (Pendeen Community Heritage)	- Geevor trading is a subsidiary of Pendeen community heritage. - Geevor stakeholders
T1	University Lecturer and Researcher	- University lecturer - Cornish researcher, interested in interpretation and technology - Researches use of technology as an embedded interface of physical objects	- Involved in workshops and meeting at Geevor for education
T2	University Lecturer and technology researcher	- University lecturer - Teaches Masters students, mainly postgraduates - Led groups to Geevor - Involved in projects with Geevor, such as using technology to enhance the experience in TV production	- Geevor internal stakeholders
T3	Secondary School teacher	- Secondary school teacher - Teaches Key Stage 3 and 4 (11-16 years old) - Set up a scheme to run annual trips to visit - Developed a learning programme for Geevor based on history curriculum	- Led school groups to Geevor

Source: Author (2017)

On the other hand, in regard to external collaboration, G9 identified Geevor already work with a number of local bodies such as Cornwall Association of Tourist Attractions, Cornish Mining Attractions Marketing Association and the National Trust, for “our mutual benefit”. Many of the local authorities are in some way, involved with supporting Geevor and collaborating to better the organisation and experience of visitors in Cornwall. B3 who manages the Cornwall Museums Partnership, of which Geevor are a member, identified Geevor attend their activities, workshops and training programmes and have “interacted with a range of our services”.

Moreover, B2 pointed out in addition to being the Chief Executive of Visit Cornwall, is also on the board of Trustees at Geevor. As well as examples such as these, many stakeholders mentioned the Tin Coast Project collaboration across Cornwall, involving Geevor, which aim to improve collaboration, communication and success of tourism in the local area, improve marketing and grow the economy. B6 explained internally the Tin Coast project aimed to foster properties together and market them more effectively, creating a better overall visitor experience and tell the mining story more effectively. Whereas externally, the Tin Coast Partnership examine destination

management in the local area, exploring how to “effectively market and coordinate the experience. How we make sure that businesses in the area can benefit from growth in the tourist economy {...} we have been talking about the potential for using AR”. The majority of stakeholders in addition to working in the tourist industry, have a personal interest in ensuring attractions such as Geevor remain a success and continue to affirm their cultural traditions and heritage significance.

#### **6.5.1.1. Additional Responsibilities**

Stakeholders identified that implementing AR would create additional stakeholder responsibilities, suggesting a clear strategy should be developed prior to actual implementation. The six key responsibilities identified are discussed in more detail below and summarised in Table 6.8. However, it is important to note many of these were also recognised as barriers to implementation. This reaffirms the need for a clear implementation strategy to effectively and successfully implement AR, with full cooperation and stakeholder collaboration.

**Table 6.8 Summary: Responsibilities**

<b>Theme</b>	<b>Key points</b>
Developing	-Create application content, curate information and check facts -Determine who will create what content to share the workload and maintain authenticity of experience -Establish realistic timeline to develop the application and create content
Maintaining	-Create clear implementation strategy -Determine whose responsibility it would be to maintain and look after AR once implemented
Funding	-Identify funding sources -Estimate development, maintenance and ongoing costs -Related to revenue model
Launching	-Launch AR across site -Education and train staff to use and understand AR -Clear communication is key
Supporting	-Provide guidance before, during, and after, AR implementation -Train staff to use AR, overcoming generational ‘technical readiness’ issues -Reiterate sensitivity of implementation, to add to, not detract from existing experience -Define value of AR, such as enhanced visitors experience
Promoting	-Market and advertising AR availability at Geevor -Ensure visitors know what to expect and are prepared -Increase likelihood and incentive to visit Geevor -Raise profile of the site, increase competitiveness

*Source: Author (2017)*

#### **Developing AR**

Stakeholders recognised although developing an AR application would add value to, and enhance the tourist experience it would be complex and difficult. Because of

this, they highlighted the importance of clearly identifying extra roles and responsibilities, such as who would create content and who would check facts to develop the AR application. Curator, G7 initially, raised concern whether he would be responsible for developing, sourcing and writing all the content. G7 and B4 recognised developing authentic, information rich content was key to creating a good AR experience, and claimed all internal stakeholders should contribute content to share the workload.

Based on previous experiences, B4 and G1 identified that developing applications and creating content was a lengthy and difficult task. For instance, B4 explained:

*"we weren't prepared for was the amount of work we had to do, to kind of get the information together [...] fact checking and making sure the scripts were right, there is a lot more there than we had anticipated, the content"*

Hence, Tertiary stakeholder T1 suggested before developing an application, it should be clearly identified what visitors want and what they would use, to add value to their experience, otherwise a lot of time, effort and resources would go into creating something visitors would not use.

### ***Maintaining AR***

Geevor Learning officer (G4) highlighted the need for a clear implementation strategy to ensure after AR was implemented it was maintained. To do this, stakeholders argued a clear strategy and BM was necessary to determine who would be in charge to maintenance, and what the extra roles would involve. However, with a clear implementation strategy, stakeholders agreed this should not be a problem. Yet, to ensure success G4 stated:

*"you would have to have a clear implementation strategy to make it successful [...] we have had quite a lot of things which get introduced and they just sort of get forgotten because no one within the site is necessarily promoting them"*

### ***Funding AR***

As already discussed stakeholders recognised many potential monetary benefits of AR implementation and identified AR could be used as a tool to attract investment by demonstrating innovation and advancement. In terms of funding, or the revenue model for AR implementation a range of ideas were discussed in section 6.7.3.

Despite diversity of ideas, stakeholders acknowledged the need to secure funding to develop, launch and maintain an AR application. Cornwall Council (B1) for instance commented AR needs would need to be carefully implemented to ensure sustainability whilst avoiding being financially inaccessible. Geevor Mine Guide (G6) was more sceptical, unsure of practical limitations such as development costs and ongoing fees to create a quality experience, highlighting because Geevor was run on a charitable basis there would always be concerns relating to funding and costs. And despite annual funding from Cornwall Council, budgets were limited, but overall agreed, if the costs are low then AR was worth trying:

*"We are really running the site on a charitable basis (...) if it is a low budget then yes, we always plead poverty, we are not a rich organisation. We depend upon a certain level of financial help from Cornwall council every year. So if the costs are low and the risks are low then yeah, go for it. Let's try it. As long as it is not conflicting with anything we are already doing on site."*

### ***Launching AR***

To successfully launch AR, manager G9 claimed there would be no issues, as along as clear communication was maintained, and staff were helped to understand and use AR. It was identified that internal stakeholders were the ones who know the customers best, therefore collaboration to develop an AR application to enhance the visitors experience whilst retaining authenticity was critical (G9):

*"Even the people who used to work in the mines, they are the ones that are saying things have to develop. So no there won't be [resistance], as long as there is an understanding from both sides then, you know, we are the people who know our customers (...) it is that knowledge that you need to understand, to appreciate and by working together that way, we will develop things that actually fit the customer who comes to see us"*

### ***Supporting AR***

Many stakeholders presented concern toward the “technical readiness” of staff, suggesting because they do not use and understand technology they may not understand its value and therefore support it. For instance, café manager LB2 claimed “we are a little bit in the past here, we would need to be updated and upgraded”. Similarly, Mine Development Officer G5 noted “you will get nothing out

of it [technology] unless you are actually part way there yourself". Therefore, Geevor Learning Officer G4 identified "people need to think it is important, because that is the biggest hurdle really". LB1 attributed this to a generational gap, recognising "I have grown up with technology, I think unfortunately {...} some of the staff aren't aware of the impact of technology and how it could enhance certain aspects". Therefore, it was suggested stakeholders would need educating to understand ARs value and translate this to sell AR to customers (G2, G4).

To avoid resistance from staff because of a lack of understanding, Trustee G1 identified a need for "communication to identify the added value it would provide". G4 commented "to really sell it, use it and celebrate it everybody would need to have to see its value, and understand its value and see its value for themselves". Likewise, The Chair of Trustees (G2) pointed out the more educated staff were, the less resistance there would be;

*"They [staff] need to be more educated into it, and made to understand the benefits [...] there would be less resistance if they knew more about it, explained in a sympathetic way, we aren't trying to change anything, this is to benefit you, making the site more successful"*

### **Promoting AR**

Prior and post implementation, promotion of AR at Geevor would be key, to ensure its success. B4 identified promotion as fundamental to improve visitors understanding of the enhanced experience AR would create and encourage visitors to visit Geevor to try it. Likewise, B1 identified promotion as crucial, to ensure people come to Geevor allowing enough time to make the most of the site and AR. Promotion was also identified as important by V18 who suggested awareness was the key to ensuring people knew about AR prior to visiting, to bring the right equipment and were prepared for the AR experience. But, T2, was concerned that AR was not a widely socially accepted technology, therefore it would not be something visitors would consider when choosing which attraction to visit. Therefore, promotion would be even more important to ensure that pre-visit visitors knew AR was available, the type of experience it created and its added value.

#### **6.5.2 Flow-Communication**

V4 specifies that value exchange and information streams are enriched by materials (e.g. knowledge, money, products, and hardware) communicated among

stakeholders. It appears there is room to improve communication among Geevors stakeholders. For example, whilst LB1 recognised communication improved in recent years, when Geevor gets too busy, it was suggested staff can easily become overwhelmed and once this happens it is hard to regain control. When this is the case, Café manager (LB1) felt AR might not have much of an impact, but it could help staff be more prepared and deliver a better service. Building on this, LB1 felt poor communication related to a broader generational issue, in that older staff were not aware of new technologies and therefore did not understand their benefits but identified that anyone can be taught with the right training and management.

Internally, “they are using radios {...} because the Wi-Fi is no existent” (LB1). Connectivity and lack of site wide Wi-Fi was recognised as a barrier negatively impacting internal communications and preventing the use and adoption of more effective communication methods. Therefore, currently most jobs are independent and stakeholders favour verbal communication. However, as discussed previously, stakeholders identified numerous ways AR could improve efficiency for stakeholders and communication with visitors, such as introducing AR self-guided tours to look after the visitors better. Moreover, AR could more effectively communicate and provide access to information such as tour times, or navigation across site would be much easier for visitors, providing value through additional revenue streams.

### **6.5.3 Channel**

In the V4, channel refers to the communication mediums used to communicate among stakeholders and interfaces such as CRM (Customer Relationship Management), online platforms and intermediaries used to communicate with customers. Stakeholders identified TripAdvisor and Facebook as important marketing channels, to reach, engage and motivate visitors, while helping them plan their trip to Geevor. Cornwall Council (B1) commented, “TripAdvisor, seems to have become an increasingly important tool for visitors in terms of how they make their decisions of what to go and see”. Adding that Geevors top ratings and reviews would confirm potential visitors decision to visit Geevor. Moreover, LB1 confirmed TripAdvisor helped spread positivity and reduce visitors’ uncertainty translating potential into actual visits.

In addition, T2 discussed the benefits of Facebook and TripAdvisor as marketing tools to engage visitors but suggested more should be done to encourage visitors

to share their experience on social media, as a “free advertising” channel. Mine Manager G9 explained over the past few years, Geevor have focused heavily on social media, and as a result successfully used it to increase visitor numbers, identifying both August 2013 and 2015 had the same weather, 2013 received 7200 visitors and 2015 9300:

*“so that 2000 visitors is £17000 of extra income. So it could be because we are doing things like that [Facebook] [...] we can’t just sit back and wait for people to come, we have to go out there and try to get them”*

Mine Manger (G9) recognised that some traditional channels are not effective at attracting visitors, however some of more traditional channels such as leaflets continue to be important, stating “most people come here having seen our leaflet” but identified newspapers are no longer a lucrative method to target visitors. Likewise, Museums Marketing Expert (B5) identified that leaflets are still fundamental and complement some of the more modern channels like social media, suggesting marketing is about selecting the most appropriate channels specific to different target segments:

*“Lots of older people said Facebook, we are on there as our grandkids have it, we always pick up a leaflet as it reminds us to go on Facebook! [...] it is knowing your community and knowing their behaviour to find out if it will work there or not. So there is no one solution on this one”*

In terms of content and materials, Visit Cornwall (B2) suggested implementing AR would provide journalists something “new” to write about, another channel to engage and attract visitors. Cornwall Museums Partnership (B4) commented that Geevors “profile isn’t as high as it could be considered the uniqueness of what they do”. Likewise, Tertiary Group leaders (T1, T2) identified Geevor have a good information intensive website, but it needs to focus more on facilitating engagement to drive visits to the website, which identifies areas for improvement. Irrespective of the channel used, communication is fundamental to ensure visitors know and understand what Geevor has to offer (G2). Stakeholders recognised the potential of AR to improve communication and the need to focus more predominantly on new channels to attract visitors.

#### **6.5.4 Network-Mode**

V4 defined that the development process of products or services either occurs in open, or closed networks. Within open networks stakeholders freely participate offering ideas, whereas in closed networks, contributions come only from stakeholders selected to participate.

Museum trustees have the ultimate responsibility to ensure the effective running of Geevor, thus all decisions have to be put before the board of Trustees and subjected to a vote. Thus, Geevor operates an open network, because any stakeholder is free to put forward a suggestion to be discussed at monthly Trustee meetings.

#### **6.6 Value Architecture**

Value Architecture, concerns the holistic structural design of an organisation, involving technical, organisational, design configurations, tangible and intangible assets and resources. The V4 asserts a RBV that resources are core-competencies and when coupled with desirable value for customers create sustainable competitive advantage.

##### **6.6.1 Core Resources**

Identified by the V4 core resources and inputs take human, physical or organisational forms. Stakeholders previously identified Geevor staff's ability to create an authentic experience was an integral part of the visitor offering, and thus an important human and organisational resource. T1 stated "the fact they have examiners that are working there is something that attracted me to it". Likewise, T2 identified Geevor have a "very valuable resource at the moment, where they have still got guides there, who actually worked there", suggesting the characters of the tour guides are the best part of the experience. However, B3 noted because staff have a personal interest in Geevor, their in-depth knowledge of the more detailed and technical side of the offering can make it difficult for them "to put their finger on what it is people with a general interest relate to, what they are interested in". Therefore, creating a barrier when interacting with the general public, highlighting the importance to ensure visitors are engaged and inspired without becoming overwhelmed by technical details.

Equally, the tour was recognised as integral to how people experience the site, yet, Tertiary group leader (T2) suggested it can be overwhelming and confusing, for someone with no knowledge of mining. Likewise, T3 identified whilst the tours provide a great experience, visitors who do not engage with tours could find the site

overwhelming and difficult to interpret. In this way, AR was acknowledged as a solution to explain or demonstrate complex processes in an easier and more digestible way, whilst also allowing guides to continue making a “really impactful visitor experience” (B3). Moreover, the site itself was recognised as a strength and is Geevor’s main physical resource. Many strengths of Geevor and the visitor offer are discussed within interviews; however, it is also important to understand the ways in which stakeholders believe Geevor could improve, thus the potential to improve upon the core resources will be evaluated.

Although Geevor was acknowledged as an important heritage resource, Cornwall Museum Partnership B3 recognised scope for Geevor to improve and build upon the Cornish diaspora, introducing human stories, connecting the landscape across the local area. Moreover, T1 claimed “Geevor is a very useful local history resource”, the above ground resources are excellent, but underground could be improved, with the use of AR. It was suggested AR would create avenues for local businesses to tap into the market, such as “come and stay here, here is a walking route you can do, you can hire a bike down the road” (B1). G1 mentioned AR would complement the broader marketing effort to increase visitors pre-visit understanding and expectations. AR is suggested was a tool to “provide a wow before they came” in terms of marketing and advertising.

### **6.6.2 Value Configuration**

Value configuration explores how resources are organised to create the most competitive VP. Configuration of resources is a key enabler of creating capabilities that deliver rare, valuable, hardly imitable and non-substitutable resources. As such, economic value is determined by the ability to absorb ICT resources and diffuse them into activities, to create VPs. Hence, value configuration is very much related to the other V4 components, and by implementing AR it was considered a new AR VP would be introduced, thus helping Geevor create a rare, valuable, hardly imitable and non-substitutable resource to enhance their visitor experience.

As well as adding value to the visitor experience, stakeholders considered a number of ways AR would create additional benefits. For example, upon closure, many jobs were lost and by turning Geevor into a tourist attraction it was hoped would sustain employment and increase spend in the local community. Implementing AR, it was suggested by stakeholders would excel these benefits, creating new jobs, whilst also continuing to positively contribute to regeneration and spend in the local area.

Equally, from an industrial heritage perspective, Geevor was described by Cornwall Council (B1) as “one of the most important heritage, industrial heritage attractions that we have here in Cornwall”.

Moreover, it was considered AR would improve sustainability (B1), through attracting more customers, enhancing the visitor offer and securing addition revenue streams. Also preserving heritite and improving accessibility (T2). Likewise, Geevor Curator (G7) considered AR could help protect and conserve Geevor. B3 claimed the opportunities of embracing digital technologies are exciting and a present a potential tool to expand Geevors offer further. Furthermore, B4 suggested potential of using AR to help visitors understand and appreciate the value in Geevors offer. Cornwall Museums Partnership (B4) claimed currently, Geevor is described as a tin mine, which immediately creates a poor perception, but AR would help increase awareness of the comprehensive varied offer.

### **6.6.3 Core Competency**

BMs need to represent an organisations resources, configurations and resultant core competencies. Geevors core competencies, in terms of its strengths are discussed in section 6.4.1.1, which examined core-competencies such as staff authenticity. In addition, section 6.4.1.2 identified stakeholders' perceptions towards ARs potential value and benefits, for example preserving the knowledge of staff. Combined, the ideas identified in each of these sections distinguish Geevors core competencies.

#### **6.6.3.1 Challenges of AR implementation**

However, stakeholders identified potential barriers to AR implementation, which could have a bearing on the attainment of core competencies. Notably, many of these perceived challenges are closely related to concerns towards additional AR responsibilities (See Table 6.8). Stakeholders' perceptions of the challenges and barriers of AR are discussed below and summarised in Table 6.9.

**Table 6.9 Challenges of AR implementation**

Theme	Key points
Technical infrastructure	<ul style="list-style-type: none"> <li>- Limited Wi-Fi, reception and connectivity on site but trigger points, or markers suggested as resolution</li> <li>- Downloading the application, content size, application loading speed</li> <li>- Needs to be robust, reliable and consistently working</li> <li>- Try and make people download the application before visiting</li> </ul>
Sensitivity	<ul style="list-style-type: none"> <li>- AR must add to, and not detract from what is there</li> <li>- Avoid information overload</li> <li>- Give visitors the choice to use AR as much or as little as they like</li> <li>- Interrupt the natural flow of the museum</li> <li>- Domination and overreliance on technology</li> <li>- Hindrance to learning</li> <li>- Use only in specific areas, sensitive to existing experience (e.g. The Dry)</li> <li>- Retain authenticity, ensure there is a balance</li> <li>- Avoid Disney-ifying the experience</li> </ul>
Health and Safety	<ul style="list-style-type: none"> <li>- Safety of the site, visitors wandering around too focused on their phone</li> <li>- AR as method to increase health and safety, 'virtual signage'</li> <li>- Insurance implication for school visits, technology not able to overcome supervision requirements</li> </ul>
Development and curation	<ul style="list-style-type: none"> <li>- Fact checking, content creation, script writing</li> <li>- Need to clearly identify resources required to create content</li> <li>- Outline responsibilities for creating content</li> </ul>
Maintenance	<ul style="list-style-type: none"> <li>- Added responsibilities of AR</li> <li>- Who would be in charge of AR</li> <li>- Who would look after and maintain AR</li> <li>- Ensure there is a clear implementation strategy</li> </ul>
Funding	<ul style="list-style-type: none"> <li>- Make sure financially sustainable</li> <li>- Ensure not financially inaccessible</li> <li>- Limited funding, charitable organisation</li> <li>- Reliant on external funding bodies</li> <li>- Low risk and low cost</li> </ul>
Support and Technical readiness	<ul style="list-style-type: none"> <li>- Resistance from staff who do not understand value of technology</li> <li>- Generational gap in users of technology</li> <li>- Need educating to understand value and benefits of technology</li> <li>- Communication needed from both sides to effectively implement</li> </ul>
Launch	<ul style="list-style-type: none"> <li>- Lack of communication would create tension</li> <li>- Lack of understanding from staff, therefore needed to train and educate about value and benefits of AR</li> </ul>
Promotion and awareness	<ul style="list-style-type: none"> <li>- Are the general public ready for AR</li> <li>- Promotion and awareness is vital</li> <li>- Ensure people are aware of what they are coming to</li> <li>- Promote the benefits and value of AR</li> </ul>

Source: Author (2017)

### **Technical Infrastructure**

Stakeholders' main concerns toward AR related to limited technical infrastructure, such as connectivity, poor Wi-Fi and reception because of the rurality of the location and the fact part of the visitor experience goes underground (B5, T2, LB1, B2). LB1 highlighted "there is almost non-existent Wi-Fi here", confirming this would be the main challenge. However, B4 suggested using trigger points as a resolution, claiming that had been done on other Cornish museum projects where connectivity was a challenge, introducing markers with pre-loaded content and encouraging visitors to download the application before visiting. Geevors IT Manager, G8 expressed concern toward "downloading of the app, the content, the actual size of

the app". Similarly, B2 identified an application would require the right infrastructure to consistently function effectively, add value and enhance visitors experiences, claiming "it has got to be robust, reliable and consistently working {...} you have got to make sure you get the infrastructure right". If it was unreliable, V22 and V29 eluded to the fact it would cause frustration, especially if visitors had paid to use it. Moreover, B5 pointed out AR "implementation is going to be tricky, it won't be seamless".

### **Sensitivity**

Many stakeholders thought AR should be implemented sensitively, ensuring it added to, not detracted from the existing experience. The need to avoid overloading visitors with information was identified as important (T2, T3, B2, V29). T2 expressed concern toward overreliance on technologies, suggesting AR would be good to combat this, because visitors could immerse themselves as little, or as much as they liked, controlling their own experience. Nonetheless, V28 felt most people would naturally look at their phones, claiming that AR "might take away from what you have actually come to see {...} looking at your phone all the time". On this topic, T3 recommended during educational trips, students should not be encouraged to walk around on their phones, because it would negatively inhibit learning. Moreover, T3 identified it would be hard to control what they were doing and ensuring they focused on using AR to enhance learning. Nonetheless, T3 understood that technologies such as AR can enhance learning, and supported use, if implemented sensitively;

*"I know there are technologies that can add to that [learning] 1000%, but I don't want technologies to dominate the day {...} so it might be more appropriate in some areas, but not in others"*

On a similar note, G3 and LB1 were concerned AR would reduce visitors likelihoods to interact with one another, interrupting the natural flow of the museum. But, LB1 explained as long as visitors still explored the site naturally, not focussing too much on AR it would not be a problem. On this note, it was considered best AR only be implemented in specific areas. Some stakeholders recognised not all visitors would enjoy using AR and identified the importance of giving visitors a choice. Cornwall National Trust (B6) added that despite this "some people will see technology as an intrusion into a visit" but suggested providing a visitor experience is in part about letting visitors explore the site in whatever way they wish. Mine Manager G9 shared this concern, concluding, as long as "AR is sympathetic and fits in with what the

visitor comes to see it lifts it, it lifts the understanding of what they are actually looking” it would be beneficial to visitors. Nevertheless, some stakeholders recommended AR use be limited to specific areas (B4, B6, G1, T3). Internal Stakeholder G2 for instance suggested The Dry is atmospheric and AR may not enhance the natural mood. This was supported by tourist bodies (B4, B6) who claimed sometimes AR may not be an effective addition the existing experience.

It is clear, the way in which Geevor chose to implement AR, must be sympathetic and sensitive to retain the integrity and authenticity of the existing experience and features. Cornwall Council (B1) identified the importance of avoiding using AR to create a “Disney” experience, and reiterated the need to honour the legacy of Geevor:

*“Keep a sense of authenticity rather than Disney-ifying the site, because I think people have worked there and it is still within their memory and their life. There needs to be a sympathy towards the feeling associated with the site [...] On the other hand you do want people to choose to go there and find out as much as they can about it.”*

Likewise, the Museum Marketing Expert (B5) suggested technologies such as AR are fantastic and can benefit visitors but should be “right for the museum”. This was supported by internal stakeholder, mine Development Officer (G5) who agreed identifying the importance of establishing balance to ensure AR was sensitively implemented to avoid detracting from the experience.

### ***Health and safety***

Tertiary group leader’s and Internal stakeholders expressed some concern towards health and safety issues. For example, T3 raised concern toward school groups wandering freely around site using AR looking at their phones. Likewise, G7 and G8 identified when underground it would be impractical and unsafe to use phones. On the other hand, T2 considered Geevor to be safe and low risk, recognising AR could be used to increase awareness of health and safety risks with ‘virtual signage’. However, in another respect, T3 discussed issues relating to insurance, and supervision of school groups. Suggesting if AR replaced guided tours, it would create problems technology could not resolve:

*"my staff are on a ratio of one to 15 {...} if you did the whole thing virtually I couldn't be having kids walking off around the mine, I would have an insurance issue with groups not being supervised {...} ratios are really crucial and they won't change because of an app"*

## 6.7 Value Finance

Value Finance determines all costs including revenue models, investments, decisions, revenue sharing, cost effectiveness, net cash and returns. All other V4 components, particularly the VP relate to the value finance, because it contains the arrangements required to ensure economic viability, identifying how organisations generate revenue. When implementing new products or services, this includes the cost of design, development and maintenance. Predominantly internal and Tourist Body stakeholder groups identified possibilities and potential financial benefits of introducing AR, such as visitors spending and retention (B1, B4), adding value to the visitor experience (B3, G9, B6, G6, B4), appealing to a wider audience (G7, G5, G9, G3, G6), increasing visitor numbers (G3, G1), improving revenues (G2, B4), increasing job security (G2), bringing Geevor into the 21<sup>st</sup> century (G9) and increasing marketing presence (G9, G4, G6).

### 6.7.1 Total-Cost-Of-Ownership

The purpose of interviews was to explore stakeholders' perception towards AR implementation. However, until AR is actually implemented core financial arrangements necessary to provide intended services, costs of tangible materials, development, support and maintenance cannot be calculated. On this basis, B3 identified a challenge for Geevor in deciding which direction to pursue; reaffirming the need for a clear business plan to help Geevor chose the right path and achieve their strategic objectives. B3 suggested Geevor should:

*"Limit it down to what is going to make the biggest difference, what is going to help you, which activities are going to help you deliver those chief charitable objectives. And that is a challenge for any board but particularly Geevor, I think when there is a number of ways they could go"*

### Own or Loan

Irrespective of financial implications, there was positive support for AR and the main financial concerns expressed by stakeholders related to the issue of whether visitors

should use their own devices or alternatively whether Geevor should loan devices to visitors. The tangible costs of materials, such as devices, were heavily debated by stakeholders and a diversity of perspectives were evident, creating a ‘own or loan’ debate. For example, the National Trust (B6) a competitor to Geevor discussed difficulties in deciding whether people should use their own devices, or alternatively Geevor provide them, identifying the safety and funding of loaning devices as a problem. If visitors were expected to use their own devices, V18 and V22 expressed issues such as battery life, connectivity, memory and size of the application download.

In terms of finance, V26 noted if visitors downloaded an application onto their own device “you wouldn’t necessarily pay more”, however if the museum provided devices visitors would be willing to pay extra. Although, for Geevor providing devices to visitors would be a large financial investment and long-term commitment involving; purchasing, maintenance and running costs. Offering devices to loan to visitors would also introduce problems, such as device security and implementing preventative measures to ensure devices were returned. T2 suggested as a resolution loaning device to pre-registered groups, or taking a deposit from a trackable payment method.

However, it would be important to make AR accessible to all visitors, including those who do not own a device, or a device without the correct power or memory. With this in mind, V22 suggested Geevor would most likely need to provide at least a certain number of devices to loan to visitors, providing both options to avoid visitors “missing out”. Likewise, V8 claimed if Geevor did not loan devices, using AR would be a barrier for a number of visitors, stating “I don’t have a smartphone”. In relation to the profile of visitors, interviewed (See Table 6.3), 17% stated they did not own a smartphone (although some mentioned they did have a tablet). Highlighting the importance of not assuming all visitors own or can bring an AR capable device everywhere with them and therefore essential to provide a number of devices for visitors to loan from Geevor.

### **6.7.2 Pricing-Method**

V4 outlined that an organisation has to be financially viable to achieve its goals, which vary according to maturity. Prices can differ according to services, products, customer categories and competition levels. Two themes emerged from interviews: AR offered free or a fee charged to use AR, creating a ‘fee or free’ debate.

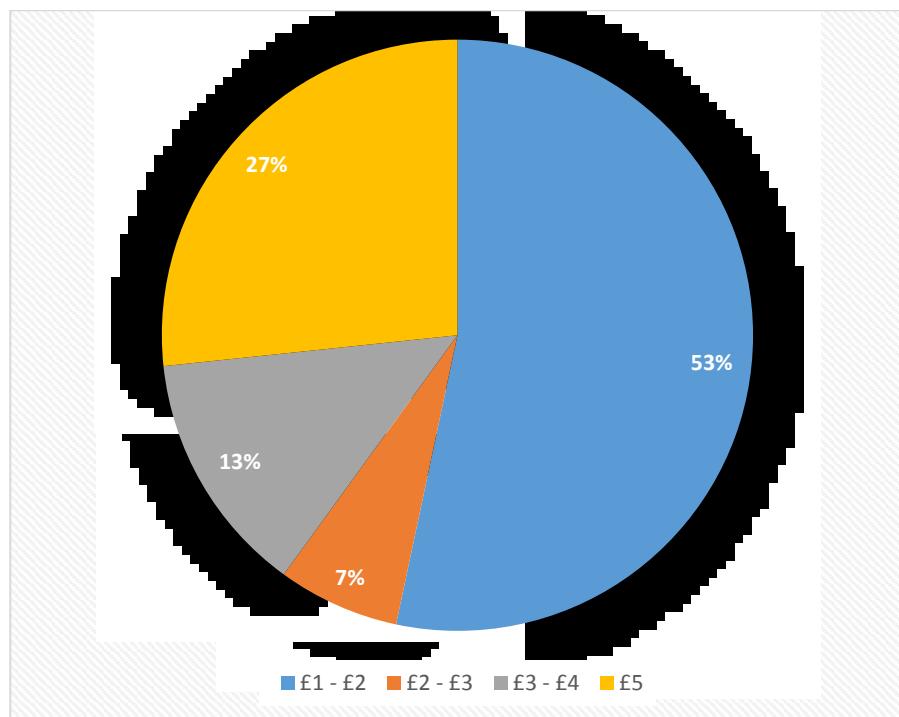
## **Fee or Free**

There was much debate toward whether AR should be offered for free or at an additional fee. However, among the stakeholders who believed AR should be charged at an additional fee, the fee amount varied. Just over half of visitors said they would be willing to pay extra to use AR, identifying a number of reasons to support their willingness (see Table 6.10). Those willing to pay a fee believed it would make visits more interesting and therefore they would get more from it. For instance, V24 was willing to pay more if AR would entertain and engage children, thus the family as a whole would get more from their visit. Considering that 67% of visitors interviewed visited Geevor with their families this is important. V24 stated “if I knew these two [children] would get a lot more from it, which means ultimately us as a family would get a lot more from it then yes {...} up to £5 to be honest”. Other visitors supported this, claiming they have paid for audio guides previously, and paying a fee to use AR would be no different (V6, V29, V30). Tourist Body (B1) supported this, claiming the success of audio guides proves visitors’ willingness to pay to have a better experience, asserting “audio sort of tours and stuff, so those have proven people are willing to pay a bit more to have a little bit more at their fingertips”.

In this way, stakeholders felt charging a fee to use AR would be appropriate, because it “would enhance the visitor experience {...} a way of getting more out the site” (B1), and therefore would “make sense” to have a fee attached (G8, T2), if it extended beyond the existing experience. Yet, stakeholders recommended that the purpose of AR would have to be clearly identified, whether it would replace or supplement existing tours. V1 expressed willingness to pay a fee if it also included other benefits, such as vouchers for the café or shop, commenting “if you brought it [AR], you could get a discount in the store or something, so there should be like another perk”. Whereas, T2 proposed at different times such as low season, AR could be offered at a discounted rate. Likewise, B6 supported that the fee should vary from £5 to £20 depending on the depth of the tour.

Out of the visitors who expressed willingness to pay an additional fee, there was variation among the appropriate fee and no ideal fee was identified. Suggestions of additional fee ranged from £1 to £5 (See Figure 6.2). Among visitors reluctant to pay a fee to use AR, a number identified a few extra pounds would not make a huge difference. V7 was hesitant to pay more than £2, claiming AR should be about Geevor trying to improve the visitor experience, suggesting the fee to use AR should

be hidden in the entry fee, claiming, “it is part of the museum being able to make itself better than it is now”.



Source: Author (2017)

**Figure 6.2 Suggested price to use AR**

T1 pointed out Geevor attracts different target segments, with different characteristics and preferences. Identifying differences between holidaymakers, domestic tourists and British families on staycations or a second holiday and international visitors, who would be more likely to have a higher disposal income in comparison to domestic tourists, and thus propensity to pay more for AR. However, visitors responses expressed the opposite, with half of the international visitors (e.g. V4, V12, V20, V21) suggesting preference for AR to be a hidden cost, absorbed in the entry price. In addition to this, minor differences were identified among other visitors, such as those visiting with family, partners or friends and visitor age groups. However, because the visitor sample was 30, it was not adequate or conclusive to determine how the profile of visitors could influence their willingness to pay extra for AR, although it is noted as a potential future study. However, the majority of visitors voicing concern toward paying extra for AR were those visiting with their families, under the age of 55.

On the other hand, just under half of visitors stated they would not be keen to pay extra to use AR (see Table 6.10), out of these visitors, the majority suggested AR

should offered free, or a cost absorbed in the entry fee. For example, V28 commented “it should be a hidden cost, included in the entrance fee” and V4 stated “I would want it as part of the price, the entrance fee”. Although willing to pay a few pounds to use AR, V7 suggested offering AR should be more about Geevor trying to better themselves than generate profit.

**Table 6.10 Visitors' willingness to pay a fee to use AR**

Willingness to pay	Reasons provided
YES (52%)	If offered other perks e.g. discount in shop/cafe
	If a visit more interesting and therefore get more out of it
	If it was to use a device provided by museum
	Already pay for audio guides at other attractions
NO (45%)	Should be included in entry fee (even if slight price increase)
	Should be addition, some people won't want it
Maybe (3%)	Unsure

Source: Author (2017)

Cornwall Council (B1) concluded that visitors willingness to pay a fee to use AR, would depend on many choices, such as free time and financial situation. Therefore, it would be preferable to provide an option, or to offer AR free initially, until the majority of visitors opt to use it, and only then should it be considered reasonable to charge extra for its use:

*“you might have just not got enough time to make the most use of it [AR] [...] so keep it as separate thing and then if you come to a point where more than 75% of visitors are opting for it, then you can do it at a joint price”*

With this in mind, offering AR at an additional fee would avoid visitors feeling obliged to pay for AR. Visitors recognised the importance of avoiding thinking, “do we really want to pay for that” (V12), as not everyone would want to use it (V17). Some stakeholders suggested having to pay a fee to use AR would make Geevor too expensive for families, despite the fact they would have a better experience. For instance, V25 believed it would put families off, because they would have to pay for more than one download or loan multiple devices, recognising for a family of four, “you couldn’t just pay for one”.

In regard to other visitor segments at Geevor, and from an educational perspective T3 commented that government budgets for school visits are small, therefore charging more for AR could make Geevor unaffordable for educational groups. This

was especially importance because the local area is deprived, thus charging more to use AR, could limit the number of local schools that could afford to visit Geevor. T3 claimed “when you are dealing with 100 kids {...} every pound does make a difference, it does count.” Likewise, B2 commented AR should be a cost covered by an increase in admission, but whilst being careful the price does not go up too much. Equally, B1 recommended Geevor should avoid pricing AR too high meaning some visitors would be unable to use it:

*“You wouldn’t want to have it exclusively for some people, if it is too expensive people won’t use it, so you have got to look actually how can this be done in a sustainable way without being sort of inaccessible financially for people”*

Similarly, T1 acknowledged that although offering AR free to visitors would be expensive for the museum, it would create a better experience which would introduce a number of secondary benefits, such as increasing visitor numbers or receiving better reviews.

There were mixed perceptions from Tourist Bodies towards AR pricing methods. For instance, B5 believed museums, such as Geevor have “enough issues financially and funding wise to contend with right now that this isn’t even on their radar” therefore suggesting AR may be viewed as a hindrance rather than a positive. However, the majority of stakeholders were supportive of AR, such as B6 who pointed out if the right AR experience was introduced it could form an income stream, using the same model adopted successfully by audio tours “AR could sort of follow that model”. However, to effectively do this, B6 acknowledged that the quality of the experience would have to be high, thus Geevor should start by developing the quality of the experience before determining how much visitors should be expected to pay. This was echoed internally by IT Manager (G8) who shared a similar opinion, stating AR could be sold as an add on, but you would need to trial it first to determine “whether that is actually workable in reality”.

### **6.7.3 Revenue Structures**

The V4 outlines revenue structures are related to costing and pricing arrangements. In addition, revenue sources can be categorised, based on customer types, products, service or a combination. V4 advocated whichever cost and revenue structure adopted should be made explicit to stakeholders. During interviews, a number of potential AR revenue structures were suggested, evidenced in Table

6.11. Some stakeholders suggested more than one potential revenue model, demonstrating and confirming uncertainty towards the most suitable AR implementation strategy and profit generation methods.

**Table 6.11 Summary: Revenue**

Theme	Key Points
Secondary Revenue	<ul style="list-style-type: none"> <li>-Do not charge directly for AR, but instead gain revenues from secondary spending, such as in the café, shop and local area</li> <li>-The more time visitors spend on site, the more likely they are to spend more money</li> <li>-Use AR as a marketing tool to motivate and attract wider audiences.</li> <li>-More money through tickets sales and secondary spending</li> <li>-Recommendations on social media, news and travel sites will increase</li> </ul>
Visitors bring devices	<ul style="list-style-type: none"> <li>-To use AR visitors have to bring their own devices</li> </ul>
Pay to hire devices	<ul style="list-style-type: none"> <li>-Offer AR free of charge, but charge visitors to loan AR devices (yet the majority will have their own devices)</li> <li>-Visitors pay to hire devices</li> </ul>
AR free	<ul style="list-style-type: none"> <li>-Offer AR separately to start with, if more than <math>\frac{3}{4}</math> of visitors opt to use AR, charge as an add-on</li> </ul>
Pay to use AR	<ul style="list-style-type: none"> <li>-Sell AR as an add-on at an additional fee</li> </ul>
Flexible costs	<ul style="list-style-type: none"> <li>-Fee variable depending on different times of the year (low/peak season) and for different customer groups (e.g. discounted for educational groups, children's content free with adult purchase)</li> </ul>
Increased entry	Raise the entrance price, to hide the extra cost of AR
In-app Purchasing	Offer the app for free, but 'up-sell' additional content such as specialist interest information or AR games

Source: Author (2017)

Visitors were asked about the possibility that AR would increase their likelihood to purchase in the shop or buy food in the café. Half of visitors interviewed claimed using AR would increase their likelihood to spend or buy in the café and shop. For instance, V7 claimed, "it is a call to action that I would have missed otherwise, so it would prompt me". It was suggested linking the AR experience to adverts of products in the café or shop would increase interest (V4, V5, V6), providing more reason to purchase (V2, V7), and encourage to buy (V24). V1 thought using the AR application to facilitate purchases would be useful and provide a multipurpose application. V3 identified this as "just another way of advertising". V29 and V30 acknowledged during busy times it would be useful for the AR application to also facilitate purchase and reservation of food in the café.

On the opposing side, just under a third of visitors said AR would not increase their likelihood to buy or spend. However, many of their justifications related to money, for example worries of family days out becoming too expensive (V25). Others claimed they do not buy in shops normally, so would not start because of an AR advertisement (V15, V16, V20 V24). V20 stated "it is maybe nothing to do with the application, but my likelihood to buy something in the shop". Equally, V22 suggested although it would not influence them to buy, "it adds to the logic of selling, it wouldn't

annoy me as such". The remainder of visitors, proposed an AR application may influence their likelihood to buy or spend. V13 mentioned it may encourage them to visit the shop, by increasing their awareness of what was available. Furthermore, V17 suggested it may encourage people to purchase online after their visit.

## 6.8 Modelling Principles

In addition to the areas discussed above, stakeholders identified a number of characteristics that should be considered when developing and implementing AR, generating principles that should be followed throughout the process. Table 6.12 provides a summary of these principles

**Table 6.12 Modelling Principles**

Principle	Description
<b>Suitability</b>	Understand the suitability of implementing AR, is it appropriate and will it add value
<b>Inclusivity</b>	Ensure stakeholders are involved in the process from the start, and receive continual updates, support and communications
<b>Transparency</b>	Make sure the process remains transparent, new roles and responsibilities are clearly identified and assigned
<b>Flexibility</b>	Make certain AR is implemented flexibly, with potential to update, innovate and change the BM to account for new developments or alterations
<b>Sustainability</b>	Ensure ARBM designed to positively contribute to sustainability, longevity and competitiveness

Source: Author (2017)

### ***Suitability***

Stakeholders identified one of the most important considerations of AR adoption was ensuring its suitability for the organisation, and therefore making certain it was implemented in a suitable way, that added to and not detracted from the existing offer. In this way, stakeholders advocated that it should be clearly identified how AR would add value to the existing visitor experience. B5 for example expressed support for the use of technologies to enhance visitors' experiences, but when there was a need and it was suitable:

*"[I am] hugely into technology [...] but when it is right for the museum. [...] AR needs to be about ease of steps, we want short cuts, and it needs to be something that is not a museum problem, it is a public issue, or a public problem that we are trying to make it easier for them. Make it so they [visitors] don't have to ask that question, or make them [visitors] feel more comfortable asking that question"*

Stakeholders proposed a number of questions, such as how AR would improve the offer and, would AR add to and not detract from the existing experience. Hence, considering the appropriateness and suitability for AR was considered crucial for successful AR implementation.

### ***Inclusivity***

Ensuring the inclusivity of the implementation process was also recognised by stakeholders as key, and many expressed the importance of involvement throughout the process. Closely related to responsibilities, stakeholders suggested AR should be an inclusive process, identifying the importance of involving the whole stakeholder network in the process. B3 for example discussed ensuring the “whole team involved in the business planning process”. B5 supported that involving the whole team from the start of the process would be vital to increase the success and ensure the support for AR adoption:

*“get stakeholders, involve them in the process from the beginning. That is very very important that they realise they are part of the process. Once you do that, it is a group effort more than you trying to pull them along, it makes it a bit easier”*

Likewise, Mine Manager G9 highlighted that stakeholders are the ones who understand visitors and their preferences, confirming the importance to include them in the process:

*“We are the people who know our customers. We know who comes though out door {...} it is that knowledge that you need to understand, to appreciate and by working together that way, we will develop things that actually fit the customer who comes to see us”*

### ***Transparency***

Similarly to ensuring inclusivity, stakeholders described the need to maintain transparency throughout the process. Such as identifying new roles and responsibilities created by AR, allocating and fulfilling these. Stakeholders felt it was important to ensure clear communication throughout the process. For instance, G4 discussed the need for a clear implementation strategy, to visibly identify any extra responsibilities resulting from AR implementation to encourage continued support:

*“There would always be a who would be in charge of it, and what extra jobs would there be and, that would be fine as long as it was*

*made very clear, you would have to have a clear implementation strategy to make it successful”*

### ***Flexibility***

Stakeholders highlighted and confirmed the need for flexibility, to allow for changes and renewal, recognising that processes change and progress over time. For instance, B3 commented that implementing AR at Geevor will not be perfect first time, suggesting the process will need renewing and updating:

*“processes like this is iterative, and they are not going to come up with a solution and it is going to be perfect and they are going to be able to roll it out. They are going to have to keep prototyping, testing and refining the visitor offer”*

Similarly, B5 supported that BMs require scalability to ensure it is flexible to change overtime, redesigned to meet the changing needs of visitors;

*“From a business model perspective {...} it is scalability, making sure it is affordable {...} but also it is adjustable to each of the ones to take the concept of what you are selling and add more to it”*

Likewise, LB1 pointed out it is important to take “baby steps to try and see how it works”. In another vein, B1 identified the importance of flexibility and finance, if a BM is not flexible it would be too costly to change or update:

*“It needs to have flexibility {...} want to do is spend an awful lot of money on coming up with an app and then it is impossible to update it with changes on site, so it needs to have the ability, at a low cost to change things, put bits in, whatever”*

Stakeholders also acknowledged flexibility as very important, identifying that BMs are subject to change and progress over time, thus require flexibility to respond to changes and react accordingly.

### ***Sustainability***

Sustainability was identified as a key concern among stakeholders, ensuring AR was implemented for the long-term, to enhance sustainability. AR was recognised as a tool to improve competitiveness, but stakeholders considered the importance this being sustainable, ensuring resources are organised and designed to create sustainable competitive advantage, whilst providing value for all involved.

Sustainability was also described by stakeholders as the need to overcome barriers and explore alternatives to find the best possible strategic and organisational fit. In addition to using AR to add to and not detract from existing resources to ensure the best possible long term, sustainable, competitive and successful future.

## **6.9 AR Business Model Development**

Throughout this chapter, the V4 provided a template for developing an AR BM, assisting in the exploration and examination of relevant elements. This was important, to ensure relevant identification and exploration of BM themes. However, as shown throughout this chapter, the V4 was not directly applicable to AR implementation in the cultural heritage tourism sector, because it does not support or reflect the contextual background and complexity. However, the ARBM does share similarities and commonalities with the V4. These are discussed at more length throughout chapters 8 and 9. The gap in research identifying effective BMs to implement AR was examined in Section 3.14, to fill this gap, and achieve objective 4, a new Augmented Reality Business Model, the “ARBM” has been developed. ARBM was developed based on themes identified during interviews as presented throughout this chapter.

The five key areas identified during interviews and their components are summarised in Table 6.13. The themes, components and descriptions presented in the table informed ARBM development and questionnaires design for stage two data collection. A brief description and the logic of each ARBM theme and components are explained below and discussed at more length throughout chapter 8.

**Table 6.13 Summary of key themes and components**

Components	Sub-Components	Descriptions
<b>Resources</b> <i>(See Table 6.4)</i>	Uniqueness	The site has not significantly changed since closure as a working mine, it is a unique piece of history
	Range of Activities	Geevor offers visitors a range of activities, catering to different markets (e.g. café, shop, museum, underground tour, children's activities)
	Education	Geevor provides an immersive learning environment with a wealth of educational resources
	Staff	Most staff previously worked in the mine, so have first-hand knowledge and experiences to share with visitors. They are a dedicated and committed team
	Heritage Significance	Geevor helps preserve and protect Cornish heritage, reinforcing local traditions and identity
<b>AR Value</b> <i>(See Table 6.5)</i>	Monetary Benefits	Increased visitor numbers and ticket sales. Increased spend in the local and in-site facilities
	Interpretation	Brings the site to life, tailoring content to different knowledge levels and improving accessibility
	Education	Appeals to different learning styles, engaging younger audiences and adding excitement
	Sustainability	Preserving knowledge of existing staff for future generations. Protecting and conserving the environment
	Marketing	Raising the profile of both Geevor and Cornwall, increasing visibility of promotional material
	Navigation	Creating an interactive AR map, to help exploration and navigation of the site and its facilities
	Games	AR games would combine education and entertainment, allowing visitors to take control of their own experience
<b>Stakeholder Benefits</b> <i>(See Table 6.6)</i>	Secure Jobs	Increased visitor numbers helps to secure jobs
	Preserve Knowledge	Recording forever the first-hand knowledge of the remaining miners
	Improve efficiency	Improved efficiency of daily tasks to ensure all aspects of Geevor run smoothly
	Community Pride	Educate visitors about Cornish heritage to increase community pride
	Attract Investment	Attract funding and investment by demonstrating site advancement and development
<b>Responsibilities</b> <i>(See Table 6.8)</i>	Supporting	Provide guidance before, during, and after, AR implementation
	Developing	Create content, prototype, test and develop the AR application
	Promoting	Marketing and advertising AR
	Maintaining	Looking after and maintaining AR
	Funding	Secure and allocate funding to develop, launch and maintain AR application
	Launching	Implement AR across site, train and help staff use AR

<b>Components</b>	<b>Sub-Components</b>	<b>Descriptions</b>
<b>Revenue</b> <i>(See Table 6.11)</i>	Secondary revenue	Revenue from secondary sources (e.g. spend in the local area and ticket sales)
	Flexible costs	Cost for AR use is flexible and varies for different times, days, months and groups
	In-app purchasing	Basic version of AR is free with an additional fee to use extra features such as AR tour
	Increased entry price	Existing entry price is increased to absorb the cost of AR
	Pay to use AR	Visitors pay to download and use AR
	AR free	Geevor cover all costs of AR, as part of improving the visitor experience
	Visitors bring devices	AR is free to use, but only accessible to visitors who bring their own devices
	Pay to hire devices	Visitors pay to hire AR devices provided by Geevor

Source: Author (2017)

### 6.9.1 Resources

The difference between Geevors existing value and resources was discussed separately, to the added value AR would introduce. In both tourism and AR, resources and core competencies are often intangible, involving the promotion and purchase of experiences rather than physical products. This was true of Geevor, and the five components identified were intangible (See Table 6.13). The V4 model was developed to sell tangible products and services, and by comparison ARBM focuses on resources necessary to create a tourist experience. For example, a unique offering, the staff and a range of activities. Yet, this was not appropriate in a cultural heritage tourism context and it was considered more effective to examine existing resources to understand their strengths and unique characteristics.

### 6.9.2 AR Value

The AR value component describes the added value AR would introduce to Geevor's existing visitor experience and resources. In addition to this, AR Value considers ARs potential added value, whether it could attract additional target segments and how AR would fulfil their desires. For instance, implementing AR stakeholders predicted Geevor would be able to engage and attract younger audiences, because it would introduce an element of fun, in combination with education (See Table 6.13).

AR Value is one of the most crucial things to get right, as identified by stakeholders AR should be introduced to enhance and add value to visitors' experiences, in addition to introducing other benefits, like generating additional revenue and introducing benefits for stakeholders. Stakeholders reiterated the importance of AR adding to, and not detracting from existing experiences. In the same way, some

stakeholders recognised there needs to be a need for AR and it has to be right for the museum, complementing strategic goals and existing features. Thus, it was essential AR Value was clearly identified and understood before AR was implemented, because without a need, want or use for AR, it would unlikely be a success.

Stakeholders recognised a number of ways AR could add value to existing resources such as introducing monetary benefits, improving interpretation, increasing the attainment of educational outcomes, making Geevor more sustainable, providing new marketing material, improving entertainment through AR gamification and easing efficiency of site navigation of the site easier and more efficient. These AR VPs could add considerable value to Geevor and improve the site helping overcome some of their challenges, increase their success, competitiveness, sustainability and secure additional sources of revenue.

### **6.9.3 Stakeholder Benefits**

As discussed though the study, to ensure the success of technical innovations, it was important to gain stakeholder support. Within a tourism context, stakeholder support is crucial to success. Therefore, it was important for stakeholders to understand the benefits of AR, to encourage support, and interest in ensuring AR was wholeheartedly supported by stakeholders. Stakeholders are individuals who have an interest in, or impact on the attainment of organisational goals, and without their support new ventures are unlikely to become a success. Identifying stakeholder benefits (See Table 6.13) was considered critical to ensure support, understanding and backing.

### **6.9.4 Responsibilities**

In comparison to stakeholder benefits, introducing AR would also present a number of additional responsibilities concerned with things such as creating AR content, funding AR, or ensuring its longevity by maintaining it. To ensure the sustainability and long-term success of AR adoption at Geevor, it was considered critical by stakeholders that new roles and responsibilities introduced by AR were clearly articulated, allocated and assigned. Stakeholders highlighted the need for a clear implementation strategy and transparency of the new roles introducing AR would create. Six responsibilities were identified during interviews, as outlined in Table 6.13, which would need to be addressed and assigned to effectively implement AR.

### **6.9.5 Revenue**

Revenue plays an important role in all businesses, but is particularly important for tourist organisations, museums and attractions that are run a charitable basis, reliant on donations or government funding. Therefore, in addition to creating an enhanced experience, and stakeholders benefits AR revenue was crucial. Although, the importance of revenue varies dependent on the type of organisation, profit, non-profit, private, public, it was important organisations understand and calculate financial arrangements prior to AR implementation. For example, non-profit public organisations may implement AR purely to enhance the tourist experience, therefore any revenue generated would be a bonus. Whereas private, for profit organisations such as Geevor, while wanting to enhance the tourist experience, generating revenue was a challenge and both AR value, and revenue would be equally as important.

During interviews, a number of potential AR revenue models were suggested (See Table 6.13), however the most suitable or appropriate AR revenue method for Geevor was not identified and stakeholders views were diverse. Nevertheless, several potential revenue options were identified and provide a basis for further exploration.

### **6.9.6 Modelling Principles**

Although this study focused on creating a BM to implement AR in cultural heritage tourism, using the case of Geevor, its application could also extend to other cultural heritage tourist attractions. Within the ARBM components, one of the key elements was value and the value added by AR to create sustainable competitive advantage by enhancing the visitor experience. To achieve competitive advantage, it was recommended the five principles should be addressed throughout the process.

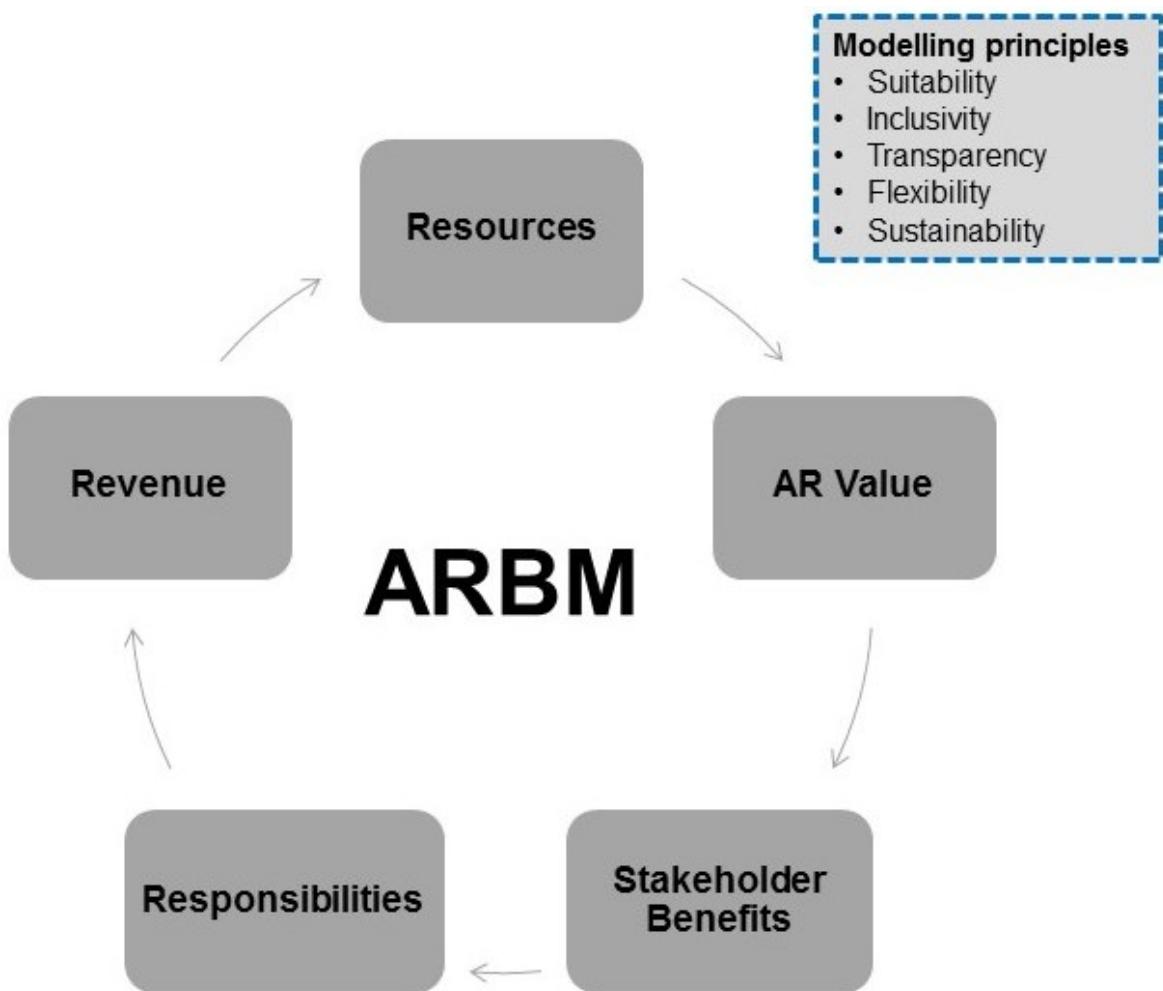
These five principles (See Table 6.12) informed the ARBM development, acting as modelling principles which should be considered during and throughout AR implementation to increase the longevity and likelihood of success. For instance, suitability should be considered and addressed throughout the process. For example, the resources component should reflect core resources and competencies to understand how AR can add value to them and whether the attraction has suitable resources for AR to enhance. Moreover, AR should be implemented appropriately to create competitive advantage whilst ensuring it complements organisations strategic goals and long-term plans. Equally, within the revenue component, the

suitability and economic viability of implementing AR and the appropriateness of different pricing methods and revenue models should be examined.

### 6.10 The ARBM

Figure 6.3 presents “The ARBM” developed based on the themes identified in Table 6.13, in addition to overall modelling principles shown in Table 6.12.

The ARBM was designed to be fluid, using a circular shape to represent the connection and linkages between the components. It advocates flexibility, representing the need for renewal and updating to respond to changing conditions and influences.



Source: Author (2017)

**Figure 6.3 The ARBM**

In addition to this, Table 6.14 provides a detailed decomposition of the ARBM components, descriptions and considerations, identifying what each component includes, involves and what considerations and decisions should be made. The considerations present questions that stakeholders should both ask and answer at each stage of AR implementation (See Table 6.14).

**Table 6.14 Decomposition of ARBM Components, Descriptions and Considerations**

Components	Description	Considerations
<b>RESOURCES</b>		
Core resources; (1) Tangible (2) Intangible	Outline core resources and identify core competencies	<ul style="list-style-type: none"> <li>- <i>What are our key resources?</i></li> <li>- <i>What are our strengths?</i></li> <li>- <i>What do our customers value the most?</i></li> <li>- <i>Are there any resources we can make more use of?</i></li> <li>- <i>Are our key resources and competencies sustainable?</i></li> <li>- <i>What improvements can we make and how?</i></li> </ul>
Existing; (1) Value Target segments	Determine the value incorporated in the existing offer and identify the existing target segments and their preferences	<ul style="list-style-type: none"> <li>- <i>Why do people visit?</i></li> <li>- <i>What value do they get from visiting?</i></li> <li>- <i>Who are our main target groups?</i></li> <li>- <i>What do they particularly enjoy about visiting Geevor?</i></li> </ul>
<b>AR VALUE</b>		
New; (1) Added value New target segments	Define the added value introduced by AR, new target segments and their preferences	<ul style="list-style-type: none"> <li>- <i>How will AR enhance the existing visitor experience?</i></li> <li>- <i>What is the added value of AR?</i></li> <li>- <i>What new elements can be introduced into the visitor offer using AR?</i></li> <li>- <i>Will AR help attract any new target markets?</i></li> <li>- <i>What value would AR offer them?</i></li> <li>- <i>Are there any changes that need to be made to cater to their needs?</i></li> </ul>
What AR application features should be offered	Decide which features are most important for the AR application to offer based on the benefits and added value of AR	<ul style="list-style-type: none"> <li>- <i>Should the AR app include a gaming element?</i></li> <li>- <i>Should the app offer content for different knowledge levels?</i></li> <li>- <i>How important is it for the app to have an interactive map?</i></li> <li>- <i>What are the most important features?</i></li> </ul>
<b>RESPONSIBILITIES</b>		
Identify Stakeholders needed to..... AR; (1) Support (2) Develop (3) Promote (4) Maintain (5) Fund Launch	Using stakeholder analysis define the core stakeholders needed to support, develop, promote, maintain, fund and launch AR	<ul style="list-style-type: none"> <li>- <i>Are there any new relationships we need to establish with stakeholders to implement AR?</i></li> <li>- <i>Which of our stakeholders have the power to implement AR?</i></li> <li>- <i>Which stakeholder's can we go to for help with funding?</i></li> <li>- <i>Which stakeholder's do we need support from to effectively implement AR?</i></li> <li>- <i>Which stakeholders will us implementing AR directly and indirectly affect?</i></li> <li>- <i>Who is going to maintain AR?</i></li> <li>- <i>Who will promote AR?</i></li> <li>- <i>Who will develop AR?</i></li> </ul>
Define existing and new stakeholder...; (1) Roles (2) Responsibilities (3) Relationships (4) Communications (5) Channels Control	Define how stakeholders are organised; identifying new roles, responsibilities, relationships, communication, channels and control	<ul style="list-style-type: none"> <li>- <i>How will we organise our stakeholder's to effectively implement AR?</i></li> <li>- <i>What are our best communication channels?</i></li> <li>- <i>Who is in control?</i></li> <li>- <i>What is the most effective way to organise stakeholders?</i></li> </ul>

<b>Components</b>	<b>Description</b>	<b>Considerations</b>
<b>STAKEHOLDER BENEFITS</b>		
Create value for; (1) Stakeholders	Plan how to organise core resources to create sustainable competitive advantage, providing value for stakeholders and customers	<ul style="list-style-type: none"> <li>- <i>How does AR introduce competitive advantage?</i></li> <li>- <i>What is our USP?</i></li> <li>- <i>What value do our customers get?</i></li> <li>- <i>What value do our stakeholder's get?</i></li> </ul>
Identify any; (1) Challenges (2) Solutions (3) Alternatives	Understand barriers and challenges, identify alternatives or solutions	<ul style="list-style-type: none"> <li>- <i>What are the main barriers to implementation?</i></li> <li>- <i>How can we overcome these barriers?</i></li> <li>- <i>What are the alternatives?</i></li> </ul>
Ensure strategic fit with; (1) Organisational goals (2) Local tourist plan (3) Regional tourist plan (4) National tourist plan	Make sure AR implementation fits with the organisational (local, regional, national tourism strategies) goals.	<ul style="list-style-type: none"> <li>- <i>Does AR implementation fit with the organisations strategic goals?</i></li> <li>- <i>How does AR complement tourist plans (regionally, nationally)?</i></li> </ul>
<b>REVENUE</b>		
Calculate implementation costs	Define costs of development, implementation and maintenance.	<ul style="list-style-type: none"> <li>- <i>What are the development costs?</i></li> <li>- <i>Are there any implementation costs, such as changes to existing infrastructure?</i></li> <li>- <i>How and from where will we fund AR development, implementation and maintenance?</i></li> <li>- <i>Will we need to buy AR capable devices?</i></li> <li>- <i>What are the ongoing maintenance costs?</i></li> <li>- <i>Are there any marketing or promotional costs?</i></li> <li>- <i>Will our staff need training?</i></li> </ul>
Determine Pricing method	Justify the most appropriate pricing method, ensuring visitors willingness to pay and above all financial viability	<ul style="list-style-type: none"> <li>- <i>For what value out our visitors willing to pay for?</i></li> <li>- <i>How much are our visitors willing to pay?</i></li> <li>- <i>What are the pricing methods?</i></li> <li>- <i>AR offered free or charged at a fee?</i></li> <li>- <i>Will visitors download AR on their own devices or loan them from us?</i></li> <li>- <i>How much will this cost?</i></li> </ul>

Source: Author (2017)

## 6.11 Summary

As discussed in previous chapters, there was an absence of research identifying BMs to implement AR in the cultural heritage tourism sector. This chapter presented findings from fifty interviews with Geevor stakeholders using the V4 as a template, assisting in the exploration and examination of relevant elements for the development of the ARBM. Five key components and numerous sub-components were identified from interviews, used to develop the ARBM. In addition to this, stakeholders identified a number of principles, for consideration when implementing AR, which formed the ARBM modelling principles. The chapter concluded by presenting the ARBM and a description of its components and sub-components, in doing so meeting objective four. To understand the applicability and validity of the ARBM for Geevor, the next chapter will verify the model, identifying its applicability for Geevor using stakeholder questionnaires.

## **CHAPTER 7 AHP: ARBM VALIDATION**

### **7.1 Introduction**

Progressing from Chapter 6, which presented interview findings and developed the ARBM, this chapter presents the results from questionnaires, aiming to validate the ARBM for application at Geevor. AHP analysis was employed to determine the most important criteria for each of the ARBMs five components, by effectively solving group decisions and complex problems using mathematical, psychological and scientific processes producing group decisions by organising criteria into a hierarchy of importance. AHP was employed to analyse questionnaires, aggregating the perceptions of fifteen stakeholders to produce a combined group decision, developing a hierarchy of importance and identifying as a group which components stakeholders considered most important for the application of AR at Geevor. This chapter discusses the process of group decision making, in addition to presenting the steps used by BPMSG AHP template. The outcomes from each stage, as well as the methods and calculations used to determine the results are detailed, and presented throughout. The chapter concludes by examining and describing the final rankings of criteria in terms of stakeholder preference, producing a hierarchy of criteria and sub-criteria validated for Geevor.

### **7.2 Stakeholder profiles**

As discussed in the methodology, fifteen stakeholders completed a questionnaire, Table 7.1 presents their profile.

***Table 7.1 Profile of questionnaire respondents***

	<b>Organisation</b>	<b>Position</b>
1	Geevor	Educational Manager
2	Geevor	Reception/Shop staff
3	Geevor	Mine Guide
4	Geevor	Mine Guide /Maintenance
5	Geevor	Trustee
6	Geevor	IT Manager
7	Geevor	Development Officer
8	Geevor	Curator
9	Geevor	Head Guide
10	Geevor	Mine Manager
11	Cornwall Museums Partnership	Community Engagement Officer
12	Cornwall Council	Council Officer
13	Falmouth University	Senior Lecturer
14	Visit Cornwall	Chief Executive
15	Cornwall National Trust	General Manager

*Source: Author (2017)*

Ten internal and five external stakeholders completed a questionnaire. Including responses from both internal and external stakeholders was important to ensure a

comprehensive understanding and balance between judgements. Moreover, internal and external stakeholders face different pressures, therefore involving both was essential to balance conflicts of opinion. As demonstrated in Table 7.1 stakeholders held a range of positions, from Mine Guide to Council Officer. Gaining response from stakeholders from a variety of positions, was important to create comprehensive and balanced understanding. All stakeholders had an impact and influence on the attainment and success of AR implementation at Geever and were, therefore, important respondents. .

### **7.3 Multi-Criteria Group Decision-Making Process**

According to Saaty (2008) everyone is fundamentally a decision-maker, everything we do consciously or unconsciously is the result of some decision. Making decisions involves the use of intelligence, wisdom, and creativity, to satisfy basic human needs (Alexander, 2012), and involves different intangibles (Saaty, 1980; Saaty, 2008). Evaluating decisions requires several considerations such as; benefits resulting from making the right decisions, costs, risks, losses from actions (or non-actions) taken if the wrong decision is made (Alexander, 2012). Saatay (2008, p.84) described that “to make a decision we need to know the problem, the need and purpose of the decisions, the criteria of the decisions, their sub-criteria, stakeholders and groups affected and the alternative actions to take. We then try to determine the best alternative, or in the case of resource allocation, we need to prioritise for the alternatives to allocate their appropriate share of resources”. This process is complicated further when it involves a group of decision-makers.

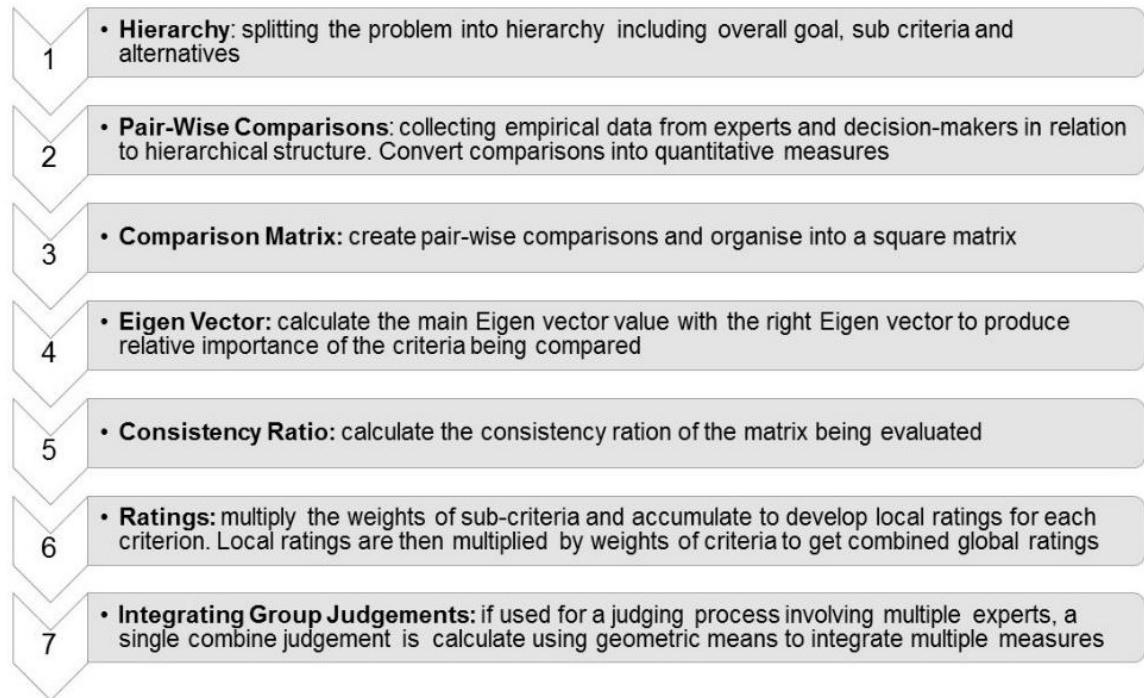
Making group decisions introduces even more complexity. Hwang and Lin (2012, p.1) identified that “the problem is no longer the selection of the most preferred alternative among the non-dominated solutions according to one individual (single decision makers) preference structure. The analysis must be extended to account for conflicts among different interest groups who have different objectives, goals, criteria and so on”. Therefore, MCDM (See Section 5.8.5) is often employed. MCDM plays a key role in many real-life situations, Triantaphyllou and Mann (1995) argued that it is not an exaggeration to say almost all local, government, industry or business activity involves the evaluation of alternatives in some form when making decisions, but often there are conflicts among criteria.

Validating the ARBM for Geevor presented a number of challenges, specifically aggregating stakeholder perceptions into one group judgement. Velasquez and Hester (2013) proposed there are two challenges when making group decisions; the inescapable presence of high levels of uncertainty, and decision complexity. The study has identified a gap outlining an AR BM, therefore developing a BM, in addition to integrating AR presents high levels of uncertainty to Geevor stakeholders. Validating the ARBM by determining the most preferable and best options to pursue is a complex decision. These uncertainties have been referred to as 'epistemic' by virtue that they represent incomplete knowledge. Introducing AR at Geevor involves epistemic knowledge, because it has not been done before and equally an AR BM has not been developed or validated before. In review of MCDM methods (see Table 5.9), AHP was chosen as a tool to effectively solve conflicting stakeholders judgements and arrive at a group decision.

#### **7.4 AHP Process**

AHP is based upon three principles: deconstruction, comparative judgment and synthesis of priorities (Eldrandaly et al., 2005). Deconstruction improves our understandings of complex decisions through rearranging the problem into a hierarchy, whereas comparative judgment evaluates parameters using pairwise comparisons at each level of the hierarchy. Synthesis uses ratio-scales from all levels of the hierarchy and constructs a group of priorities for each parameter (Lai and Hopkins, 1989). Thus, AHP has been used to solve many decision-making problems, such as: price of service, history of company, dissemination of information, relationship with customer, business and delivery (Pongpanich et al., 2015), choice, prioritisation or evaluation, resource allocation, benchmarking, quality management, conflict resolution, strategic planning and public policy (Forman and Gass, 2001).

The process of AHP demonstrated in the seven steps model (See Figure 7.1), involves complex mathematical procedures (Goodwin and Wright, 2004), therefore computer software is often used to support the method. BPMSG AHP Microsoft Excel template developed by Goepel (2013) was employed in this study. Compared to other software packages, BPMSG was suitable to determine weights of each category and sub-category, because it does not include a hierarchy of decision problem or final aggregation of weights. However, these calculations are not necessary for this study.



Source: adapted from Saaty and Vargas (2012)

**Figure 7.1 Seven steps of AHP**

The provision of end-tourism requires the collaboration of a network of stakeholders, producing complex relationships. By using AHP, collaborative decisions were reached to validate the proposed BM from the opinion of Geevor's stakeholders.. The analysis produced an outcome with strong proof of concept, (Saunders et al., 2012) and an effective BM to implement AR at Geevor.

To achieve objective five, it was important the ARBM was validated in terms of its applicability to Geevor. Validating the ARBM for Geevor using AHP would allow managers to understand stakeholders combined decision, ranking components in terms of importance. For example, for the Revenue component, ranking sub-components in terms of importance would allow managers to identify the most suitable revenue model to implement AR, as a result of an aggregation of preferences from fifteen stakeholders who completed the questionnaire. AHP was important to generate a group decision, accounting for conflicts and differences of opinion among stakeholders and minimising tensions by ranking options in terms of importance.

Questionnaire results were analysed using BPMMSG Excel template, which applied the same principles identified within the seven steps of AHP in a simplified easier format (See Figure 7.2). The template involved inputting stakeholder judgements

into worksheets which calculated individual priorities (pairwise comparisons), presenting results from aggregating judgements of all fifteen stakeholders. In addition to this, BPMSG calculated consistency, comparison matrix's and aggregated group judgements, ranking criteria based on levels of importance.



*Source: Author (2017)*

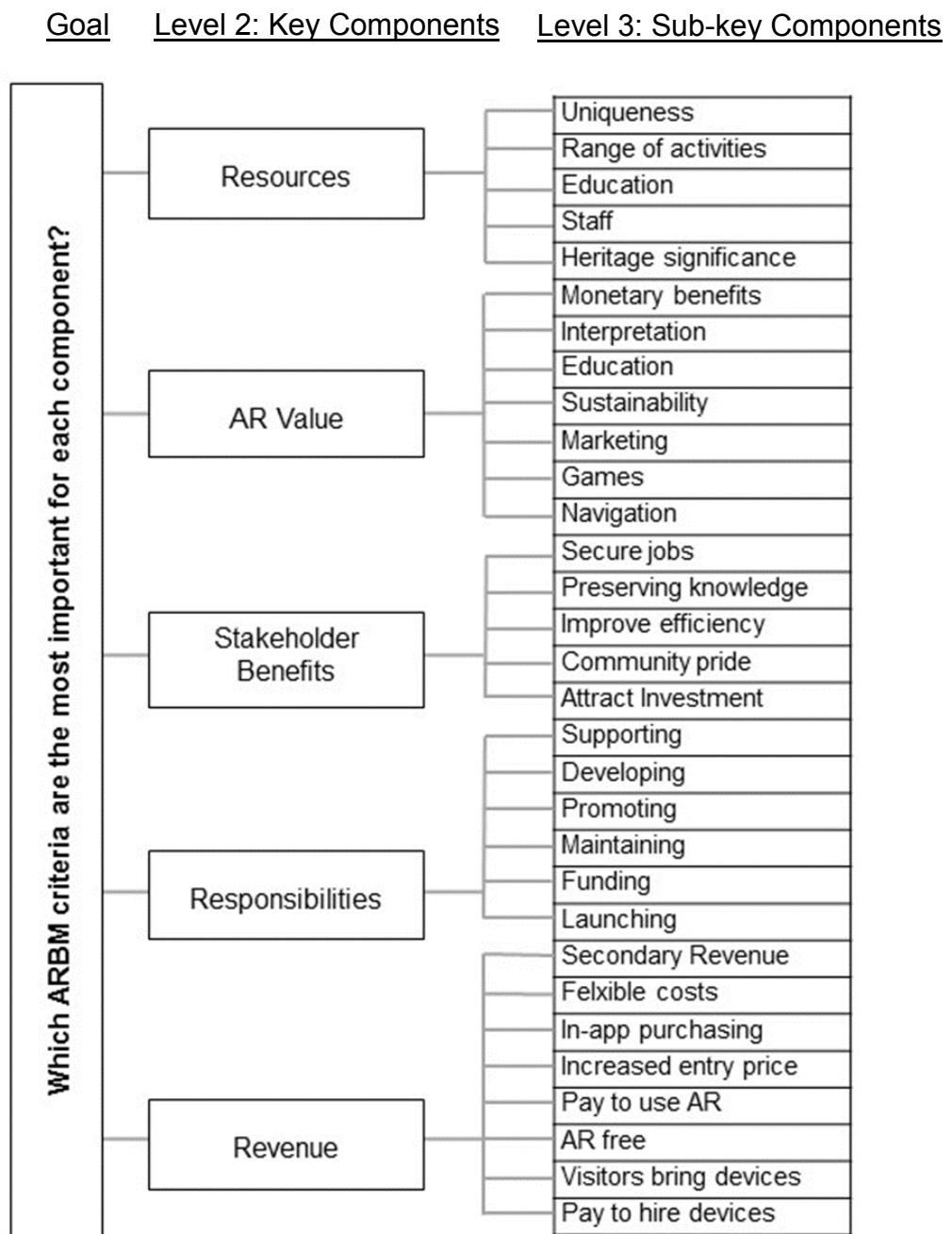
**Figure 7.2 BPMSG AHP process**

#### 7.4.1 Decision Hierarchy

The first step of AHP involved creating a hierarchy of the decision problem, identifying the most and least important criteria (Elgazzar et al., 2012), from criteria (ARBM Components) and alternatives (ARBM Sub-components). Figure 7.3 illustrates the decision hierarchy for Geevor, based on key findings presented in Chapter 6 (See Table 6.13). The desired outcome of AHP questionnaires was to validate the ARBM and determine by group decision, combining the ideas of multiple influential stakeholders which sub-components were preferable and therefore most important. Key factors refer to the ARBM components, and the sub-key factors are the ARBM sub-components, which were compared and ranked against one another, to produce a comparison matrix. Figure 7.3 used the Hierarchical Decision Structure developed by Pongpanich et al. (2015, p. 250) which was adapted and applied to the ARBM for Geevor.

Based on this hierarchy, criteria were put into the BPMSG template and stakeholders judgements input. Stakeholder judgements (pairwise comparisons)

were then converted into quantitative measures using the 1-9 Fundamental Scale of Absolute Numbers (See Table 5.10) developed by Saaty to determine how important criteria A is relative to criteria B.



Source: Author (2017). Adapted from: Pongpanich et al. (2015, p.250)

**Figure 7.3 Geevor ARBM Hierarchical Decisions Structure**

#### 7.4.2 Pairwise Comparisons

Once the decision hierarchy had been created, stakeholders indicated priorities in questionnaires by judging how much more important they considered criteria 'A' to be than criteria 'B', using the 1-9 scale (See Table 5.10). Stakeholder's

questionnaire responses (or priorities  $\rho_i$ ) were input into BPMSG template, which calculated individual priorities using the RGMM method. RGMM method created a pairwise  $N \times N$  comparison matrix  $A = a_{ij}$ , calculated by:

$$r_i = \exp \left[ \frac{1}{N} \sum_{j=1}^N \ln(a_{ij}) \right] = \left( \prod_{i=1}^N a_{ij} \right)^{1/N}$$

and normalised using:

$$p_i = r_i / \sum_{i=1}^N r_i$$

RGMM weights for each five ARBM components are presented below:

#### 7.4.2.1 Resources

Table 7.2 shows the ARBM ‘resources’ component RGMM weights for each stakeholder. As evident in the table, stakeholders expressed many variations toward criteria, but heritage significance overall had higher weights compared to a range of activities, but no other significant commonalities were identified.

**Table 7.2 Resources: Individual RGMM**

S.	Individual RGMM Weights (%)				
	Uniqueness	Range of activities	Education	Staff	Heritage significance
1	7	6	13	37	37
2	10	4	17	25	45
3	27	22	6	38	7
4	50	3	7	30	11
5	18	4	31	31	15
6	19	8	46	1	11
7	8	5	24	15	49
8	32	4	9	15	40
9	17	5	22	32	25
10	6	2	25	12	55
11	11	4	47	7	31
12	8	25	30	6	30
13	20	8	32	9	30
14	23	10	27	10	29
15	45	4	16	11	24

\*S = Stakeholder

Source: Author (2017)

#### 7.4.2.2 AR Value

Table 7.3 displays the RGMM weights for ‘AR value’ ARBM sub-components. Examining the table, it is clear stakeholders considered some criteria (e.g. sustainability and education) to be more important than others (e.g. games) because

of the higher RGMM weights. In general games RGMM weights were considerably lower in comparison to other sub-components. Predominantly, monetary benefits and sustainability have higher RGMM weights.

**Table 7.3 AR Value: Individual RGMM**

S.	Individual RGMM Weights (%)						
	Monetary benefits	Interpretation	Education	Sustainability	Marketing	Games	Navigation
<b>1</b>	32	5	16	31	9	2	4
<b>2</b>	26	8	14	30	13	4	4
<b>3</b>	32	6	6	29	14	5	8
<b>4</b>	12	2	5	50	23	2	7
<b>5</b>	14	4	17	35	20	3	7
<b>6</b>	22	11	9	23	18	5	12
<b>7</b>	7	36	17	22	11	3	4
<b>8</b>	5	22	22	21	4	9	17
<b>9</b>	9	27	22	16	8	4	13
<b>10</b>	10	35	15	19	12	3	7
<b>11</b>	13	8	46	16	9	3	5
<b>12</b>	17	27	26	15	8	2	4
<b>13</b>	5	32	16	9	5	2	31
<b>14</b>	25	6	4	14	40	7	5
<b>15</b>	15	37	15	21	4	6	3

\*S = Stakeholder

Source: Author (2017)

#### 7.4.2.3 Stakeholder benefits

Table 7.4 presents RGMM weights of ‘stakeholder benefits’ ARBM sub-components. There were no identifiable patterns between weights assigned to each criterion, which implies there were mixed perceptions among stakeholders. This highlights the importance of aggregating judgements to generate ranks of importance to prioritise criteria in order of group preference and importance.

**Table 7.4 Stakeholder Benefits: Individual RGMM**

S.	Individual RGMM Weights (%)				
	Secure jobs	Preserve knowledge	Improve efficiency	Community pride	Attract investment
1	30	41	6	11	11
2	28	40	6	5	20
3	22	15	15	2	45
4	14	42	31	10	3
5	53	8	4	16	20
6	12	27	41	6	15
7	18	28	12	4	37
8	23	27	7	31	11
9	33	21	5	8	33
10	23	39	11	4	22
11	6	26	10	41	18
12	5	22	8	42	23
13	29	29	5	24	14
14	53	8	7	17	15
15	35	29	7	18	12

\*S = Stakeholder

Source: Author (2017)

#### 7.4.2.4 Responsibilities

Table 7.5 shows the RGMM weights for the ARBM ‘responsibilities’ sub-criteria. Similarly, to the ‘stakeholder benefits’ component, there was no clear pattern between weights, representing stakeholders mixed perceptions. However, it is important to note, respondents 5 and 11 judged all responsibilities to be of equal importance, therefore, generating an RGMM weight of 17% for each criterion. This suggests that both these stakeholders either had difficulty determining which ‘responsibilities’ were more important in comparison to others, or they believed all responsibilities had the same level of importance.

**Table 7.5 Responsibilities: Individual RGMM**

S.	Individual RGMM Weights (%)					
	Supporting	Developing	Promoting	Maintaining	Funding	Launching
1	31	10	28	6	4	22
2	10	37	4	21	8	20
3	12	16	5	47	13	7
4	2	23	16	13	37	9
5	17	17	17	17	17	17
6	30	9	7	19	18	17
7	12	34	10	13	20	12
8	25	12	4	24	17	19
9	6	13	8	12	52	9
10	12	34	11	13	18	12
11	17	17	17	17	17	17
12	13	30	9	28	5	17
13	6	25	5	19	29	17
14	9	15	24	14	10	27
15	14	32	8	19	18	10

\*S = Stakeholder

Source: Author (2017)

#### 7.4.2.5 Revenue Model

Table 7.6 displays RGMM weights for the ‘revenue’ ARBM sub-components. The table presents no clear patterns between judgements, again reiterating stakeholders varied judgements and demonstrating a conflict of perspectives and opinions, reiterating the importance of aggregating group judgements to create a hierarchy of importance.

**Table 7.6 Revenue: Individual RGMM**

R.	Individual RGMM Weights (%)							
	Secondary Revenue	Flexible costs	In-app purchases	Increased entry	Pay to use AR	AR free	Visitors bring devices	Pay to hire devices
1	21	8	7	2	3	17	34	8
2	7	8	14	7	18	6	3	38
3	13	18	18	2	14	5	17	14
4	6	9	16	15	14	14	14	14
5	23	24	14	1	18	4	8	7
6	8	2	2	5	25	5	33	19
7	13	13	13	15	8	23	10	6
8	23	4	14	8	4	30	10	7
9	15	9	15	9	12	33	2	4
10	19	10	9	13	15	7	14	14
11	14	35	6	4	3	20	11	7
12	4	6	14	2	7	25	32	11
13	17	4	4	12	4	42	12	4
14	5	13	9	19	16	3	23	13
15	11	4	8	6	25	3	4	39

\*S = Stakeholder

Source: Author (2017)

## 7.5 Checking Consistency

After calculating individual RGMM weights, the next step was to check for inconsistencies among judgements. BPMSG calculated the most inconsistent judgement within comparisons, identifying the most inconsistent pairwise  $i,j$  comparison using:

$$\max(\varepsilon_{ij} = a_{ij} \frac{p_j}{p_i})$$

CR (Consistency Ratio) were calculated for input sheets and within the summary sheet,  $\lambda_{\max}$  which calculated the principle eigenvalue, based upon the priority eigenvector from RGMM weights of the EVM summary sheet. The Consistency Index (CI) was calculated by BPMSG using:

$$CI = \frac{(\lambda_{\max} - N)}{N - 1}$$

CR was worked out using:

$$CR = \frac{CI}{RI}$$

Alonson/Lamata linear fit was then created using CR:

$$CR = \frac{\lambda_{\max} - N}{2.7699N - 4.3513 - N}$$

And Geometric Consistency Index (GCI) was calculated by:

$$CGI = \frac{2 \sum_{i < j} \ln a_{ij} - \ln \frac{p_i}{p_j}}{(N - 1)(N - 2)}$$

CR provided a way to determine how many ‘errors’ were created when stakeholders provided judgements in questionnaires. A perfectly consistent answer would create a CR value of zero. However, according to Saatys rule of thumb CR 0.1 (10%) was acceptable. Yet, for this study, a higher CR of 0.2 (20%) was deemed acceptable, based on the justification it was not considered appropriate to ask stakeholders to amend their judgements purely to increase consistency. For this study, it was accepted that stakeholders identified conflicts and similarities between criteria and therefore when judging importance there would undoubtedly be inconsistencies.

Moreover, Badri et al. (2016) identified individuals are demonstrably inconsistent when making comparative judgements, particularly when it involves intangibles,

such as a tourist or AR experience, without objective scales of measurement. Therefore, emphasising the importance of making “good” judgements, rather than minimise the inconsistency ratio.

Only one component ‘resources’ had a CR that exceeded Saatys suggested 10%. One reason for this could have been because asking stakeholders to determine the importance of criteria such as staff in comparison to education, would likely be influenced by their position within Geevor, internally or externally. For example, the educational manager would most likely attribute more significance to education, but also staff and uniqueness, creating inconsistencies. In an examination of individual stakeholder judgements, only two had a high inconsistency ratio, which increased the overall CR to 17%, therefore, results were still considered valid.

Importantly the focus of the study was not to encourage stakeholders to make “good” judgements, but rather “honest” judgements which when making comparative judgments without objective scales of measurements is notably difficult. Equally, based on the Goepel’s argument, a CR below 20% are still considered consistent. Table 7.7 presents overall GCI and CR for each five ARBM components.

**Table 7.7 Summary of GCI and CR**

	GCI	CR (%)
Resources	0.06	0.17
AR Value	0.03	0.07
Stakeholder Benefits	0.04	0.1
Responsibilities	0.02	0.06
Revenue	0.04	0.1

Source: Author (2017)

## 7.6 Comparison Matrix

To consolidate the decision matrix C, the BPMSG template combined all  $K$  participants’ inputs to generate aggregated group results, using the weighted geometric mean of the decision matrices and individual decision makers weights from input sheets:

$$c_{ij} = \exp \frac{\sum_{k=1}^N w_k \ln a_{ij(k)}}{\sum_{k=1}^N w_k}$$

Final priorities were calculated based on the EVM method.

## **7.7 Aggregated Group Judgement and Criteria Ranking**

The aggregated group decision matrix for each five ARBM components can be found in appendix 20. Individual stakeholder judgements were aggregated based on calculations of the weighted geometric mean of all judgements to produce an aggregated rank of importance. Below are the aggregated ranks of importance for each of the ARBMs five components and brief interpretation of results. Full interpretation and discussion of the implications of AHP ranking can be found in Chapter 8.

### **7.7.1 Resources**

Stakeholders considered ‘heritage significance’ the most important of the five resources. ‘Heritage significance’ was ranked highly, in comparison to other resources, and 4.6% higher than ‘education’ which was ranked second most important. This implies stakeholder’s agreed Geevors heritage significance was the most important resource, confirming it’s cultural and heritage contributions and importance to local identity. Whereas, Geevors educational resources, such as the immersive, hands-on environment and award winning educational experience was considered second most important.

‘Staff’ were deemed third most important, however, ‘uniqueness’ ranked fourth, was calculated only 0.3% less, demonstrating both ‘staff’ and ‘uniqueness’ were considered more or less equally important. It could be argued both resources share the same characteristics since staff provide a unique experience which contributes to the overall ‘uniqueness’ of the visitor experience.

Interestingly, ‘range of activities’ was considered the least important of all resources, gaining 10.8% less weighting than ‘uniqueness’. Demonstrating that in comparison to all other resources, stakeholders considered ‘range of activities’ the least important and therefore the least essential of Geevors resources. Table 7.8 presents the hierarchy of importance of resources as perceived by stakeholders.

**Table 7.8 Resource: Hierarchy of Importance**

Criteria	Weights (%)	Rank
Heritage Significance	27.6	1
Education	23.0	2
Staff	20.3	3
Uniqueness	20.0	4
Range of Activities	9.2	5

*Source: Author (2017)*

### **7.7.2 AR Value**

In terms of the value of AR, stakeholders believed ‘sustainability’ was the most important benefit AR presented (See Table 7.9). This implied AR should be implemented to preserve the knowledge of staff for future generations while helping conserve and protect the site. Moreover, ‘sustainability’ was weighted considerably higher (6.3%) than ‘education’ which ranked second most important, suggesting stakeholders felt ‘sustainability’ should be the overriding focus when implementing AR. ‘Education’ was ranked second most important, for its ability to appeal to, and engage different learning styles, target audiences (e.g. younger audiences) and add an element of excitement. Interestingly, ‘monetary benefits’ ranked third, was calculated only 0.01% less important than ‘education’, implying stakeholders considered both fairly equal. Signifying both ‘education’ and ‘monetary benefits’ should be a predominate focus and consideration when implementing AR at Geevor.

Ranked fourth most important was ‘interpretation’ demonstrating stakeholders thought that using AR to bring Geevor back to life, tailor content to different knowledge levels and improve accessibility was the fourth most preferable AR value. Deemed to be fifth most important was ‘marketing’, and the use of AR to raise the profile of both Geevor and Cornwall as a tourist destination and to increase the visibility of promotional materials.

Ranked sixth was using AR as a tool to facilitate ‘navigation’ of the site. This implies either stakeholders thought ‘navigation’ of the site does not need improving by AR, or alternatively, in comparison to the other AR values, it was not considered as important. Weighted least important, and 4.1% lower than the former was ‘games’, representing stakeholders did not consider AR games combining education and entertainment should be the main focus at Geevor.

**Table 7.9 AR Value: Hierarchy of Importance**

Criteria	Weights (%)	Rank
Sustainability	22.7	1
Education	16.4	2
Monetary Benefits	16.3	3
Interpretation	15.0	4
Marketing	13.7	5
Navigation	10.0	6
Games	5.9	7

Source: Author (2017)

### **7.7.3 Stakeholder benefits**

Stakeholder benefits aimed to distinguish which benefits of AR implementation stakeholders considered to be most important. ‘Preserving knowledge’ was judged the most important benefit which is related to the fact for AR Value, ‘sustainability’ (involving the preservation of knowledge) was also judged to the most important criteria in terms of AR Value. Highlighting the high level of importance stakeholders ascribed to the use of AR to preserve and sustain Geevor for future generations.

The second most important benefit of AR implementation was judged to be ‘secure jobs’, implying stakeholder’s thought AR could help increase visitor numbers and therefore job security. ‘Attract investment’ was identified third most important, involving the use of AR to attract funding and investment, demonstrating site advancement and development. ‘Attracting investment’ also links closely to job security because the more money on site the more secure jobs will be.

‘Community pride’, concerning the use of AR to educate visitors about Cornish heritage, thus improving pride within the community was judged as fourth most important. Whereas, ‘improving efficiency’ was considered to be least important, suggesting stakeholders believed Geevor is run effectively already and did not think AR would improve or enhance efficiency. Table 7.10 provides a summary of stakeholder benefits hierarchy of importance.

**Table 7.10 Stakeholder Benefits: Hierarchy of Importance**

Criteria	Weight (%)	Rank
Preserve knowledge	26.8	1
Secure jobs	24.5	2
Attract investment	20.6	3
Community pride	15.3	4
Improve efficiency	12.8	5

Source: Author (2017)

### **7.7.4 Responsibilities**

Responsibilities concern the extra responsibilities implementing AR would introduce. Stakeholders were asked to identify which responsibilities they considered to be the most important, to ensure the most time, money and resources went into fulfilling and effectively satisfying the extra responsibilities presented by AR.

Stakeholders viewed ‘developing’ as the most important responsibility, because logically without developing an AR application there would be nothing to implement to create benefits or enhance the tourist experience.

Second most important was ranked as ‘maintaining’, ensuring AR ran effectively and correctly. Third most important was identified as ‘funding’, which without the former would not be possible.

‘Launching’, was identified as fourth most important, to train and help staff use AR. Similar to this, ‘supporting’ to provide guidance before, during and after AR implementation was identified as fifth most important. Interestingly, ‘promoting’ was considered least important, implying stakeholders did not consider advertising and promoting AR to be of high importance. Table 7.11 displays the hierarchy of importance for responsibilities.

**Table 7.11 Responsibilities: Hierarchy of Importance**

Criteria	Weight (%)	Rank
Developing	20.7	1
Maintaining	18.6	2
Funding	17.7	3
Launching	16.4	4
Supporting	14.5	5
Promoting	12.1	6

Source: Author (2017)

### 7.7.5 Revenue

Stakeholders considered that ‘secondary revenue’ created by AR was the most important method to generate revenue using AR. Interestingly this implied stakeholder thought AR should not only generate revenues to benefit on-site businesses but also external business in the local area. Closely followed (ranked only 0.02% lower) ‘visitors bring devices’ was deemed the second most preferable method to generate revenue from AR. Demonstrating stakeholders considered visitors should bring their own devices to enjoy AR and revenues would be generated through secondary sources.

Third most preferable criteria was identified as offering ‘AR free’ demonstrating stakeholder’s believed AR implementation should be covered by Geevor as part of an effort to improve the visitor experience and better themselves. This implies

Geevor would have to fund or bid for funding to cover the costs of implementing and developing AR.

Visitors ‘pay to hire devices’ was identified as the fourth most suitable revenue model, generating money through loaning devices and downloading AR. Ranked fifth, but owning the same weight (12.5%) (See Table 7.12) was ‘in-app purchasing’, whereby a basic version of AR would be offered for free, but visitors would have to pay to access additional features, confirming uncertainty regarding the most appropriate AR revenue model.

‘Flexible costs’ was not a preferential method revenue model, ranking in seventh place, implying stakeholders did not feel offering AR at different prices to different target groups and at different times of the day or year is appropriate. Ranked least important was ‘increased entry’ which defined stakeholder’s do not want to raise the price of entry to cover the costs of AR.

**Table 7.12 Revenue: Hierarchy of Importance**

Criteria	Weight (%)	Rank
Secondary revenue	14.3	1
Visitors bring devices	14.1	2
AR free	13.5	3
Pay to hire devices	13.3	4
Pay to use AR	12.5	5
In-app purchasing	12.5	6
Flexible costs	11.5	7
Increased Entry	8.4	8

Source: Author (2017)

The implications and explanations for outcomes of hierarchical ranking will be explored and discussed in more detail in the next chapter. In addition to comparing outcomes to previous studies and interview findings. Table 7.13 presents a summary, grouping all five components ranking hierarchy’s and their weighted rank percentages. This outlines to Geevor management stakeholders preference and perceived importance of each criterion, demonstrating the most preferable and desirable choices for AR implementation.

These are important, because they provide a collaborative group decision, therefore minimising the possibility of tensions and conflicts arising if management chose to

pursue one option, in comparison to another, because AHP aggregated stakeholder judgements to produce a shared group decision.

**Table 7.13 Inclusive hierarchy of ARBM components and sub-component ranking**

ARBM Component	Rank	Importance	Weight (%)
Resources	1	Heritage Significance	27.6
	2	Education	23.0
	3	Staff	20.3
	4	Uniqueness	20.0
	5	Range of Activities	9.2
AR Value	1	Sustainability	22.7
	2	Education	16.4
	3	Monetary Benefits	16.3
	4	Interpretation	15.0
	5	Marketing	13.7
	6	Navigation	10.0
	7	Gamification	5.9
Stakeholder Benefits	1	Preserve Knowledge	26.8
	2	Secure Jobs	24.5
	3	Attract Investment	20.6
	4	Community Pride	15.3
	5	Improve Efficiency	12.8
Responsibilities	1	Developing	20.7
	2	Maintaining	18.6
	3	Funding	17.7
	4	Launching	16.4
	5	Supporting	14.5
	6	Promoting	12.1
Revenue	1	Secondary Revenue	14.3
	2	Visitors bring devices	14.1
	3	AR Free	13.5
	4	Pay to Hire devices	13.3
	5	Pay to use AR	12.5
	6	In-app purchasing	12.5
	7	Flexible Costs	11.5
	8	Increased entry	8.4

Source: Author (2017)

## 7.8 Summary

This chapter presented an analysis of questionnaires using AHP, identifying the most important criteria for each of the five ARBM components. This validated the ARBM with application to Geevor, demonstrating to management the most preferable areas to focus when developing and implementing AR, thus achieving objective five; creating a validated and effective ARBM for Geevor to implement AR, by combining stakeholders' perceptions, judgments and preferences into a group decision, such as which AR revenue model is most suitable. This bridged a gap in knowledge, not only proposing, but also validating an ARBM to provide Geevor with a framework to adopt AR, the principles of which can be shared by similar cultural heritage attractions, who can learn from, share the same principles. The study has

fulfilled each of the five research objectives, thus the next chapter ties each section together, by exploring and understanding implications of both interview and questionnaire findings, in relation to findings from previous studies.

## **CHAPTER 8 DISCUSSION**

### **8.1 Introduction**

This chapter ties together interview findings, the ARBM presented in chapter 6, questionnaire results detailed in chapter 7, with previous literature. The purpose of the chapter is to present a discussion linking research findings with previous literature to understand and outline the value of AR from a BM perspective, identifying how and why the ARBM was necessary to bridge a gap in existing research. To do this, the chapter discusses links and examines the extent research findings extend or confirm previous studies and BM thinking. The chapter structure mirrors the five ARBM components; resources, AR value, stakeholder benefits, responsibilities and revenue. Finally based on the discussion, the chapter presents guidelines and recommendation for Geevor to apply the ARBM and concludes by recommending a number of ARBM modelling principles.

### **8.2 The ARBM**

Irrespective of the industry context, all businesses are primarily founded on the need to create value and capture returns from that value (Shafer, et al., 2005), and because BMs represent this process in reality. BMs are considered crucial to business success and competitiveness (Magretta, 2002). Dating back to the 1950s (Bellman, 1957; Ovans, 2015), interest in, and adoption of BMs intensified as a result of the internet boom, when organisations embraced the concept to integrate technology into their operations (Afuah and Tucci, 2001; Osterwladar, 2004; Wirtz et al., 2016). Nowadays, BMs are recognised as effective tools to innovate, improve competitiveness, profitability (Al-Debei and Avison, 2010; Chesbrough, 2007; Teece, 2010; Zott and Amit, 2010) and sustainability in the face of heightened competition (Bocken et al., 2014; Thompson and Martin, 2010). BMs are also considered to be effective tools to help commercialise technologies (Chesbrough, 2010). In this way, the ARBM was developed as a tool to help cultural heritage organisations integrate AR to improve their offer and generate other benefits, such as securing additional revenue streams and attracting more visitors.

Reviewing BM literature was challenging because of uncertainty, born from confusion as a result of the variety of viewpoints and contexts from which BMs are researched (Al-Debei and Fitzgerald, 2010; Lambert and Davidson, 2013; Zott et al. 2010). Despite the fact from 2002 onwards the majority of research focused on developing a unified definition (Wirtz et al., 2016), it remains that no clear BM

definition exists, because BM scholars have failed to establish common agreement (Al-Debei and Avison, 2010; Shafer et al., 2005; Zott et al., 2010).

Nevertheless, the importance of BMs was clear, and as argued by Magretta (2002) no business can afford ‘fuzzy’ thinking about BMs. The importance of BMs exemplified by studies such as IBM, who found organisations that updated, renewed and changed their BM, focusing on consequential and sustainable management were more financially successful (Wirtz et al., 2016). Similarly, a number of scholars identified BMs as effective tools to secure and expand competitive advantage (Johnson et al., 2008; Wirtz et al., 2016; Magretta, 2002; Zott et al. 2010), and realise the value of technologies (Veit et al., 2014).

In a tourism context, securing and identifying competitive advantage was acknowledged to be especially important, because often it is characterised by high levels of competition (Tscheu and Buhalis, 2016; Ukpabi and Karjaluoto, 2016). This was revealed to be the case at Geevor, where stakeholders identified Geevor was facing an increasing pressure to differentiate and add value to continue attracting visitors. Such challenges were also recognised by tourism scholars, who have widely supported the need for tourism organisations to invest in, and integrate technologies to add value to the tourist experience, improving competitive advantage, longevity and success (e.g. Cranmer et al., 2016; Leue et al., 2014; Neuhofer et al., 2014; Tussyadiah, 2014; Yovcheva et al., 2013;), as well as overcome challenges imposed by decreasing government funding (Jung and tom Dieck, 2017; Lee et al., 2015). From interviews it was clear that Geevor face continuous pressure to modernise, update and improve their visitor experience, increase their competitiveness as well as secure additional sources of revenue to remain financially viable.

In the specific context of cultural heritage tourism, Tscheu and Buhalis (2016) suggested whilst AR presented a tool to obtain competitive advantage, how organisations created this advantage was unclear. They questioned the benefits AR presented to cultural heritage tourism, such as, what would be required from stakeholders and what elements were important to consider during the development process. Concluding that understanding these aspects was fundamental to create value and gain competitive advantage, commenting “only with the knowledge of how and where value is created can developers and providers create and implement

a successful solution" (Tscheu and Buhalis, 2016, p. 608). Yet it was acknowledged the topic remains underexplored in literature.

A review of literature confirmed a need to develop an AR BM to realise ARs full potential and enable cultural heritage attractions to explore, understand and implement AR to benefit from this potential. During interviews, support for and recognition of the need to develop a clear implementation strategy to effectively implement AR at Geevor was clearly expressed by stakeholders. In addition to stakeholder acknowledgment, and as previously identified in BM literature (e.g. Zott et al., 2010) during the transition from traditional to eBusiness many organisations faced a number of challenges as a result of high levels of uncertainty. In the same way, this study explored the transition from a traditional museum experience to an AR museum experience, which also presented uncertainties. During the transition, organisations had to innovate their BMs to move into the eBusiness marketplace. In a similar way this study outlined how Geevor should transition from a traditional to a AR museum experience. The ARBM plays a critical role in this process, supporting managers and identifying how Geevor should integrate AR.

The critical review of literature in chapters 2 to 4 confirmed the absence of an ARBM, through an examination of literature from three distinct areas. Despite substantial recognition of the potential AR presents to tourism and equally the importance of BMs, it was evident organisations remained unsure how to adopt and implement AR. The need for tourist organisations to adopt modern technologies was clearly articulated in research, but there was a gap identifying an AR BM to help translate AR's potential and the necessity for tourism organisations to implement innovative technologies to remain competitive and attractive, into actual value adding benefits. The need to develop an AR BM was highlighted by Jung et al. (2015), Lee et al. (2015), tom Dieck and Jung (2017) as key to moving AR toward meaningful implementation in tourism, but so far no AR specific BM has emerged. Therefore, developing the ARBM extended BM thinking into a new context.

BMs scholars have advised that BMs are essential to unlock the "latent value from a technology" (Chesbrough and Rosenbloom, 2002, p.529). Similarly, within interviews stakeholders suggested that to be successful AR would require their support and backing, highlighting the need for an implementation strategy or BM. Within BM literature, the need to make BMs explicit was clearly identified, for instance, V4 developers Al-Debei and Avison (2010) advised that technology does

not succeed by itself, but rather a consistent and effective organisational setting and structure are needed if the technology is to be successful and useful to its intended users. Thus, adopting a case study approach was considered crucial to develop the ARBM, in that Geevor provided a consistent and effective organisational setting and structure to develop the ARBM. Although none of the existing BMs examined throughout chapter 3 adopted a case study approach during development, in line with suggestion that organisational settings are essential to understand how technology, namely AR, could be implemented successfully and provide value to intended users, it was considered necessary to adopt a case study approach. This facilitated a detailed examination of the case of Geevor to gain a comprehensive understanding of multi-stakeholder perceptions to develop an effective ARBM.

Bouwman et al. (2008) developed the STOF BM (See Figure 3.5) in consideration of the unique characteristics presented by the tourism sector, namely intangibility, non-materiality, inseparability, heterogeneity and perishability. In this way the STOF BM shares similarities with the ARBM, in that these common features also characterise the AR tourist offering and experience. In acknowledgement of these characteristics, Bouwman et al. (2008) identified a need to differentiate between value for customers and value for providers. In the same way, the ARBM differentiated between value for visitors, represented by the 'AR value' component and value for stakeholders within the 'stakeholder benefits' component. This need to differentiate between different types of value, as exemplified by Bouwman et al. (2008) was revealed during the analysis of stakeholder interviews, which revealed a need to differentiate between existing value and the value introduced by AR. This differentiation and thinking (discussed in more detail within sections 8.3 and 8.4) emphasises the importance of developing the ARBM. In addition to extending BM thinking and theory into a contextually new area and demonstrating the applicability of the BM concept to AR use in the cultural heritage tourism sector.

During interviews, internal stakeholders in particular revealed that introducing new ideas or processes had to add to, not detract from the existing experience, and as long as the risks were low, stakeholders demonstrated support for AR adoption, recognising its potential, uses and value adding benefits. Stakeholder questionnaires validated the ARBM for Geevor, employing AHP to organise stakeholders perception into a hierarchy of preference, and therefore minimised the risk associated with integrating new technologies or services. Using a stakeholder approach, involving stakeholder interviews and questionnaires was considered

essential to gain stakeholder support for tourism development, especially the introduction of new technologies, because of stakeholders ability to influence decisions, options and sustainable growth (Lindberg and Johnson, 1997), impacting a museums ability to achieve their objectives (Legget, 2009), as well as to improve collaboration between stakeholders during the planning process (Sautter and Leisen, 1999). Yang et al. (2009) suggested it was essential to involve stakeholders from the start and include their perception in decision-making. Equally, Kamal et al. (2011) supported this was especially important when implementing new technologies. Bearing the importance of a stakeholder approach in mind and to “address the concerns of a wide range of stakeholders” when introducing new technologies (Hall and Marti, 2005, p.281). The ARBM was considered crucial to provide a holistic framework to synchronise multi-party, complex tourism networks and was developed to provide a framework to synchronise and understand relationships between stakeholders, to gain a more comprehensive understanding of how all elements of a system fit into a working whole (Al-Debei and Avison, 2010; Magretta, 2002). Moreover, the ARBM ‘stakeholder benefits’ component, outlines why stakeholders should have a “legitimate interest” in the achievements of objectives (Yuksel et al., 1999), which has been identified as essential to the long-term success and sustainability of tourism developments and technology adoption (Kamal et al., 2011; Hall and Martin, 2005).

In comparison to selected BMs examined throughout this study, the ARBM has a number of key differences. The ARBM provides a tool for managers and practitioners to approach and effectively implement AR to improve their existing offer and add value. Moreover, the ARBM was developed based on a stakeholder approach, which is considered essential to gain and sustain support. Whereas, other BMs such as V4 were developed based on thematic analysis of existing BM definitions and components, and therefore did not consider stakeholder perspectives. The V4 was useful to scaffold and provide themes to develop research questions and analysis for interviews providing focus to the interviewing phase. However, as revealed in interview analysis, most of the V4 BM components and sub-components were not applicable to business modelling in AR and in this way, whilst the V4 components provided focus to interview questions and analysis the V4 components were not directly relevant to the integration of AR in cultural heritage tourism.

BM literature revealed there was no ‘best’ way to design and develop new BMs, however, Drucker (1954) who developed the concept, suggested asking; (1) Who is the customer and what do they value? (2) What is the underlying economic logic that explains how value can be delivered to customers at the appropriate costs? Magretta (2002) added a third question (3) How do we make money? The ARBM components examine and answer all these (See Table 6.14). For example, the ‘Resources’ component examines core resources, identifying existing value, target markets, and their preferences, for example answering (1) Who is the customer and what do they value. Furthermore, the ARBM provides a framework to explore economic logic, and determine appropriate costs to deliver value to customers, revealing a number of potential revenue models. The ARBM also extends beyond these, by examining ‘responsibilities’ involved in AR implementation to ensure effective and ongoing support for AR and classifying ‘stakeholder benefits’ to increase engagement and support. In this way, as suggested by Casadesus-Masanell and Ricart (2010, p.5) the ARBM ensures alignment with organisational goals, encourages self-sufficiency and robustness, matching choices made to meet organisational goals, complement one another and form consistency.

Johnson et al. (2008) proposed that precision was key to building a good BM but agreed that achieving precision was difficult, yet, organisations that precisely fill their customer VP were generally more successful. Again, using a stakeholder approach, providing stakeholders’ with the ability to express their perception of the uses, benefits, barriers and concerns during interviews and questionnaires and therefore influence ARBM design, helped to precisely fill the VP. Within literature, McCabe et al. (2012) recommended involving tourists’ perspective, or in the case of this study, the visitors’ perspective (interviews), to create valuable experiences. In addition to this, stakeholders, more specifically internal stakeholders noted during interviews that they knew their visitors the best, and therefore had the ability to develop an AR application and experience to cater to their needs the most precisely. Thompson and Martin (2010) supported that good BMs clearly identify their products or services, for whom they are intended, and why these targeted customers would have a compelling reason to do business with them. Thus, the ARBM components allow managers to accurately understand their existing ‘resources’, strengths, tangible and intangible assets, value and target segments to assess how AR could add value to these, improving and building on the existing offer to create added value. In this way, the ‘AR value’ component enables managers to clearly articulate

added value of AR and new target markets, understanding what visitors want and how AR can be implemented to meet these needs, as well as complement organisational goals, such as attracting younger, wider audiences.

Chesbrough (2007, p.12) argued “a better business model often will beat a better idea or technology”. Instead of just developing the ARBM, this study also validated the proposed ARBM through questionnaires, analysed by AHP (see chapters 5 and 7) to provide strong proof of concept by organising components into a hierarchy of importance, to offer Geevor managers with areas on which to focus and prioritise when implementing AR. The next section will connect the outcomes of AHP analysis discussed in chapter 7, under the five ARBM components, with findings from previous studies (chapters 2 to 4). This will confirm the significance of findings, identify new insights and understandings, and highlight implications for practice and research, exploring the relationship of findings with results of previous BM, tourism and AR studies.

### **8.3 Resources**

The resources component of the ARBM was designed on the basis that to add value through implementing AR, it was first important to understand existing value. For tourism, this involved the tourist offer or experience, including intangibles rather than tangible products. AR enhances a user’s surroundings by adding a layer of digital information into the real-world environment. Therefore, to understand how AR can improve the current offer, it was considered crucial to first determine existing resources to understand how AR could add value to these whilst increasing competitiveness and enhancing the tourist experience. This was also voiced strongly by internal stakeholders.

The need to differentiate between different types of value was exemplified by Bouwman et al. (2008) during the development of the STOF BM (See Figure 3.5) which differentiated between value for customers and value for providers. The ARBM applied the same logic, because stakeholders revealed the importance of separating existing and added AR. This is represented in the ARBM ‘resources’ and ‘AR value’ components. More specifically, in relation to the B4U model, Faber et al. (2003) differentiated between intended and perceived value within their service design component, acknowledging the need to ensure intended value was translated into perceived value.

In comparison to the BMs examined throughout chapter 3, the resource component of the ARBM is most similar to the V4 core-competency, which involved the product-service offer. The ARBM adopted the RBV view, advocating that organisations are heterogeneous, resources and core competencies vary, but the uniqueness of an organisation can be captured in its BM (Morris et al., 2006). In line with this thinking, BMs represent the specific way resources are combined, ensuring resources are valuable, rare, imitable and non-substitutable (Morris et al., 2006). In this way, the ARBM ‘resource’ component shares commonalities with components of Thompson and Martin (2010), Teece (2010), Newth (2013), Al-Debei and Avison (2010) BMs outlined in Table 3.1.

Most existing BMs, assessed existing products and services and intended offer, combined in one component. For example, within the V4 value proposition component, examination of product-service (offered or intended to be offered), intended value element (value incorporated into the offering) and target segment (target segments and their preferences), occurred in one BM component. When developing the ARBM it was considered more productive to separate existing and added value, first determining existing strengths and value (e.g. ‘resources’) before exploring how AR could add value to these (e.g. ‘AR value’), to ensure AR was developed to answer customer needs, create added value, enhanced experiences and provide genuine utility. Teece (2010) supported the need for BMs to precisely fill the customer VP to increase their success. By separating value elements, it is argued the ARBM can more precisely build on existing strength to add value and create precise VPs.

In the world of traditional business, resources are tangible products or services. Whereas, tourism involves selling an experience, so resources at tourist attractions include organisational processes or strengths, in terms of how the organisation creates an experience. Adopting an activity systems perspective of BMs, Zott et al. (2010) outlined content for design elements should identify activities that should be performed. If applied to AR, this reiterated the need to separate existing activities (e.g. resources), from the potential of AR to add value to these activities (e.g. offer). This logic supports the thinking of Chesbrough (2007, p.12) who suggested “to innovate your business model, you must first understand what it is, and then examine what paths exist for you to improve upon it”. Based on these arguments the first two components of the ARBM (1) resources and (2) AR value, separate existing and added value and distinguish between the two.

A review of literature confirms there is no ‘best’ way to develop a BM because the components and functions vary depending on context and characteristics. In application to tourism and the adoption of AR, it was considered more important to define the value of existing resources before identifying how AR could enhance and add value. After all, there has to be a need for adopting AR to generate support and improve success. If there was no demand for AR, it would unlikely be a success. Below is an explanation of the five criteria identified in interviews and validated through questionnaires, for the first ARBM component; ‘resources’.

### ***Heritage Significance***

‘Heritage significance’ was voted Geevor’s most important resource, which was not unexpected given Geevor was one of ten Cornwall and West Devon Mining Landscape sites to receive UNESCO recognition because it offers universal value, housing extensive original and historically important components (UNESCO, 2016). Equally, Geevor have won awards for its authentic value and culturally-defining past (Coupland and Coupland, 2014). Because of this status and awards, Geevor management have focused on the need to protect and conserve authenticity for future generations. Recognising this, visitors commended Geevor for its ability to authentically educate about Cornish history, by providing a “snapshot” into the past. It was also identified because Geevor closed within living memory, it was a significantly important “living history” resource, to preserve history and increase appreciation of the culturally defined local area.

Masser et al. (1994, p.31) argued “heritage is not only something we want to hand down to future generations but also something we want to appreciate and experience to the fullest”. This also became clear during interviews because stakeholders had a personal connection to Geevor, their interest in preserving and maintaining its heritage significance was important. This was reinforced by stakeholders’ desire to continue Geevor’s legacy, by ensuring its ‘heritage significance’ was not forgotten and continued to be enjoyed by visitors for years to come. Many stakeholders involved in the research process were Cornish and had a close personal connection to mining. The majority of stakeholders (excluding visitors) grew up in the area, worked in mining or related sectors and were deeply affected by Geevor’s closure as a working mine. Therefore, their desires to maintain and preserve Geevor heritage significance were strong.

Stakeholders recognised that Geevor became the success it was by exploiting its ‘heritage significance’. Within literature, heritage has also recognised as one of the most significant components of tourism (Poria et al., 2003), after the demise and closure of traditional industries such as mining (MacDonald and Jolliffe, 2003), communities often turned to tourism as a tool to create jobs and raise the standard of living (Fleischer and Felsenstein, 2000; Sharpley and Sharpley, 1997; Smith, 2009). Therefore, it was common for culture and heritage to be exploited for tourism purposes, as well as to preserve the past by selling and retelling the past (Hardy, 1988; Miller, 1989). This was undoubtedly the case at Geevor, which now has a significant role as an employer, sustaining local services and generating revenue for the local area.

‘Heritage significance’ was one of Geevor’s marketing and selling points, therefore it was not unexpected that stakeholders considered it most important. This supported the argument made by Greffe (2004) that for local tourist bodies, heritage tourism and significance provide an opportunity to create a positive image for the area and improve national identity, while for locals it created a way to satisfy personal needs and motivations. This was found to be true within interviews, and a number of visitors appreciated and enjoyed learning about Geevor’s legacy and heritage significance, gaining a “snapshot” into the past.

### ***Education***

‘Education’ was identified by stakeholders as Geevor’s second most important resource. Within literature, it was proposed ‘education’ and ‘heritage significance’ are closely related since cultural heritage tourists are motivated by a desire to learn about the history and lifestyles of communities at a destination (Li and Lo, 2004; Richards, 2007; Timothy, 2011). Recognising this, Geevor have placed great emphasis on its educational resources, and as a result, have won numerous awards for educational excellence.

In addition, studies have found cultural heritage tourists are motivated and keen to learn about indigenous cultures and their traditions (Smith, 2009). Findings from Visit Britain (2010) supported that learning about history and culture have a strong influence on tourist’s choice of holiday destination. Likewise, Richards (2007) identified cultural heritage tourists tend to be highly educated, and highly educated individuals often have more of a desire to consume culture. Timothy (2011, p.27) reiterated this commenting “education can be seen as a stimulus for opening

people's eyes to various elements of the past and increasing a desire to experience historic places and cultural events". This was certainly true for Geevor, who have prided themselves on their educational resources, and a number of stakeholders revealed that developing their educational offer had been a recent focus, in recognition of the strength of the experience offered onsite to appeal to and engage different learning styles.

Moreover, Fonseca and Ramos (2011) suggested cultural heritage tourism has become increasingly popular as a result of improved education and an increasing desire for information as a reflection of societal change. In the case of Geevor, this was reflected by the claim educational groups were an important all-year round market. To meet the needs of such groups, stakeholders discussed a recent focus on developing, creating and delivering enhanced educational experiences. The success of which was exemplified by visitors noting Geevor's strength as a learning resource, and many identifying education as a reason and motivation to visit (See Figure 6.1).

### **Staff**

The 'staff' were considered the third most important resource at Geevor, recognised as a valuable asset because of their ability to deliver first-hand knowledge of their personal experiences which visitors can relate to. Stakeholders claimed human interactions created a more memorable, personal and informative encounter, than reading an information plaque and identified that 'staff' had the additional value of being 'real authentic' miners.

Tourism has been explained as an expression of human behaviour, and therefore it was identified as critical to understand visitor behaviour to ensure the right services, value and experience are created (Kim and Uysal, 2013). In the same way, Sharpley and Sharpley (1997, p.3) defined tourism as a "social activity", and Smith (2009) supported that the local community was an important contributor to tourist products. This mirrors and confirmed stakeholder's perception that the 'staff' are an important resource. Visitors, for instance, recognised the importance and benefit of the opportunity to interact with "real ex-miners", claiming it both provided more authentic insight and made the experience more relatable. Within BM literature Kleef et al's (2010) application of the BM canvas to AR, they identified two types of resource within the key resources component; technology and staff (See Table 3.7).

Therefore, the ARBM validation and identification of staff confirms Kleef et al's (2010) thinking, reiterating the importance of acknowledging 'staff' as a resource.

Moreover, within tourism literature, UNESCO (2009) promoted the importance of protecting and conserving intangible assets. Cultural heritage tourism, especially in rural locations, exploits "objects and buildings as well as intangible people" (Smith, 2009, p.94) or in the case of Geevor, the 'staff'. The ability of 'staff' to interpret the past and play the role of storytellers was identified as a challenge for many cultural heritage attractions and museums alike. Geevor has a particularly unique offering, by virtue of having only closed as working mine in 1990, and reopening as a tourist attraction in 1993, making it recent 'living' history, because of the fact the 'staff' still work there. The high-quality interpretation and personal storytelling provided by the 'staff', as argued by Timothy (2011), add considerable value to Geevor, giving it a competitive advantage. However, considering the unique resource and value of 'staff', it could be questioned why 'staff' were not ranked higher, hence the importance of reiterating that visitors were not involved in questionnaires, therefore their perception of the importance of 'staff' was not included in AHP analysis to influence ranked outcomes.

### ***Uniqueness***

Interestingly, 'uniqueness' was voted fourth most important, but only 0.3% lower than 'staff'. 'Uniqueness' related to the fact Geevor has not changed since its closure as a working mine; it remains an untouched piece of history and stakeholders identified value in the fact the site is complete, untouched, and in a fully preserved state. Although within interviews, stakeholders did point out that in part this was because Geevor has Protected Monument Status so its physical structures could not change. Nonetheless, visitors appreciated and valued the uniqueness of the site, explaining it provided an authentic insight into the lives of miners, mining traditions, and how Geevor would have been during its mining days.

In relation to literature, 'uniqueness' can be associated with the concept of authenticity, or inheritance from the past, for the benefit of the present (Fonseca and Ramos, 2011). It was found that cultural heritage tourists seek authenticity, uniqueness, originality and quality destinations (Chhabra et al., 2003; Halewood and Hannam, 2001), and one of Geevor's great strengths remains its authentic and 'unique' representation of the past. For example in the miners' Dry, with spray paint on the lockers stating "The End, 16/2/90", written by miners on the last day of mining.

In this way, it was clear from interviews visitors appreciated the originality, integrity, and authenticity of Geevor.

Yet, it has been criticised that some cultural heritage attractions focus on ‘soft’ heritage (Swarbrooke, 2000), sanitising, glorifying or softening the past to entertain tourists rather than shock or horrify them during their leisure time (Smith, 2009). That was not revealed to be the case at Geevor, which provided an authentic, real and ‘unique’ experience, as demonstrated both from interviews and AHP ranking. BM literature identified that to increase BM success, organisations should reduce inimitability, making it hard for competitors to isolate and replicate individual BM components (Chesbrough, 2007; Kindström and Kowalkowski, 2014). In this way, the uniqueness of Geevor is a rare and inimitable resource, which competitors would not be able to replicate.

### ***Range of Activities***

‘Range of activities’ was considered significantly (10.8%) less important in comparison to other resources, despite the fact that stakeholders regularly made reference to the ‘range of activities’ on offer at Geevor as a selling point, identifying there was a “comprehensive offer” and something for everyone. Smith (2009, p.94) identified often cultural heritage attractions focused on their “historic attractions, buildings, and objects, as well as intangible people in their homes, partake of their traditions and cultural practices”. This was evident in the case of Geevor and visitors were particularly positive about the range of things to do, identifying Geevor was great for both children and adults. But, again, it should be stressed that visitors did not participate in the questionnaire; therefore, their influence on the rankings was not incorporated.

Literature revealed a number of difficulties defining what features and characteristics rural and cultural heritage attractions entail (see Appendix 15). For instance, McAreavey and McDonagh (2011) claimed that rural tourist attractions are complex and multifaceted with a wide range on offer, appealing to a variety of different interest groups. Based on this, Huang et al. (2016) suggested rural tourist attractions should bundle activities together, rather than focus on one type of activity, in the hope of increasing competitiveness and motivating visits. However, managing attractions such as this, like Geevor, is complex and requires a careful balance between conservation and visitor management. Supporting this, a number of stakeholders expressed Geevor should make more effort to market specific

elements of their offering, such as their educational assets, or promote more of their social history because a number of stakeholders felt instead they focused on their mechanical industrial offering.

#### **8.4 AR Value**

One of the main differences of the ARBM in comparison to traditional existing BMs is the separation of products and services, from added value. The purpose of introducing AR at Geevor was to overcome some of their challenges whilst adding value and enhancing the visitor experience in an attempt to secure and expand competitive advantage. Although Geevor has a positive visitor relationship, as a council-owned and publically funded venture, they faced growing pressure to remain economically viable as a tourist attraction (Coupland and Coupland, 2014), which placed greater emphasis on using technologies, namely AR to add value and improve their existing offer.

When comparing the ARBM to other BMs, for instance the V4 BM, ‘AR value’ is most closely related to the ‘intended value’ element of the V4’s VP component, which described how products or services will introduce value. In addition, in line with Magretta’s (2002) BM description (See Table 3.1), BMs should tell a logical story, explaining what customers value. This also supports the separation of understanding existing resources prior to defining AR value, and how AR could create a more valuable experience. Similarly, Kamoun (2008) suggested BMs are the way an organisation creates and captures value from new services, products or innovations. In this way, the ARBMs, ‘AR value’ component complements this thinking, because it explored new value introduced by AR, to understand ARs ability to improve and enhance the visitor experience and create other, economic, cultural and social benefits. The ‘AR Value’ component promotes BMI, considered essential to long-term success and sustainability (Amit and Zott, 2010), and increased business performance (Zott et al., 2010).

BM scholars advised that organisations should adopt a holistic approach to business modelling, to improve competitive advantage, reducing imitability and making it difficult for competitors to isolate or copy individual elements of their BM (Chesbrough, 2007; Kindström and Kowalkowski, 2014). The need for tourism organisations to adopt innovative technologies has been clearly identified within literature, in order to increase future competitiveness and attractiveness (e.g. Han et al., 2014; Tscheu and Buhalis, 2016). In this context, “innovation is about doing

things differently from the norm. Therefore, a BMI is a framework or recipe for “creating and capturing value by doing things differently” (Afuah, 2015, p.4). Hence, the implementation of AR could be argued as innovative, introducing changes, and “doing things differently” to create and capture value. In this way, the ‘AR value’ component of the ARBM was designed to promote innovation, encouraging stakeholders to explore and recognise how to do things differently, using AR to improve and overcome existing challenges.

Yet, BMI was identified as hard to achieve, because, despite its importance, Chesbrough (2007; 2010) suggested many organisations do not understand their existing BM, and therefore cannot identify where to improve. Bearing this in mind the ARBM ‘resources’ promotes a need for stakeholders to determine their existing value, and the ‘AR value’ helps identify ways in which AR could be introduced innovatively, to create added value. Hayes (2009) supported that AR value propositions should seek differentiation, to increase competitiveness, focusing on being innovative and building new ways to create customer value. Importantly, Heimo et al. (2016a) noted a need for organisations to integrate AR in such a way it provides what visitors want, fulfilling a genuine want. The next section examined the new offer and potential of AR to add value.

### **Sustainability**

Literature has widely discussed the benefits of AR for tourism, cultural heritage tourism museums and education (see Table 2.1, to 2.4). Integrating AR in cultural heritage tourism is considered a tool to increase competitiveness (Tscheu and Buhalis, 2016). Equally, sustainable tourism development and the need to create sustainable practices has been widely discussed within tourism literature (e.g. Smith, 2009; Swarbrooke, 1999; Sharpley and Sharpley, 1997), however previous studies have failed to identify the benefits and potential of using AR to increase the ‘sustainability’ of tourist attractions, like Geevor. Thus, the use of AR in tourism to increase ‘sustainability’ emerged as a newly identified value.

BM literature emphasised the need to develop SBMs (see Section 3.9). Bocken et al. (2014) suggested that SBMs are essential to support organisations to operate in such a way that minimises their negative impact on society and the environment, whilst promoting social, environmental and economic benefits for both internal and external stakeholders. In this way, scholars discussed the need to develop SBMs

that create benefits for the environment as well as socially, culturally and economically for stakeholders (Morioka et al., 2016; Schaltegger et al., 2015).

In a rural cultural heritage tourism context, Smith (2009) argued that the sustainability and economic viability of attractions depended largely on what was offered, by whom, and what value-added products were provided. In the case of Geevor, AR is the value-adding product, recognised by stakeholders as a tool to enhance and improve tourist's experiences. However, despite expressing support for AR, stakeholders noted the importance that AR was implemented to add value to, not detract from, the existing experience. The need to integrate sustainability into a BMs value creation process was recommended by França et al. (2016). Yet, Rohrbeck et al. (2013) suggested often organisaiions fail to adopt a collaboraive network, unifying stakeholders to achive sustinability. In this respect, the process of AHP unified stakeholders preference indicating stakeholders thought AR should be intergrated to imporve Geevors 'sustainability' and build sustainability into the value creation process. In line with this, Baumgartner and Korhonen (2010) and Osterwalder and Pigneur (2013) claimed that BMs that addressed 'sustainability' increased their competativeness and created sources for innovation.

However, in a tourism context, 'sustainability' and achieving sustainable development has been subject to much debate and criticism. For instance, McAreavey and McDonagh (2011) criticised that 'sustainability' was a social construct, reflecting a set of idealised aspirations, to which stakeholders continually align to their strategic objectives. It has also been critiqued that tourist attractions often claimed to be 'sustainable' but never achieved sustainability (McAreavey and McDonagh, 2011). Therefore, highlighting the importance for Geevor to outline their strategic objectives, and to use AR to add value.

In attempting to define sustainable tourism development Swarbrooke (1999, p.13) claimed that tourism should be economically viable without destroying the resources on which the future of tourism will depend "particularly the physical environment, and the social fabric of the host community". In line with this, stakeholders perceived AR could be used to help protect Geevor, whilst preserving knowledge, creating an enhanced experience and generating revenues. Using virtual signage to improve interpretation without affecting the environment or disturbing Geevor's preserved state, was proposed by stakeholders and used in this way, they believed AR would improve Geevors 'sustainability', making it more environmentally friendly, whilst

increasing interpretation and overcoming some of Geevor's environmental challenges.

Although Han et al. (2014) and Yovcehva et al. (2013) previously recognised AR's potential to reduce the requirements for physical signs. Haugstvedt and Krogstie (2012) and Kalay et al. (2007) also argued AR could help prevent the degradation of cultural heritage sites, particularly at sensitive and outdoor sites such as Geevor. In addition, Jung and Han (2014) commented that attractions could exploit the virtual space enabled through AR, as an alternative way to provide information without negatively impacting the environment, whilst overcoming restrictions limiting the use of information signage. Similarly, Alberti and Giusti (2012) noted the interdependency and compatibility between conservation of cultural heritage and its economic enhancement, especially in rural areas, and recognised AR as a tool to achieve both. However, none of these studies identified the link to 'sustainability' and the use of AR to improve 'sustainability'. Whereas, stakeholders noted potential to introduce AR virtual signage to provide better interpretative materials, allowing visitors to get more from their experience, creating a more sustainable option to improve interpretation without negatively impacting the environment. Yet, as previously identified in literature, AR is often limited by tracking technology and 3G connectivity, therefore to avoid user dissatisfaction, which could detract from the experience (Kounavis et al., 2012) these issues would have to first be overcome to ensure if used in this way, AR would add value, and not create visitor frustration, negatively impacting on the visitor experience.

Preserving knowledge was identified as another area where AR could be introduced to improve 'sustainability'. Previous studies have explored the use of AR to replace traditional tour guides and brochures (Fino et al., 2013; Kounavis et al., 2012; Pang et al., 2006), but do not identify its ability to preserve knowledge, and therefore sustain the authenticity of the visitor experience. Stakeholders recommended that AR "digital people" could be modelled on the miners to recreate the experience they provide, using their voices and storytelling abilities. It was believed these AR "digital people" or avatars would be the perfect substitute for real people in instances when the staff were unable to interact with visitors, or in the future, ensuring visitors received the same level of experience, integrity, authenticity and originality as visitors on current tours. Equally, during interview, several stakeholders identified the potential for AR tours to reduce commitment associated with participating in tours, eliminate time constraints and reducing the need for additional staffing. Many

of these AR values have also been identified in previous literature, for example the availability to change the view of surroundings, context-aware experiences, exploration, mobility, navigation and orientation presented in Table 2.1.

Moreover, stakeholders recognised the potential of AR to complement local and regional development policies, increasing business opportunities and revenue potential. They considered AR would create more money, which could then be invested back into conservation and preservation of the area. Overall, 'sustainability' was ranked 6.3% more important than 'education', which demonstrates the importance placed by Geevor on improving their sustainability to ensure longevity and continued competitiveness, and the recognition by stakeholders of AR as a tool to achieve this. In the same way, Jung and Han (2014) identified AR as a way of obtaining a competitive advantage.

### ***Education***

Considerable research attention has focused on the benefits of AR in education (e.g. Billingham and Duenser, 2012; Dede, 2009; Dunleavy et al., 2009; Wu et al., 2013) and most AR applications involve an underlying educational theme. Stakeholders also recognised AR's educational potential, ranking it second most important and discussing a number of ways AR could enhance visitor's learning experience, such as; bringing Geevor back to life, engaging wider audiences and personalising content to different knowledge levels, most of which are previously identified in the literature (See Section 6.4.1.2. and Table 2.4).

Previous studies have praised AR's ability to create contextual and on-site learning experiences (Johnson et al., 2010; Yuen et al., 2011) and enhance learning outcomes (Bower et al., 2014; Lee, 2012). Stakeholders reinforced that AR could effectively help visitors appreciate the bigger picture, gaining a broader understanding of Geevor. In a similar way, research has discussed the benefit of AR in helping individuals grasp complicated concepts, relationships, and connections, by providing visual and interactive learning, providing superior cognitive support (Bower et al., 2014; Dunleavy et al., 2009). This was also recognised by stakeholders, who identified that AR would help visitors understand and appreciate the site as it used to be. In addition, mine guides felt that AR would improve the efficiency and effectiveness of their role, speeding up the explanation of complex processes using AR animations. This was also supported in the literature, with a number of scholars recognising AR's ability to provide a new and

exciting way to interact and share information (e.g. Kesim and Ozarslam, 2012; Santos et al., 2014).

During interviews, it was identified that Geevor attracts many educational groups, and the educational team, in particular, felt AR would facilitate site-wide learning, extending beyond classroom techniques making ‘education’ an immersive and fun experience. These benefits were also supported by scholars such as Billinghurst et al. (2001) and Chen and Huang (2012) who argued MAR overcomes time and place limitations, and, because of the seamless interaction between virtual and real-world environments, AR was superior to traditional classroom teaching methods. Stakeholders noted AR would be particularly beneficial to children, who they suggested do not read information plaques and therefore AR would enable them to “see history”. In a similar way, stakeholders identified AR as a tool to create and deliver content tailored to different knowledge levels or interests, for visitors who wanted a ‘flavour’ of Geevor, in addition to those who desired specific and detailed information on particular elements. This was also recognised in literature (e.g. Fino et al. 2013; Kounavis et al., 2012; Kourouthanassis et al., 2015).

Overall, stakeholders recognised many benefits presented by AR to improve ‘education’, the majority of which have been previously identified in the literature (See Table 2.4). It was believed AR would have a significant and positive impact at Geevor, increasing engagement and site interaction, adding an element of fun, as well as being factually educational. These findings confirmed results from previous studies that suggested AR had a positive influence on education and learning, increasing learning outcomes and engagement.

### ***Monetary Benefits***

Han et al. (2014) claimed the number of tourism organisations that have demonstrated AR’s impacts in terms of revenue is limited. Equally, to understand AR’s economic potential, Jung and Han (2014) identified further research was necessary. However, Stakeholders recognised the potential of AR to increase ‘monetary benefits’, ranking it the third most important AR value offering. But it is important to point out that it was only ranked 0.1% less important than education, identifying that stakeholders considered both ‘education’ and ‘monetary benefits’ more or less equal.

Contrary to Skeldon (2011), who argued the commercial opportunities of AR are vast but not obvious, stakeholders identified a number of AR monetary benefits.

Despite the fact, hand-in-hand with the absence of research exploring AR BM's, the majority of studies have also failed to discuss the 'monetary benefits' of AR adoption. Yet, recently, Heimo et al. (2016a) proposed a few potential MR revenue models, by synthesising video game business logic and mobile ecosystem BMs. Although, these revenue models were developed for application of MR in museums and cultural heritage travel, and while several interesting points were identified, they are not AR-specific. Likewise, Inoue and Sato (2010) and Kleef et al. (2010) both proposed a number of potential ways to gain revenue from AR, based on examples of existing revenue models, but again these were not developed specifically for AR. Hence, it remains true that no studies exploring AR's 'monetary benefits' have been identified.

One reason for this could be attributed to the fact that most AR adoption studies (e.g. Chung et al., 2015; Haugstvedt and Krogstie, 2012; Jung et al., 2014) are conceptual, examining the potential of AR based on evidence from trials or prototypes, rather than actual long-term implementation. AR is still evolving, meaning its true potential and benefits are yet to be discovered. Likewise, the absence of an AR BM to guide implementation has delayed adoption in many sectors, particularly tourism. Whilst, some industries, such as advertising and marketing have reported financial benefits of AR implementation (Neagle, 2013; Thompson, 2010), tourism research is yet to assess AR's true economic potential.

From a BM perspective, Zott and Amit (2010) suggested that the purpose of BMs was to exploit business opportunities by creating value for all stakeholders involved and generating a profit. However, in application of AR to the BM Canvas Kleef et al. (2010) claimed value does not have to be financial. Yet, stakeholder ranking of 'monetary benefits' as third most important implies that financial value would be an important focus of the ABRM for Geevor. Stakeholders believed that AR could increase revenue in a number of ways, most predominantly attracting wider audiences, therefore increasing ticket sales. It was considered AR could help create a connection between the museum experience and the café or shop, to increase awareness, interest, and customer retention, driving traffic through to improve sales. The suggestion of linking the museum experience to the on-site businesses (Café and shop) presents a potential AR 'monetary benefit' that has not previously been identified by research and therefore creates new knowledge, contributing to existing theory.

Tourism has been used, and is widely recognised, as a tool for economic development (Cooper, 1993; Gursoy et al., 2002; Ko and Stewart, 2002; Mansfield and Ginosar, 1994). In rural locations, the role of tourism is even more important, and communities often depend on the income it generates (Smith, 2009), to create jobs and raise the standard of living (Fleischer and Felsenstein 2000; Sharpley and Sharpley, 1997). Tourism is an umbrella-industry or conglomerate of individuals and organisations involved in the production and distribution of tourism products (Kärcher, 1997; Lundberg, 1990; Sharpley and Sharpley, 1997). Therefore, the local community plays an integral role in providing the tourism product (Smith, 2009). In this way, tourism becomes part of the ‘economic fabric’ of rural communities, regions, and countries (Cook et al., 2014). So, if AR can increase ‘monetary benefits’ it would have an increased beneficial impact on both Geevor and local communities.

‘Monetary benefits’ is closely related to the theme of sustainable tourism, which has received much research attention, in a rural tourism context. McAreavey and McDouagh (2011) claimed that in rural areas, tourism benefits locals economically, socially, and culturally. Economically, it provided opportunities for business growth, employment, and supplementary income options. It was considered that if Geevor linked the museum AR experience to the café by providing an AR supplement explaining that the same recipe used to make miners pasties a hundred years ago are still used to make those sold in the café, it would increase traffic and spend in the café. In turn, it was believed this would, for example, create increased demand for local produce, increasing farmer’s income.

Similarly, if the AR museum-experience generated more interest in local produce, such as tin jewellery it was suggested this would increase sale and demand in the shop, thus benefiting local craftsmen and suppliers. In this way, AR would also help to positively revive traditional activities by creating value-added commercial channels (Fonseca and Ramos, 2011). It has also been identified that cultural heritage tourist’s socio-economic position lets them stay longer and spend more money at destinations, in comparison to other tourists (Timothy, 2011), reinforcing the commercial potential and opportunities of linking the AR experience to on-site businesses for ‘monetary benefit’. However, it was important to note that since this study focused on perceptions, thus results remain theoretical, demonstrating potential and opportunities because without implementing and testing AR, it was not possible to determine the true economic value and ‘monetary benefits’.

## ***Interpretation***

Exploring and interpreting history in compelling ways has been identified as a challenge, especially in outdoor environments (Keil et al., 2011). Stakeholders also recognised this, identifying the difficulty of interpreting the whole site, and thus proposing AR as a tool to improve ‘interpretation’. ‘Interpretation’ was ranked fourth most important, and stakeholders expressed a number of ways AR would improve visitor’s interpretation of the site. For example, it was believed that AR would create a multi-sensory experience, providing different forms of interpretation. This benefit has already been confirmed by Aluza-Sorzabal et al. (2006) and Agapito et al. (2012) who identified that, although museums often focus on visual interpretation, AR provides an option to apply to all senses. In this way, tom-Dieck and Jung (2016) and Leue et al. (2015) also claimed AR adds value to museums, facilitating the visualisation of information in different formats, to create an enhanced experience (Aluza-Sorzabal et al., 2006; Jung and Han, 2014).

Moreover, stakeholders’ perceived AR could help create context-aware experiences based on information from the user’s real-world location. Previous studies such as Chou and ChanLin (2012), Yovcheva et al. (2013) and Höllerer and Feiner (2004) also identified this. Stakeholders claimed AR would help avoid visitors being overloaded with non-profiled information. This has also been identified in previous studies as a benefit of AR, avoiding cognitive overload by providing contextual experiences (e.g. Bower et al., 2014; Kounavis et al., 2012; Rey-López et al., 2011).

One of Geevor’s challenges is providing complete site ‘interpretation’, because the site has been granted Protected Monument and UNESCO status, limiting signage use and changes to the physical environment. In addition, Geevor receives limited funding, and cannot afford to hire additional staff to interact with and answer visitor’s queries. This presents a challenge as much of Geevor remains without interpretation, and, as recognised by Smith (2009), many cultural heritage tourists view themselves as explorers. Thus, AR was perceived as a method to increase interpretation whilst also allowing visitors to freely explore the site, as well as saving money by not having to hire additional staff.

Johnson et al. (2010) argued that museum education has always been in the business of AR, creating bridges between objects, ideas, and visitors, but only since the technology has

progressed has this become possible in reality. Stakeholders recognised that AR would allow visitors to fully appreciate and interact with objects, such as moving 3D AR models with their hands. This benefit of AR ‘interpretation’ has already confirmed by a number of scholars (e.g. Damala et al., 2007; Santos et al., 2014; Kesim and Ozarslam, 2012) who identified that AR enhances the way users see and interact with objects, allowing them to explore them in different ways. Building on this, and an area not discussed in previous studies, visitors suggested that because AR can provide different forms of ‘interpretation’ it has a benefit and uses for those with visual or hearing-impairments or learning difficulties. It was believed that AR could help make Geevor more widely accessible, interpretative, and enjoyable for every type of visitor, adding value, improving understanding and importantly enhancing the visitor experience.

On the same theme, stakeholders perceived that using AR would make ‘interpreting’ exhibits and objects more enjoyable, entertaining and exciting. Research also supported this notion, such as Haugstvedt and Krogstie (2012) who identified that AR offers a way to make the extra materials accompanying exhibits and collections more interesting, engaging and educational. Similarly, Palumbo et al. (2013) claimed that to sustain and maintain competitive advantage, museums have to create ‘info-cultural-tainment’ experiences, introducing innovative technologies, such as AR. Many of these AR interpretative benefits discussed in interviews closely relate to ARs educational potential, and there is much overlap between the themes of ‘interpretation’ and education (e.g. See Table 2.4).

Few previous studies have discussed the benefits of AR to facilitate interpretation in different languages. Although this is one area visitors suggested was particularly important and would add considerable value to their experience, worth noting because, over the two-day interview period, 30% of visitors interviewed were international (See Table 6.3), This confirms the importance and potential of using AR to improve language interpretation.

### ***Marketing***

‘Marketing’ was ranked fifth, which was interesting in comparison to previous studies which have widely discussed ARs marketing potential (e.g. Jung and tom Dieck, 2017; Kasinathan et al., 2016; Selvam et al., 2016). One reason for this may be that stakeholders did not fully comprehend or understand what the marketing potential

of AR was. Alternatively, in relation to the other AR VPs, they simply did not consider it as important.

In literature, AR is widely recognised as a tool to improve marketing and therefore competitiveness. Yuen et al. (2011, p. 124) argued that “in no other field has the AR experience exploded in such a huge way than in advertising and marketing”. Because of AR’s ability to create tailored, context-aware and location-based material it has been praised as the perfect marketing tool and marketing has emerged as a key application of AR (Hassan and Jung, 2016; Nguyen, 2011; Palumbo et al., 2013) which facilitates the integration of digital content into the real-world (Craig, 2013).

In interviews, stakeholders discussed many opportunities for implementing AR at Geevor to improve its marketing presence, increase the profile of the site and visibility of promotional materials. Furthermore, they suggested AR would help attract new markets, raising the profile to generate more visits and help sustain an all year-round market by appealing to different types of visitors. In this way, it was noted that AR would not only improve Geevor’s ‘marketing’ presence but also help overcome some of its challenges, such as combating seasonal visitor numbers.

Stakeholders recognised that Geevor is not very accessible or appealing to younger audiences currently, hence identifying AR’s potential to increase engagement and interest. This was supported by Yuen et al. (2011) who found that AR creates a new exciting way to engage and attract customers, providing cheaper, better solutions and services. Likewise, it has been established that AR can help engage the younger tech-savvy generation (Craig, 2013), as well as older users (Celtek, 2015). This is particularly important in a rural location, such as Cornwall, where engaging younger audiences was considered crucial by stakeholders to not only to increase visitor numbers but also to ensure that they continue to interact and visit attractions in the future.

However, stakeholders identified that traditional marketing materials are still important, in addition to AR content. A study by Yovcheva et al. (2012) also reported this, identifying that some tourists still preferred traditional sources of information, such as paper-based materials and guide books. Likewise, although slightly outdated a study by ATLAS, in 2007, found that guidebooks were the third most popular source for travel information, and their use has continued to rise, despite

the internet. Bearing this in mind, it was suggested that AR should be offered as a supplement and addition to Geevor's existing marketing material.

Another benefit identified in both literature and during stakeholder interviews was the potential of using AR to introduce a pre, during and post experience. In this way, AR would enable organisations to follow a user through the whole journey (Palumbo et al., 2013), as well as measure the success of marketing efforts (Liao, 2015). In addition to engaging and reducing uncertainty at the start to increase visits, providing an enhanced experience during, and allow visitors to recall or return to information reliving the experience after. It was believed that used in this way AR would add value to Geevor, increasing its competitiveness. However, the true potential of AR marketing in tourism remains to be understood, and it has been argued that AR marketing is still a niche, experimental marketing medium (Jensen, 2014).

### ***Navigation***

Within tourism, AR has received much attention for its orientation and navigational abilities (e.g. Chung et al., 2015; Dredge, 2011; Jung et al., 2015; Marimon et al., 2014; Martínez-Graña et al., 2013b; Pang et al., 2006; Takada et al., 2009; von der Pütten et al., 2012; Yovcheva et al., 2012; Yuen et al., 2011). One of the main reasons that AR has been widely accepted and researched in the tourism context is based on its practical ability to allow tourists with little or no knowledge of their surroundings to naturally and realistically experience it (Chung et al., 2015; Martínez-Graña et al., 2013b; von der Pütten et al., 2012). As far back as 2005, Fritz et al. identified within cultural heritage tourism settings, AR allows tourists to explore unfamiliar surroundings in an enjoyable and thrilling way. Nowadays AR is still praised for its navigational abilities (Van Krevelen and Poelman, 2010).

A number of MAR applications have been developed to aid tourists in exploring destinations and are considered one way for attractions to gain a competitive advantage, by providing personalised contextual information based on a user's location and surroundings (Haugstvedt and Krogstie, 2012). Therefore, it was interesting that stakeholders ranked 'navigation' second to last important AR value. This may be because personally they know the site well and do not consider 'navigation' an issue or it could be because they were not fully aware of the navigational potential of AR, although, during the interview, many stakeholders

recognised AR's navigational and orientation potential suggesting it could help visitors explore the site effectively and efficiently.

During interview a number of stakeholders suggested creating AR-annotated maps to help exploration of the site, but also improve awareness of facilities to potentially drive sales and increase traffic in the café and shop. In addition, AR was seen as a possible tool to improve visitor and site management, encouraging visitors to follow specific routes, avoid overcrowding certain areas and explore the site much more efficiently and effectively. In this way, it was perceived that AR could help organise visitors, and improve the flow of people around the site by avoiding congestion and overcrowding in specific areas, such as waiting areas. This would in turn increase visitor satisfaction and enjoyment of the site, adding value to the visitor experience, in addition to minimising environmental damage. This was also identified in a study by Fino et al. (2013) which found AR reduced negative impacts onsite and helped alleviate overcrowding.

### ***Gamification***

Contrary to gaining much research focus, stakeholders did not consider AR 'games' as least important. In comparison to other potential VPs offered by AR, 'games' were least preferable, regardless of the fact, 'games' are closely related to education, by virtue of the fact that they combine entertainment and learning.

Research interest in gaming has been driven by the need to offer new experiences (Viana and Nakamura, 2014), entertainment (Pucihar and Coulton, 2014), and games have been identified as powerful mediators of learning (Rieber, 1996). AR location-based games provide a link between real and virtual environments enabling mobile and location games to be pervasive and apply to any situation in life (Weber, 2014). However, games focused on learning have been labelled as boring (Bellotti et al., 2009). Equally, because the potential and actual benefits of AR implementation in tourism are yet to be understood, stakeholders may not be sure how gaming could enhance the visitor experience. Alternatively, they may have thought that museums should focus solely on educating and this should, therefore, remain the predominant focus.

Despite this fact research suggests AR games have enormous educational potential combining fun and entertainment (Froschauer et al., 2010; Weber, 2014). It was suggested that once AR has been established successfully at Geevor and

stakeholders recognise its education value, the use of gaming should be reconsidered. Moreover, it is important to note the demographics of stakeholders. While some had a good understanding of AR, others identified they were not very technically savvy and would require support to use technology. Based on this, it could be implied that a number of stakeholders did not comprehend the value of AR games since they were not users of technologies themselves.

### **8.5 Stakeholder Value**

In comparison to the selected BMs, the ARBM places greater emphasis on generating value not only for visitors but also stakeholders, to increase support for AR implementation in the long-term. While other BMs do identify the need to capture value (e.g. Andersson et al., 2006; Saebi and Foss, 2015; Shafter et al., 2005; Voelpel et al., 2005) they do not explicitly identify a need to outline stakeholder value (See Table 3.1). Despite the fact in both a tourism context and for BMI, stakeholder support is crucial to success. In tourism, complex value networks with numerous stakeholders collaborate to produce the end-product. Thus, BMs are recognised as essential tools to align functions (Al-Debei and Avison, 2010), as well as synchronise and understand the relationships between stakeholders (Livi, 2008), and encourage organisations to adopt a holistic outlook (Gleeson, 2013).

Timmers (1998) identified that BMs should outline a description of potential benefits for various stakeholders. Similarly, Gordijn et al. (2000, p.41) claimed that a BM should answer questions as to “who is offering what and to whom, and what is expected in return?” Therefore, in comparison to existing BMs, the ARBM outlined the stakeholder value of AR implementation, highlighting what benefits stakeholders should expect. Whereas most BMs focus on creating value for the customers or making economic returns (See Table 3.1), AR is about adding value, and for stakeholders to support the process it was considered fundamental that AR also generated value for stakeholders.

The ‘stakeholder value’ component of the ARBM summaries the structure and stakeholders required to implement AR effectively. As discussed in chapter 4, an analysis of Geevor’s stakeholder network revealed five groups with an impact on, and interest in, the attainment of Geevor’s goals and strategies. Based on this, stakeholders identified their roles and existing responsibilities, to determine strengths and skills. This revealed most of Geevor’s processes were performed in-house, mainly due to funding limitations. However, it was clear external stakeholders

such as the Cornwall Museums Partnership and Cornwall Council have an active and positive interest in Geevor, offering support and funding where possible to ensure its continued success. This supports an argument made by Smith (2009) that rural tourism attractions are perhaps the best example of stakeholders being directly engaged in the shape, execution, and profits made from the tourist product. Moreover, in a study of a small cultural heritage museum, tom Dieck and Jung (2017, p.1) stated “it is imperative to explore the perceived value of AR from multiple stakeholders’ perspectives to ensure the long-term viability of technological innovations in small cultural heritage organisations”.

With regard to AR adoption, Cornwall Council, who own the site, and Pendeen Community Heritage (Geevor Trustees) who manage the site, demonstrated their full support toward AR implementation. In comparison to other tourist organisations Geevor’s stakeholder structure is fairly simple, maybe because of its small organisational scope. However, equally, this made it even more crucial for stakeholders to understand the benefit that AR presents to Geevor and support implementation. There was a common understanding that tourism benefits the community (Gursoy et al., 2002; Ko and Stewart, 2002), and since Cornwall is a deprived area with high levels of unemployment, Geevor plays a key role in the local economy and community. Yet, as argued by Plog (2001), tourism carries the seeds of its own destruction, if not managed effectively negatives can outweigh positive benefits. Ko and Stweart (2002) supported that without effective planning and community support for tourism developments it can cause unplanned and unmanaged development, and, although Geevor is already an established tourist attraction, support is fundamental.

Thus, stakeholder’s support for tourism development was essential to ensure that the right services and experiences were offered to the tourist (Kim and Uysal, 2013). Within interviews, Geevor’s manager reiterated this, highlighting that stakeholders were the ones who know their customer the best and could ensure that the right AR experience was developed to engage and attract every visitor. Fundamentally, stakeholder support was important, because of their influence on decision-making, management options and sustainable growth (Lindberg and Johnson, 1997). Bouwamn (2002) also supported the need to identify benefits, not exclusively for customers, but all those involved.

Likewise, from a BM perspective, BMs act as a vehicle to demonstrate the appeal of a venture, attracting investors and resource providers (Morris et al., 2006). Therefore, it was important to demonstrate stakeholder benefits, to encourage collaboration, support, and funding prior to implementation. Thus, Geevor stakeholder benefits as identified in interviews, are discussed below, in order of ranked importance:

### ***Preserve Knowledge***

'Preserving knowledge' was ranked as the most important stakeholder value. In a review of the literature, the use of AR as a tool to preserve knowledge was not previously identified. Although tom Dieck and Jung (2016) and Selvam et al. (2016) suggested that AR was capable of preserving history for the enjoyment of future generations (See Table 2.3). Moreover, Fino et al. (2013) have referred to AR as a tool to recover knowledge, but not to preserve it. Yet, the use of AR to specifically 'preserve knowledge' has not been directly identified within previous studies. Equally, literature discussing AR in cultural heritage tourism does discuss the use of AR to replace traditional tour guides and provide information upon request (Fino et al., 2013; Kounavis et al., 2012; Marimon et al., 2014; Pang et al., 2006; Think Digital, 2010), but does not suggest AR tour guides should be used to 'preserve knowledge'.

Both in interviews and based on the AHP questionnaire ranking, 'preserving knowledge' was regarded as highly important, as illustrated in section 8.4, discussing the importance of sustainability, perhaps in part, this is due to the nature of Geevor and its significance in the local area. Having only closed in 1991, Geevor is a recent living history resource. The majority of stakeholders also worked in the mine or were significantly affected by its closure. Therefore, many have a personal affiliation or connection with Geevor, influencing their perception of the need to preserve knowledge.

AR's ability to preserve knowledge as a stakeholder benefit would also be advantageous for visitors, creating an enhanced experience, and ensuring visitors in the future who do not have access to the mine guides receive the same level of authentic first-hand knowledge. Used in this way, AR would be significantly valuable, ensuring visitors continued to receive the current excellent, award-winning experience long into the future, whilst also sustaining and maintaining the integrity and authenticity of the visitor encounter.

Much research attention has focused on the need to create a balance between authenticity and creating an ‘enjoyable’ tourist experience. It has been argued that museums often focus on ‘soft’ heritage, to avoid conflict and controversy (Swarbrooke, 2000), and in this way, sanitise, glorify or soften the past, to entertain rather than shock tourists (Smith, 2009). Thus, Timothy (2011) identified that telling stories of the past in a way that encourages visitors to learn is a challenge, although high-quality interpretation can add value to an attraction, increasing competitive advantage. Using AR to ‘preserve [*the*] knowledge’ of miners would ensure stories of the past were authentic and avoid ‘softening’ their impact. In addition to this, AR has been proven to increase learning and engagement, therefore it is likely creating AR miner avatars, sharing their first-hand experiences, anecdotes and authentic knowledge would increase engagement, and provide high-quality interpretation whilst avoiding commoditising the past.

### **Secure jobs**

Tourism development has long been associated with growth, revenue generation, and diversification (e.g Ko and Stewart, 2002; Gursoy et al., 2002; Mansfield and Ginosar, 1994). Equally, AR has been identified as a tool to increase the competitiveness of attractions (e.g. tom Dieck and Jung 2016; Neuburger and Egger, 2017; Lashkari et al., 2010), but little literature identifies AR as a tool to directly secure jobs, although logically the more successful and therefore competitive an attraction, the more secure the jobs.

As a region, and in comparison, to the rest of the country, Cornwall has high levels of unemployment. One of the main reasons Cornwall Council brought Geevor was to turn it into a tourist attraction, with the aim of sustaining the local economy and increasing revenue generation in the local area. Tourism is a key industry and economic contributor across Cornwall, demonstrated by the fact Visit Cornwall (2014) reported that tourism contributed to 17% of employment in the region, although it has often been criticised that the quality and quantity of jobs here is low (Reeder and Brown, 2005) and seasonal (Fonseca and Ramos, 2011). Moreover, during interviews, managers claimed the employment opportunities created by tourism across the region was, in fact, higher than reported in statistics, if you considered secondary roles, such as suppliers and services. Equally, it was recognised, Geevor was a significant employer in the area and, in comparison to many tourist attractions, provides year-round employment.

Initially, some stakeholders expressed concern towards AR, uncertain of its role, but, once they understood AR would be implemented to add to, supplement, and not detract from, existing processes and visitor experiences, they supported implementation confirming they did not feel it would threaten their job security. In fact, stakeholders predicted that if AR was implemented successfully and attracted more visitors, demanding and supporting services, it could, in fact, increase supply and demand, which would be likely to create new employment opportunities. Therefore, it was considered that if AR was effectively and successfully implemented at Geevor, it would have a positive impact on the local economy, not only sustaining, securing and creating new employment opportunities but also introducing other benefits, such as economic, social and cultural benefits, and increasing demand for local amenities and services.

The need to create economic, social, cultural and environmental benefits was also recommended in BM literature, and a number of scholars identified the need to develop SBMs to help organisations to minimise their negative impact on society (Bocken et al., 2014), focusing on long and short term objectives (Bolis et al., 2014). Thus, in this sense the ARBM should focus on ‘securing jobs’ and creating jobs to have a positive social, cultural and economic impact locally.

Whilst tourism studies have suggested that tourism development can create new employment opportunities (Bowitz and Ibenholt, 2009; Greffe, 2004; Ishad, 2010; McAreavey and McDonagh, 2011), studies exploring the impacts of AR have so far failed to mention the impact of AR on employment. Although, previous AR studies have identified that AR could replace tour guides (e.g. Fino et al., 2013, Mariman et al., 2014; Tekin, 2016), which implies tour guides would no longer be necessary. Stakeholders, noted that introducing AR to replace tour guides, was unfavourable and should be avoided, rather AR should be introduced to help tour guides efficiently and effectively deliver guided tours.

### ***Attract Investment***

As mentioned, Cornwall Council brought Geevor after its closure as a working mine in 1990, to protect its heritage and history. After 3 years dormant, Geevor was reopened as a tourist attraction in the hope of generating the associated economic benefits of tourism development for the local area, such as business growth, employment opportunities (McAreavey and McDonagh, 2011; Irshad, 2010), increased local standard of living (Sharpley and Sharpley, 1997; Fleisher and

Felsenstein, 2000), and local development (MacDonald and Jolliffe, 2003). In the same way, stakeholders agreed that AR would help ‘attract investment’ and the associated benefits (e.g. see Table 2.2), ranking it the third most important stakeholder benefit.

The fact that ex-miners work at Geevor was recognised during interviews as one of its best resources. However, the inherent challenges of this were also recognised, and stakeholders suggested it was important stakeholders focused on the future, improving and developing the visitor experience to develop Geevor as a tourist attraction, doing things they may not want to do, but needed to do to increase success. Because stakeholders have a personal and emotional connection to Geevor, some felt they often forgot it was a tourist attraction and needed to look to the future not necessarily doing things they wanted to do but implementing changes that would improve Geevor’s tourist offering. Despite some initial uncertainty, support for AR implementation was universal, and considering its benefits, stakeholders felt AR would keep Geevor fresh and interesting, adding to, and building on, the existing experience. In this way, AR adoption was seen as one way to attract investment, creating opportunities to develop, maintain and improve Geevor. However, Geevor would still need to find and secure capital to implement AR initially, working with bodies such as Cornwall Council, or Cornwall Museums Partnership to ascertain potential funding sources.

Stakeholders suggested that implementing AR would demonstrate efforts were being made to secure Geevor’s longevity and future sustainability to investors and potential funders. Equally, it was considered that AR would create a better experience, attract more visitors, grow the local economy and demand for services, increase revenues and generate more money to invest back into conservation and infrastructure of local areas. The use of tourism as a tool for development has been discussed in literature (Sharpley and Sharpley, 1997; Smith, 2009; Irshad, 2010), which identified that tourism helps encourage the development of local services (MacDonald and Jolliffe, 2003) and creates income opportunities (Smith, 2009). Being a deprived area, these outcomes would have a significant and positive impact on Cornwall and would benefit not only stakeholders who live in the local area but also their families and local community.

Adopting a SBM approach, the need to address such issues was also identified as important to ensure Geevor had a positive impact and AR introduced new long and

short-term opportunities in the area (e.g. Bocken et al., 2014; Bolis et al., 2014). Bolis et al. (2014) commented that economic results were not enough to create sustainable value capture, thus the ARBM also focused on creating axiological benefits for Geevor, such as generating revenue to invest back into the area to improve Cornwall future.

### ***Community Pride***

'Community pride' was ranked the fourth most important stakeholder value, which was surprising considering 'heritage significance' and 'sustainability' were voted most important 'resource' and 'AR offer'. In common with many cultural heritage attractions, Geevor has become a success by exploiting its cultural heritage significance, selling and retelling the past (Hardy, 1988; Millar, 1989). Many stakeholders described themselves as passionate and dedicated to Geevor, thus it was interesting that in line with findings from previous studies, this has not promoted, or increased, a sense of pride within the community.

Nonetheless, stakeholders suggested that AR would help introduce a perception change about Geevor, increasing awareness of the need to protect and conserve cultural heritage. Previous studies exploring the benefits of AR in cultural heritage tourism have not identified the use of AR in improving 'community pride' (See Table, 2.2 and 2.3), and therefore this is a newly-identified AR benefit. However, tourism studies have identified that tourism development helps to celebrate cultural heritage assets, such as Geevor (McAreavey and McDonagh, 2011). Similarly, it has been found that tourism development can help increase interest in resources for conservation and preservation (Greffé, 2004; Fonseca and Ramos, 2011; Irshad, 2010; Sharpley and Sharpley, 1997). Equally, this helps increase a political focus on heritage (Bowitz and Ibenholt, 2009), creating a positive image for the area (Fonseca and Ramos, 2011).

Importantly, tourism development has been found to encourage younger generations to preserve and engage with culture (MacDonald and Jolliffe, 2003; Smith, 2003). In a similar way, stakeholders suggested that AR would increase Geevor's accessibility among younger generations, helping maintain a sense of 'community pride'. Previous studies have found AR helps to engage and address the needs of new and younger tourists (Han et al., 2014; Murphy, 2015; tom Dieck and Jung, 2016; Weber, 2014). Therefore, it was suggested, AR would also contribute to a behavioural change, increasing awareness of the need to protect and

preserve cultural heritage because of Geevor's significance and role in shaping the landscape and lives of locals, which in turn would increase 'community pride'. The use of AR to spark a behavioural change and increase appreciation was also not identified in previous research, thus emerges a new AR benefit, extending current understanding of AR's potential.

Stakeholders suggested AR could create more of a connection between the museum experience and the onsite café and shop. Studies have identified food as an important part of the tourist offering, especially in rural areas, claiming promotion of a region's traditional cooking can help reinforce traditions and increase community pride (Gallardo and Stein, 2007; Sidali et al. 2015). On the same note, in a study based in Cornwall, Everett and Aitchison (2008) found a connection between local food, regional identity, and increased social cultural benefits. In this way, it could be supposed that using AR to create a stronger connection to Geevor café by telling the story of the miner's pasties, could not only increase 'community pride' but also improve traffic and generate sales.

### ***Improve efficiency***

The use of AR to 'improve efficiency' was considered the least important stakeholder benefit, although stakeholders perceived AR would improve their role as a member of staff, raise morale, increase the profile of the site and thus staff engagement. One of the main areas stakeholders discussed that AR would 'improve efficiency' was by helping educate and explain complex processes or descriptions. It was perceived that AR demonstrations, animations or videos could help guides explain processes quicker, easier and more effectively than talking. While research has suggested that AR allows tourists to become more engaged in tours (Hume and Mills, 2011; Palumbo et al., 2013), it does not identify the positive benefits this would introduce to 'improve efficiency'. However, previous studies have discussed the use of AR to provide cognitive support (Arvanitis et al., 2009; Bower et al., 2014; Dunleavy et al., 2009; Klopfer and Squire, 2008), enhance exploration of materials (Kerawalla et al., 2006; Klopfer and Squire, 2008) and increase knowledge acquisition (Wu et al., 2013; Yuen et al., 2011).

Stakeholders recognised that AR presents many benefits to 'improve efficiency' at tourist attractions and for visitor's exploration of the site, facilitated by mobility and availability, but research has failed to specifically define a positive impact this has on 'efficiency'. Many small museums and tourist attractions share the same

challenges as a result of limited access to funding and resources. Therefore, AR's ability to 'improve efficiency' by saving time, such as speeding up explanations of complex processes offers great potential to attractions to enhance day-to-day routines, while improving the tourist experience. Whilst, AR has been proven to enhance the visualisation of information (Aluza-Sorzbabal et al., 2006; Jung and Han, 2014), the way in which this improves 'efficiency' or effectiveness remains to be clearly defined. Although stakeholders identified this new AR benefit of 'improving efficiency', they considered it to be the least important stakeholder benefit. Further research is necessary to understand exactly how AR could improve efficiency, moving it from a conceptual idea to actual value-adding benefit.

## **8.6 Responsibilities**

Inoue and Sato (2010) discussed the importance of exploring how future AR BMs could be built to support and complement existing stakeholder roles. Research was lacking an AR implementation strategy, therefore factors concerning design features of the ARBM have not been previously identified. Prior to implementation, it was considered imperative that factors such as additional responsibilities were clearly identified and assigned to stakeholders, ensuring roles were filled, stakeholders were aware and supportive of the extra responsibilities created by AR.

Many of the design features identified in interviews were also raised as concerns, reiterating a need to develop a clear implementation strategy, to define and allocate additional responsibilities ensuring complete stakeholder cooperation. In part of his definition of a BM, Slywotzky (1996) outlined that BMs should define the tasks it will perform itself and those it is best to outsource to take the product or service to market. In a similar way, Dubosson-Torbay et al. (2002) and Osterwalder et al. (2005a) suggested BMs should organise their network of partners to create, market, and deliver value. In the context of Geevor, this would involve stakeholders assessing their ability to fulfill the six identified design responsibilities, determining which should be performed in-house and which, if any, needed to be outsourced. Likewise, Timmers (1998) claimed BMs should include a description of business actors and their roles, in addition to potential benefits for business actors. The ARBM adopted this thinking within the 'responsibilities' component, recognising the need to develop a SBM which addressed and minimised potential stakeholder conflicts. To develop a SBM, Rohrbeck et al. (2013) advocated the need to develop a collaborative network, bringing stakeholders together to improve sustainability. In the same way, Morioka et al. (2016) advised the importance of satisfying the needs

and wants of stakeholders, overcoming stakeholder conflict to create mutually-shared benefit. The ARBM clearly identifies and outlines the additional ‘responsibilities’ that AR would introduce with the aim of ensuring both long and short-term support, and minimising stakeholder conflicts suggesting ‘responsibilities’ are clearly assigned and agreed among stakeholders prior to implementation and, in this way increasing the sustainability of the ARBM.

Interestingly, in the selected BM descriptions examined in Table 3.1 ranging from 1996 to 2015, the more recent definitions do not include value for stakeholders, in comparison to older definitions. One reason for this could be attributed to changes involved in the transition from traditional to internet-based business. Nevertheless, to ensure and maintain stakeholder support for AR, it was considered crucial to clearly articulate additional stakeholder responsibilities introduced by AR, to ensure it was the most successful and effective it could be, and thus created benefits, improving Geevors longevity, sustainability, and competitiveness. This thinking was supported by Faber et al. (2003, p.3) who proposed the overriding success of a BM was “dependent on the commitment of all parties involved”, thus by clearly articulating and assigning responsibilities it is perceived it would increase success. More recently, Jung and tom Dieck (2017) supported the need to train staff to facilitate the smooth running of an AR experience, because crucially staff are the visitor interface.

### ***Developing***

It was agreed that developing an AR application for Geevor would add value to, and enhance the visitor experience, but in recognition of the difficulty in ‘developing’ an AR application, stakeholders ranked it the most important design responsibility. During interviews, stakeholders expressed concern towards responsibility for developing an AR application, content, and interpretation. Implying that prior to development, responsibility for content and interpretation should be clearly identified and agreed. Content is one of the most important parts of an AR application, and if the content was not appropriate it would be unlikely to add value to the visitor experience. Research supported that AR applications should provide value-added content (Aluza-Sorzbabal et al., 2006), but highlighted the availability of an application does not automatically guarantee enhanced tourist experiences (Jung et al., 2014). However, with the correct content, AR applications can enhance the way visitors see, experience and interact with exhibitions, enabling users to interpret pieces in different ways (Damala et al., 2007).

Thus, during design, stakeholders must be educated to clearly understand the value of AR and define the ways it could improve the visitor experience (Jung and tom Dieck, 2017). Section 8.4 outlined that stakeholder's 'sustainability' most important, followed by 'education', and 'monetary benefits' the most important 'AR offer'. Bearing this in mind, an AR application for Geevor should be developed to increase sustainability, while educating and improving revenue generation. Hence, the process of content creation should consider this, for example, designing content for outside areas currently un-interpreted because of the need to preserve the environment and therefore the limited capacity for signage. In this instance, AR would provide virtual signage, minimising negative environmental impacts, whilst enhancing the experience, extending dwell time and increasing intention to spend. Jung and tom Dieck (2017) also confirmed the use and design of AR to provide an enhanced experience, extending dwell time and intention to spend. In addition, based on stakeholder judgements it was proposed content should focus on educating, creating substance aimed at different knowledge levels; whilst subtly linking the museum experience to the café and shop in an attempt to increase monetary benefits.

In another vein, it was noted as important content was developed to avoid overloading visitors with information, identifying that content should be relevant and related. Research by Olsson et al. (2012) supported the importance of designing AR applications, identifying in a study of user attitudes to AR applications, users were worried about being presented with excessive amounts of information and wanted to be in control of the amount of type of information they received. Confirming the need for Geevor to develop AR application content that was relevant, targeted, and educational, and created an enhanced experience. To achieve this, stakeholders recommended that a clear strategy should be developed to identify who was responsible for creating what content. This reiterated the importance of the ARBM as a tool to identify and assign stakeholder roles. BM literature widely discussed the strength of BMs as tools to align and manage multi stakeholder networks (e.g. Al-Debei and Avison, 2010; Camponovo and Pigneur, 2003)

Moreover, Palumbo et al. (2013) proposed understanding the antecedents of user-experience was crucial to create added value. In addition, tom Dieck and Jung (2017) identified the necessity to include stakeholders' perspective to increase longevity and viability. When implementing and developing new technologies, Kristensson et al. (2008) highlighted the importance of understanding perceived

consumer value to ensure high acceptance and intention to use. However, understanding the acceptance “of mobile augmented reality applications with cultural heritage resources are rare” (Haugstvedt and Krogstie, 2012, p.247). Nevertheless, research suggested AR applications should be intuitive, easy-to-use, increase enjoyment and provide genuine utility (Haugstvedt and Krogstie, 2012; Scarles et al. 2016b). tom Dieck et al. (2016) added AR applications should provide in-depth, rich, appropriate, additional information, that was easy to access and created a personalised experience. Although an increasing challenge faced by developers to create customer-orientated, engaging content low cost or free, whilst meeting increasing user-expectations was also identified (Palumbo et al., 2013), as well as accounting for changing consumer demand (Yovcheva et al. 2012). Stakeholders noted the need to add to, and not detract from the existing experience, in addition, to identifying a number of ‘AR values’ and ‘Stakeholder values’. Thus, when developing a Geevor AR application it was suggested developers consider these to increase viability and longevity and most importantly add value. The ARBM was important to clearly identify roles and outline why stakeholders had a “legitimate interest” (e.g. Kotler et al., 2008; Yuksel et al., 1999) to be involved in AR development.

### ***Maintaining***

Stakeholders reiterated the need for a clear implementation strategy, voting ‘maintaining’ as the second most important responsibility. ‘Maintaining’ ensures that once AR was implemented AR would be sustained and kept running efficiently. Crucially, stakeholder’s responsibility and role in ‘maintaining’ AR once implemented should be clearly defined prior to implementation. Without support and agreement to ‘maintain’ AR, it would unlikely become a long-term success and would soon be forgotten, thus its potential benefits would not be discovered.

Within literature, Scarles et al. (2016b) recognised the need for AR applications to be easy-to-use and intuitive, identifying challenges faced by smaller organisations to both develop and maintain AR applications. They advocated the need to encourage visitor empowerment and autonomy, increasing the ability for organisations to develop and maintain their own content, by designing flexible applications. Kasinathan et al. (2016) also identified the need for applications to be feasible in terms of cost and content creation. Thus, for Geevor an application should be developed with a degree of flexibility, promoting visitor autonomy to

ensure ‘maintenance’ was efficient and seamless. In this way the ARBM was important to identify the AR VP and gain stakeholder support for AR integration.

### ***Funding***

Interestingly, ‘funding’ was ranked the third most important responsibility, despite the fact stakeholders frequently mentioned AR’s potential monetary benefits, such as attracting investors or increasing ticket sales. Van Krevelen and Poelman (2010) suggested one reason that AR has not been widely adopted, was due to high development costs. Geevor is a council-owned and publicly-funded attraction (Coupland and Coupland, 2014), therefore, because of limited budgets, ‘funding’ was always a key concern. However, as identified in section 8.5, stakeholders recognised AR as a way to attract investment and potential funders, by demonstrating a commitment to improving the quality and longevity of the tourist experience.

Scarles et al. (2016b), Jung and tom Dieck (2017) and tom Dieck and Jung (2017) confirmed the difficulty faced by smaller cultural heritage organisations investing in, and integrating technologies, concluding large investments often present too much risk without proof of concept. Jung and tom Dieck (2017) suggested in the future the ‘funding’ implications of AR are likely to decrease, as a result of technical advancements and innovations. Equally, Selvam et al. (2016) confirmed visitors are increasingly dependent on the internet and smartphones to obtain information about unknowns. However, Scarles et al. (2016b) and Jung and tom Dieck (2017) recognised smartphones offer a cost-effective implementation option, because of high levels of ownership and use. In this case, BMs are crucial as a tool to clearly outline revenue sources, and as suggested by Magretta (2002) identify how to make money.

### ***Launching***

To effectively launch and execute the implementation of AR at Geevor, clear communication is necessary. Prior to ‘launching’ which was ranked fourth most important, stakeholders identified the need for further education and support to help them, and visitors, understand how to effectively use AR. Jung and tom Dieck (2017) supported the need to train staff to facilitate the smooth seamless integration of AR. Stakeholders, noted they are the ones who know and understand their visitors the best, thus communication between AR application developers to create an application that appeals to all visitors was fundamental prior to ‘launching’.

Yet research has described AR as ‘gimmicky’ (Johnson et al. 2010; McQuarter, 2013; Yuen et al., 2011) therefore, when ‘launching’ it was advised Geevor avoid the AR application being described as a gimmick, and instead focus on its potential to create an enhanced experience and add value. The marketing benefits of AR have been widely praised in literature, in addition to recognition of AR’s ability to provide pre-visit information, influencing decisions and increasing visitors awareness of facilitates. Stakeholders identified AR would excel Geevor into the 21<sup>st</sup> century, modernising the offer, and providing something new and exciting to promote. This was considered crucial, since stakeholders acknowledged markets are always seeking something new, to promote and advertise. In this way, it was implied ‘launching’ AR at Geevor would increase marketing materials, improving competitiveness and attracting more visitors. Jung and tom Dieck (2017) identified cultural heritage sites needed to think of new to directly attract visitors, in line with this, stakeholders recognised the benefits of ‘launching’ an AR application at Geevor, and its potential and benefits.

### ***Supporting***

‘Supporting’ AR prior to, during and after implementation was ranked fifth most important, which was interesting considering stakeholders previously identified challenges in using AR suggesting they were not technically ready, unsure of how to use it, or the benefits that the technology offers. Despite being ranked fifth most important, support throughout the implementation process would be critical to the success of AR at Geevor. As argued by stakeholders, staff would need to fully support adoption, understand its value, importance, and use, while celebrating its presence and encouraging visitors to engage with AR. Faber et al. (2003, p.3) argued that the overriding success of a BM was “dependent on the commitment of all parties involved”. Therefore it can be assumed that without ‘support’ and full understanding from stakeholders of AR, its potential to add-value and likelihood of success would be limited. In this way adopting a stakeholder approach to develop the ARBM was crucial to align conflicting opinions (Camponovo and Pigneur, 2003; Teece, 2010), essentially the ARBM ‘stakeholder benefits’ also clearly articulated the benefits for stakeholders, giving them an incentive to support AR integration.

Support from host communities plays an integral role in the success of tourism development, however, there is often conflict between different interest groups (McAreavey and McDonagh, 2011; Smith, 2009). Swarbrooke (1999, p.13) confirmed the need for tourism development to be economically viable, without

having a negative impact on the environment and “the social fabric of the host community”. In addition, stakeholders identified the need to educate and train staff to use AR, so they could pass on and translate the benefits to visitors. This was also confirmed as important by Jung and tom Dieck (2017). The importance of using a stakeholder approach in both tourism, and during implementation of new technologies is advised by a number of scholars (e.g. Lindberg and Johnson, 1997; Legget, 2009; Kotler et al. 2008). Stakeholders are important influencers of decisions, management and sustainable growth options (Lindberg and Johnson, 1997). In a tourism context, stakeholder collaboration is key to create an enhanced tourist experience (Kourtit et al. 2014), and because tourism is an expression of human behaviour adopting a stakeholder approach is important to understand this behaviour, provide the right services and gain support (Kim and Uysal, 2013). Tourism literature is closely related to SBM research which outlines that BMs should not only address economic value, but also environmental, social and cultural impacts (Bocken et al., 2014; Bolis et al., 2014).

### ***Promoting***

‘Promoting’ an AR experience would be key to ensure people were aware AR was available, what it offered, and the type of value it created. Stakeholders considered that if visitors knew AR was available prior to visiting, it might seal or confirm their intention to visit. Research has increasingly explored AR’s capability as a decision-making a tool pre-visit, identifying that AR can help visitor’s en-route and pre-planning (Gretzel, 2012; Kennedy-Eden et al. 2008; Mickael, 2011). Stakeholders echoed this, suggesting AR would provide something new to promote, and could attract visitors purely interested in trying the technology. Moreover, they thought AR would help promote Geevor to more generalist and fewer specialist segments, attracting a broader range of visitors. In this way, it would be important that visitors were made aware of AR before visiting to ensure they had enough time to maximise the experience, get the most out of the site and bring the right equipment\* (\*dependent on the pricing method that was chosen). This was also supported by a number of studies that have identified the ability of AR to increase engagement with promotional materials and offer a better sense or impression of what to expect (e.g. Celtek, 2015, Hassan and Jung, 2016; Kounavis et al. 2012; Yovcheva et al. 2011). Although literature heavily discusses, and stakeholders recognise, the marketing benefits of AR, stakeholders evidently do not consider it as important in comparison to other criteria. In this way the ARBM had a critical role in identifying the ‘AR value’

or unique VP to promote and market to encourage visitors to engage and visit Geevor.

The need to ‘promote’ AR was considered the least important responsibility according to AHP hierarchical ranking. Similarly, ‘marketing’ was ranked fifth out of seven AR value (See Section 8.4). Logically, this makes sense, because without developing an AR application (ranked most important) there would be nothing to promote. It implied that stakeholders did not consider marketing and promotion a key focus for Geevor, contrary to views expressed by some stakeholders during interviews. However, on further examination, in comparison to other stakeholders groups, tourist bodies expressed the most interest in and discussed the potential of, AR for marketing and promotion. One reason for this could be due to roles and responsibilities, as most of the tourist bodies had a responsibility to improve the marketing and profile of Cornwall as a tourist attraction and therefore ‘promotion’ would be higher up their list of priorities in comparison to Geevor’s internal stakeholders. In this way adopting a stakeholder approach was crucial to minimise stakeholder conflicts. AHP effectively aggregated multi stakeholder judgements into one group hierarchy of importance, validating the ARBM and providing managers with a clear strategy or path to pursue during AR implementation.

## **8.7 Revenue**

Although no universal BM definition has emerged, one thing attempted definitions have in common is their reference to value, and economic factors (e.g. See Table 3.1). For instance, Dubosson-Torbay et al. (2002) and Osterwalder et al. (2005) identified that BMs should generate profitable and sustainable revenue streams. Equally, Linder and Cantrell (2000) and Rajala and Westerlund (2005) supported that BMs outline an organisation’s logic for creating value, and in the case of for-profit organisations, make money. In the same way, the ARBM ‘revenue’ component explored avenues to generate revenue and make money from AR.

In regard to the application of technology, BMs have been acknowledged as important tools to turn technical potential into economic value (Smith, 2010). Chesbrough (2007, p.12) proposed that technology per se has no inherent value, suggesting “a better business model will beat a better idea or technology”. Zott et al. (2010) described that BMs play a critical role in capturing value from innovative early-stage technologies and converting this value into financial returns. In application to AR, although it has been found to add value to and enhance the tourist

experience, its ability to create and sustain revenue remains underexplored. This study identified eight potential AR revenue methods, ranking them in terms of preference, and thus goes some way to bridging the research gap, adding to the existing pool of knowledge and identifying new avenues to generate revenue.

Despite some evidence of innovative technologies being used in cultural heritage tourism (Salmon and Nyhan, 2013), implementation strategies, potentials and uses remain to be fully explored (Cranmer and Jung, 2014). AR remains an evolving and novel technology, and the majority of applications have been conceptual, exploring the potential and added-value, rather than actual-value or monetary benefits. Hence, Jung and tom Dieck (2017, p.11) “recommended to explore a suitable business model for the investment and implementation of multiple technologies into cultural heritage”. Importantly, by not only identifying potential revenue methods but also ranking them in a hierarchy of importance, this study proves to Geevor management the best, most preferable options to pursue aggregating conflicting stakeholder judgements.

Determining the pricing method prior to implementation was considered important to allow managers and developers to calculate costs and estimate returns, ensuring there was enough capital to implement AR successfully. After all, as Chesbrough and Rosenbloom (2002) identified, BMs revolve around the realisation of economic value. The ARBM played a significant role in demonstrating different revenue options and thus reducing the uncertainty and risk associated with technology adoption. This was especially important for Geevor, as it has been identified that small cultural heritage organisations and museums fear the risk associated with high investments (e.g. Scarles et al., 2016b; tom Dieck and Jung, 2017).

Revisiting existing literature, it was clear there are no apparent existing AR BM and equally, existing AR applications in tourism have mainly been prototypes or trials and therefore did not have a revenue model. Although in BM literature, Inoue and Sato (2010) adapted existing business revenue models, Heimo et al. (2016) adapted revenue models from video gaming and Hyrynsalmi et al. (2012) modified mobile ecosystem revenue models. Hence, this study helped fill a gap in research, by identifying potential revenue models for AR implementation in the cultural heritage tourism sector. Practically, this was important to identify which AR pricing methods were most preferable among Geevor stakeholders. Yet, importantly, as identified by Chesbrough (2010, p. 354) “the same idea or technology taken to market through

two different business models will yield two different economic outcomes". Equally, Skeldon (2011) proposed one of the biggest challenges for organisations remains converting AR potential into rock-solid profits. On this note, Juniper Research (2013) suggested AR revenue model must fit the application purpose and function and monetisation strategies may vary.

Heimo et al. (2016a, p.150) claimed "the delivery method for acquiring the best cost-benefit ratio is yet under research and thus the business model is important in finding the optimal method". Thus, using AHP to create a hierarchy of importance, determining a preferable AR revenue model for Geevor offers genuine utility to Geevor managers and practitioners, rather than just presenting a conceptual framework. Magretta (2002, p.3) commented that "a good business model begins with an insight into human motivations and ends in a rich stream of profits". Based on this, below follows a description of the eight suggested AR BM revenue models, examined in order of perceived importance:

### ***Secondary Revenue***

Geevor remains publicaly funded, owned by Cornwall Council and therefore continually seeking new ways to remain economically viable (Coupland and Coupland, 2014). One of the main reasons Geevor was keen to explore AR adoption was to improve revenue and increase visitor numbers, and in turn, improve its sustainability, longevity, and competitiveness. Therefore, revenue generation was a key priority among stakeholders, although interviews revealed the diversity of perspectives toward AR revenue options (see Table 6.11), demonstrating conflicting opinions and fuelling a debate among stakeholders towards the most appropriate and equally viable AR revenue model. In addition to this, a number of stakeholders proposed more than one potential AR revenue model.

Hereby, AHP was crucial in unifying these perspectives, creating a group decision which revealed 'secondary revenue' as a preferable revenue model, despite the fact that previous studies have adapted existing revenue models, from sectors such as video gaming (Heimo et al., 2016), mobile ecosystems (Hyrynsalmi et al., 2012), and adaptions from existing businesses (Inoue and Sato, 2010), suggesting these could be used as AR revenue models. When reviewing literature, no specific AR revenue models for cultural heritage tourism emerged and previous studies have failed to identify or rank potential AR revenue models in terms of applicability, relevance, and suitability. Equally, no previous studies have explored the potential

of implementing AR as a tool to generate secondary revenue and its associated benefits; therefore, this study extends the existing pool of knowledge. However, in regard to tourism BMs, specifically the ETM, Joo (2002) differentiated between direct and potential revenues. In this way, ‘secondary revenue’ generation by integrating AR at Geevor would be seen as a potential revenue source.

Stakeholders identification of ‘secondary revenue’ as the most preferable Revenue option, complements acknowledgment of the use of tourism as a tool for economic development (Smith, 2009; MacDonald and Jolliffe, 2003; McDonagh, 2007). In many populations especially in rural locations such as Cornwall, communities depend on the income generated through tourism (Smith, 2009), because tourism creates employment and raises the standard of living (Fleischer and Felsenstein, 2000; Sharpley and Sharpley, 1997) and in many cases tourism becomes part of the economic fabric of rural communities and regions (Cook et al., 2014). Thus, identification of ‘secondary revenue’ as a preferable revenue model supports previous findings that tourism plays an important role, contributing economically and helping sustain rural communities.

### ***Visitors Bring Devices***

‘Visitors bring devices’ was identified as the second most preferable revenue option, implying stakeholders wished to avoid costs of purchasing devices to loan to the visitor. Within interviews, there was much debate around “own or loan” devices (see section 6.7.1), yet clearly, stakeholders’ aggregated preference was for visitors to bring their own devices to experience AR, despite its drawbacks.

Recent hype surrounding AR has raised user’s expectations creating problems in creating rich AR experiences without putting devices under too much strain (Gherghina et al., 2013). Smartphones are the most popular internet-enabled device; however, they are only equipped with basic components to support AR (Nazri and Rambli, 2014). Scarles et al. (2016b) and Jung and tom Dieck (2017) proposed high levels of smartphone ownership make smartphones an affordable and effective option for organisations to create content downloadable by visitors onto their own devices. But, it is likely this would introduce a number of problems, such as device limitations; low memory capacity (Nazri and Rambli, 2014; Schmalsteig et al., 2011), slow loading speed causing frustration (Jung et al., 2013), or developing an AR application to work across multiple platforms and devices (Young, 2014; Yuen et al., 2011). Equally, it would limit use, because it could not be

assumed all visitors would have AR-capable devices, and even among those who did, they may not have enough memory capacity or battery power and therefore would not be able to participate in the AR experience at Geevor.

Based on the sample of thirty visitors interviewed, 17% identified that they did not own a smartphone, confirming the importance of not assuming that everyone has their own AR-capable device. Visitors were not included in questionnaires and thus did not have an influence on AHP analysis. Yet, based on views expressed in interviews, visitors would prefer to have the option to use their own devices or alternatively loan a device from Geevor. Therefore, it was suggested that Geevor management should reconsider this when implementing AR, and further explore purchasing a small number of devices to loan to visitors without their own, to ensure exclusivity and accessibility of AR.

### ***AR Free***

Ranking third, 'AR free' was identified as a preferable revenue model, mirroring the finding that AR should be implemented at Geevor to generate 'secondary revenue'. The high ranking of 'AR free' demonstrated that stakeholders believed AR should be free to visitors, and the development, implementation and maintenance costs were covered by Geevor. In the same way, some stakeholders expressed support that AR should be offered free, claiming Geevor should cover all associated costs as part of improving their offering and bettering the visitor experience. Although many stakeholders also recognised this would have a significant financial implication, recognising that securing funding for AR was vital to cover the initial costs.

The suggestion of offering 'AR free' as an AR revenue model was similar to Hyrynsalmi et al. (2012) and Heimo et al. (2016a) categorisation of mobile and gaming application revenue models (See Appendix 12), which outlined free trial or freeware revenue model, whereby parts of an application are offered free, and premium content was available at cost. However, neither identified the value or implications of adopting such revenue models for the organisation, thus this study extends existing knowledge.

Much research has recognised the necessity for tourist organisations to adopt technologies to pursue new ways to enhance the tourist experience (Neuhofer et al., 2014; Tussyadiah, 2014), provide value-adding services (Garcia-Crespo et al., 2009) and facilitate enriched and unique experiences (Leue et al., 2014; Yovcheva

et al., 2013). Studies identified tourists now expect access to relevant information anytime or anywhere (Holmner, 2011; Kounavis et al., 2012; Ukpabi and Karjaluoto, 2016) and the distinction between individual's use of technology in their daily lives has "spilt over" into their travel experiences (MacKay and Vogt, 2012; Wang et al., 2016). Therefore, the adoption of modern technologies has been argued as a necessity for organisations wishing to stay competitive and attractive (Han et al., 2014; Tscheu and Buhalis, 2016; Jung and tom Dieck, 2017).

Equally, it has been claimed that future competitive advantage should be built on the effective use of technologies to add value to tourist's experiences (Carlsson and Walden, 2010; Cranmer et al., 2016; Deloitte, 2013). In line with such arguments, offering 'AR free' at Geevor could be considered essential to ensure their long-term sustainability, competitiveness, and attractiveness. In addition to bettering the site, moving it into the 21<sup>st</sup> century and attracting less specialist and more generalist visitors, as proposed by stakeholders.

### ***Pay to Hire Devices***

Visitors 'pay to hire devices' was ranked the fourth most important revenue model. If visitors paid to hire devices from Geevor, stakeholders identified a number of potential revenue generating options, such as charging a deposit and hire fee. On the other hand, purchasing enough AR capable devices to meet visitor demand, would have a significant economic implication, in addition to maintenance costs, processing updates and ensuring all devices worked at an optimal level. During the peak period, in August 2016, 10,503 visitors (See Table 4.1) visited Geevor, and stakeholders projected an increase in visitor numbers this year. If even half of these visitors wished to hire a device from Geevor, the cost implications of the provision would be significant. Therefore, this should be something Geevor management thoroughly consider before AR implementation, and that visitors 'paying to hire devices' while presenting income generation opportunities may not be the most practical or logical revenue option for Geevor.

A number of scholars recognised the impact of audio guides popularity and use in tourism (Jung et al., 2016; tom Dieck and Jung, 2016b; Tscheu & Buhalis, 2016), and noted paying to use AR would be based on the same principle, and demonstrated the possibility to implement a 'pay to use AR' model (Heimo et al., 2016b; Hyrynsalmi et al., 2012). Likewise, stakeholders also supported that the popularity of audio guides proved visitors are willing to pay a little extra for an

enhanced experience, and out of those visitors willing to pay more to use AR (See Table 6.10) a number identified they already pay to use audio guides, implying charging a fee to pay to hire AR devices as a viable revenue option.

### ***Pay to use AR***

Visitors having to ‘pay to use AR’ was ranked fifth most preferable pricing method. As previously discussed, many stakeholders suggested that visitors should either bring their own devices, which it would be assumed had enough memory, power, capability and connectivity to download and successfully use AR. Alternatively, as above, Geevor would have to also provide a number of devices to loan to visitors without personal AR-enabled devices, otherwise, AR would become exclusive.

Although developed for MR, Hyrynsalmi et al. (2012) and Heimo et al. (2016) advocated using paid download or pay once revenue models for museums and cultural heritage travel (See Appendix 12). Furthermore, they recognised that audio guides are based on the same principle and demonstrated the possibility of adopting a ‘pay to use AR’ model. As mentioned above, stakeholders considered the success of audio guides demonstrated the viability of charging a fee to use AR. The main difference between ‘pay to hire devices’ and ‘pay to use AR’ revenue options would be the financial implications for Geevor, more so for ‘pay to hire devices’ which would involve large initial investments purchasing enough devices to meet demand. BM literature recognised all BMs have choices and consequences from these choices (Casadesus-Masanell and Ricart, 2010; Faber et al., 2003). In this way, the ARBM plays a key role in mapping out options and allowing managers to explore these options in consideration of their consequences.

### ***In-app Purchasing***

‘In-app purchasing’ was considered the sixth most preferable AR revenue option. ‘In-app purchasing’ is a widely adopted existing BM, and in the context of Geevor stakeholders considered that it could also facilitate the purchase of products relevant to the experience, such as a book from the shop. Alternatively, a basic version of AR would be offered free, and visitors would have to pay extra to access additional content or information related to specific interests. ‘In-app purchasing’ has proven its success as a BM within a variety of industries, however; stakeholders did not support its applicability to Geevor. This is similar to findings in Heimo et al. (2016a) synthesis of video game and mobile revenue models, did not advocate the

use of ‘in-app purchasing’ as a viable MR revenue model for museums and cultural travel.

### ***Flexible Costs***

Offering AR using a ‘flexible cost’ structure was ranked seventh and was therefore considered unattractive by stakeholders. Although, Stakeholders suggested AR could be priced differently for different target segments, times of the day, days or months. Methods such as this have been successfully employed in other sectors, however, stakeholders did not consider it appropriate to Geevor. One reason for this was that it was considered it could be confusing to visitors or discourage visitors paying to use AR during higher priced or peak times, which could negatively impact the success of AR was implemented with a flexible cost structure at different times. On the other hand, it was recommended as appropriate to trial or introduce ‘flexible costs’ to understand visitors’ perception and willingness to pay to use AR and determine the most effective pricing structure. Stakeholders supported the need for flexibility in regard to pricing structure, experimenting with differing prices, to identify the most well-received option. ARBM plays a key role in clearly identifying options and allowing management to assess and understand the implications of each before choosing. BMs are flexible and therefore can change over time as outlined in Kijl (2005) dynamic BM framework (See Figure 3.4) recognising the evolution process of implementing new technologies passes phases.

### ***Increased Entry***

During interview, stakeholders expressed one option, and perhaps the most obvious AR revenue model was to increase the price of entry to cover all costs associated to AR. However, AHP questionnaire results interestingly ranked ‘increased entry’ least preferable and therefore the least preferable AR revenue option. Furthermore, in comparison ‘flexible costs’, ‘increased entry’ ranked significantly lower (3.1%), confirming that stakeholders collectively agreed the cost of entry should not be increased by any means to cover the costs of AR adoption.

Heimo et al. (2016a) suggested that one of the easiest and most effective ways for museums to generate revenue from MR, and by extension AR, would be to adopt a ‘freeware’ model which involved adding the approximated value of AR to the entry fee regardless of whether visitors chose to use AR or not. However, this option was considered least preferable by stakeholders, therefore, indicating it was not a suitable option to pursue.

Yet, interestingly, during interviews when asked directly if they would pay more to use AR, 52% of visitors said yes (See Table 6.10), claiming they would pay between £1-£5 extra (See Figure 6.2). Whilst only slightly over half the visitors identified that they would pay more to use AR in addition to the entry fee, this implied that 'increased entry' would have been a viable revenue model for Geevor. Yet, as mentioned, visitors were not involved in questionnaires, and therefore their opinions did not contribute to AHP results, ranking importance, and preference of criteria. However, this result reiterates the importance of validating the ARBM for Geevor, demonstrating differences between interview and questionnaire outcomes.

### **8.8 Recommendations for Geevor**

Based on a combination of literature, interview findings and the outcome of AHP questionnaire ranking a number of recommendations for Geevor are suggested. These recommendations are based on the identified preference of ARBM options and demonstrate to Geevor suggested areas to focus, guidelines and options to pursue to implement AR at Geevor. The guidelines and recommendations present a verification of the ARBM for Geevor, ordered in rank of importance (See Table 8.1).

***Table 8.1 Guidelines and Recommendations of Geevor applying the ARBM***

ARBM Component	Ranking	Recommendations and Guidelines
<b>Resources</b>	1	Heritage Significance Ensure AR is implemented sympathetically to enhance, sustain and protect Geevors heritage significance
	2	Education Build upon Geevors existing educational abilities, using AR to complement and enhance learning outcomes
	3	Staff Maintain support from staff and make sure they are 'kept in the loop' throughout the process
	4	Uniqueness Use AR to capitalise on Geevors uniqueness, heritage, and history. Allowing visitors to appreciate what it was like to be a miner
	5	Range of Activities Improve pre-visit information about the variety and range of activities offered
<b>AR Value</b>	1	Sustainability Develop AR primarily to improve sustainability, helping ensure longevity and success, improving the experience for future generations, while also protecting the environment and preserving knowledge of existing miners
	2	Education Integrate AR to improve education, building upon Geevors existing strengths, providing additional information, tailoring information to different interests and knowledge levels, whilst introducing an element of fun and excitement.

<b>ARBM Component</b>	<b>Ranking</b>		<b>Recommendations and Guidelines</b>
<b>AR Value</b>	3	Monetary Benefits	Maximise monetary benefits of AR, such as attracting and engaging wider audiences, increasing ticket sales. Encouraging visitors to spend more money and longer on site, visiting the café and shop, by linking the museum experience to products
	4	Interpretation	Use AR to improve and offer more interpretation across site, including archival material and AR tour, language options and personalisation of information
	5	Marketing	Explore opportunities to exploit ARs marketing potential, engaging wider audiences, and raising the profile of the site.
	6	Navigation	Introduce an AR map to aid site navigation and orientation
	7	Gamification	Experiment with AR gamification to improve learning, increase engagement and entertainment
<b>Stakeholder Benefits</b>	1	Preserve Knowledge	AR provides the ability to preserve and protect the authenticity of the visitor experience by preserving knowledge, experiences, and stories of existing staff members for the enjoyment of visitors and to retain the authenticity of the visitor experience.
	2	Secure Jobs	Implementing AR would help secure and create employment opportunities at Geevor. Such as developing and maintaining the application or generating more money increasing success and creating more jobs.
	3	Attract Investment	AR adoption would demonstrate site advancement and efforts made to improve the visitor experience, increasing the likelihood to attract investors.
	4	Community Pride	AR would contribute to a behavioural change, increased appreciation of Cornish heritage and increased community pride
	5	Improve Efficiency	AR could be used to improve the effectiveness and efficiency of daily tasks, such as explanation of complex mining processes
<b>Responsibilities</b>	1	Developing	The most important additional responsibility created through AR involves developing the application. The creation of content needs to be assigned and divided among staff, based on their areas of expertise. AR application development would likely be outsourced
	2	Maintaining	Maintaining the AR application once implemented is of significant importance, to ensure its success, effectiveness, longevity and continual enjoyment by visitors. Whilst also receiving the associated benefits (such as monetary benefits, or increased job security)
	3	Funding	Establishing and securing funding is paramount to be able to develop an AR app, add value, enhance the visitor experience and realise the associated benefits.
	4	Launching	Ensure staff and stakeholders celebrate and promote AR across site
	5	Supporting	Support and educate staff how to use, the benefits and purpose of AR
	6	Promoting	Market and promote the introduction of AR at Geevor to increase appeal and engage more visitor groups
<b>Revenue</b>	1	Secondary Revenue	AR should be funded by Geevor (grants, external funding etc) and revenue streams will be generated through secondary revenue, such as increased ticket sales, increased traffic and spend in the café/shop, increased spend in the local area

<b>ARBM Component</b>	<b>Ranking</b>		<b>Recommendations and Guidelines</b>
<b>Revenue</b>	2	Visitors bring devices	Visitors should bring their own devices to use AR across site, But to ensure AR does not become exclusive it is recommended Geevor purchase a number of devices to loan to visitors who do not have their own
	3	AR Free	AR should be offered free, there should be no additional fee for visitors to use and experience it. The cost of development, implementation and maintenance should be covered by Geevor, as part of bettering their experience
	4	Pay to Hire devices	After examination of the former three revenue options, consider purchasing devices to hire to visitors
	5	Pay to use AR	Consider making visitors pay to use AR or pay per download
	6	In-app purchasing	Explore the option of offering a basic version and an enhanced or personalised AR application features at an additional cost
	7	Flexible Costs	Experiment with different pricing structures, at times of the day, days of the week/year, different target groups
	8	Increased entry	If no other revenue models are effective, increase the entry fee to cover the costs of AR

*Source: Author (2017)*

## 8.9 ARBM Modelling Principles

In addition to five components, the ARBM was also developed based on five modelling principles, which should be carefully considered when using the model to implement AR. Heimo et al. (2016, p.3) claimed that the “field of cultural travel, including cultural heritage sites, museums, galleries as well as heritage and tourism organisations, has its special characteristics which must be taken into account when considering business models”.

Al-Debei and Avison (2010) proposed a number of modelling principles supporting the V4 (conceptual, multi-level, dynamic, granular and coherent) (See Appendix 10), however these are different from the ARBM modelling principles, which focus on ensuring the success and longevity of AR, rather than the mobile market environment. There is a similarity between V4 and ARBM modelling principles, most significantly the V4 dynamic principle, which outlined the need for configurations and design to change over time, in the reflection of internal and external variations. This is comparable to the ARBM flexibility principle. Yet, the V4 emphasises the need to continually review modelling principles, re-evaluating their attainment at each stage of AR implementation. Whereas, V4 suggested modelling principles should inform BM design.

Within the context of this study, it is recommended the ARBM modelling principles guide and support the integration of AR to maximise success and realisation of AR’s

benefits, these principles should be considered a guiding force throughout the AR implementation process;

### **Suitability**

Confirming the suitability of AR integration and use was identified as extremely important to stakeholders. Stakeholders expressed AR should only be implemented to complement and add value, not detract from the existing offer. In this way, it was concluded AR implementation should be sensitive and supplementary. Moreover, literature has identified the importance of ensuring a genuine need and use for technologies, prior to implementation.

Morris et al. (2006) claimed BMs have five purposes, one of which involves ensuring logical and internal consistency within design and operation. Moreover, Panagiotopoulos et al. (2012) argued BMs are tools to formulate and represent logic behind a firm's business decisions. Based on this, using the ARBM, the logic behind business decisions should also consider suitability, identifying how decisions made would complement, improve or add to existing processes or offer. Al-Debei and Avison (2010) commented building a BM requires a balance between conflicting elements. In this way, when examining conflicts, ARBM advocates identifying the suitability of elements prior to selecting options. Similarly, Casadesus-Masanell and Ricart (2010, p.5) claimed "business models are composed of *choices* and the *consequences* derived from those choices". In this way the ARBM proves useful to outline different choices and understand their consequences.

### **Inclusivity**

The importance of being inclusive was discussed by stakeholders, who expressed the need to involve stakeholders at all stages of AR integration. 'Inclusivity' was noted as important within literature. For example, adopting a stakeholder approach, maintaining inclusivity to encourage support for development, has been identified as critical to success (e.g. tom Dieck and Jung, 2017). Furthermore, Heimo et al. (2016a, p.150) acknowledged the need to adopt a consumer-led perspective, fulfilling a genuine consumer desire. Within the stakeholder approach, a stakeholder was defined as "an organisation is (by definition) any group or individual who can affect or is affected by the achievement of the organisation's objectives" (Freeman, 1983, p.46). Inclusivity is considered crucial to gain and maintain support, minimise conflict and encourage collaboration and cooperation to increase success and effective AR adoption (Robson and Robson, 1996; Sautter and Leisen, 1999).

Therefore throughout the integration of AR, the ARBM advocates continual analysis of the stakeholder network, to ensure inclusivity and as suggested by Legget (2009, p.214) identifying “to whom might the museum matter”.

### ***Transparency***

Stakeholders noted the need to maintain transparency, maintaining clear communication and visibly outlining processes to encourage continued support for AR and increase success. BM scholars, Andersson et al. (2006) advised a need for BMs to make the relationship between business stakeholders clearer. Thus, processes driven by the ARBM should be transparent and clearly communicated to stakeholders across the network. Inoue and Sato (2010) suggested ARBMs should be designed to support and complement existing areas of expertise and stakeholder roles. Ensuring transparency was considered key to ensuring continued stakeholder support, cooperation and backing.

Zott and Amit (2010) claimed the purpose of BMs should be to exploit business opportunities, in this case, AR, by creating value for all parties involved, and generating a profit. In this way, applying the ARBM should be a transparent process, with value, added value, stakeholder benefits, additional responsibilities and revenue options clearly outlined and agreed prior to AR implementation, to maximise cooperation and support.

### ***Flexibility***

Stakeholders recommended to react and respond to changes over time, a BM should be flexible to allow for and support renewal. Moreover, a number of stakeholders noted that visitor preferences and needs change over time, therefore AR should be integrated with a degree of flexibility a to allow the ARBM to respond to this. Based upon this, ‘flexibility’ was considered a key modelling principle of the ARBM, and it is advised AR is implemented with a degree of flexibility to adapt and change with consumer demands, organisational strategy or market demands. Teece (2010, p.171) supported that “business models must morph over time as changing markets, technologies and legal structures dictates and/or allow”.

The concept of ‘flexibility’ has also been widely discussed in literature, closely related to the BMI. For instance, Porter (2001, p.4) suggested BMs should be built to be “flexible to respond rapidly to competitive and market changes”. Within his B4U BM, Kijl (2005) developed a phasing model, demonstrating phases a BM can

pass through numerous times, suggesting when introducing new technical innovations, it was important to understand their evolution and recognise they will need to be flexible to pass through phases. In this way, the ARBM modelling principle also advocates the need to be ‘flexible’ in recognition that BMs are likely to change as they evolve.

Moreover, Johnson et al. (2008, p. 59) proposed the “secret in maintaining a thriving business is recognising when it needs a fundamental change”. Designing and building flexibility into BMs, has been found to increase business performance, competitiveness and sustainability (Afuah, 2005; Amit and Zott, 2012; Zott et al., 2010). Thus, flexibility should be an overriding consideration of the ARBM, and influence AR implementation.

### ***Sustainability***

Similar to BMI, the importance of building SBMs was revealed as an important field within BM literature. ‘Sustainability’ in this instance should focus on improving the longevity and viability of AR implementation and tourist organisation success, but also using AR to minimise negative impacts on socially, culturally, environmentally and economically (Bocken et al., 2014), in addition to introducing benefits for both internal and external stakeholders (Bocken et al., 2014; Donaldson and Preston, 1995).

In this way, SBMs reinforce stakeholder theory by encouraging BMs to view their VP as the value they offer, whereas a sustainable VP should satisfy the needs and wants of stakeholders, in the short and long-term (Morioka et al., 2016). Creating a SBM is considered a lever of organisational success (Kiron et al., 2013). Stakeholders also noted the importance of underpinning decisions with sustainability, from ensuring AR increased Geevors longevity, and competitiveness but also as a tool to minimise negative tourism impacts, such as environmental degradation, and also to make a positive contribution to Geevor such as preserving knowledge or increasing job security. Thus, all decisions regarding AR use and implementation should consider addressing the issue sustainability, creating organisational, environmental, social, cultural, or economic benefit.

### **8.10 Summary**

The chapter tied together literature with interview and questionnaire findings to understand the implications of findings in a broader context and in application to the ARBM. Based on the results of questionnaire analysis, sub-components were

discussed in ranked hierachal order based on AHP, identifying preferences for each sub-component applicable to Geevor using the ARBM. Comparing results to findings from previous studies identified a number of areas not previously addressed or examined in literature, such as using AR to preserve knowledge, or implementing AR to generate secondary revenue. In addition to this, the chapter presented several recommendations and suggested guidelines for Geevor when implementing AR, using the validated ARBM.

This bridged a gap in existing research, by identifying how AR could be effectively implemented in cultural heritage tourism using the ARBM and highlighted the importance of the ARBM. Finally, the chapter explored ARBM modelling principles in relation to previous studies and implications for AR implementation. To conclude the study, the next chapter will review the attainment of the research aim and objectives, in addition to identifying contributions to knowledge, and suggestions for industry and academia.

## **CHAPTER 9 CONCLUSION**

### **9.1 Introduction**

This chapter summarises the study, discussing how the research aim and objectives have been met. In addition, it outlines both theoretical and practical contributions and suggests several areas for future research, proposing recommendations for tourism organisations adopting AR. The chapter concludes, discussing limitations of the study, reflecting on the overall process and identifying future aspirations.

### **9.2 Review of Aim and Objectives**

The aim of the study was to develop an AR BM for cultural heritage tourism. To achieve this, five research objectives were developed. The attainment and achievement of both of these are discussed in the following section;

#### ***Objective 1: To evaluate Augmented Reality and its usefulness in the cultural heritage tourism sector***

Previous research identified the benefits AR presents to cultural heritage tourism and a number of studies recognised the need for tourism organisations to adopt and invest in innovative technologies to improve their competitiveness, sustainability, longevity, and attractiveness. AR's value-adding potential, ability to link content to a user's immediate surroundings and create enhanced tourist experiences, make AR the perfect complement to cultural heritage tourism.

To understand the potential use and opportunities presented by AR, a critical evaluation of AR use in various tourism contexts was conducted (see Chapter 2). This clearly identified AR presented numerous benefits for tourism, cultural heritage tourism, museum and education as well as other industries (see Tables 2.1 to 2.5). One of ARs greatest strengths was recognised as its ability to overlay information without disrupting or disturbing existing features, landscapes, or experiences. Instead, AR adds to, builds on and enhances what exists in the real-world, creating possibilities to add information, depth, authenticity and integrity. Thus, AR presents many opportunities to add value to, and enhance experiences, whilst also introducing other benefits such as improved education and accessibility.

Although it was argued AR perfectly complemented cultural heritage tourism, because of its ability to seamlessly overlay digital information onto the real-world. Adoption has been slower than anticipated, as the number of cultural heritage attractions using AR was and remains low, and therefore many attractions were

losing out on AR's potential. tom Dieck and Jung (2017) and Scarles et al. (2016b) argued one reason for the delayed application of AR, was because its integration presented too much risk, especially for small cultural heritage organisations who feared large investments and risk of failure without prior proof of concept. Hence, despite its uses and associated benefits, it became apparent specifically in a cultural heritage tourism context, organisations were missing out on the potential presented by AR, to create an enhanced tourist experience, increase competitiveness, sustainability and longevity.

Many of the studies identifying AR uses and benefits are conceptual, gathering results from prototypes or trial applications, therefore reporting potential rather than actual value-adding benefits. The number of tourism organisations that have demonstrated an economic impact from AR are limited, confirming a need for further exploration (Han et al., 2014; Jung and Han, 2014). Scholars supported that the number of successful implementations remains low, and AR use in cultural heritage tourism necessitates further exploration (e.g. Jung and Han, 2014; Jung and tom Dieck, 2017; tom Dieck and Jung, 2017; Tscheu and Buhalis, 2016). Although, research also acknowledged increased pressure for cultural heritage organisations to develop creative and innovative interpretation and experiences (Scarles et al., 2016b). Nevertheless, AR remains an evolving field, with its full benefits and potential remaining to be seen. This supported the need to progress research from a discussion of AR's potential advantages, to actual value-adding benefits, bridging a gap in research and identifying ways AR could be meaningfully implemented.

### ***Objective 2: To critically review the theory of Business Models***

In recognition of a gap in research identifying how AR could be implemented in cultural heritage tourism to generate value-adding benefits and capitalise upon its use potential, a critical review of BMs was conducted. Chapter 3, presented a critical review of literature exploring the concept of BMs, providing a theoretical foundation and understanding of BM processes and importance. However, during a review of BM literature, it became apparent that BM concepts were subject to much criticism and uncertainty. This was attributed to the fact the concept has been approached from various different contexts, and therefore there was considerable heterogeneity among definitions. It became clear, BM definitions were often created to serve the purpose and suit the context of the author and it remains that no universal BM definition exists. Thus, the BM concept remains 'fuzzy' (Al-Debei and Avison, 2010) 'murky' (Porter, 2001), 'fragmented' (Chesbrough and Rosenbloom, 2002; Wirtz et

al., 2016), ‘ill-defined’ (Seddon et al., 2004), ‘underdeveloped’ (Magretta, 2002) and thus confusing. To overcome this divergence and unify multiple perspectives, Al-Debei and Avison (2010) developed the V4, using thematic analysis in an attempt to combine the fragmented, mixed opinions and definitions surrounding the concept.

The process of developing and innovating existing BMs was plagued by confusion and research failed to clearly identify what BMs do, their key elements, and how they should be designed (Shafer et al., 2005). Despite this, the importance of business modelling was clearly articulated, and studies demonstrated organisations that updated and innovated their BM generally excelled, exhibiting superior performance, increased sustainability, competitiveness and importantly profits. Magretta (2002, p.5) proposed that BMs are like stories; “when business models don’t work, it is because they fail either the narrative test (the story does not make sense) or the numbers test (the profit and loss doesn’t add up)”.

The internet created many new opportunities, sparking a rise of interest in BMs as organisations looked to develop and secure a competitive advantage in the move from traditional to eBusiness and mBusiness. The internet had a profound effect on businesses and as a result, many new BMs emerged and BMs became even more important. Business modelling has been proven to help firms structure their business in a more efficient, responsive, and flexible manner (Dubosson-Torbay et al., 2002). In this way, BMs are considered the missing link between strategy, process, and technology (Viet et al., 2014). With regard to technology adoption, BMs are recognised as crucial to help implement, realise and commercialise technologies, transforming ‘technical potential’ into economic value (Chesbrough, 2003; Smith, 2010). It was argued that “a better business model often will beat a better idea or technology” (Chesbrough, 2007, p.12).

From an examination of literature, it was clear that BMs play an equally important role in tourism and are used to provide a holistic understanding of complex and fragmented networks. For example, Little (2009) reviewed existing tourism BMs from high performing organisations and found those that understood their BMs were more successful. In comparison to the number of other BMs examined (See Table 3.10), the V4 was considered the most complete, interrelated and comprehensive BM and was used as a framework to inform interview themes and questions during the interview data collection phase.

As mentioned, AR presented many opportunities, but is yet to be widely adopted. There was a gap in research identifying AR BMs. It was suggested, the commercial opportunities of AR were vast, but still not obvious (Skeldon, 2011) and an AR BM is yet to crystalise (Juniper, 2013). In a 2011 study of 400 existing AR applications, Bernardos and Casar (2011) identified that application providers did not expect to generate revenues, despite the fact that they produced high-quality applications well rated by users. This remains the case, confirming the need to develop an ARBM to begin to turn potential into actual value-adding benefits and revenues.

***Objective 3: To assess understanding of stakeholders towards the implementation of Augmented Reality***

To achieve this a case study approach was necessary. As identified throughout Chapter 4, the context of cultural heritage tourism was complex, with a unique set of characteristics. To gain a rich understanding of the context and develop an effective AR BM, Geevor Tin Mine Museum was used as a case. Geevor was chosen because it is recognised by UNESCO and is a multi-award-winning attraction, but, more importantly, it presented much scope and the organisation was interested in implementing AR to improve competitiveness and overcome many of their challenges. Additionally, as a council-owned, publically-funded venture, Geevor were keen to explore avenues to remain economically viable as a tourist attraction (Coupland and Coupland, 2014). Geevor management were eager to explore the use of technologies, to overcome their problems, such as improving their visitor offering, attracting a wider audience, combatting seasonality and most importantly securing an additional source of revenue.

Stakeholder analysis was undertaken leading to the identification of five stakeholder groups: visitors, internal, tertiary users, tourist bodies and local businesses. Freeman (1983, p.46) who developed the stakeholder theory, claimed organisations are characterised by their relationships with various groups and individuals, defining “[a] stakeholder in an organisation is (by definition) any group or individual who can affect or is affected by the achievement of the organisations objectives”. Because tourism is a complex and dynamic industry and research identifies the need for collaboration between stakeholders (Sautter and Leisen, 1999), it was important to identify to whom the museum might matter (Legget, 2012). However, as identified during stakeholder analysis and supported by Kotler et al. (2008, p.60) “some stakeholders are active or important to an organisation, and others less so. Nevertheless, all stakeholders must be considered”.

Geevor stakeholder analysis identified five stakeholder groups “who have an interest in, or influence on, a museum’s ability to achieve its objectives” (Legget, 2009, p. 214) (See section 4.7). Fifty interviews with representatives from each group were interviewed to achieve the third aim and explore stakeholders’ perceptions towards AR adoption at Geevor, identifying its uses, value, potential, barriers and importantly, the need to develop a clear implementation strategy. Interviews were conducted between March 2015 and March 2016 (See Table 5.6) using a semi-structured interview approach, which facilitated freedom to add to and extend questions to gain richer data and a deeper, broader understanding of the context.

The interviews with 50 Geevor stakeholders served two purposes; firstly, to confirm the potential of AR to add value to Geevor and understand how AR could be implemented to create these benefits and realise its potential. Secondly, to validate the need to develop an AR BM and translate the potential of AR, into actual value adding benefits, such as establishing a source of additional revenue to help Geevor increase its competitiveness, sustainability, and profits. Importantly, stakeholder interviews revealed support for, and recognition of ARs potential (see Chapter 6), identifying themes which were used to develop the ARBM.

The stakeholder approach used to develop the ARBM was crucial to provide a comprehensive and complete understanding of Geevor. Adopting a stakeholder approach was also imperative, to increase support, success and longevity of AR (Jung and tom Dieck, 2017; tom Dieck and Jung, 2017), and in comparison to other BMs, few have adopted a multi-stakeholder approach during development. Moreover, interviews identified a number of criteria, some of which had not been previously identified in literature; the use of AR as a tool to improve sustainability, preserve knowledge, link the museum experience to on-site businesses, stimulate a behavioural and perception change and improve stakeholder efficiency.

#### ***Objective 4: To develop a business model to implement Augmented Reality in a cultural heritage tourist organisation***

The V4 BM was used as a tool to scaffold interview questions, providing focus and themes for research questions, providing a template to structure and assist in the exploration and examination of interview themes to develop an AR BM. In this way, the V4 was useful supporting the analysis of interview findings into relevant BM themes (See Chapter 6). These themes (See Table 6.13) were used to develop the

ARBM presented in Figure 9.1 and led to the identification of five ARBM components and a number of criteria related to each component. Five key areas and sub-components were identified resulting in the development of the ARBM. Similar to the V4 employed as a template to scaffold analysis, stakeholders also identified a number of important and necessary considerations during AR implementation, which formed the five ARBM modelling principles. In this respect, the ARBM and V4 are similar, in that they outline specific modelling principles that should be considered when applying the BM. This strengthens the need for new BMs to outline modelling principles, which should guide and support BM application. These modelling principles are unique to the contextual background of AR and cultural heritage tourism, and important to ensure the successful implementation of AR.

However, this study did not seek to validate, apply, expand or extend the V4, it was used only to guide themes that informed interview research questions (based upon its four components). It is important to note that the V4 did not influence the design of questionnaires, since these were used to validate the ARBM for Geevor, and were therefore based on the five ARBM components and subcomponents that were identified in interviews.

As discussed throughout Chapter 8, the ARBM shares a number of similarities with existing BMs, evolving from and confirming many ideas and theoretical BM concepts. This study has extended BM thinking into a new context, identifying the importance of applying BM theory when introducing new technologies, such as AR in the cultural heritage tourism context. Developing the ARBM also provides incremental knowledge to further discussions around the need to adopt innovative technologies in cultural heritage tourism organisations. AR is a new and evolving technology, and although a number of the criteria were identified in previous literature, various new criteria were also identified, for example, using AR to increase sustainability and the identification of new AR monetary benefits in a tourism context. On the other hand, a number of criteria identified by stakeholders' during interviews had been previously identified; hence, this study confirmed and reiterated their importance.

A number of commonalities and well as differences between the ARBM and existing BM literature were identified and discussed throughout Chapter 8. BM literature provided a theoretical background, which the ARBM has extended. For example, the ARBM shares common features with the V4 such as modelling principles developed to respond to the rapidly changing and highly competitive marketplace.

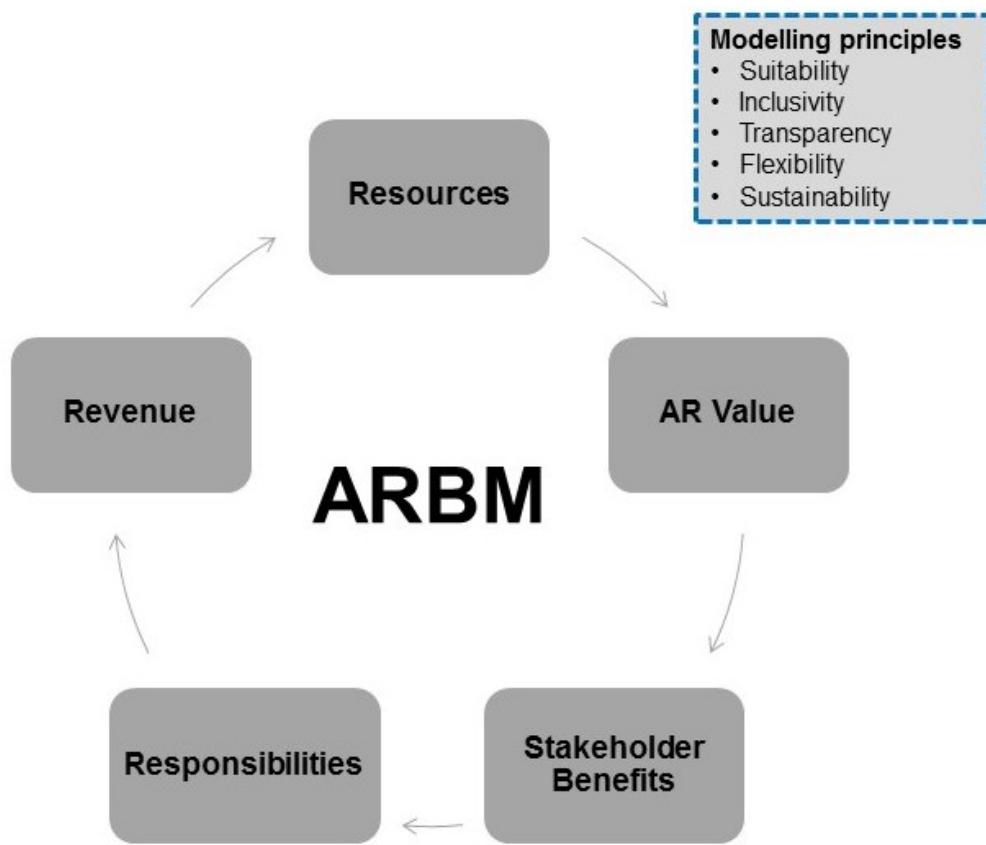
Within tourism BM literature, scholars also identified that the tourism and cultural heritage tourism sector had unique characteristics, such as intangibility, recommending that organisations should consider these unique contextual characteristics during BM development. Crucially the ARBM bridges a gap between tourism BM thinking and mobile BM thinking, outlining five ARBM modelling principles applicable to both tourism and MAR. In addition, ARBM furthers incremental thinking regarding BMs, innovation and technology adoption in practice to mobilise future thinking.

Although derived from stakeholder interviews - and therefore based on perception - the ARBM components share commonalities with existing BM literature. For example during development of the B4U model, Faber et al. (2003) discussed the need to differentiate between intended and perceived value. This was also revealed to be important during ARBM development, leading to the creation of 'resources' and 'AR value' components. In this way, the ARBM advocates the need for organisations to understand their existing strengths and resources, before identifying how AR could enhance or add value to these. In the same way Johnson et al. (2008) and Thompson and Martin (2010) proposed that organisations who perform better have good BMs, and precisely fulfil VPs. The ARBM both confirms and reiterates the significance of precisely filling VPs.

The importance of adopting a stakeholder approach to tourism development was recommended by a number of tourism scholars, to gain stakeholder support (Lindberg and Johnson, 1997; Yang et al., 2009) and "address the concerns of a wide range of stakeholders" especially when introducing new technologies (Hall and Martin, 2005, p.281). Adopting such an approach Kamal et al. (2011) claimed helped tourism organisations gain a holistic overview of internal and external stakeholders' perception to technology adoption in a tourism context. In a similar way, BM literature widely discussed the necessity to use BMs to map out and understand relationships between stakeholders in complex value networks (e.g. Camponovo and Pigneur, 2003). Pigneur (2002, p.1) explained that in business modelling "no single player can provide its customers with an end-to-end solution on its own". Faber et al. (2013) and Arrayent (2012) strengthened that organisations inability to harmonise and accommodate conflicting stakeholder requirements as a barrier to BM success. Thus, Klein-Woolthuis (1999) recommended organisations should take time to jointly discuss and agree on BM objectives. In this way, the use of AHP to validate the ARBM was effective, in that it aggregated multiple conflicting stakeholders

preferences to produce one group outcome, prioritising criteria in a hierarchy of importance. This demonstrates the benefits and use of AHP as a tool to harmonise and balance conflicting stakeholder preference in business modelling.

BM schloar Gordijn (2002) advised that organisaiions should invovle their network of stakeholders and imporntantly ensure all had an incentive to participate. Furthermore, Morris et al. (2006) suggested BMs act as a vehicle to demonstrate the appeal of a venture, attracting investors and resource providers. As outlined in BM literature, the ARBM 'stakehodler benefits' component confirmed the importnace of outlining stakehodler incentive or benefit to implement, invest or remain involved. In this way, the ARBM confirmed and strengthened the need to adopt a stakeholder approach to business modelling



Source: Author (2017)

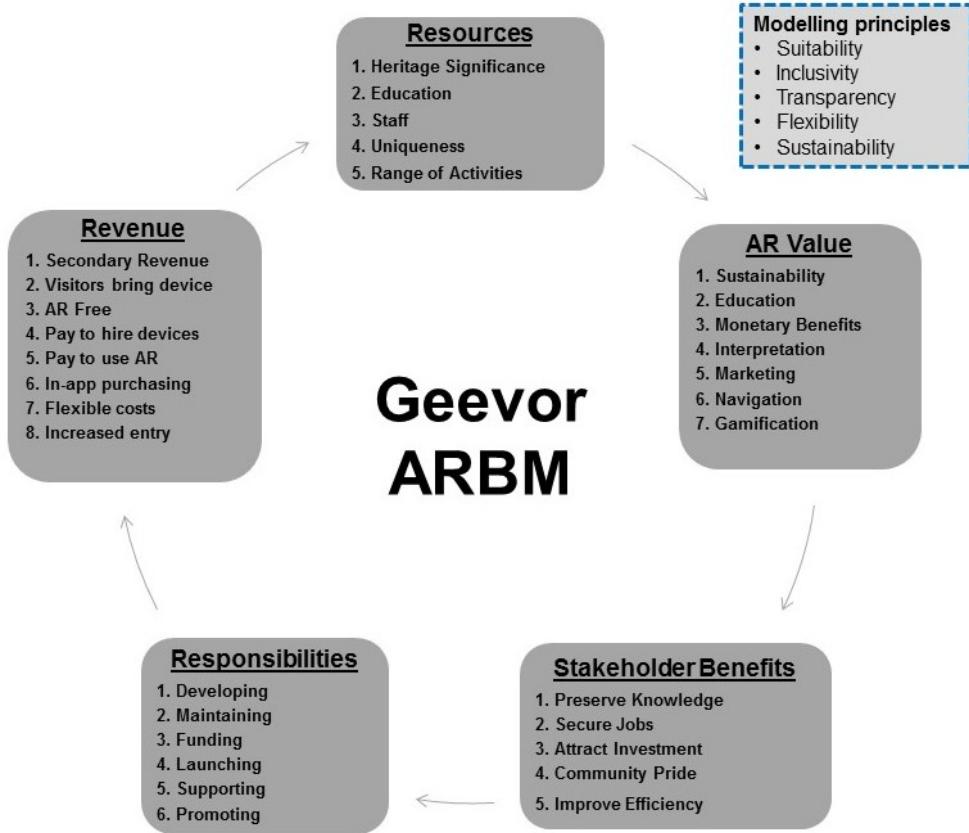
**Figure 9.1 The ARBM**

#### **Objective 5: To validate the proposed Augmented Reality Business Model**

It was identified that validation of the ARBM was important to Geevor. By not only developing but also validating the ARBM, this study makes a number of contributions to knowledge and practice. Figure 9.2 presents the validated ARBM

applied to Geevor, validated through 15 stakeholder questionnaires, analysed using AHP, a proven multi-criteria decision-making method, which organised criteria into a hierarchy of importance, aggregating stakeholder's perceptions to identify the most important criteria. The use of AHP in business modelling had not been previously identified, thus effectively applying it in this context extends existing understanding and increases use cases.

Ranking of criteria in order of importance demonstrated to Geevor management the most preferable and important areas to focus on when implementing AR. For instance, validation of the 'AR value' component suggested that AR should enhance sustainability, followed by education and monetary benefits, before focusing on integrating AR to improve interpretation, marketing, navigation, and gamification. Applying these findings, when developing the AR offer, Geevor management should design AR application features to enhance these areas and improve upon the existing offer. AHP demonstrated the best BM options by collaboratively combining stakeholder's preferences, whilst concurrently complementing the modelling principles. Questionnaire results and a ranking of ARBM components are presented in Table 7.13. Lastly, Chapter 8 discussed the outcome of primary data collection in relation to literature, identifying how findings were supported by, or extended, existing knowledge. Furthermore, it explored the implications of research outcomes, concluding by presenting a number of recommendations and guidelines for Geevor when implementing AR (See Table 8.1), confirming the importance and significance of the ARBM. In addition to this, ARBM validation demonstrates the effectiveness of using AHP to aggregate multiple and conflicting stakeholder preference into one group outcome, creating a hierarchy of importance and crucially ranking the most preferable ARBM options to pursue.



Source: Author (2017)

**Figure 9.2 Geevor ARBM**

### 9.3 Theoretical Contributions

The proposed ARBM signifies the start of a new area of practice and research the purpose of which will be to inform the integration of AR in cultural heritage organisations. Incrementally this study contributes to theory in a number of ways; providing new insight and a widening understanding of the topic, as well as applying the BM concept in a contextually new area. Such insights make a theoretical contribution to a number of areas, eliciting and promoting wider discussions such as innovation, technology and innovation use in cultural heritage tourism, and business model use in practice.

It has been evidenced tourist organisations face increased pressure to invest in and adopt modern technologies in order to advance their offering and create enhanced unique tourist experiences. For organisations such as Geevor, this pressure is intensified by a need to seek new ways to secure additional revenue and increase their competitiveness. These challenges become even more complex for rural tourism organisations because of a number of important factors that must be considered for example the cultural and social role the organisation has within the community. Fundamentally this study illustrated that AR should only be pursued

where and when appropriate. Interviews revealed AR is not always desirable. For example, the majority of Geevor stakeholders felt that AR would not add to the visitor experience in the miner's Dry room. This demonstrates a need to carefully explore whether AR adoption is the right option to enhance the visitor experience. It further confirms the importance of adopting a multi-stakeholder perspective to ensure unified support prior to adoption. In comparison to previous studies, which apart from some exceptions, often focused only on the positives of AR, thus, this study broadens understanding, outlining new areas for further research. Thus, this study adds incremental knowledge by providing a more comprehensive insight into stakeholder perception of AR adoption in addition to highlighting a number of important areas for consideration.

Previous studies have employed a range of processes to develop existing BMs, however, none of the selected models examined have, as far as the researcher is aware, developed and validated a BM using mixed methods or AHP analysis, nor have previous studies in an AR context used mixed methods. Moreover, the use of mixed methods for BM development is uncommon. Therefore, this study goes so way to extending academic understanding of the selection of methods appropriate for BM development by illustrating a BM development process employing mixed methods. In addition to demonstrating the benefits of using qualitative findings to build theory, verify and verify results using quantitative methods.

To the authors knowledge, no previous AHP studies have examined AR in cultural heritage context. Whilst, AHP has been adopted in a number of other application contexts and is a proven method to determine the importance of criteria, combining group decisions to produce one outcome, it has not been used to validate a BM. Hereby, the use of AHP to validate business modelling extends existing application cases of AHP. It demonstrates how AHP can be applied in business modelling, to aggregate a multiplicity of conflicting and diverse stakeholder preferences to produce a hierarchy of importance and preferable criteria. The use of AHP analysis to validate the ARBM contributes make an incremental contribution to both BM and tourism theory, demonstrating its ability to effectively aggregate multiple and conflicting stakeholder preference into one group judgement. Further, feeding a broader discussion regarding research methods applicability and use in group decision making.

The discussion and analysis of interview findings in Chapter 8 highlighted AR values not previously identified in previous studies. These offer novel perspectives and ideas, adding to the existing pool of knowledge enriching understanding of AR's potential, value, and benefits, such as adopting AR in cultural heritage tourism attractions to generate secondary revenue, increasing profits both on-site and in the local community. The use of AR to preserve knowledge emerged as a newly identified AR benefit, not previously recognised in literature, as did employing AR to increase attraction sustainability. These findings can fuel further debate and research of the use of AR in tourism contexts, incrementally broadening existing understanding of the value of AR. But, it is important to highlight the study is rooted in perception rather than practice, therefore the true potential of AR adoption remains to be explored.

So far, only tom Dieck and Jung, 2017 have examined AR at cultural heritage sites from a multi-stakeholder approach. This study adds to, complements and extends tom Dieck and Jung's (2017) study exploring AR implementation and potential from multi stakeholder perspectives rather than focusing solely on one stakeholder group, such as visitors, or internal staff. This extends theory, increasing understanding and adding to the existing pool of knowledge providing a more comprehensive understanding of the requirements for AR adoption. To the researcher's knowledge, this study is the most comprehensive in terms of the number and range of participants interviewed. Thus, providing a more holistic, comprehensive and incremental understanding of AR in cultural heritage attractions. Findings help mobilise further thinking and research projects that continue to explore AR adoption from a multi-stakeholder approach.

The most significant contribution of this study was the development and validation of the ARBM (See Figure 9.1). Although developed based on Geevor and rooted in perception rather than practice, the ARBM was designed encompassing a number of modelling principles and could therefore be used by other cultural heritage attractions. The potential of AR to add value has been widely discussed, and the need for tourist attractions to adopt modern technologies is considered a necessity. Nevertheless, research has so far failed to provide or offer a framework for tourism managers to implement AR and reap benefit from associated profits. Hence, the ARBM provides new insight into AR BM theory, demonstrating ways for tourist organisations to create AR value and capture returns from that value, be it stakeholder and visitor benefits, or revenue generation. The ARBM provides a

model for cultural heritage tourism organisations to explore and benefit from ARs potential to add value, whilst confirming the importance of extending BM thinking into this contextually new area. The ARBM can also scaffold further discussions regarding the implementation and adoption of AR in cultural heritage tourism. This seeks to mobilise future thinking about the importance of BM concepts in technology adoption. The multiplicity of stakeholder perspectives their similarities and differences further confirm the importance of adopting BM principles when approaching the integration of new technologies in cultural heritage tourism.

Despite confusion and lack of definition, BMs are considered critical to success. Organisations that actively innovate their BMs often outperform their rivals. Interest in, and popularity of, business modelling grew because of intensified competition introduced by the internet and electronic business. BMs for application in mobile, electronic, traditional and many other fields exist, but the lack of an AR-specific BM has so far delayed meaningful AR implementation. The ARBM helps illustrate areas for consideration by tourism organisations prior to implementation, deepening and extending understanding of the AR implementation process. Incrementally, the ARBM components facilitate areas for further discussion and highlighting a need for tourist organisations to address each of the five ARBM components. Due to the absence of an AR BM in academia, the study fulfils the gap, by both developing and validating the ARBM. This makes a significant contribution to BM theory by providing a tool illustrating key consideration areas when considering business modelling for AR adoption in cultural heritage tourism.

ARBM was designed as a fluid and flexible model, with the ability to be amended and updated given the context in which it is being explored. By extension ARBM could be applied to other tourism sectors, for example adventure or sports tourism. Equally, the ARBM could support AR implementation at other tourist attractions such as art galleries, theme parks, or events. The fundamental principles of the ARBM are applicable to all forms, types, and typologies of tourism and not just limited to cultural heritage attractions in a rural setting, broadening existing understanding. However, in urban environments, it would be recommended to conduct further research to understand the unique contextual characteristics such settings. Whilst the ARBM provides a structure to elicit discussion, its development was founded in perception rather than practice, rooted in the context of rural, cultural heritage settings. Nonetheless, as a fluid model, it can be employed to inform future practice,

and amended according to the context, and therefore provides a foundational basis as a BM to implement new technologies.

In comparison to existing BMs, the ARBM places significant emphasis on first understanding an organisations existing strengths and resources, before considering how AR could enhance and add value to these, as well as introduce new benefits. Contrary to existing BMs, which mostly describe the need to create value and capture returns from that value. As revealed through the case study process, it was essential to examine existing and added value separately to understand if, and where AR was appropriate to add value. Contrary to some existing BM literature, this differentiates the importance of examining these areas in succession, instead of simultaneously, representing a key consideration to inform future BM developments.

Although the ARBM shares commonalities with existing BM theory, the ARBM extends these, applying BM thinking in the context of AR in cultural heritage tourism. The ARBM applies the BM concept in a contextually new area, illustrating how BM thinking can be extended into the context of AR and the cultural heritage tourism sector. The B4U BM also confirmed the need to differentiate between intended and perceived value, however rather than simply differentiating between types of value, the ARBM expands thinking through the creation of two ARBM components; ‘resources’ and ‘AR value’. This thinking was supported by interview findings revealing the need for AR to add to, not detracted to the existing offer, and resources. This highlighted the importance that the strengths and value of Geevors resources were identified, prior to exploring how AR could add value to these. Understanding this process of AR integration in relation to BM development is incremental to future technology adoption projects, representing an important avenue for further discussion.

A number of scholars (e.g. Haugstvedt and Krogstie, 2012; Jung and Han, 2014; Jung and tom Dieck, 2017; Kasinathan et al. 2016; Olsson et al. 2012; Scarles et al. 2016b; Tscheu and Buhalis, 2016; tom Dieck and Jung, 2017) have explored the uses of AR in cultural heritage tourism (See Section 2.5.2) and called for a need for future research to explore the use and implementation of AR in cultural heritage tourism. Fundamentally, this study addressed the call, contributing incrementally, providing new theoretical insights knowledge and highlighting areas for further exploration. By addressing the gap, this study helps minimise the risk associated

with AR adoption described as a prohibiting factors for smaller companies to invest in AR (Jung and tom Dieck, 2017; tom Dieck and Jung, 2017; Scarles et al. 2016b). Moreover, the study responded to Jung and tom Dieck's (2017, p.11) call for "a suitable business model for the investment and implementation of multiple technologies into cultural heritage places", by developing the validated ARBM as a tool to scaffold and support future AR implementations and research projects.

#### **9.4 Practical and Managerial Implications**

As well as making a significant theoretical contribution, the ARBM is also the main practical contribution of the study. ARBM is a validated BM to implement AR in cultural heritage tourism. For Geevor, the ARBM identifies to managers and practitioners how to implement AR, outlining avenues to pursue. As widely identified in research, it has become a necessity for tourist organisations to invest in and integrate modern technologies to remain competitive, attract wider audiences and increase sustainability (e.g. Neuhofer et al., 2014; Tussyadiah, 2014; Han et al., 2014; Tscheu and Buhalis, 2016; Jung and tom Dieck, 2017). Developing the validated ARBM helps ensure Geevor do not miss out on the potential presented by AR, whilst providing a practical and authenticated BM and outlining areas of specific focus. Crucially, the ARBM development also successfully collaborated multiple-stakeholders perspectives into one group decision, minimising potential conflicts. In both practice and managerially ARBM is a framework for Geevor to implement AR, and the validation illustrates the most preferable avenues to pursue (e.g. guidelines and recommendations Table 8.1).

In reference to Tscheu and Buhalis (2016, p. 608) claim that despite the fact AR is "a tool for gaining competitive advantage is the cultural heritage sector, it is questionable how this advantage is generated. What benefits exactly emerge through AR at cultural heritage sites? What stakeholder requirements exist? What needs to be considered in the development process? [...] Only with the knowledge of how and where value is created can developers and providers create and implement a successful solution". The ARBM bridged a gap in existing research, outlining how and where value can be created, recognising avenues for developers to create and integrate AR. In this way, the study contributes and extends upon the existing understanding of ARs benefits in cultural heritage, by outlining stakeholder requirements, responsibilities and benefits, as well as areas that should be examined during development to improve managerial and practical understanding in future implementation projects.

The ARBM provides practical ways for other cultural heritage attractions and equally tourism sector organisations to explore and pursue AR adoption. This helps minimise the risk associated with adopting and investing in new technologies, which is particularly important for smaller organisations such as Geevor. Within interviews stakeholders discussed ways AR implementation can complement and support existing strategies and tourism plans extended benefits beyond the bounds of the organisation. Stakeholders also considered practical formalities of AR implementation such as whether the development and maintenance of AR could be performed in-house or the costs of outsourcing. Such discussions form important foundations to inform future policy and tourism strategies.

The study presented ways AR can add value to visitor attractions in addition to creating benefits for the local area, region and destination. This suggests the use of AR should be considered in future policy development to inform future practice. For example, Chapter 4 examined Visit Cornwall's regional tourism strategy that outlined a need to protect and enhance both tangible and intangible assets, develop cultural products, enhance competitor analysis, and, crucially, adopt "innovative destination marketing and communications, including the effective and innovative use of digital and social media channels" (Visit Cornwall, 2014). The strategy acknowledged a need to develop and integrate innovative technologies to improve the tourism offer. In this way, interview findings can be used to inform national level tourism development policies. For instance, it was revealed if implemented, AR should add to, not detract from, existing experiences, to increase sustainability and competitive advantage.

A further contribution to existing knowledge and practical solutions for the use of AR were identified by use of the ARBM to overcome traditional challenges faced by cultural heritage attractions. Often, a key concern held by managers and curators is that the integrity and authenticity of heritage and history is maintained. Literature criticised that often cultural heritage attractions commercialise the past, (e.g. Burnett, 2001; Samuel, 1994; Smith, 2009; Swarbrooke, 2000). However, this study demonstrates a number of practical solutions using AR that honour and preserve authenticity, such as creating an AR guided tour using and thus preserving existing miner's knowledge. This marks an interesting area for future research to further explore the ability for AR to maintain authenticity and integrity of tourist experiences.

Moreover, though the development of the ARBM additional roles and responsibilities were identified that managers need to address prior to AR implementation. This helps improve current understanding of the practical implications of adoption AR, reiterating and confirming the need for cultural heritage and general tourist attractions to adopt and invest in modern technologies. Interviews revealed that visitors, internal, and external stakeholders agreed AR should be adopted to raise the profile of the site, engage with wider and younger audiences and improve Geevor's long-term sustainability and viability. The ubiquity of technology has now reached a point where it is difficult to ignore. The study confirms that tourist organisations urgently need to invest in and adopt modern technologies such as AR, and importantly provides a practical framework to integrate AR. As identified, the most suitable way to approach the adoption of modern technologies is to improve the visitor offer, while creating practical benefits such as improving efficiency, and, most importantly, generating revenue. Business is fundamentally concerned with money and financial benefit. The ARBM identified potential pricing methods and revenue model options, demonstrating practical ways AR could be introduced to generate a financial return. This make a significant practical contribution by exemplifying to tourist attractions how to implement AR for economic return. However, it must be highlighted the proposed pricing methods are conceptual, rooted in perception rather than practice. The ARBM is a fluid framework to inform future practice and therefore proposed pricing methods remain to be implemented to determine their success and return of investment.

Table 8.1 proposed practical recommendations and guidelines for Geevor when implementing AR. AHP combined diverse stakeholder perspectives, minimising conflicts in attempt to maximise the success of AR adoption at Geevor following the suggested guidelines and recommendations. The potential value and benefits of AR presented throughout the study can support managers and tourist developers understand the potential of introducing AR.

Within existing research, a gap was identified within discussion and exploration of the monetary and revenue potential of AR in cultural heritage tourism. The study addressed this gap proposing practical solutions, such as integrating AR to generate revenue, whilst linking the tourist experience to attractions onsite businesses, such as food and beverage and retail offering. Essentially business is about money and in the case of Geevor, establishing sustainable additional sources of revenue was considered key for their future sustainability and success. The

ARBM provide a framework outlining potential revenue options and pricing methods to capitalise on ARs added value.

In addition the ARBM advances existing knowledge, extending BM theories by applying the BM concept to AR. The ARBM provides a framework to enhance cultural heritage tourism organisations decision-making and performance when integrating AR, providing a practical and validated framework for AR implementation in a cultural tourism context. Furthermore, the ARBM considers the complex and interrelated nature of both tourism and AR, employing AHP to combine these broad stakeholder perspectives into one group decision hierarchy, creating strong proof of concept. Overall, ARBM provides a comprehensive and fluid template for management outlining a practical approach for cultural heritage attractions to implement AR, which can be updated and adapted as necessary. Since the research is based on perception rather than practice the ARBM was developed as an adaptable and fluid framework to inform future practical and managerial decisions, mobilising further thinking.

## **9.5 Research Limitations**

It is important to acknowledge that the present study was based on perceptions and the ARBM is therefore conceptual. The true impact and effectiveness of the model cannot be determined or confirmed until AR is implemented. This was beyond the scope of the present study which aimed to develop an AR BM for the cultural heritage tourism sector, not to implement and test the developed model in a practical scenario. The boundaries of the study was limited to developing a model prior to actual implementation. Nevertheless, as discussed in the previous two sections the study provides incremental knowledge to inform future theory and practice. Moreover, the study bridged and addressed a call for research to develop an AR BM.

Due to its exploratory nature, the use of a case study was most appropriate to develop the ARBM, however, often case studies are criticised to not readily support the generalisation of results and extension to other attractions. But, employing such as methodology was fundamental to the success of the research project and fulfilling the aim and objectives. The most significant outcome is the validate BM to implement AR at Geevor. The findings can be used to inform and support future managerial and theoretical understanding for adoption of AR in contextually similar attractions. As identified by research, many cultural heritage attractions face the

same challenges and barriers. Therefore, this study proved useful to inform and promote discussion for other attractions to address their barriers through the implementation of AR.

There is no perfect methodology, but given the time, scope and resource limitations, a mixed-method case study approach was considered most appropriate to achieve the research aim and objectives within the boundaries of the study. It has been suggested that the use of mixed methods overcomes the limitations associated with each method in isolation. Measures taken to minimise threats to reliability and internal validity during data collection and analysis are presented in Table 5.13. One of the main criticisms and arguably, perceived limitations of this study is the use of a case study to develop the ARBM, being un-generalisable. However, the researcher does not consider the use of Geevor as a case study to be a limitation. Moreover, within the scope of the study the researcher agrees with Thomas's (2011, p.21) argument that "case study's conspicuous shortcomings in generalisability, far from minimising case study's offer, in fact, free it to offer something different and distinctive in social scientific enquiry". The case study was employed to create exemplary knowledge, developing a deep understanding of the complex research problem to producing practical outcomes and solutions. The ARBM has been developed as a fluid and flexible model, scaffolding areas for future research and investigation. After all, as discussed in section 5.4, it would be contradictory to philosophical assumptions to develop an ARBM without empirical evidence. The ARBM was developed within the organisational setting of Geevor, but nevertheless generated practical outcomes, creates new knowledge and provides a framework to other organisations in a similar context to effectively implement AR.

While every effort was made by the researcher to minimise and avoid bias, to a degree it unavoidable to employ judgement to interpret and analyse results, which introduced a degree of bias. It has been suggested that when employing thematic analysis, more than one researcher should interpret results to reduce the influence of bias and ensure similar interpretation of themes. However, PhDs are single researcher studies, hence this was not possible. Although it could be argued this increased the risk of bias, in line with pragmatic philosophy, reality is only relevant when it supports action, and the practical impact of ideas or knowledge is valuable to enable actions to be completed successfully (Kelemen and Rumens, 2008; Saunders et al., 2016). Therefore, instead of deducing law-like generalisations in line with positivist thinking, pragmatists view outcomes as the creation of practical

solutions to inform future practices (Saunders et al., 2016). With this in mind, it can be argued that understanding ideas and themes to create practical outcomes is more important than the risk or influence of researcher bias, thus the outcome is valid as it provides practical contributions and can be used to inform future practice.

Originally, the researcher had planned to involve the same stakeholders in both interviews and questionnaires. However, this was not possible due to their time commitments, responsibilities, and availability. Therefore, whilst some of the same stakeholders were interviewed in both stages of data collection and all stakeholder interviews belonged to the same organisations, not all interviews and questionnaires involved the same participants for both. It is not considered that this negatively impacted results because all stakeholders were experts in their field and their perceptions were as valid as the next person's. Indeed, it would have been the preference of the researcher to use the same stakeholders in both stages of data collection.

One stakeholder expressed a conflict of interests when asked to complete the questionnaire suggesting because of their role and relationship to Geevor it could have negative consequences if they identified a preference of one criterion in comparison to the other. The stakeholders suggested that some of the criterion were too independent. For example, they argued that it would be difficult to decide if 'education' was more important than 'marketing' because 'education' depends on having something to 'market'. Whilst the researcher acknowledged the validity of this argument, Geevor already have both a successful marketing presence and educational offer and the purpose of implementing AR was to enhance and add to this. While for a completely new organisation you could not prioritise 'education' over 'marketing' because the two are inherently related and interdependent, for Geevor, an existing organisation, the aim was to identify which existing areas or new areas AR could add value. Ranking criterion in order of perceived importance identified which areas AR implementation should focus on improving or developing, thus adding to the existing offer. A copy of the email from the stakeholder expressing and explaining their concerns can be found in Appendix 21. It should be noted only one stakeholder expressed difficulty completing the questionnaire, and, after conversations between the researcher and stakeholder, the stakeholder agreed to complete the questionnaire on the condition that the results were anonymous.

The fact that visitors were not included in the questionnaires meant their perception was not represented in AHP rankings, which could be argued as a limitation. However, the researcher felt that visitors would not be able to answer all of the questions, and not all would be relevant, such as which stakeholder benefits or responsibilities were more important. Because of this, the decision was made to exclude visitors from questionnaires. The interviews with 30 visitors influenced and had an important role in shaping the development of the ARBM. To validate the ARBM, visitor preference was not originally necessary, and, although they are an important stakeholder group, their influence was not considered essential to validate the ARBM. However, in hindsight, it would have been useful to develop a visitor specific questionnaire to include the judgement of visitors in AHP ranking.

While every effort has been made to use up-to-date and relevant literature sources, AR is still an evolving concept, and therefore its potential in cultural heritage remains to be fully understood. Greater access to university databases, resources, and subscriptions to publishers could have increased the use of relevant studies. However, to the author's knowledge, based on the literature used and referenced in this study, the chapters were as complete and up-to-date as possible upon submission.

The use of AHP created many benefits, providing strong proof of concept and aggregating stakeholder perceptions to produce a group decision. However, the use of AHP and the need to compare each criterion against another meant the questionnaire has five sections and a total of eighty-four pairwise comparisons. This could be considered a limitation by the fact that it required total concentration, presenting a lot of information to process and towards the end participants, concentration levels may have decreased. Likewise, some of the comparisons appeared repetitive. To maximise completion the introductory script and instructions on completing the questionnaire (See Appendix 19) explained the process and importance. During the pilot and questionnaire completion, stakeholders expressed no concern with completing the questionnaire and all questionnaires were returned fully completed.

Moreover, to ensure ease of completion and make sure all stakeholders shared a similar understanding of the criteria to improve validity of results, the researcher included a description of each criterion. While this may be argued to have introduced an element of influence, descriptions were based on interview results and therefore

reflected stakeholders' perceptions rather than the researchers ideas. In addition, the benefits of including a description box (e.g. ease of completion, increased consistency, universal understanding of criteria) are perceived to outweigh the negatives (e.g. researcher influence, bias).

## **9.6 Recommendations**

Throughout the research process, the researcher identified a number of areas and recommendations for both further research and to the cultural heritage tourism sector.

### **9.6.1 Recommendations for Future Research**

A number of potential areas for future research can be identified from this thesis. Firstly, it is recommended to apply the ARBM to similar case studies, to determine commonalities between criteria, and importantly facilitate comparisons between cases to increase the generalisation of results. It is suggested to compare urban and rural cultural heritage attractions, examining differences between criteria, such as resources, AR offer, and stakeholder benefits to better understand differences between contextual characteristics and visitor perception of the ways in which AR can enhance tourist experiences. Likewise, it is recommended to apply the ARBM to other tourism sectors, exploring similarities and differences. Moreover, it is recommended future research should examine AR pricing methods and revenue models because this remains an under-researched field. Future studies should attempt to research practical examples of AR implementation using the ARBM to fully understand the success of proposed pricing methods and revenue models.

Furthermore, as a newly identified AR benefit, it is suggested to further examine the potential of using AR to increase tourist attraction sustainability. No previous studies have explored the relationships between AR adoption and increased sustainability. At the time of submission, the researcher drafted a paper exploring how AR could be employed as a tool to increase tourist attraction sustainability, with plans to publish in the near future.

In a similar way, it would be an interesting future study to extend exploration of other case studies, in order to make comparisons, identifying similarities and differences between stakeholder networks, such as preference for AR, or long-term strategies. Although the ARBM was developed as a fluid and flexible model, it would be interesting to compare the different perspective of stakeholders in other contextually similar case examples.

It is recommended to conduct context-specific studies of other cultural heritage organisations to understand their unique characteristics and demands. Although other researchers can share understanding from this study, to effectively apply the ARBM it is imperative to comprehensively understand the unique characteristics of the context, different organisational structures, and stakeholder networks fully.

Another interesting area for future study would be an in-depth analysis comparing the similarities and differences between different stakeholder groups, exploring the extent to which their role and responsibilities influenced their perception. Geevor's stakeholder network is complex and whilst this study drew some comparison between different groups within the boundaries of the aim and objectives, it would be valuable to conduct a further study to explore these in depth for a more comprehensive understanding.

Lastly, it is important to note, the outcomes of this study are based largely on perception rather than practice and thus remain conceptual. Therefore, whilst the study offers a number of theoretical and practical contributions, promoting future research and informing practice, the true implications and success of AR implementation will not be fully realised until the ARBM is put into practice and adopted as a tool to implement AR. Therefore it is suggested as fundamental future studies apply the ARBM in practice, because without data to prove the ARBM it remains theoretical. The researcher hopes to explore the adoption of AR using the ARBM in the future.

### **9.6.2 Recommendations to Cultural Heritage Tourist Organisations**

The necessity of adopting modern technologies is essential for the future success and competitiveness of tourism. The author proposes a number of recommendations for cultural heritage tourism organisations; Firstly, AR has proven its ability to create a number of benefits, enhancing the tourist experience, visitor and stakeholders benefits and avenues for revenue generation, thus it is recommended organisations integrate AR into their offer using the ARBM to exploit these opportunities and realise AR potential. AR presents a number of revenue generating options, which it is suggested organisations should carefully examine to select the most appropriate method complementing their organisational strategies; not forgetting that more than one method can be used in combination. In addition, AR has the potential to attract funding and investment, and it is advised organisations explore this avenue to secure additional revenue sources and

investment. There is evidence of an increased number of funding opportunities for organisations interested in exploring the use of AR technology to improve their visitor experience.

Secondly, as identified throughout the study, AR increases interpretation, whilst minimising negative impacts on the environment, without impacting or altering physical infrastructures. Hence, it is recommended that tourist organisations explore ways in which AR could be introduced to improve their environmental sustainability. In addition to building sustainability principles into their future or existing BM. In a similar way, the study identified a number of ways AR can increase sustainability, socially, culturally and environmentally. It is advised organisations integrate AR to explore this potential fully and exploit the affordances to increase sustainability. Likewise, AR has been identified to strengthen cultural identity, improving and reaffirming cultural traditions therefore AR is proposed as a tool to conserve and continue sharing these for the enjoyment of future generations. Further, findings suggested AR could create a behavioural change, increase interest in, and recognition of, the importance and need to protect cultural heritage, especially among younger generations. Future research should further explore this avenue, exploring the extent to which AR can help engage younger audiences, broaden appeal and contribute to a positive perception change and attitude towards cultural heritage attractions. Crucially, AR has been identified as a tool to preserve knowledge whilst maintaining authenticity and integrity. The author acknowledges this as a key future application area for AR as a method to improve the visitor experience and offering and combat some of the traditional challenges faced by cultural heritage attractions.

Thirdly, AR can be used to broaden the appeal, attracting less specialist and more generalist visitors. Tourist organisations should explore the use of AR as a method of attracting audiences, increasing visitors numbers and encouraging more sustainable year-round visitor flow. Likewise, organisations should consider integrating AR to improve the efficiency and effectiveness of educating their visitors to improve learning. Such as introducing AR animations or overlays on existing displays to demonstrate complex processes. Importantly, it is recommended that adopting AR could create new employment opportunities and improve the demand for local services. However, stakeholders also advised AR could contribute to increased job security but increasing visitor numbers ensuring the attraction remains economically viable year-round.

Furthermore, it was suggested AR could help create a deeper connection between museum experiences and on-site businesses, which would drive more visits and increase intention to purchase. This would introduce significant financial benefits and is suggested as an important avenue for further exploration. In line with this, AR has been recognised to engage younger generations. Thus, cultural heritage organisations should integrate AR to improve their educational and entertainment offering. Engaging younger audiences is essential for the future, because younger generations become the visitors of the future, therefore engaging them now increases likelihood of future intention to visit cultural heritage attractions.

The study illustrated the ARBM can aid organisations within their decision-making processes. Findings suggested AR can be implemented to increase awareness of attraction facilities and experiences pre, during and post experience. Thus, organisations should examine the use of AR to improve management of visitors around site, as well as their expectations on site and intention to visit again post visit. In the same way, organisations should consider the use of AR to increase visitor length of stay and enjoyment of site facilities.

Lastly and most importantly, organisations should use the ARBM as a tool to explore their options to effectively implement AR in a way that it adds value. It is recommended organisations experiment with AR to find the best fit aligned with their organisational strategies. The ARBM should be treated as fluid model to inform implementations and promote both further research and discussions.

### **9.7 Reflections on Research Process and Study**

This section concludes the thesis, reflecting on the overall study process. The researcher faced several challenges throughout the research process, notably jumping from Undergraduate to PhD entered into completely new and unfamiliar territory. Initially, the researcher anticipated the researcher process would be straightforward, and did not expect so many “hiccups”. In reflection, if to embark on the PhD journey again, a number of small changes would be made, mostly involving data collection. In the present study, time and resource limitations meant the researcher could not conduct all interviews face-to-face, which would have been preferential. Nevertheless, 50 stakeholder interviews yielded rich data, eliciting interesting insights and discussion. In hindsight the researcher would have developed a visitor-specific questionnaire, to include a visitor perception in the AHP

ranking process. However, this was limited by the bounds of the project and only became obvious during the analysis stage.

The study confirmed the importance and necessity for tourist organisations to integrate modern technologies, identifying ways AR can add value, increase sustainability, competitiveness, and longevity, in addition to numerous other benefits producing several notable contributions. Overall and importantly, the researcher thoroughly enjoyed the PhD process and the opportunities it presented, gaining confidence and establishing a new passion for research. Throughout the PhD journey, the researcher achieved a number of awards and looks forward to the future.

- MMU 3 Minute Thesis Competition Institutional Winner, 2016
- Best PhD Proposal, IFITT (International Federation for IT and Travel and Tourism), 2016
- ITT (Institute of Travel and Tourism) PhD Student of the Year Award, Runner Up, 2016

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## APPENDICES

### **Appendix 1: Components of the AR system**

<b>Forms of AR</b>	Mobile AR (MAR)	Mobile AR (MAR) gives the user mobility to move around freely in their environment. MAR is largely more popular than fixed AR, emerging as one of the fastest growing research fields in AR, driven by increased use of smartphones that provide powerful platforms to support MAR	<i>Kipper and Rampolla (2012), Höllerer and Feiner (2004), Azuma et al. (2001)</i>
	Fixed AR	Fixed AR systems cannot be moved and have to be used in a specially equipped area	<i>Kipper and Rampolla (2012), Höllerer and Feiner (2004)</i>
<b>AR Components</b>	Computational Platform	To generate and manage the virtual material to be layered on top of the physical environment, process the tracker information and control displays	<i>Casella and Coelho (2013), Höllerer and Feiner (2004)</i>
	Displays	To present virtual material in the context of the physical world. This can be through HMDs, mobile hand-held displays or displays integrated into the real world	<i>Casella and Coelho (2013), Höllerer and Feiner (2004)</i>
	Registration and tracking	To align the virtual elements with the physical objects they annotate within a 3D co-ordinate in the reality view. Uses the devices location-based tracking sensors (GPS, compass and accelerometer) to track objects in the real physical environment or an image recognition (optical tracking with the use of a marker, marker-less or both)	<i>Casella and Coelho (2013), Höllerer and Feiner (2004)</i>
	Wearable Input and Interaction Technologies	To enable a mobile person to work with the augmented world, to further augment the world around them and communicate with other mobile AR users	<i>Casella and Coelho (2013), Höllerer and Feiner (2004)</i>
	Point of Interest	Representations of an information point in a digital geographic map that has its reference in a place in the real world	<i>Casella and Coelho (2013), Höllerer and Feiner (2004)</i>
	Wireless Networking	Needed to communicate with other people and computers while on the run. Dynamic and flexible information for AR relies on up-to-the-second information	<i>Casella and Coelho (2013), Höllerer and Feiner (2004)</i>
	Virtual Object	All digital content that is represented by the app of AR and superimposed to the actual view captured by the camera. Content type can be mixed media, text, 2D and 3D images/animations, movies, music, sound effects, interactive media and hyper text	<i>Casella and Coelho (2013), Höllerer and Feiner (2004)</i>
	Markerless and Marker based AR	The two types of optical systems for the recognition of brands used in aligning virtual objects; detection systems that identify a fiducially artificial mark and systems that use	<i>Casella and Coelho (2013), Höllerer and Feiner (2004)</i>

		the natural unchanged features of objects in the real-world	
	Six Degrees of Freedom	The concept relates to the track system capacity to maintain aligned a real-world object in a 3Dimentional space. Refers to 6 tracking actions that any smartphone AR app can obtain; forward/back, left/right, up/down (GPS), yaw (compass), pitch and roll (accelerometer)	<i>Casella and Coelho (2013), Höllerer and Feiner (2004)</i>
<b>Types of AR</b>	Marker-based	Markers come in various forms; pre-defined images, image-recognition, physical symbols, QR codes and barcodes. Process of augmentation is triggered when markers are detected, activating appropriate AR content to be presented. Cameras on AR devices calculate the relative pose (location and orientation) to prompt the AR process. This involves specific labels to register the position of 3D objects on the real-world image and trigger the augmentation of an object at a point where the computer recognises the tag interface (marker) serving as a pointer, connecting the real-world and the virtual-world. Because of the simplicity of the process and ease of use marker-based AR is the most common type of AR, most suitable for indoor use, although it has been criticised that marker-based tracking systems hinder the naturalness of the AR user interface	<i>Pokric et al. (2014), Exeter University (2012), Schmalstieg et al. (2011), Siltanen (2012), Cheng and Tsai (2013), Jung et al. (2013), Schultz (2013), Lee et al. (2013), Shepard (2013), MacRae (2011), Kapoor et al. (2013), Radkowski and Oliver (2013)</i>
	Marker-less	Marker-less AR, also known as location-based AR systems, use a combination of a device's accelerometer, compass and location data (GPS) and image-recognition to determine the position of the user in the physical world. Location data is compared to a database to determine which direction the device is looking, to display relevant graphics on-screen. Marker-less systems require feature points which are extracted from the image captured by the device's camera, built upon the concept of computer vision, offering high degrees of freedom of the user. Marker-less AR is more dependent upon the device's capabilities, but the fact it does not require codes, makes it better-suited to outdoor environments	<i>Exeter University (2012), Johnson et al. (2010), Shepard (2013), Abowd et al. (1999), Kapoor et al. (2013), Cletek (2015) Chung et al. (2015), Jung et al. (2013)</i>
<b>AR Role</b>	Augmented perception of reality	Shows reality, the real-world, but enhances what users can see and do. In this way, AR lends itself to practical decision-making processes, particularly in mobile environments by enhancing the user's senses and response rate. It has also been found to have entertainment benefits, allowing users to discover things in their surrounding environment, presenting real-world objects of potential interest, aiding navigation, and providing additional information	<i>Kipper and Rampolla (2012); Nguyen et al. (2015).</i>

<b>AR Role</b>	Creation of an artificial environment	Shows users what does not exist in the real-world, allowing them to see the imaginary. For instance, Tissot watches created an app allowing users to virtually try on watches. This creates a perception that the real and the virtual could exist by creating an environment allowing the user to 'try on' a digital watch that could be purchased in the real-world	<i>Kipper and Rampolla (2012), Thompson (2010)</i>
<b>AR Platforms</b>	Personal computers with webcams	The fixed nature of the device is a marker which is placed within view of the webcam, and shows a live feed. When the marker is detected it creates an augmentation on screen for the user to interact with	<i>Celtek (2015), Craig (2013)</i>
	Kiosks, digital signage and window displays	Stations such as kiosks, are implemented for customers to bring items to them to find out more information about them. Window displays and digital signs use large static markets so users can interact with them using mobile devices	<i>Celtek (2015), Craig (2013)</i>
	Smartphones and Tablets	On smartphone and tablet devices, markers are identified when users point their camera towards a point of interest, the device's compass and GPS functions augment the location relative to the positioning of the device	<i>Celtek (2015), Craig (2013)</i>
	AR Glasses and HMDs	Although AR glasses and HMDs are not yet common-place, it is possible to view AR using such devices.	<i>Celtek (2015), Craig (2013)</i>
<b>AR Displays</b>	Mobile handheld displays	Mobile handheld are the most commonly used AR display, using small computing devices such as smartphones and tablets that users can hold in their hands. The three types of handheld displays used for AR systems are: smartphones, PDAs and tablet PC. Handheld displays are popular because of their minimal invasiveness, social acceptance, commercial availability and mobility	<i>Carmigniani and Furht (2011), Celtek (2015), Zhou et al. (2008), Van Krevelen and Poelman (2010), Marimon et al. (2014)</i>
	Video Spatial and projection-based displays	Spatial displays use a video projector, optical elements, holograms, radio frequency tags and other tracking technologies to display graphical information directly onto physical objects without requiring the user to wear or carry the display. The main advantages are that minimal intrusiveness because users do not have to wear anything and therefore it can cover a wide areas	<i>Celtek (2015), Carmigniani and Furht (2011), Zhou et al. (2008), Van Krevelen and Poelman (2010)</i>
	Wearable displays (HMDs)	HMDs are display devices worn on the head or as part of a helmet/hat that place both images of the real and virtual environment over the user's view of the world. They display imagery in front of the user's eyes, allowing them to see the real world, while displaying virtual objects superimposed by optical and video techniques.	<i>Celtek (2015), Rhodes and Allen (2014b), Carmigniani and Furht (2011), Taqvi (2013), Azuma et al. (2001), Zhou et al. (2008)</i>

<b>AR Displays</b>	HMDs: Optical see-through	Optical see-through (OST) HMDs provide an AR overlay through a transparent display, allowing the users to see the real world naturally, while overlaying graphics onto their view using holographic and digitisation techniques. Therefore the real world resolution remains unchanged. Google Glass is a popular example of OST HMD technology	<i>Azuma et al. (2001), Zhou et al. (2008), Carmigniani and Furht (2011), Van Krevelen and Poelman (2010)</i>
	HMDs: Video see-through	Video see-through (VST) HMDs use video capture from the devices camera as a background to overlay AR showing an opaque display, providing the user with a video of the real world with graphics overlaid onto it.	<i>Azuma et al. (2001), Zhou et al. (2008)</i>
<b>AR Methods</b>	Pattern	Pattern systems perform simple pattern-recognition on basic shapes or markers and once recognised the system replaces that area with static or moving digital content. This makes the item items appear in the scene with the user such as 3D models, audio, video clips or text	<i>Hayes (2009), Kipper and Rampolla (2012), Celtek (2015), Craig (2013)</i>
	Outline	Part of the body is recognised e.g. hands, faces, feet and seamlessly blended with digital elements allowing the user to interact with 3D objects using natural movements, like picking up a virtual object with their real hand. To do this, the camera tracks the outline of the persons hand to adjust the virtual object accordingly	<i>Craig (2013), Hayes (2009). Celtek (2015), Kipper and Rampolla (2012)</i>
	Location	Location uses detailed GPS or triangulation information combined with the position view of the camera to enable the AR system to precisely overlay icons and virtual objects over buildings or people as the user explores the real world. Commonly, location-recognition is used on mobile devices such as smartphones equipped with the necessary components to enable location-based AR; camera, screen, GPS capabilities, accelerometer and digital compass. These components combined with location-recognition are often used to create AR Browsers, designed to let users see information on nearly anything they point their devices camera toward.	<i>Celtek (2015), Craig (2013), Kipper and Rampolla (2012)</i>
	Surface	Surface recognition is the most logical form of AR. It works by using screens, floors or walls that respond to touch or objects that provide users with real-time information For example, Microsoft launched a coffee-table sized computer in 2007 called “surface” which sees and responds to touch and real-world objects	<i>Hayes (2009), Craig (2013), Kipper and Rampolla (2012)</i>
	Hologram	The hologram method is when virtual or real items are projected into physical spaces, by camera tracking real-world impulses such as hand gestures or audio signals	<i>Hayes (2009)</i>
	Tangible interface	Tangible user-interfaces blend real and virtual worlds, giving a physical feel to digital	<i>Celtek (2015), Zhou</i>

<b>Interactions with AR</b>		<p>information, allowing objects in the real world to be used as AR interfaces that users can physically manipulate, offering an intuitive way to interact with virtual content. Hand gestures are one of the most natural ways to interact with an AR environment. AR delivers an enhanced view of the world, when combined with haptic feedback (sense of touch), creating a platform allowing the tangible interface to enhance the user's sense of physically interacting with virtual data. This process works when a virtual object is registered to a physical object, thus the user interacts with the virtual objects by manipulating the corresponding tangible object. The main benefit of tangible interfaces is that they provide true spatial registration and presentation of 3D virtual objects anywhere in a physical environment, enabling users to interact with virtual content using the same interactions as they would with a real tangible object</p>	<i>et al.</i> (2008), Kipper and Rampolla (2012), Carmigniani and Furht (2011), Billinghurst et al. (2001)
	<b>Collaborative interface</b>	<p>Collaborative interfaces allow multiple users to share the same augmented environment, using multiple displays to support both remote and co-located activities. Co-located collaboration enhances sharing using 3D interfaces to create collaborative workspaces, whereas remote location collaboration AR seamlessly integrates multiple users with display devices enhancing telepresence in multiple contexts, for example in teleconferences. Both type of collaborative interface, allow multiple users to share the same augmented environment, simultaneously seeing and interacting with common virtual objects, and the real world remains part of what they see. In industry, this type of AR interface has been used in various cases, such as teleconferencing and integration with AR medical apps, to help medical teams perform diagnostics, surgery and maintenance in different locations.</p>	Regenbrecht (2002), Carmigniani and Furht (2011), Celtek (2015), Zhou et al. (2008)
	<b>Hybrid user interface</b>	<p>Hybrid interfaces combine different but complementary interfaces allowing interaction through a variety of devices. They provides a flexible platform for unplanned, everyday interaction where device type and display type are not known in advance, for example systems automatically accommodate a changing set of input and output devices and interaction techniques that use them</p>	Carmigniani and Furht (2011), Kipper and Rampolla (2012), Zhou et al. (2008), Celtek (2015)
	<b>Multimodal interface</b>	<p>Multimodal interfaces interact with real objects with naturally occurring forms of language and behaviours, such as speech, touch and natural hand gestures, or gaze, thus combining multiple methods to interact with a system, allowing users to interact with real objects using natural language and behaviours such as eye-gaze, speech, touch and natural hand gestures. These forms of interaction are suggested to become the preferred type of interaction for future AR</p>	Celtek (2015), Kipper and Rampolla (2012), Carmigniani and Furht (2011), Lee et al. (2010), Online

<b>Interactions with AR</b>	<p>apps as they offer robust, efficient, expressive and mobile forms of human-computer interaction with the user's preferred interaction method. They also have the additional beneficial capability of supporting different styles of interaction should users wish to switch between interaction depending on the task, setting or use-context; for example museum, library, café and so on. The freedom of users to choose the mode of interaction is suggested to be critical for wide-scale user-adoption of technologies in public places</p>	<i>encyclopedia (2014)</i>
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## Appendix 2: Thematic Summary of BM literature and Representative

### Definitions

Theme	Sample Publications	Summary	Representative Definition
Design	Slywotzky (1999); Timmers, (1998)	Agent-driven or emergent configuration of firm's characteristics	"A business model is an architecture for product, service, and information flows, including a description of the various business actors and their roles" (Timmers, 1998).
RBV	Mangematin et al. (2003); Winter and Szulanski (2001)	Organisational structure co-determinant and coevolving with firm's asset stock or core activity set	"Each business model has its own development logic which is coherent with the needed resources—customer and supplier relations, a set of competencies within the firm, a mode of financing its business, and a certain structure of shareholding" (Mangematin et al., 2003).
Narrative	Magretta (2002)	Subjective, descriptive, emergent story or logic of key drivers of organisational outcomes	"[Business models] are, at heart, stories—stories that explain how enterprises work" (Magretta, 2002).
Innovation	Chesbrough and Rosenbloom (2002)	Processual configuration linked to evolution or application of firm technology	"The business model provides a coherent framework that takes technological characteristics and potentials as inputs and converts them through customers and markets into economic outputs" (Chesbrough and Rosenbloom, 2002).
Transactive	Amit and Zott (2001); Zott and Amit (2007)	Configuration of boundary spanning transactions	"A business model depicts the content, structure, and governance of transactions designed so as to create value through the exploitation of business opportunities" (Amit and Zott, 2001).
Opportunity	Afueh (2003); Downing (2005); Markides (2008)	Enactment and Implementation tied to an opportunity landscape	"[The business model] is a set of expectations about how the business will be successful in its environment" (Downing, 2005).

\*\*RBV – Resource Based View

Source: George and Bock (2011, p. 84)

### Appendix 3: Core Business Model Components

Component (1) How do we create value?	(Factors relating to the offering)
<p><i>Select one from each set</i></p> <p>Offering:</p> <ul style="list-style-type: none"> <li>- primarily products/ secondary products/ heavy mix</li> <li>- standardised/ some customisation/high customisation</li> <li>- broad line/medium breadth/narrow line</li> <li>- access to product/product itself/product bundled with other firms product/service</li> <li>- internal manufacturing or service deliver/outsourcing/licensing/reselling/value added reselling</li> <li>- direct distribution/ indirect distribution (if indirect: single or multi-channel)</li> </ul>	
Component (2) Who do we create value for?	(Market factors)
<p><i>Select one from each set</i></p> <ul style="list-style-type: none"> <li>- type of organisation: B2B, B2C/both/other</li> <li>- local/regional/national/international</li> <li>- where customer is in value-chain: upstream supplier/downstream supplier/government/institutional/wholesaler/ retailer/ service provider</li> <li>- broad or general market/niche market</li> <li>- transactional/ relational</li> </ul>	
Component (3) What is our source of competence/advantage?	(Internal capability factors)
<p><i>Select those that apply</i></p> <ul style="list-style-type: none"> <li>- production /operating systems</li> <li>- selling/marketing</li> <li>- information management/mining/ information packaging</li> <li>- technology/ RandD/ creative or innovative capability/ intellectual</li> <li>- financial transaction/ arbitrage</li> <li>- supply chain management</li> <li>- networking/resource leveraging</li> </ul>	
Component (4) How do we differentiate ourselves?	(Competitive strategy factors)
<p><i>Select one from each set</i></p> <ul style="list-style-type: none"> <li>- image of operation excellence/consistency/dependability</li> <li>- product or service quality/selection/feature/availability</li> <li>- innovation leadership</li> <li>- low cost/efficiency</li> <li>- intimate customer relationship/experience</li> </ul>	
Component (5) How can we make money?	(Economic factors)
<p><i>Select one from each set</i></p> <ul style="list-style-type: none"> <li>- pricing and revenue sources: fixed/mixed/flexible</li> <li>- operating leverage: high/medium/low</li> <li>- volumes: high/medium/low</li> <li>- margins: high/medium/low</li> </ul>	
Component (6) What are our time, scope and size ambitions?	(Personal/investor factors)
<p><i>Select one</i></p> <ul style="list-style-type: none"> <li>- subsidence model</li> <li>- income model</li> <li>- growth model</li> <li>- speculative model</li> </ul>	

Source: adapted from Morris et al. (2006, p.36)

#### Appendix 4: Example of traditional Business Models

BM Analogy	How it works	Example
<b>Affinity Club</b>	Pay royalties to large organisations for the right to sell your product exclusively to their customers	MBNA
<b>Brokerage</b>	Bring together buyers and sellers, charging a fee per transaction to one or another party	Century 21 Orbiz
<b>Bundling</b>	Package related goods and services together	Fast-food value meals. IPod and ITunes
<b>Cell Phone</b>	Charge different rates for discrete levels of a service	Sprint Better place
<b>Crowdsourcing</b>	Get a large group of people to contribute for free in exchange for access to other people's content	Wikipedia YouTube
<b>Disintermediation</b>	Sell direct, sidestepping traditional middlemen	Dell WebMD
<b>Fractionalisation</b>	Sell partial use of something	Net-Jets Timeshares
<b>Freemium</b>	Offer basic services for free, charge for premium service	LinkedIn
<b>Leasing</b>	Rent, rather than sell, high-margin, high-priced products	Cars
<b>Low-touch</b>	Lower prices by decreasing service	Walmart Ikea
<b>Negative operating cycle</b>	Lower prices by receiving payment before delivering the offering	Amazon
<b>Pay as you go</b>	Charge for actual metered usage	Electric companies
<b>Razor/blades</b>	Offer the high-margin razor below cost to increase volume sales of the low- margin razor blades	Printers and ink
<b>Reverse razor/blades</b>	Offer the low-margin item- below cost to encourage sales of the high margin companion product	Kindle IPod and ITunes
<b>Reverse auction</b>	Set a ceiling price and have participants bid as the price drops	Elance.com
<b>Product to service</b>	Rather than sell a product, sell the service the product performs	Zipcar
<b>Standardisation</b>	Standardise a previously personalised service to lower costs	MinuteClinic
<b>Subscription</b>	Charge a subscription fee to gain access to a service	Netflix
<b>User communities</b>	Grant members access to a network, charging both membership fees and advertising	Angies List

Source: Johnson (2010)

## Appendix 5: Detailed description of BM Canvas and its nine components

Components	Description
<b>Customer Segments</b>	
<i>Defines different groups or people or organisations a firm aims to reach and serve. Customers are at the heart of any BM, without customers no organisations can survive. To better serve customers, they can be grouped into distinct segments with common needs, behaviours and attributes. Firms can serve one, all, or ignore certain segments.</i>	
Mass Market	Do not distinguish between different customer segments, instead focusing on one large group of customers with broadly similar needs and problems
Niche Market	Targeting niche markets to cater to specific, specialised customer segments, thus tailored to specific requirements
Segmented	Distinguish between market segments with slightly different needs and problems
Diversified	Serves two unrelated customer segments with very different need and problems
Multi-sided platforms	Serve two or more interdependent customer segments
<b>Customer Value Propositions</b>	
<i>Describes the products of bundles and services that create value for specific customer segments by solving a problem or satisfying needs. Each VP contains a set of selected bundle of products/service to cater to specific customer segments requirements. Value can be quantitative (e.g. price) or qualitative (e.g. design, customer experience)</i>	
Newness	Satisfies an entirely new set of needs that customers previously did not perceive because there was no similar offering, often technology related
Performance	Improving product/service performance is a common way to create value
Customisation	Tailoring products and services to the specific needs of individual customers or segments creates value
Getting the job done	Value can be created simply by helping customers get the job done
Design	Important but difficult element to measure, products can stand out because of superior design
Brand or status	Customers can find value simply by using or displaying a specific brand
Price	Offering similar value at a lower price is a common way to satisfy the needs of price-sensitive customer segments
Cost reduction	Helping customers reduce costs creates value
Risk reduction	Customer value reducing the risks they incur when purchasing products/services
Accessibility	Create value by providing products/services to customers who previously lacked access to them
Convenience/usability	Making things more convenient or easier to use can create substantial value
<b>Channels</b>	
<i>The channel component, describes how a firm communicates with, and reaches its customer segments to deliver the VP. Therefore, channels are customer touch points that play a critical role in the customer experience, serving several functions; increasing awareness about a company's products/services, helping customers evaluate a company's VP, allowing customers to purchase specific products/services, delivering VP to customers and providing post-purchase support. Channels have five distinct phases (See below figure), thus finding the correct mix of channels to satisfy how customers want to be reached is crucial in bringing the VP to market.</i>	
<b>Customer Relationships</b>	
<i>Describes the type of relationships an organisation establishes with specific customer segments, ranging from personal to automated. The type of relationships an organisation wants to establish, depends upon customer retention, acquisition, and boosting sales.</i>	
Personal assistance	Relationship based on human interaction, customer can communicate with a real customer representative to get help
Dedicated personal assistance	Relationship involves dedicating a customer representative specifically to an individual client
Self-service	Company maintains no direct relationship with customers, instead provides the necessary means for customers to help themselves

<b>Components</b>	<b>Description</b>
Communities	Online communities that allow users to exchange knowledge and solve each other's problems, which can also help companies better understand their customers
Automated service	Mixes customer self-service with automated process
Co-creation	Going beyond the traditional customer-vendor relationship to co-create value with customers, such as allowing customers to write product/service reviews
<b>Types of Revenue Stream</b>	
<i>Revenue streams are the cash a company generates from each customer segment. Each customer segment can have one or more revenue streams, which can have different pricing mechanisms (e.g. fixed-list prices, bargaining, market-dependent, volume-dependent, yield management). A BM can contain two different types of revenue streams; transaction revenues from one-time customer payments and recurring revenues from ongoing payments.</i>	
Asset sale	Selling ownership rights to a physical product
Usage fee	Generated by the use of a particular service, the more the service is used, the more the customer pays
Subscription fees	Generated by selling continuous access to a service
Lending/Renting/Leasing	Created by temporarily granting someone the exclusive right to use a particular asset for a fixed period in return for a fee. Renting or leasing incurs expenses for a limited time
Licensing	Generated by giving customers permission to use protected intellectual property in exchange for licensing fees, giving them the rights to generate revenue from their property without having to manufacture a product or commercialise a service
Brokerage fees	Revenues comes from intermediation service performed on behalf of two or more parties
Advertising	Fees from advertising a particular service, product or brand
<b>Pricing mechanisms</b>	
<i>Each Revenue stream can also have different pricing mechanisms, the type chosen can have a big impact upon revenue generation. The two main types are; fixed and dynamic pricing (see figure below)</i>	
<b>Key Resources</b>	
<i>Key resources are considered the most important assets required to make the BM work. Resources allow a firm to create and offer a VP, reach markets, maintain relationships with customers and generate revenue</i>	
Physical	Includes physical assets such as manufacturing facilities, buildings, vehicles, machines, systems and distribution networks
Intellectual	Such as brands, propriety knowledge, patents and copyrights, partnerships and customer databases are increasingly important components of a strong BM, difficult to develop but when successful create and offer substantial value
Human	Necessary in all BMs, but human resources for example are crucial for their knowledge intensive and creative industries
Financial	Such as cash, lines of credit, stock option pools for hiring employees
<b>Key Activities</b>	
<i>Key activities are the most important things a company must do to make its BM work and operate successfully. The same as key resources, they are necessary to create and offer a VP. Activities differ depending upon the type of BM</i>	
Production	Relate to designing, making, and delivering a product in substantial quantities and/or of superior quality
Problem solving	Coming up with new solutions to individual customer problems
Platform/network	Designed with a platform as a key resource and are dominated by platform or network-related key activities
<b>Key Partnerships</b>	
<i>Key partnerships include the network of suppliers and partners needed to make a BM work. Likewise there are three types of motivations for creating partnerships</i>	
<u>Partnerships</u>	<u>Motivations</u>
1) Strategic alliances between non-competitors	1) Optimisation and economy of scale

2) Cooperation: strategic partnerships between competitors	2) Reduction of risk and uncertainty
3) Joint ventures to develop new business	3) Acquisition of particular resource and activities
4) Buyer-supplier relationships to assure reliable supplies	
<b>Characteristics of cost structures</b>	
<p><i>Cost structure outlines that costs should be minimised through every BM, but low-cost structures are more important to some BMs than others. There are two broad types of BM cost structures; cost-driven and value-driven. Cost-driven; focus on minimising costs wherever possible, aims to create and maintain the leanest possible cost structure using low price VPs, maximum atomisation and extensive outsourcing. Value-driven; less concerned with cost implications, instead focus on value creation. Premium VPs and high degree of personalised service usually characterise value-driven BMs. All cost structures have different characteristics</i></p>	
Fixed costs	Costs that remain the same despite the volume of good or services produced, such as rents, salaries etc.
Variable costs	Costs that vary proportionally with the volume of goods or services produced
Economies of scale	Cost advantages that a BM enjoys as its output expands, larger companies benefit from lower bulk purchase rates
Economies of scope	Cost advantages that a business enjoys due to larger scope of operations

Source: Adapted from Osterwalder and Pigneur (2010, p. 22-41)

### **BM Canvas: five stages of BM channels**

Channel Types		Channel Phases				
Own	Sales force					
	Web sales	<b>1. Awareness</b> How do we raise awareness about our company's products and services?	<b>2. Evaluation</b> How do we help customers evaluate our organization's Value Proposition?	<b>3. Purchase</b> How do we allow customers to purchase specific products and services?	<b>4. Delivery</b> How do we deliver a Value Proposition to customers?	<b>5. After sales</b> How do we provide post-purchase customer support?
	Own stores					
	Partner stores					
Partner	Wholesaler					

Source: Osterwalder and Pigneur (2010, p. 27)

### **BM Canvas Pricing Mechanisms**

Fixed "Menu" Pricing		Dynamic Pricing	
Predefined prices are based on static variables		Prices change based on market conditions	
List price	Fixed prices for individual products, services, or other Value Propositions	Negotiation (bargaining)	Price negotiated between two or more partners depending on negotiation power and/or negotiation skills
Product feature dependent	Price depends on the number or quality of Value Proposition features	Yield management	Price depends on inventory and time of purchase (normally used for perishable resources such as hotel rooms or airline seats)
Customer segment dependent	Price depends on the type and characteristic of a Customer Segment	Real-time-market	Price is established dynamically based on supply and demand
Volume dependent	Price as a function of the quantity purchased	Auctions	Price determined by outcome of competitive bidding

Source: Osterwalder and Pigneur (2010, p. 33)

## Appendix 6: Characteristics of mobile and digital markets

Characteristics	Description
Low barriers to entry	There are numerous Software Development Kits (SDK) offered at free or low costs encouraging and attracting developers (Delhumeau, 2013). Therefore, mobile apps can be developed with SDK for little or no fixed costs (ACMA., 2011)
Low barriers to exit	Few sunk costs mean developers can enter or exit the markers quickly and easily (Delhumeau, 2013)
Strong competition	The vast number of sellers, developers and wide choice of mobile apps available to users has created a highly competitive market (Delhumeau, 2013; ACMA., 2011)
Extended value chains with multiple players	Numerous platforms exist through which mobile apps can be delivered, complicating the supply chain. Hereby, responsibility for specific elements relate to different organisations, leading to a complex relationship between service providers and the end-user (Delhumeau, 2013). Multiple platforms exist, complicating the supply chain, therefore all parties involved have a role in the delivery of the service to the end-user (ACMA., 2011). “The provisioning of complete mobile service solutions requires the collaboration of a large number of market players” argue Camponovo and Pigneur (2003, p.4).
Global scale	Smartphones and other devices work on a global scale, app stores are therefore available worldwide attracting a global consumer base. As a result of the global nature of the market there are cross-border and trans-jurisdictional market implications (Delhumeau, 2013)
Unpredictable revenue	There is financial instability and viability within the mobile apps market, for example fashions and phases lead to a variable marketplace (Delhumeau, 2013)
Mobility	Mobility “represents its only distinctive advantage upon which mobile services can build their value proposition” (Camponovo and Pigneur, 2003, p.2). Mobility offers unique benefits, such as freedom of movement, ubiquity, localisation, reachability, convenience, instant connectivity and personalisation (Muller-Versee, 2000).
Network externalities	Camponovo and Pigneur (2003, p.3) argue that network externalities “occurs when a transaction between two actors affects, as a side-effect, a third party that is external to the transaction. The externality is said to be positive because the third party gains value from the function”. Network externalities influence both consumers and whether they decide to adopt a new technology, and producers when they decide whether to standardise their products to allow compatibility with their other producers, set the product quality and choose the pricing policy.
Exclusive control over important assets	M-businesses have control of important assets under exclusive control of a firm. These can arise for a number of reasons; the rarity of an item, the existence of a fabrication secret, special privilege or patent giving its owner exclusivity over an asset and the presence of a particular cost structure with high initial investments causing natural monopolies (Camponovo and Pigneur, 2003).

Source: Author (2017)

## Appendix 7: Deconstruction of eBusiness Model

Component	Description
<b>Product innovation</b>	
<i>The value the firm wants to offer customers. Hinges upon the idea that in order to deliver the value proposition there are certain processes that can be either in-house and/or outsources capabilities</i>	
Value proposition	Refers to the value offered to the specific target-customer. M-business offers a variety of new ways to create and deliver value, for example thorough disintermediation and customisation
Target	the goal of creating value for specific target-customer segments, such as b2b (business to business or b2c (business to customer)
Capabilities	to deliver the value proposition to customer groups, the firm must make sure it has the correct range of capabilities that underpin the proposed value
<b>Customer relationship</b>	
<i>The importance of customer relationships is often forgotten; however, ICT offers new opportunities to exploit existing customer relationships by "getting a feel for the customer's desires, serving them and developing an enduring relationship with them" (Dubosson-Torbay et al., 2002, p.8). Branding has also evolved to include relationship capital, emphasising the interaction between the firm and the customer.</i>	
Getting a feel:	for the customer refers to all customer information and knowledge a company can gather and exploit, with the aim of discovering new profitable business opportunities, customer segments and improve relationships with customers. Each of these is useful for marketing, sales and CRM (customer relationship management).
Serving the customer	including fulfilment, support and CRM. Firm must decide if they want to deliver additional value to customers and therefore what support/services it wishes to provide. Fulfilment and support refer to the way the firm goes to market and how it reaches customers (Hamel, 2000).
Branding	shifts towards relationship dynamics where emotional and transactional, elements in an interaction between a firm and the client form an image of a company
<b>Infrastructure management</b>	
<i>Describes the value-system configuration necessary to deliver the value- proposition. Therefore the relationship between in-house and/or partners, resources, assets, activities and the network</i>	
Resources/ Assets	to create value a firm requires resources (tangible, intangible or human assets)
Activity and Processes	the main purpose of a company is the creation of value that customers are willing to pay for, the value is a result of a configuration of inside and outside activities and processes
Partner Network	closely related to the value proposition and the value creation process. The partner network details how the value creation process is distributed among partners in the firm
<b>Financial Aspects</b>	
<i>The consequences of all the other components. "Financial aspects can be understood as costs required to get the infrastructure to create value and as revenues of sold value...the difference between revenues and costs determines the profitability of a company" (Dubosson-Torbay et al., 2002, p.10).</i>	
Revenue	measures the ability of the firm to translate value if offers to customers into money generating incoming revenue streams. There are varying revenue models available, such as subscription fees, advertising revenues, commissions from in-app purchases and so on
Cost	measures all the costs the firm incurs to create, market and deliver value to its customers
Profit	measures the ability of a firm to create a positive cash flow

Source: adapted from Dubosson-Torbay et al. (2002, p.6-11)

## Appendix 8: Deconstruction of B4U Model

Service design	
<i>The central issue in any BM is value, a provider intends and delivers a certain value-proposition and a customer or end-user expects a certain value- proposition. Also important in the service design element is innovation and the nature of these elements. Faber et al. (2003) suggest there are two distinguishable types of innovations; 'new versions of services' developed to increase services one step further, this is often called evolutionary. Secondly, 'way new services' new services that are new in one or more aspect, including very new ideas. These are called revolutionary innovations and influencing variables</i>	
<i>Intended value</i>	The value the provider intends to offer to consumers/end-users through the service. This ambition forms the starting point for the innovation or value-proposition. Yet there is often a gap between intended and perceived value. Intended value can be translated into functional requirements (technical design) and requirements for a value-network (organisational design)
<i>Delivered value</i>	The value that a provider actually delivers to customers/end-users with the service. Functional requirements are translated into technological functionalities (technical design) and these determine the delivered-value. Yet these are also determined by (non-technical) value activities (organisation design) like help desk support
<i>Expected value</i>	Value that a customer/end-user expects from the service. Determined by the customer/end-user's previous experience with previous versions of the service or with similar services. Also influenced by resources and capabilities, like branding and trust (organisational design) and financial arrangements (financial design) like paying for the device, usage or fees
<i>Perceived value</i>	Value that a customer/end-user actually perceives when consuming or using the service. This perspective on value is the 'bottom line' it is the customer/end-user who evaluates the value of the innovation. Therefore, perceived value is like the sum of the expected value and delivered value, including functional, emotional and process aspects. "The higher expected value, or the lower delivered value, the lower perceived value" (Faber et al., 2003, p.6).
<i>Influencing variables:</i>	
<i>Customer/end-user</i>	knowing and understanding customers/end-users is crucial for successful innovation and must be a starting point for intended value. Since the customer has the role of paying for the service, whereas the end-user has the role of actually using the service
<i>Context</i>	a service is always used or consumed in a specific context. Therefore, an innovation is only successful if it offers benefits in a concrete context
<i>Tariff</i>	a customer pays a tariff to consume the service and an end-user makes an effort to use the service, this has a clear influence on adoption and usage and thus the success of a service
Organisational design	
Describes the value network that is needed to realise a particular service offering. A value network consists of actors possessing certain resources and capabilities, which interact and together perform value-activities, to create value for customers and realise their own strategies and goals	
<i>Actors</i>	play a powerful role in the value network depending on their resource and capabilities. Hawkins (2002) identifies three types of basic type of partners in a value-network; structural partners (provide essential and non-substitutable, tangible assets), contributing partners (provide goods and services to meet specific network requirements) and supporting partners (provide substitutable, generic goods and services to the network).

<i>Value-Network</i>	the number of actors, the frequency and type of interactions contributes to the complexity and density of the value-network. Interactions and relations stemming from reciprocal interactions relations may develop, these relations are important for the value-network as they contribute to trust and commitment within the network
<i>Strategy and goals</i>	actors differ with respect to their goals therefore trust between partners is an important condition for an open and constructive collaboration
<i>Organisational arrangements:</i>	collaborations give rise to the complex interdependencies between organisations because no individual partner has a formal authority over another partner, therefore formal agreements between actors are required
<i>Value activities</i>	the activities that an actor is supposed to perform in order for the value-network to deliver the proposed service, these can be seen as costs but also investments sources
<b>Technology design</b>	
Describes fundamental organisation of a technical system, technical architecture, needed by firms in the value-network to deliver their service offering, as part of the service design	
<i>Technology Architecture</i>	can be divided into sections, backbone infrastructure (the long and medium range backbone network infrastructure), access networks (the first and second mile network infrastructure and service platforms), middleware platforms enable different functions (e.g. billing, customer data management, location services) and devices (the end-user devices proving access to services)
<i>Applications</i>	user application running on the technological system
<i>Data</i>	data streams transferred over networks
<i>Technical functionality</i>	functionality offered by the technological system
<b>Finance Design</b>	
The finance domain describes the design of financial arrangements between different actors in the value-network. The resulting finance design is the set of financial arrangements between actors in the value-network in which profit, investment, cost, risk and revenue sharing among actors is organised. Overall, it demonstrates how the value-network intends to capture monetary value from its activities	
<i>Tariff and tariff structure</i>	the most visible element of the arrangements for the end-user
<i>Revenues</i>	can come directly from the end-user, but also from other revenue sources
<i>Investments and costs</i>	closely related to design choices made in the technology design domain
<i>Risks</i>	that could exist in other domains that come with financial consequences, for instance if perceived customer value is much less than the assumed value it may have a negative impact on the revenues
<i>Performance indicators</i>	a necessity for management of the financial arrangements over time

Source: adapted from Faber et al. (2003)

## Appendix 9: V4 Business Model Deconstruction

Value Proposition	
<ul style="list-style-type: none"> <li>- Describes the products/services offered or that plan to be offered.</li> <li>- The elements that will add value to the offer. New services should be defined by; name, type, function, technical and non-technical requirements.</li> <li>- Involves two approaches; (1) how an organisation and suppliers create value for customers, (2) how an organisation and stakeholders create value for all parties involved.</li> </ul>	
Value Network	
Product-Service	- The products/services offered or are intended to be offered
Intended value Element	- The value incorporated in the offering
Target Segment	- Identifies and evaluates the nature of each target segment and their preferences
Value Network	
<ul style="list-style-type: none"> <li>- Defines different actors roles and the value transfer between them, collaboration and communication flows</li> <li>- Encourages collaborative, multi-stakeholder networks, with a cross-company and inter-organisational perspective</li> <li>- Perspectives are needed to capture and create value from innovations (collaboration/coordination of parties)</li> <li>- Defines which actors are governing or being dominant, or have functional or strategic roles, identifying flows among the network</li> </ul>	
Actor	<ul style="list-style-type: none"> <li>- Identifies the core actors needed to collaborate and cooperate to engineer, launch and deliver particular services effectively</li> <li>- Knowledge domains for each actor and their requirements have to be explicitly defined to identify their position in the network and potential contribution</li> <li>- Extends to include customers and competition</li> <li>- Needs to align strategic outcomes to ensure consistency and capture value</li> </ul>
Role	<ul style="list-style-type: none"> <li>- Actor's roles are either strategic or functional</li> <li>- Functional; based on knowledge in their domain, experience and speciality or the provision of services</li> <li>- Strategic can be; resource allocation, efficiency, risk mitigation, effectiveness, time-to-market, agility or intelligence</li> <li>- To keep business healthy and sustainable accurate descriptions of functional/strategic stakeholder contributions is necessary</li> </ul>
Relationship	<ul style="list-style-type: none"> <li>- The links organisations needs to establish with their stakeholders (e.g. strategic alliances, partnerships, joint ventures etc.)</li> <li>- Importance of each stakeholders role indicates kind of relationship the organisation should build with them</li> <li>- Customers are the main sources of revenue, so it is important to create positive relationships with them so increase loyalty and retention</li> </ul>
Flow Communication	<ul style="list-style-type: none"> <li>- Value exchange and information streams are enriched by materials communicated among actors</li> <li>- Materials can be; knowledge, money, products, hardware, documents, agreements etc.</li> </ul>
Channel	<ul style="list-style-type: none"> <li>- Communication mediums or ports used to communicate materials among actors</li> <li>- Construction of interfaces (e.g. with customers) CRM, online platforms, intermediaries</li> </ul>
Governance	<ul style="list-style-type: none"> <li>- Who has control or power over what objects (data, relationships, channels, function and transactions)</li> </ul>
Network Mode	<ul style="list-style-type: none"> <li>- Development of innovative products/services are either open or closed</li> <li>- Open; actors can fully participate offering ideas</li> <li>- Closed; contributions only come from selected actors eligible to participate</li> </ul>
Value Architecture	
<ul style="list-style-type: none"> <li>- Holistic structural design of an organisation involves technical, organisational and design configurations</li> <li>- Tangible and intangible organisational assets, considers that resources are core competencies</li> <li>- Based on RBV assuming each company is a bundle of resource, which when coupled or integrated generate desirable value for customers, creating sustainable competitive advantage</li> <li>- Includes technical and organisational resources</li> </ul>	

<b>Core Resource</b>	- To serve market effectively needs resources and inputs that can take human, physical and organisational forms
<b>Value Configuration</b>	<ul style="list-style-type: none"> <li>- Resources should be organised and configured in an appropriate manner that facilitates a competitive VP</li> <li>- Economic value is determined by the ability to absorb ICT resources and diffuse them into activities managed to create VPs</li> <li>- Resource configuration is a key enabler of combinative capabilities important in creating rare, valuable, hardly imitable and non-substitutable resources</li> </ul>
<b>Core Competency</b>	- BMs need to represent organisations resources, their configurations and resultant core competencies
<b>Value Finance</b>	
<ul style="list-style-type: none"> <li>- <i>Concerned with revenue models, investments, decisions, revenue sharing, cost effectiveness, net cash and returns</i></li> <li>- <i>Determines all the costs, but all other elements particularly the VP are related to value finance</i></li> <li>- <i>Arrangements are needed to ensure economic viability, how the organisation aims to generate revenue</i></li> <li>- <i>Includes the costs of design, development and maintenance</i></li> </ul>	
<b>Total Cost of Ownership</b>	<ul style="list-style-type: none"> <li>- Costs of core arrangements needed to provide intended services</li> <li>- Includes costs of tangible materials, development, support, maintenance and collaboration</li> </ul>
<b>Pricing Method</b>	<ul style="list-style-type: none"> <li>- Organisation has to be financially viable to achieve their goals which differ over time according to maturity</li> <li>- Competition level can determine prices of products/services. These can differ across services, products and customer categories</li> <li>- Revenue distribution among stakeholders should be explicit</li> </ul>
<b>Revenue Structure</b>	<ul style="list-style-type: none"> <li>- Depends largely on arrangements made for costing and pricing</li> <li>- Sources of revenue can be categorised based on customer types, products, services or a combination</li> <li>- Cost and revenue distribution across stakeholders should be explicit</li> </ul>

Source: Adapted from: Al-Debei and Avison (2010); Al-Debei and Avison, 2011; Al-Debei and Fitzgerald (2010); Panagiotopoulos et al. (2012) and Hedman and Kalling (2003).

## Appendix 10: A Hierarchical taxonomy of the Business Model concept

BM facets	BM classes	Brief description	Representative literature
<b>V4 dimensions</b>	(1) Value proposition	A way that demonstrates the business logic of creating value for customers and/or to each party involved through offering products and services that satisfy the needs of their target segments.	<i>Amit and Zott (2001), Petrovic et al. (2001), Magretta (2002), Osterwalder et al. (2005).</i>
	(2) Value architecture	An architecture for the organization including its technological architecture and organizational infrastructure that allows the provisioning of products and services in addition to information flows.	<i>Timmers (1998), Venkatraman and Henderson (1998)</i>
	(3) Value network	A way in which an organization enables transactions through coordination and collaboration among parties and multiple companies.	<i>Amit and Zott (2001); Gordijn et al. (2000); Bouwman (2002)</i>
	(4) Value finance	A way in which organizations manage issues related to costing, pricing, and revenue breakdown to sustain and improve its creation of revenue.	<i>Timmers (1998); Linder and Cantrell (2000)</i>
<b>Modelling principles</b>	(5) Conceptual	A conceptual tool, an abstraction and a blueprint of the existing business and/or the future planned business.	<i>Stähler (2002); Osterwalder et al. (2005)</i>
	(6) Multi-level	A way of designing, analysing and evaluating different units or levels within organizations such as products and services, business unit, an organization, or even a network of organizations.	<i>Magretta (2002); Kallio et al. (2006); Al-Debei et al. (2008); Bouwman et al. (2008); Haaker et al. (2006)</i>
	(7) Dynamic	A dynamic concept as the BM configurations and design change over time reflecting internal and external variations.	<i>Hedman and Kalling (2003), Al-Debei et al. (2008)</i>
	(8) Granular	A grainy controllable way of designing and evaluating business as the concept is subdivided into manageable elements.	<i>Gordijn et al., (2000); Osterwalder et al. (2005); Shafer et al. (2005).</i>
	(9) Coherent	A comprehensive way of depicting a particular business entirely taking into consideration the interlinks between its different aspects.	<i>Chesbrough and Rosenbloom (2002); Al-Debei and Fitzgerald (2010)</i>
<b>BM reach</b>	(10) Intermediate layer	An interface or a theoretical intermediate layer between the business strategy and the ICT-enabled business processes. Nevertheless, it intersects with both: strategy and ICT-enabled business processes. The BM intersection with strategy represents a set of organization's strategic-oriented choices for business establishment and management, while its intersection with processes signifies a set of business implementation practices and functions.	<i>Giaglis et al. (2006); Leem et al. (2004); Morris et al. (2005); Shafer et al. (2005); Rajala and Westerlund, (2007); Al-Debei et al. (2008)</i>
<b>BM Functions</b>	(11) Alignment instrument	A theoretical tool of alignment providing a crucial instrument (i.e. bridge) for improving harmonization and consistency among	<i>Osterwalder et al. (2005); Al-Debei et al. (2008a)</i>

		strategy and business process including their supportive information systems.	
(12)	Interceding framework	A mediating construct or framework that connects technological potentials and innovations with the realization of economic value and the achievement of strategic outcomes.	<i>Chesbrough and Rosenbloom (2002); Kamoun (2008); Al-Debei and Fitzgerald (2010)</i>
(13)	Knowledge capital	An intangible and tactical information/knowledge asset useful in supporting strategic decision-making functions, and thus valuable in providing the organization with an enduring competitive advantage.	<i>Venkatraman and Henderson (1998); Al-Debei et al. (2008)</i>

Source: Al-Debei and Avison (2010, p.366)

## Appendix 11: ETM Revenue Sources

Direct revenues	
<b>Sales</b>	Service producer or supplier's revenues coming from selling tickets and tour packages
<b>Transaction fee</b>	Intermediaries such as cyber travel agencies and facilitators who participate in the electronic tourism market can charge a fee for each transaction
<b>Advertising fee</b>	Revenues coming from Web advertising
<b>Consultancy fee</b>	The electronic tourism market brings together professional travel advisers and potential travellers having personal requirements and needs by exploiting interactivity and connectivity of the Internet; travel advisers and managers can either offer differentiation value by designing high-quality personalized travel arrangements for which travel consumers will be willing to pay a premium, or they can offer cost reduction value by recommending less expensive products or services
<b>Subscription/ Membership fees</b>	The electronic tourism market can provide premium or high-quality contents via a Web-based tourism information and knowledge management system for subscribers only as well as free contents for general visitors
<b>Revenue sharing</b>	Affiliate programs such as revenue sharing and banner swapping or exchange are well suited to the Web; the affiliate program provides sales opportunity at partner's web sites so that the businesses in the electronic tourism markets can mutually share revenues
Potential revenues	
<b>Customer experience, loyalty and brand image</b>	When the business offers the experience that customers want and expect on the Web, their experience is maximised; great customer experience can result in strong word-of-mouth exposure, generate a high loyalty, and enhance the brand image
<b>Trust</b>	Building of trust in terms of both customer and partner relationships is seen as a crucial step to the success of the ETM. Trust in the ETM encompasses not just the notion of trust as secure, reliable, and available systems, but also that of privacy protection, refund, and assurance of quality; the reason why trust can become sources of potential revenues is as follows: -Can decrease the cost of maintaining partner relationships in the electronic tourism market -Will derive long-term competitive advantage for the business -Encourage robust cooperation among players -Integral to effective customer relationships -Create considerable switching costs for competitors

Source: Joo (2002, p.63)

## Appendix 12 (A) Mobile application Revenue Models applicability to BMs for MR in museums and Cultural travel

<b>Revenue Models</b>	<b>Description</b>	<b>Applicability</b>	<b>Reason</b>
Paid Download	Relies on money earned before download	Yes	
Free Trial	Subcategory of directly-paid downloads, whereby some parts of the application are free (but have restrictions or advertisements) and the full or premium version is available at a cost	Yes	
Advertising	Content provider generates revenue placing advertisements in the application. Mostly single-use products, used for a few minutes occasionally	Yes	
Subscription	Application-provider gets revenue from subscriptions, such as monthly fees. Application is often part of the service where it works as a front-end for a service	Yes	
Pay-per-use	(Or In-application Purchase Model) is a model where the customer is able to purchase increased amount or improved content. Customers can buy a single portion rather than the whole offering, such as chapters of books or levels of games instead of the whole book or game	Yes	
Hosting	Because of lack of expertise or technology the content provider uses a third party to host their content	No	Unfeasible
Point-of-Traffic	Content created is aimed to increase traffic to a third party website, therefore supporting the revenue model of the third party who compensate the content provider	No	Unfeasible

*Source: Hyrynsalmi et al. (2012) Adapted from Heimo et al. (2016a)*

## (B) Gaming Models applicability to BMs for MR in museums and Cultural travel

Gaming Revenue Models	Categories and descriptions	Applicability	Reason
Traditional	Pay Once – Most traditional, customer expects to get whole game without hidden payments afterward	Yes	
	Pay Periodically – customers pay for a period of time (e.g. Monthly fee)	Yes	
	Freeware – Give a particular version of a game away free, then advertise the next version or another game	Yes	
	Shareware- often advertises the whole game, adware, donationware, nagware all variations	Yes	
	Lure to Play – or freemium, offers in various ways a substantial part of the game free, encouraging users to buy the next part	No	Time
Pay-while-playing	Pay to Win – player given perks for an advantage over other players	No	Time
	Pay to Pass Boring – allows player to skip boring parts	No	Time
	Pay for Visual – players gets visual materials to improve visual appearance or the game or players avatar	No	Time
	Access to options	Yes	
	Add-ons	Combine	Experimental
	Downloadable content	Combine	
	Possibility for multiplayer	Combine	
	Removal of unwanted content	Yes	

Source: Adapted from Heimo et al. (2016a)

## (C)Synthesis of Models: BMs for MR in museums and Cultural travel

Hyrynsalmi et al. (2012) Model	Heimo et al. (2016b) Model	Synthesis: MR in museums and cultural travel
Paid download	Pay Once	Pay Once
Subscription	Monthly Fee	Subscription
n/a	Pay Once and Monthly fee	Pay Once and subscription
Advertising	n/a	Adware
	Removal of Ads	Removal of Ads
Free Trial	Freeware	Freeware
	Shareware	Shareware
Pay-per-use	n/a	Pay-per-use
	Possibility to multiplier	Extra content
	Downloadable Content	
	Add-ons	
n/a	Access for options	Access for options
Hosting	n/a	n/a
Point-of-traffic		
n/a	Lure-to-play	
	Pay-to-win	
	Pay-to-pass-boring	
	Pay-for-visual	

\*n/a = irrelevant to synthesis

Source: Heimo et al. (2016a, p.7)

## Appendix 13: Geevor Opening Times

Geevor managements reaction to decision to close on Saturdays

The screenshot shows a web browser window with a blue header bar. The title bar reads "Geevor Tin Mine: Openin X". The main content area displays several comments from visitors. The first comment is by "Larry Coleman" on 2009-11-12 at 01:39:24, expressing a positive experience. The second comment is by "D Ellisdon" on 2011-08-19 at 12:00:12, suggesting Saturday might be the most popular day. The third comment is by "Liz Bagley" on 2012-03-15 at 10:17:19, which is highlighted with a red rectangular box and contains a detailed explanation of Geevor's decision to close on Saturdays.

Comment left by **Larry Coleman** on 2009-11-12 01:39:24

My wife and I visited about a year ago and were stunned by the whole experience. Our guide was knowledgeable and enthusiastic and obviously loved to tell visitors the story of the mine. And what a story! After that, to go down into the mine to see firsthand how it was done was almost a religious experience. My wife and I have rather different tastes in museums but we agreed that this was the most memorable of any of its type that we have ever seen. Go...you will not regret it.

Comment left by **D Ellisdon** on 2011-08-19 12:00:12

One would think Saturday being the most popular day of the week, you would be open!

---

Comment left by **Liz Bagley** on 2012-03-15 10:17:19

Twice we have wanted to visit you when we have had visitors. Both times (being Saturdays) you have been shut. I'm amazed you can afford to lose so much business on the busiest day of the week. GEEVOR REPLY... Thank you for taking time to comment. Obviously we are sorry that having made the effort to get here we were closed. However, unlike most attractions we do not close during the winter months, and are open for 6 days a week throughout the year. It may come of some surprise to you that Saturday is not the busiest day of the week for Geevor, but in fact the quietest. We made the decision to open 7 days a week in 2009 for July and August (having also done so in trials in previous years), and it did not make commercial sense. Saturday was by far the quietest day of the week. We have many educational tours during the year so closing during weekdays is not an option, and Sundays are busy. Therefore in line with the National Trust in the far west of Cornwall (Levant Mine, St. Michael's Mount, Trengwainton Gardens) we do not open on Saturdays.

S

Source: <http://www.geevor.com/index.php?page=19>

Accessed on 9<sup>th</sup> February 2017

## Appendix 14: Geevor TripAdvisor Rating

padvisor.co.uk/Attraction\_Review-q528863-d188514-Reviews-Geevor\_Tin\_Mine-Pendeen\_Cornwall\_England.html

Attraction Reviews

Pendeen Hotels Flights Holiday Rentals Restaurants Things to Do Forum Best of 2017 More

Find: Things to Do Near: Pendeen, England Search

Europe > United Kingdom (UK) > England > Cornwall > Pendeen > Things to do in Pendeen > Geevor Tin Mine

**Geevor Tin Mine**

5 743 Reviews | #1 of 5 things to do in Pendeen | Certificate of Excellence

Mines, Sights & Landmarks

Overview Reviews (743) Q&A (5) Location Save Write a Review

All visitor photos (286)

Is this attraction a good picnic spot?  
 Yes  No  Unsure



Get directions Address: Pendeen TR19 7EW, England  
Phone Number: +44 1736 788662  
E-mail

Improve this listing Today 09:00 - 17:00 Open now  
See all hours

Description:  
This preserved mining site features a museum, underground tour and visitor...

TripAdvisor Reviewer Highlights

Read all 743 reviews

Visitor rating

Excellent	529
Very good	159
Average	23
Poor	5
Terrible	2

"worthwhile in spite of Doris!"  
We arrived just as storm Doris was venting her fury at all things Cornish so were uncertain whether to proceed with our visit so retired to the cafe to decided over a pasty. BTW... read more

  Reviewed 2 days ago  
Stephen S, Kent, England

Source: TripAdvisor (2017) Accessed on 9<sup>th</sup> February 2017

## Appendix 15: Heritage Attraction Typologies

Heritage Typologies	Attraction	Examples	Author/s
Tangible		<u>Immovable</u> Buildings, rivers, natural areas, castles, cities, monuments <u>Movable</u> In museums, documents in archives	Timothy and Boyd (2002)
Intangible		Arts, social customs, traditions, languages folklore, locals ways of life, and cultural celebrations	Chhabra et al. (2003); González, (2008), Ashworth and Poria (2009); Smith (2009); Tweed and Sutherland (2007);
Natural		Landscapes which encompass natural features with relevant cultural attributes, such as flora and fauna, canyons, rain forests, coastlines.	Courtney et al. (2006); Timothy (2011); UNESCO (2009); Prentice (1993)
Industrial		Elements of a regions past, that were influential in its growth and development, coal, textiles, mining	Edwards et al. (1996); Jonsen-Verbeke (1999); Prentice (1993)
Personal		Aspects of regions that have value and significance to individuals or groups of people, religious sites, cemeteries, Normandy beach landing	Timothy and Boyd (2002); Prentice (1993)
Natural		National parks utilised for economic purposes e.g. eco-tourism	Bowitz and Ibenholt (2009); Prentice (1993); Butler and Boyd (2000); Smith (2009)
Living Cultural		Cultural fashions, foods, customs	Boniface (1995); Prentice (1993)
Built		Buildings, historic cities, castles, cathedrals, cities, monuments	Ashworth et al. (2000); Prentice (1993); Tweed and Sutherland (2007); Smith (2009)
Dark		Symbols of pain and death, elements of the past people would prefer to forget	Lennon and Malcolm (1999); Prentice (1993)
Literacy		Houses or hometowns of famous writers	Smith (2009)
Artistic		Landscapes that inspired artists)	Smith (2009)
Cultural		Events, traditional festivals, dance	Smith (2009)

Source: Author (2017)

## Appendix 16: Interview Pilot:

\* ***Changes made to questions highlighted in red***

Interview Questions – Tourist Bodies		
Value Network	1	In what way is your role / responsibility related to Geevor? What is your relationship to Geevor?
Value Proposition	2	Why do you believe people visit Geevor?
	3	What value do you believe Geevor provides as a tourist attraction? What is the value of Geevor?
	4	What value do you believe it offers to visitors?
	5	To what extent do you believe an AR application could add value to Geevor? Why? How?
Value Architecture	6	How do you think AR could improve Geevor?
	7	In what way do you see an AR application having a beneficial impact to Geevor?
Value Finance	8	Do you believe introducing AR at Geevor would be of benefit to you? / the organisation?
	9	Do you think AR could help increase income and profits? How?

Interview Questions – Visitors		
Value Proposition	1	Why did you visit Geevor today? What did you enjoy?
	2	What value do you see in visiting Geevor?
Value Architecture	3	Based on what I showed you (AR application demo) do you think AR could add value to Geevor?
	4	Do you think using AR would have improved your experience? How? Why?
	5	In what ways How do you imagine using AR?
	6	If Geevor offered an AR application, would it encourage you to visit? Why?
	7	Is an AR application something you think you would use?
Value Finance	8	Would you pay more to use an AR app? How much?
	9	To what extent do you think AR would encourage you to buy/purchase? *Recommend you give an example here, how could AR do this?

Interview Questions – Tertiary Groups		
Value Network	1	What is your relationship with Geevor?
	2	How many group visits have you organised / led to Geevor?
Value Proposition	3	What value do you believe Geevor offers to school/university groups?
	4	What do students particularly enjoy?
	5	Do you think an AR application would improve Geevor as an attraction?
	6	In what ways do you think an AR application would improve students' experience of Geevor?
Value Architecture	7	<del>What value do you think students would get from using AR during a visit?</del> <del>What value do you perceive in students using AR during a visit to Geevor?</del>
	8	Do you perceive that AR could enhance learning?
Value Finance	9	Would you/organisation pay more to use an AR app at Geevor? Why Why not?
	10	Would an AR application encourage you to take school groups to Geevor compared to an attraction without AR?

Interview Questions – Local Businesses		
Value Network	1	What is your relationship to/with Geevor?
Value Proposition	2	Why do you believe people visit Geevor?
	3	What is Geevor's value? The value of Geevor?
	4	What value do you believe it offers to visitors?
	5	To what extent do you believe an AR application could add value? Why? How?
Value Architecture	6	How do you think AR could improve Geevor?
	7	In what way do you see an AR application having a beneficial impact to Geevor?
Value Finance	8	Do you believe introducing AR at Geevor would be of benefit to you? / the organisation?
	9	Do you think AR could help increase income and profits? How?
	10	In what ways do you see an AR application could be linked commercially to the café/shop?
	11	If AR allowed visitors to reserve/buy food/souvenirs Do you think if an AR application had a feature allowing visitors to reserve/buy food/souvenirs it would be beneficial to you?

Interview Questions- Internal Stakeholders (Geevor Staff)		
<i>Contextual</i>	1	What is your <u>current</u> understanding of AR?
	2	Based on what I showed you (video) has your understanding of AR changed?
<i>Value Network</i>	3	What is your role at Geevor?
	4	How long have you worked at Geevor?
	5	What are your responsibilities <u>at Geevor?</u> ?
	6	Who are your main business partners?
<i>Value Proposition</i>	7	Why do you think people visit Geevor and what value does it offer?
	8	Who are the main target markets?
	9	<u>To what extent do</u> <u>Do</u> you think AR can add value to Geevor?
	10	In your opinion, what is the main strength of Geevor?
	11	Could anything be improved upon, <u>if so how</u> ?
<i>Value Architecture</i>	12	Do you think implementing AR could help improve Geevor from your point of view <u>as a member of staff</u> ?
	13	Do you think implementing AR could help improve Geevor from the point of view of the visitor?
	14	<u>How do you</u> /To what extent do you think AR could be used to make a difference?
<i>Value Finance</i>	15	In what ways do you think developing <u>an AR application</u> could help increase income?
	16	In your opinion, could implementing AR at Geevor be beneficial?
	17	Do you see any potential problems with implementing AR <u>at Geevor</u> ?

## Appendix 17: Interview Questions

Interview Questions – Tourist Bodies		
<i>Value Network</i>	<b>1</b>	What is your relationship to/with Geevor?
<i>Value Proposition</i>	<b>2</b>	Why do you believe people visit Geevor? e.g. day out, something to do, interest in mining, heritage, machinery etc.
	<b>3</b>	What is the value of Geevor? e.g. preservation of history, cultural and heritage offering
	<b>4</b>	What value do you believe it offers to visitors? e.g. education, entertainment, special interest
	<b>5</b>	To what extent do you believe an AR app could add value? Why? How? e.g. entertainment, enhance knowledge, fun, exciting
<i>Value Architecture</i>	<b>6</b>	How do you think AR could improve Geevor? e.g. modernise site, bring things to life, make more interactive
	<b>7</b>	In what way do you see an AR app having a beneficial impact to Geevor?
<i>Value Finance</i>	<b>8</b>	Do you believe introducing AR at Geevor would be of benefit to you/the organisation?
	<b>9</b>	Do you think AR could help increase income and profits? How? e.g. sell app as an add-on, link to café and shop

Interview Questions – Visitors		
<i>Value Proposition</i>	<b>1</b>	Why did you visit Geevor today? What did you particularly enjoy?
	<b>2</b>	What value do you see in visiting Geevor?
<i>Value Architecture</i>	<b>3</b>	Based on what I showed you (AR app demo) do you think AR could add value to Geevor?
	<b>4</b>	Do you think using AR would have improved your experience? How? Why? e.g. navigation, self-guided tour, increase knowledge
	<b>5</b>	How do you imagine using AR? e.g. entertainment, learning
	<b>6</b>	If Geevor offered an AR app would it encourage you to visit? Why?
	<b>7</b>	Is an AR app something you think you would use?
<i>Value Finance</i>	<b>8</b>	Would you pay more to use an AR app? How much?
	<b>9</b>	If you could reserve and buy food in the café or souvenirs in the shop linked to your experience using an application to what extent do you think it would encourage you to buy/purchase?

Interview Questions – Tertiary Groups		
Value Network	<b>1</b>	What is your relationship with Geevor?
	<b>2</b>	How many group visits have you organised/led to Geevor?
Value Proposition	<b>3</b>	What value do you believe Geevor offers to school/university groups? e.g. <i>Education, fun, interactive learning environment, specialist subject</i>
	<b>4</b>	What do students particularly enjoy? e.g. <i>going underground, gold panning, learning about rock cycles</i>
	<b>5</b>	Do you think an AR app would improve Geevor as an attraction? How? e.g. <i>make experience more...entertaining, enjoyable, fun, interesting</i>
	<b>6</b>	In what ways do you think an AR app would improve students' experience of Geevor? e.g. <i>immersive learning environment, interactive learning, explain complex processes</i>
Value Architecture	<b>7</b>	What value do you perceive in students using AR during a visit to Geevor? e.g. <i>navigation, more information, explaining complex processes, entertainment, fun</i>
	<b>8</b>	Do you perceive that AR could enhance learning?
Value Finance	<b>9</b>	Would you/organisation pay more to use an AR app at Geevor? Why? Why not?
	<b>10</b>	Would an AR app encourage you to take school groups to Geevor compared to an attraction without AR?

Interview Questions – Local Businesses		
Value Network	<b>1</b>	What is your relationship to/with Geevor?
Value Proposition	<b>2</b>	Why do you believe people visit Geevor? e.g. <i>day out, something to do, interest in mining, heritage, machinery etc.</i>
	<b>3</b>	What is the value of Geevor? e.g. <i>preservation of history, cultural and heritage offering</i>
	<b>4</b>	What value do you believe it offers to visitors? e.g. <i>education, entertainment, special interest</i>
	<b>5</b>	To what extent do you believe an AR app could add value? Why? How? e.g. <i>entertainment, enhance knowledge, fun, exciting</i>
Value Architecture	<b>6</b>	How do you think AR could improve Geevor? e.g. <i>modernise site, bring things to life, make more interactive</i>
	<b>7</b>	In what way do you see an AR app having a beneficial impact to Geevor?
Value Finance	<b>8</b>	Do you believe introducing AR at Geevor would be of benefit to you/the organisation?
	<b>9</b>	Do you think AR could help increase income and profits? How? e.g. <i>sell app as an add-on, link to café and shop</i>
	<b>10</b>	In what ways do you see an AR app could be linked commercially to the café/shop?
	<b>11</b>	Do you think if the app had a feature allowing visitors to reserve/buy food/souvenirs it would be beneficial to you?

Interview Questions- Internal Stakeholders (Geevor Staff)		
<i>Contextual</i>	<b>1</b>	What is your current understanding of AR?
	<b>2</b>	Based on what I showed you (video) has your understanding of AR changed?
<i>Value Network</i>	<b>3</b>	What is your role at Geevor?
	<b>4</b>	How long have you worked at Geevor?
	<b>5</b>	What are your responsibilities at Geevor?
	<b>6</b>	Who are your main business partners?
<i>Value Proposition</i>	<b>7</b>	Why do you think people visit Geevor and what value does it offer?
	<b>8</b>	Who are the main target markets?
	<b>9</b>	To what extent do you think AR can add value to Geevor?
	<b>10</b>	In your opinion, what is the main strength of Geevor?
	<b>11</b>	Could anything be improved upon, if so how?
<i>Value Architecture</i>	<b>12</b>	Do you think implementing AR could help improve Geevor from your point of view as a member of staff?
	<b>13</b>	Do you think implementing AR could help improve Geevor from the point of view of the visitor?
	<b>14</b>	How do you/to what extent do you think AR could be used to make a difference?
<i>Value Finance</i>	<b>15</b>	In what ways do you think developing an AR application could help increase income?
	<b>16</b>	In your opinion, could implementing AR at Geevor be beneficial?
	<b>17</b>	Do you see any potential problems with implementing AR at Geevor?

## **Appendix 18: AR Information Sheet and Consent from**

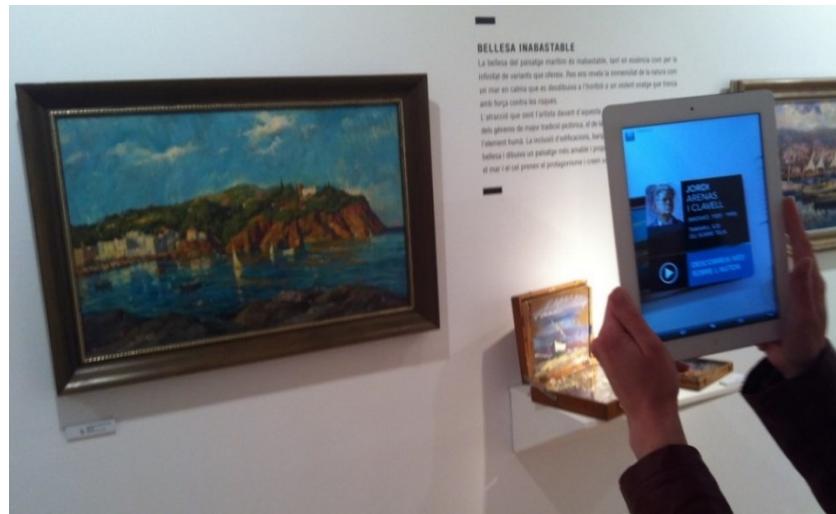
### **AR INFORMATION SHEET**

Augmented Reality (AR) “represents a system where a view of a live, real physical environment, is supplemented by computer-generated elements such as sound, video, graphic or location data”

#### **AR can be used to;**

- Deliver education, entertainment and interactivity
- Provide a different version of knowledge through video, text, images, audio
- Create an interactive learning environment
- Provide self-guided tours and navigational support
- Immerse the user in a digitally enhanced world, making the world around them come to life
- Improve the users' perceptions of and interaction with the real-world
- Provide personalised, tailored information to suit individual preferences

#### **Example of AR application in a museum;**



Please feel free to ask any questions!

## **ONLINE CONSENT FORM (\*Telephone Interviews)**

### **Title of study:**

The development of an effective Business Model (BM) to implement Augmented Reality (AR) in the context of Cultural Heritage Tourism: The case of Geevor, Cornwall

### **Name and position of researcher:**

Ella Cranmer, PhD student at the Manchester Metropolitan University

### **By participating in the telephone interview, it is assumed you agree and consent to the following;**

1. I confirm that I have read and understand the information sheet for the above study and have had the opportunity to ask questions
2. I understand that my participation is voluntary and that I am free to withdraw at any given time without giving reason
3. I agree to take part in the study
4. I agree to the interview being audio-recorded
5. I agree to the use of anonymised quotes in publications

## **CONSENT FORM**

### **Title of study:**

The development of an effective Business Model (BM) to implement Augmented Reality (AR) in the context of Cultural Heritage Tourism: The case of Geevor, Cornwall

### **Name and position of researcher:**

Ella Cranmer, PhD student at the Manchester Metropolitan University

*Please initial box*

1. I confirm that I have read and understand the information sheet for the above study and have had the opportunity to ask questions

2. I understand that my participation is voluntary and that I am free to withdraw at any given time without giving reason

3. I agree to take part in the study

YES

NO

4. I agree to the interview being audio-recorded

5. I agree to the use of anonymised quotes in publications

Name of participant:

Date:

Signature:

Ella Cranmer:

Date:

Signature:

## **Appendix 19: Questionnaire**

**\*Please note, tables not to original scale in order to fit into page margins**

### **Introductory script**

I am a PhD student from Manchester Metropolitan University, developing a business model to implement Augmented Reality (AR) technology at Geevor. The model is essential to understand the value, benefits, costs and possible barriers to implementation. It will also help understand how AR may add-value to Geevor, while generating revenue. Previously, I conducted 50 interviews with Geevor stakeholders and used the findings to influence the business model.

The next phase of my research requires validation of the business model through questionnaires. During interviews, a number of important criteria were identified. For the next phase of research these criteria need to be compared to one another for analysis using a questionnaire.

### **How to complete the questionnaire**

- In each section, please read the description box before answering any questions
- If you are unsure of the descriptions or want further clarification, please ask
- For each pair indicate which criteria you think is more important and identify the degree of importance using the scale
- Please complete all 5 sections
- Look at the 2 examples below which show how to complete the questionnaire

### **Example (1)**

**Which do you consider more important to Geevor, marketing or education? Indicate the degree of importance using the scale.**

If I consider education is 'extremely more important' than marketing, I would complete by putting a cross under 9, for extreme, on the education side of the scale. See below.

	1=Equal		3= Moderate		5=Strong		7= Very Strong		9= Extreme									
	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	
Marketing																	X	Education

### **Example (2)**

**Which resource do you consider to be more important to Geevor, education or heritage significance? Indicate the degree of importance using the scale**

If I consider heritage significance is 'moderately more important' than education I would complete as follows

	1=Equal		3= Moderate		5=Strong		7= Very Strong		9= Extreme									
	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	
Heritage significance							X											Education

**Thank you for your time!**

## Section 1 : Resources

Resources	Description
Uniqueness	The site has not significantly changed since closure as a working mine. It is an unique piece of history
Range of activities	Geevor offers visitors a range of activities, catering to different marketing (e.g. café, shop, museum, underground tour, children's activities)
Education	Geevor provides an immersive learning environment with a wealth of educational resources
Staff	Most staff previously worked in the mine, so have first-hand knowledge and experiences to share with visitors. They are a dedicated and committed team
Heritage significance	Geevor helps preserve and protect Cornish heritage, reinforcing local traditions and identity

**For each pair of resources, indicate which one you think is more important for Geevor**

**Please identify the degree of importance using the scale**

1=Equal	3= Moderate	5=Strong	7= Very Strong	9= Extreme														
	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	
Range of activities																		Uniqueness
Heritage significance																		Uniqueness
Staff																		Uniqueness
Education																		Uniqueness
Heritage significance																		Range of activities
Education																		Range of activities
Staff																		Range of activities
Education																		Staff
Heritage significance																		Staff
Heritage significance																		Education

## Section 2: AR value

AR Values	Description
Monetary benefits	Increased visitor numbers and ticket sales. Increase spend in the local and in-site facilities
Interpretation	Brings the site to life, tailoring content to different knowledge levels and improving accessibility
Education	Appeals to different learning styles, engaging younger audiences and adding excitement
Sustainability	Preserving knowledge of existing staff for future generations. Protecting and conserving the environment
Marketing	Raising the profile of both Geevor and Cornwall, increasing visibility of promotional material
Games	AR games would combine education and entertainment, allowing visitors to take control of their own experience
Navigation	Creating an interactive AR map, to help exploration and navigation of the site and its facilities

For each pair of AR values, indicate which one you think is more important for Geevor  
Please identify the degree of importance using the scale

1=Equal	3= Moderate	5=Strong	7= Very Strong	9= Extreme														
	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	
Interpretation																		Games
Education																		Games
Navigation																		Games
Marketing																		Games
Monetary benefits																		Games
Sustainability																		Games
Education																		Interpretation
Navigation																		Interpretation
Marketing																		Interpretation
Monetary benefits																		Interpretation
Sustainability																		Interpretation
Navigation																		Education
Marketing																		Education
Monetary benefits																		Education
Sustainability																		Education
Marketing																		Navigation
Monetary benefits																		Navigation
Sustainability																		Navigation
Sustainability																		Marketing
Sustainability																		Monetary benefits
Marketing																		Monetary benefits

### Section 3 : Stakeholder benefits

Stakeholder benefits	Description
Secure Jobs	Increased visitor numbers helps to secure jobs
Preserving knowledge	Recording forever the first-hand knowledge of the remaining miners
Improve efficiency	Improved efficiency of daily tasks to ensure all aspects of Geevor run smoothly
Community pride	Educate visitors about Cornish heritage to increase community pride
Attract investment	Attract funding and investment by demonstrating site advancement and development

For each pair of stakeholder benefits, indicate which one you think is more important for Geevor

Please identify the degree of importance using the scale

1=Equal	3= Moderate	5=Strong	7= Very Strong	9= Extreme
	9	8	7	6
	5	4	3	2
	1	2	3	4
	5	6	7	8
	9			
Preserve knowledge				Secure jobs
Improve efficiency				Secure jobs
Community pride				Secure jobs
Attract investment				Secure jobs
Improve efficiency				Preserve knowledge
Community pride				Preserve knowledge
Attract investment				Preserve knowledge
Community pride				Improve efficiency
Attract investment				Improve efficiency
Community pride				Attract investment

## Section 4 : Responsibilities

Responsibilities	Description
Supporting	Provide guidance before, during, and after, AR implementation
Developing	Create content, prototype, test and develop the AR application
Promoting	Marketing and advertising AR
Maintaining	Looking after and maintaining AR
Funding	Secure and allocate funding to develop, launch and maintain AR application
Launching	Implement AR across site, train and help staff use AR

For each pair of responsibilities, indicate which one you think is more important for Geevor

Please identify the degree of importance using the scale

	1=Equal	3= Moderate	5=Strong	7= Very Strong	9= Extreme														
	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9		
Developing																			Supporting
Promoting																			Supporting
Maintaining																			Supporting
Funding																			Supporting
Launching																			Supporting
Promoting																			Developing
Maintaining																			Developing
Funding																			Developing
Launching																			Developing
Maintaining																			Promoting
Funding																			Promoting
Launching																			Promoting
Funding																			Maintaining
Launching																			Maintaining
Funding																			Launching

## Section 5: Revenue

Revenue	Description
Secondary revenue	Revenue from secondary sources (e.g. spend in the local area and ticket sales)
Flexible costs	Cost for AR use is flexible and varies for different times, days, months and groups
In-app purchasing	Basic version of AR is free with an additional fee to use extra features such as AR tour
Increased entry price	Existing entry price is increased to absorb the cost of AR
Pay to use AR	Visitors pay to download and use AR
AR free	Geevor cover all costs of AR, as part of improving the visitor experience
Visitors bring devices	AR is free to use, but only accessible to visitors who bring their own devices
Pay to hire devices	Visitors pay to hire AR devices provided by Geevor

For each pair of revenue possibilities, indicate which one you think is more important for Geevor. Please identify the degree of importance using the scale

	1=Equal	3= Moderate	5=Strong	7= Very Strong	9= Extreme													
	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	
Flexible costs																		Secondary revenue
In-app purchasing																		Secondary revenue
Increased entry																		Secondary revenue
Pay to use AR																		Secondary revenue
AR free																		Secondary revenue
Visitors bring devices																		Secondary revenue
Pay to hire devices																		Secondary revenue
In-app purchasing																		Flexible costs
Increased entry																		Flexible costs
Pay to use AR																		Flexible costs
AR free																		Flexible costs
Visitors bring devices																		Flexible costs
Pay to hire devices																		Flexible costs
Increased entry																		In-app purchasing
Pay to use AR																		In-app purchasing
AR free																		In-app purchasing
Visitors bring devices																		In-app purchasing
Pay to hire devices																		Increased entry
AR free																		Pay to use AR
Visitors bring devices																		Pay to use AR
Pay to hire devices																		Pay to use AR
Visitors bring devices																		AR free
Pay to hire devices																		Visitors bring device
Pay to hire devices																		

\*Not to original scale to fit into page margins

## Appendix 20: Aggregated Decision Matrix for the five ARBM components

### Resources:

Matrix		Uniqueness	Range of activities	Education	Staff	Heritage significance	0	0	0	0	0	0	normalized principal Eigenvector
		1	2	3	4	5	6	7	8	9	10		
Uniqueness	1	-	2 3/4	4/5	2/3	7/8	-	-	-	-	-	-	19.98%
Range of activities	2	3/8	-	2/5	1/2	2/5	-	-	-	-	-	-	9.16%
Education	3	1 1/4	2 1/2	-	1 3/8	2/3	-	-	-	-	-	-	23.02%
Staff	4	1 1/2	2	3/4	-	2/3	-	-	-	-	-	-	20.27%
Heritage significance	5	1 1/7	2 4/7	1 5/9	1 1/2	-	-	-	-	-	-	-	27.57%
0	6	-	-	-	-	-	-	-	-	-	-	-	0.00%
0	7	-	-	-	-	-	-	-	-	-	-	-	0.00%
0	8	-	-	-	-	-	-	-	-	-	-	-	0.00%
0	9	-	-	-	-	-	-	-	-	-	-	-	0.00%
0	10	-	-	-	-	-	-	-	-	-	-	-	0.00%

### AR Value:

Matrix		Monetary benefits	Interpretation	Education	Sustainability	Marketing	Games	Navigation	0	0	0	0	normalized principal Eigenvector
		1	2	3	4	5	6	7	8	9	10		
Monetary benefits	1	-	1	1	3/4	1	2 3/4	2 1/5	-	-	-	-	16.25%
Interpretation	2	1	-	1	7/9	1 1/8	2 1/2	1	-	-	-	-	15.03%
Education	3	1	1 1/9	-	3/4	1 1/3	2 1/2	1 2/3	-	-	-	-	16.37%
Sustainability	4	1 3/8	1 2/7	1 3/8	-	1 5/6	4	2 1/2	-	-	-	-	22.71%
Marketing	5	1	8/9	3/4	1/2	-	2 1/9	1 3/5	-	-	-	-	13.73%
Games	6	1/3	2/5	2/5	1/4	1/2	-	1/2	-	-	-	-	5.94%
Navigation	7	1/2	1	3/5	2/5	5/8	1 8/9	-	-	-	-	-	9.96%
0	8	-	-	-	-	-	-	-	-	-	-	-	0.00%
0	9	-	-	-	-	-	-	-	-	-	-	-	0.00%
0	10	-	-	-	-	-	-	-	-	-	-	-	0.00%

## Stakeholder Benefits:

Matrix	Secure jobs	Preserve knowledge	Improve efficiency	Community pride	Attract investment	0	0	0	0	0	normalized principal Eigenvector
Secure jobs	1	-	1 1/2	2	1 1/5	-	-	-	-	-	(24.46%)
Preserve knowledge	2	1	-	2 3/4	1 5/9	1 1/8	-	-	-	-	(26.82%)
Improve efficiency	3	2/3	3/8	-	6/7	5/8	-	-	-	-	(12.82%)
Community pride	4	1/2	2/3	1 1/6	-	5/6	-	-	-	-	(15.30%)
Attract investment	5	5/6	8/9	1 5/8	1 1/5	-	-	-	-	-	(20.60%)
0	6	-	-	-	-	-	-	-	-	-	0.00%
0	7	-	-	-	-	-	-	-	-	-	0.00%
0	8	-	-	-	-	-	-	-	-	-	0.00%
0	9	-	-	-	-	-	-	-	-	-	0.00%
0	10	-	-	-	-	-	-	-	-	-	0.00%

## Responsibilities

Matrix	Support	Develop	Promote	Maintain	Fund	Launch	0	0	0	0	normalized principal Eigenvector
Support	1	-	2/3	1 1/2	3/4	7/8	5/7	-	-	-	(14.53%)
Develop	2	1 5/9	-	1 2/3	1	1	1 2/5	-	-	-	(20.68%)
Promote	3	2/3	3/5	-	5/7	5/6	2/3	-	-	-	(12.12%)
Maintain	4	1 1/3	1	1 3/7	-	1	1 1/4	-	-	-	(18.56%)
Fund	5	1 1/7	1	1 1/5	1	-	1 2/9	-	-	-	(17.73%)
Launch	6	1 2/5	5/7	1 1/2	4/5	5/6	-	-	-	-	(16.38%)
0	7	-	-	-	-	-	-	-	-	-	0.00%
0	8	-	-	-	-	-	-	-	-	-	0.00%
0	9	-	-	-	-	-	-	-	-	-	0.00%
0	10	-	-	-	-	-	-	-	-	-	0.00%

## Revenue:

Matrix	Secondary revenue	Flexible costs	In-app purchasing	Increased entry	Pay to use AR	AR free	Visitors bring devices	Pay to hire devices	0	0	normalized principal Eigenvector
Secondary revenue	1	-	2	1 2/7	1 1/2	7/8	1	5/6	1 1/8	-	-
Flexible costs	2	1/2	-	1 1/8	1 2/5	1	1	5/7	1	-	-
In-app purchasing	3	7/9	8/9	-	1 1/2	1 2/5	7/8	1	5/6	-	-
Increased entry	4	2/3	5/7	2/3	-	1/2	5/7	3/4	4/7	-	-
Pay to use AR	5	1 1/7	1	5/7	2	-	1	7/9	1	-	-
AR free	6	1	1	1 1/7	1 3/7	1	-	1 1/8	1	-	-
Visitors bring devices	7	1 1/5	1 2/5	1	1 1/3	1 2/7	8/9	-	1 1/9	-	-
Pay to hire devices	8	8/9	1 1/9	1 1/5	1 3/4	1	1	1	-	-	-
0	-	-	-	-	-	-	-	-	-	-	0.00%
0	-	-	-	-	-	-	-	-	-	-	0.00%
0	-	-	-	-	-	-	-	-	-	-	

## Appendix 21: Stakeholder email

Dear Ella

Following on from our telephone conversation, I regret to say that I do not feel able to complete the questionnaire in the format in which it is presented because of the interdependence of the areas that you are asking me to prioritise. For example, to decide on whether marketing is more important than education; marketing is totally dependent on having something to market (so a service like the education service or programme of events and activities) and it is not a stand-alone element and indeed, there is no point in developing an excellent education service, or a programme of events and activities if you then don't also invest in marketing that offer.

The next example given of prioritising 'heritage significance' or 'education'; again, the education service is intimately linked with the significance of the heritage in that it is even more important for people to learn about heritage of significance than of insignificance. So a site like Geevor, which is part of the Cornish Mining World Heritage Site as well as being a site with very important connections to the lives of people in the community, the culture of the place, etc. etc. would mean that there is a very good argument for ensuring a strong education service ensuring people have opportunities to learn about and engage with this heritage.

Whether we are talking marketing, education, 'heritage significance', 'range of activities'; these are also dependent on staffing and so putting staffing up against these categories also doesn't really make sense. You can't have a 'range of activities' without the appropriate staffing and for all the money you might spend on marketing, unless you invest in staffing, the visitor experience will suffer.

Even Section 2 on AR value, I would suggest that something that is a 'game', could also be 'interpretation' and 'education' and 'marketing' - a good game could do all of this.

In the end, heritage sites like Geevor have to prioritise areas of their service - what they have to do (and doing these as well as they can and embracing new opportunities to raise standards, enhance offer, etc.) - against what they'd like to do (especially if this doesn't help them to achieve their vision).

In terms of any AR proposition, or assessing other opportunities that emerge, each would need to be assessed against:

- Is there demand for it?
- Does it help us to achieve our vision?
- What are the risks involved?
- Is it sustainable?

There would have to be a business case developed to support any significant investment and it is a priority for the site when considering other areas that need investment. So if the site had £x to spend, would it prioritise spending it on AR or on another area.

So in summary, very few things are stand-alone, one thing or the other thing, and most need elements of it all; if you were developing a new family activity, you would want it to be sustainable, well marketed, appropriately staffed, with sufficient content (learning), enjoyable, flexible and even provide monetary benefit to the organisation.

I'm not sure if this helps, but it explains why I was struggling to fill in the questionnaire.