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# A Theoretical Model of Augmented Reality Acceptance

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## Abstract

Recent tourism research increasingly explored the opportunities of using Augmented Reality (AR) in order to boost tourism and increase the value for tourists while travelling within a destination. The Technology Acceptance Model (TAM) has been applied to a number of research disciplines, lately also AR however, studies focusing on the tourism context are still scarce. As this field is expected to increase in importance rapidly due to technological advancements and research into functionality, acceptance and usefulness, it is important to identify what the basic requirements are for AR to be accepted by users. Furthermore, the provision of a conceptual model provides researchers with a starting point on which they can base their future research. Therefore, this paper proposes an AR acceptance model including five external variables that might be included in future AR acceptance research.

**Keywords:** Augmented Reality, Technology Acceptance Model, Conceptual Paper

## 1 Introduction

Recent tourism research increasingly explored the opportunities of using augmented reality (AR) in order to enhance tourists' experience (Kounavis et al., 2012; Yovcheva et al., 2013). However, despite the popularity of AR within recent research, there have only been limited attempts to study travellers' acceptance of AR applications. Haugstvedt and Krogstie (2012) used the technology acceptance model (TAM) which was originally proposed by Davis (1986) as a theoretical foundation to examine users' acceptance of AR applications for cultural heritage sides and identified an overall lack of TAM research within the AR context. As the importance of AR is expected to increase rapidly due to technological advancements and research into functionality, acceptance and usefulness, it is important to identify what the basic requirements are for AR to be accepted by users. Therefore, the present study aims to propose an AR acceptance model within the tourism context in order to fill the gap within the tourism AR acceptance literature.

## 2 Augmented Reality for Tourism

With the emergence of AR, tourism organizations and destinations are able to enhance the tourism experience through visualisation of relevant information. The increased situational awareness for tourists gained from linkages of information and real world elements has been utilized in many fields (Yovcheva et al., 2013). Fritz et al. (2005) identified that AR applications are particularly valuable within the tourism industry as they provide travellers with an opportunity to get to know unknown

surroundings in a manner that enhance the overall experience. In addition, in terms of increasing the overall tourism experience, AR applications have the strengths of developing enjoyable holiday trips through the integration of high quality, new and interesting information or AR gaming such as TimeWarp or Urban Sleuth (Herbst et al., 2008). These applications provide opportunities for tourists to get to know an unknown area in an enjoyable manner. As the real world blends into computer generated content, travellers' are enabled to discover old heritage sides or monuments. In addition, information are provided in a different form than simply checking online sources or travel guides which enhances the overall tourism experience (Kounavis et al., 2012). In addition, there are a number of applications such as Tuscany+, the first application of its kind, or "Augmented Reality for Basel", that aim to deliver augmented and interactive information in regards to food and dining, museum, entertainment or (Kounavis et al., 2012). Another example of a destination that aims to enhance the overall tourist experience through AR is Dublin. The initiative to utilize AR to strengthen and promote the city of Dublin as an "innovative city" started in 2012 as a cooperation between the Manchester Metropolitan University, the Dublin Institute of Technology and the City Council of Dublin. A major focal point was the inclusion of several tourism stakeholders into the development of an AR application for the destination of Dublin. Due to the scope of this project and the possible gains from a successful implementation the importance of achieving user acceptance of the AR application is paramount. Therefore, the identification of variables leading to user acceptance and also the basic requirement for a business case is the primary goal of this conceptual paper.

## 3 Proposed Augmented Reality Acceptance Model

According to Wu et al. (2011), the TAM has been the predominant theory to examine technology acceptance since its development by Davis in 1986. Ayeh et al. (2013) acknowledged that the TAM is considered the most influential framework for addressing user acceptance. The TAM incorporates users' attitudes and beliefs into the intention to adopt new technologies. Davis (1986) highlighted the importance of undestanding users' reasons to accept or reject a technological innovation based on its perceived ease of use and perceived usefulness in order to avoid implementation failure. The majority of TAM researchers extended the TAM through additional external variables. Ayeh et al. (2013) identified the importance of using context-specific external variables within TAM research in order to ensure the applicability within different technological context

Ha and Stoel (2009) and Wojciechowski and Cellary (2013) confirmed the significance of enjoyment for the intention to use new technologies. Particularly the addition of enjoyment into the latest version of the TAM (TAM3) shows the high significance for future research (Venkatesh & Bala, 2008). Wojciechowsk and Cellary (2013) concluded that enjoyment had a strong effect on the attitude toward using AR e-learning applications. Haugstvedt and Krogstie (2012) implemented the construct of enjoyment into their AR acceptance model within the cultural heritage context and strengthened the importance of enjoyment for AR acceptance research.

Amoako-Gyampah and Salam (2004) have thoroughly discussed the importance of benefits for the technology acceptance behaviour. Within the research discipline of mobile service acceptance, Lopez-Nicolas et al. (2008) revealed that perceived status and perceived flexibility benefits influence perceived usefulness and the attitude towards using. Particularly within the context of the present research, Olsson et al. (2012) identified that perceived benefits are an important reason for AR users to accept this new technology.

According to Lin et al. (2007), the inclusion of personal innovativeness is particularly valuable when studying within the voluntary research setting, as users' willingness to be a technological pioneer is particularly applicable to voluntary users. The concept of personal innovativeness roots back to the Diffusion of Innovation Theory (Rogers, 1962) and can be defined as users' willingness to try out new services and products (Morosan, 2012). The positive effect of personal innovativeness on the intention to use has also been confirmed within the context of AR (Yussof et al., 2011).

Olsson et al. (2012, p. 43) examined the perception of early adopters in regards to AR services and revealed that "the most valuable mobile AR services were those demonstrating pragmatic usefulness for the user, e.g. by saving time and effort". They concluded AR adopters desire rich and high quality information that are contextually relevant. The importance of the quality dimension within TAM research has been supported by Ha and Stoel (2009). Olsson et al. (2012) revealed the importance of information quality specifically for users' acceptance of AR.

Parra-López et al. (2011) furthermore identified the importance of including costs of use when studying users' acceptance of e-commerce applications. They concluded that researchers should include efforts costs, loss of privacy costs as well as difficulty of usage costs in order to account for "the sacrifices, both monetary and non-monetary, made for the sake" of using applications (Parra-López et al., 2011, p. 642).

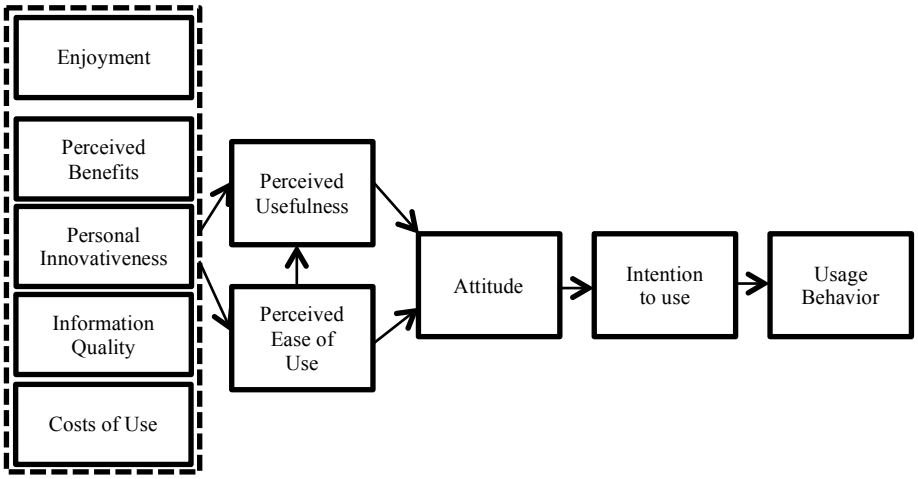


**Fig. 1.** Proposed AR Acceptance Model

Based on the reviewed literature, the present research posits that enjoyment; personal innovativeness; perceived benefits, information quality and costs of use are the primary antecedents of users' perceived ease of use and perceived usefulness leading to attitude, behavioral intention to use and usage behavior as shown in Figure 1.

## 4 Conclusions and Future Research

The aim of the present study was the development of an AR acceptance model in order to fill the gap in AR acceptance research within the tourism context. The present study identified that there are four potential external variables that influence AR user acceptance including enjoyment, personal innovativeness, perceived benefits, costs and information quality. The findings of this research should benefit both, academics and practitioners by elaborating on the theoretical understanding of the proposed framework within the AR context. For tourism practitioners, this research shows that there are various avenues in regards to AR applications that should be explored in order to fully benefit from an AR implementation and thus, ensure the enhancement of the overall tourist' experience. This study has acknowledged tourists' desire for high quality information, enjoyable features and content, perceived benefits and cost benefits as well as innovativeness. Therefore, practitioners should evaluate if their field of business is suitable for AR applications and meaningful use cases can be established. In addition, tourism practitioners are advised to follow the developments of AR applications to start progressing on their learning curve as to what is crucial for AR application acceptance. For academia, this present research has provided a research model that can be applied to the AR context in general, and the tourism discipline in particular. However, one limitation of this present research is the exclusive usage of previous literature in order to propose external variables for the AR acceptance model. Baron et al. (2006) for instance raised questions in regards to the validity of TAM variables due to the predominant usage of quantitative measures. One of the main shortfalls of only using previous literature to identify existing variables is that it does not allow the inclusion of consumers' perception in regards to technology acceptance (Baron et al., 2006). In addition, Ayeh et al. (2013, p. 265) recommended that "future studies might explore additional context-specific factors to better explain the complex relationships among variables". Consequently, it becomes apparent that future studies should conduct qualitative interviews in order to confirm or extend the presented AR acceptance model before moving on to quantitatively testing it through a large-scale questionnaire.

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