UK National Health Service

Information Systems Implementation:

Emergence in Informal Groups

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PhD 2024

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A thesis submitted in partial fulfilment of the requirement of Manchester Metropolitan University for the degree of Doctor of Philosophy

School of Nursing and Public Health

Manchester Metropolitan University

August 2024

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Abstract

The implementation of Information Systems (IS) is a critical area of study in both academic research and industry practice. However, a research gap remains in understanding the role of spontaneous, informal interactions during IS implementation and their impact on the overall process. This gap was identified through two literature searches conducted in 2011—one combining systematic and unsystematic approaches—and a comprehensive systematic review in 2023. In the context of the United Kingdom's National Health Service (NHS), IS developed by vendor organisations under the National Programme for Information Technology (NPfIT) are typically designed based on predefined scenarios, rather than the complex, real-world dynamics of the organisations they aim to support.

The implementation of such highly specified IS fails to accommodate the emergence of informal interactions within the organisational context, creating a design-reality gap. This gap poses significant challenges to the success of IS implementation, as it disrupts organisational routines and hinders the adaptability of individuals and teams. To address this issue, the research aims to contribute to understanding the design-reality gap through the development of the Informally-interactive Deferred Adaption Process (IDAP) model.

The IDAP model posits that the design-reality gap disrupts organisational routines, influencing informal interactions reflective of complex adaptive systems (CAS). The model suggests that recognizing and supporting these adaptations is crucial for the successful implementation of IS. The research investigates IS implementation projects in 10 NHS organisations using ethnographic interviews, practitioner observations, and documentary evidence. Data analysis, conducted through NVivo and employing a thick description analysis method, provides empirical evidence supporting the IDAP model's propositions.

The key findings include (1) the design-reality gap as a fundamental cause for CAS behaviour; (2) disruption of individuals' organisational routines due to the design-reality gap; (3) localized actions resulting in adaptations resembling 'deferred actions'; (4) individuals aligning their behaviour with natural designs or organisational life rather than specified designs; and (5) diffusion management mechanisms supporting deferred action. These findings contribute to the understanding of how organisational actors' informal interactions align with the IDAP model to achieve desired adaptations despite specified IS designs. The implications of this research extend to IS developers and implementation managers, highlighting the importance of considering IDAP processes in their work.

Acknowledgements

Gratitude fills my heart as I reflect on the challenging journey that led me to this point of writing acknowledgements. I found solace in the support of remarkable individuals who encouraged and uplifted me, making this arduous journey possible. To each person acknowledged here, no contribution, however small, went unnoticed in helping me complete this immensely rewarding work.

Special appreciation goes to the dedicated National Health Service (NHS) staff who participated in the research. Your professionalism and commitment to patient care have been inspiring. Gratitude extends to Deborah McBeal, those in the NHS Luton area, and Mr. Bobby Mahabir and colleagues at Central and NorthWest London NHS for their invaluable insights.

My supervisory team Dr. Nigel Cox, Dr. Christopher Wibberley, Prof. Carol Haigh, and Prof. Mark Hayter deserve heartfelt thanks for their unwavering support. Dr. Nandish Patel's encouragement at the start of my PhD journey was instrumental, and Dr. JMSB Jarasundara's kind words were truly appreciated. Colleagues like Mr. Anthony Schnaar at Maudsley NHS Trust and the late Mrs. Marta Osiekowicz and Dr. Maritana Sedoseva at NATO offered encouragement during pivotal moments.

Finally, my deepest appreciation goes to my family my late father, WWP Silwa, my mother, Rupa Abeysinghe, my sister Chintha Karunarathne, and Achini Caldera for their unwavering support. Heartfelt thanks to my lovely Abir, Zara and my daughters, Vidhyani and baby Amaaya, for being constants in my life and sheering me up in difficult times. Your presence is a privilege that I cherish deeply.

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1.1 Introduction

The implementation of Information Systems (IS) in the National Health Service (NHS) is predominantly regarded as a technical challenge, with research focusing on the information technology, software, and hardware aspects of IS. However, the role of 'people' affected by IS implementation during the NHS's implementation process remains less researched and understood. This discrepancy arises from the fact that people and their behaviours are not considered objectively in the same light as the technological aspects in IS implementation research. People in organisations play a critical role during IS implementation, as they derive purpose and attach significance to their work and actions, providing them with meaningful value. Moreover, the work of healthcare professionals in NHS organisations differs significantly from that of individuals in commercial organisations. Healthcare professionals are driven by empathy for patients and the imperative to achieve successful patient health outcomes, resulting in a work environment characterized by care and empathy (Larson and Yao, 2005). These social realities play a distinctive role in the implementation of IS.

The introduction of new structured Information Systems (IS) disrupts normal organisational processes and routines aimed at saving lives and achieving health outcomes. This disruption occurs because IS developers, who often work for third-party organisations, design, develop, and implement systems to support core health functions of healthcare organisations like the NHS based on a specification of users' requirements. These specifications are merely abstractions of organisational reality and do not cover informal, complex and nuanced properties within the organisational

context. Especially, the growth of informal user interactions aimed at mitigating interruptions caused by specific IS is a problem that IS developers often overlook during implementation. Understanding and explaining the 'what' and 'how' of these emergent informal interactions are crucial for successful IS implementation.

The NHS has introduced IS to collate, manage, and utilise patients' health information to facilitate safer, more efficient, cost-effective, and high-quality service delivery (Brennan, 2022). Implementing IS is viewed as a means to alleviate the widening supply-demand imbalance in the health industry and enhance organisational effectiveness. Legacy health information systems introduced in the 1980s primarily focused on patient administration aspects such as physician order systems and electronic health records, but they provided limited contributions to daily operations in healthcare organisations (Brennan, 2022).

With the development of Information and Communication Technology (ICT), programmers have designed sophisticated IS to capture the 'patient journey' through care pathways in primary, secondary, and community healthcare organisations. This enables the provision of management information and cost control, facilitates total quality management, improves patient safety, and increases productivity (Greenhalgh *et al.*, 2017).

The British Government's National Project for Information Technology (NPfIT), operational between 2002 and 2011, aimed to digitize health information and data within the NHS. This initiative sought to incorporate ICT into the NHS to enable physicians to track clinical notes, order and view test results online, simplify drug prescriptions, and ensure secure data transfers between various NHS organisational units. Additionally, the program aimed to establish a foundation for faster, more efficient, safer, and cost-effective patient care. To achieve this, the

National Spine (N3), a high-speed core network system, was connected to IS at different service locations throughout the NHS, including GP offices, hospitals, Primary Care Trusts (PCTs), Community Care Centers, and Strategic Health Authorities (SHAs), to provide real-time access to patients' Electronic Health Records (EHRs) regardless of their location within the NHS. This development represented a logical progression from the initial health IS, which originated as a patient administration and laboratory system in the 1960s before evolving into the HISS project in the 1980s. (Figure 1).

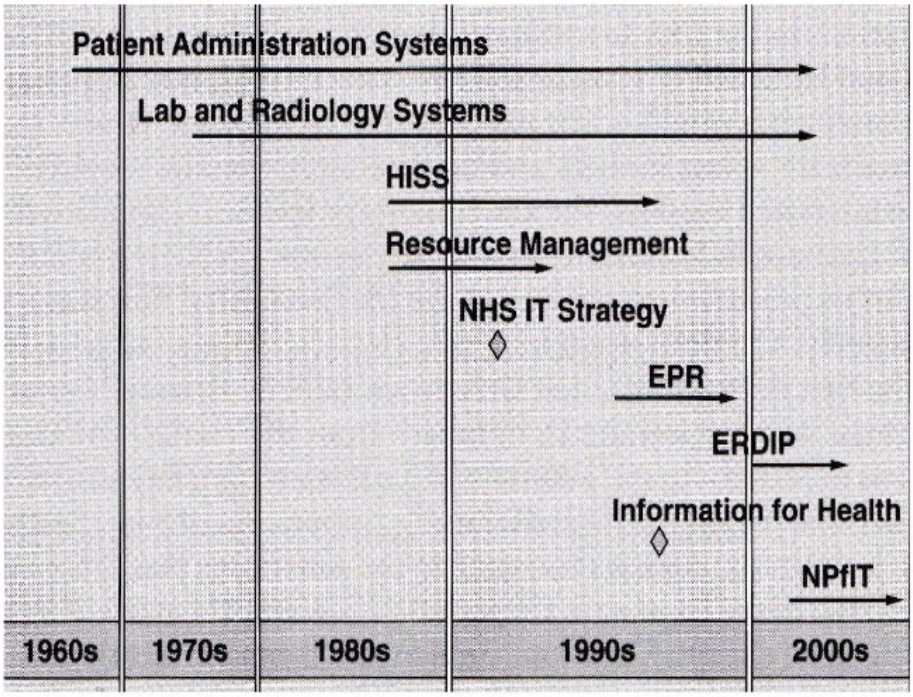

Figure 1:Timeline of Major NHS IT Projects,1960s-2000s

Source: Brennan (2022, p. 49)

While the project was disbanded in 2011, the government considered certain elements of the NPfIT as part of the essential infrastructure. The Spine, N3 Network, NHS mail, Choose and Book, Secondary Uses Service and Picture Archiving, and Communications Service were judged as essential infrastructure, despite the

staggering cost of the project and the lack of political will to continue the project as a result of the recession (Campion-Awwad *et al.*, 2014).

Regressing to the academic query, there are two schools of thought regarding IS research in healthcare providers. The first school of thought, which assesses the project implementation and infrastructure components of the NPfIT methodologies, is concentrated on project aspects of IS implementation (Cadle and Yeates, 2004; Verner and Sarwar, 2021). These studies investigate financial aspects, workflow facilitation, and planning and training during IS implementation. Such studies can be categorised as the structured aspects of IS implementation. This school of research may be termed 'technical.' Yet, more recent research focused on softer aspects, such as IS interface, interactivity, interactions, interoperability and various organisational aspects and staff behaviours (Irani *et al.*, 2023). With the development of social networks such as Facebook and Twitter, the latter grew using social media data in healthcare management (Zhou *et al.*, 2018; Yang *et al.*, 2022). For obvious reasons, the second school evaluates IS implementation's sociological and technological aspects and is termed the 'socio-technical' approach. The research reported in this dissertation aligns with the socio-technical approach.

The two schools can be further categorised by their respective methodological approaches based on their philosophical epistemologies. The 'technical' school adopts the positivist methodology, which assumes that, like the reality of the ICT used to develop IS, users' experiences similarly exist independently and can be captured and understood as 'objective' experiences, for example, by Delone & DeLone and McLean (2003) and Abdulla *et al.* (2019). It assumes that the researcher is independent of the object of study. The socio-technical school adopts the interpretive methodology, which assumes both the ICT and the users' experiences are socially constructed realities which are subjective and concrete only

in terms of the interpretations of the actors involved. Interpretivism assumes that the researcher also is an integral part of the socially constructed reality and has their interpretations. Much research is conducted using the interpretive approach by Mattarelli, Bertolotti and Macrì (2013) and Pekkola *et al.* (2019), which considers organisational reality and the behaviour of subjects' effects to shape one another's response.

However, interpretivists have not yet investigated the complex and emergent nature of healthcare organisations like the NHS and how that nature affects IS implementation. This research adopts the interpretivist approach to focus on the emergent informal interactions of actors during IS implementation. As a result, the literature reviewed did take into account the complexity of social components, the unpredictable nature of organisational behaviour, or the richness and importance of the context, all of which are posited to be emergent. This emergence is especially acutely observed in the informal interactions and relationships of organisational staff and directly affects the successful implementation of IS. It is further postulated that such informal interactions amongst staff members are a self-organising response to IS implementation that needs to be a critical aspect to ensure success. Research on such organisational emergence highlights how the implementation of specified IS affects organisational processes, workflows, and management processes and reshapes organisational reality of members.

1.2 Research Problem

Information Systems implementation success varies significantly across industries. In the healthcare sector, studies indicate a broad range of success rates, with between 27% and over 60% of implementations either exceeding budget or facing

quality issues (Kheybari *et al.*, 2020; Wijayati and Achadi, 2023). In contrast, the industrial sector generally experiences IS failure rates ranging from 30% to 40% (Booth, 2003; Kaplan and Harris-Salamone, 2009). However, recent research on Toyota Astra Motor Indonesia by Prasetyo *et al.* (2019) highlights an ERP failure rate between 67% and 90%, suggesting a concerning view of more frequent failures in IS implementation.

Numerous factors contribute to the varying success rates across industries. In healthcare organisations (HCOs), researchers attribute the lower success rates to the complex organisational context (Brennan, 2005; Heeks, 2006; Sobo, Bowman and Gifford, 2008; Ludwick and Doucette, 2009; Karim and Ahmad, 2010; Heeks, 2017; McCarthy *et al.*, 2021), the nature of the business (Lenz and Kuhn, 2004; Sindhwani *et al.*, 2019), infrastructural complexity (Irani *et al.*, 2023), high investment costs (Anderson and Balas, 2006; Gopal *et al.*, 2019), and the extensive administrative and training requirements needed to ensure accuracy (Norton *et al.*, 2019). Moreover, the critical focus on patient care in HCOs often prioritizes clinical needs over standard IS processes, further complicating successful implementation.

The complexity of HCOs, often overlooked in research, encompasses a myriad of variables. Previous studies have primarily examined organisational complexity in HCOs at face value (Herbst *et al.*, 1999; Khoumbati, Themistocleous and Irani, 2006; Sobo, Bowman and Gifford, 2008), with recent research by Champion *et al.* (2017); (Peng *et al.*, 2020) continuing this trend. However, the validity and generalizability of such factorial explanations are limited due to their epistemological and ontological orientation. A more thorough discussion on this topic is provided in the Literature Review (Chapter 2.4).

Literature concerning IS failure typically falls into two categories: design failures (Williams *et al.*, 2021) and project failures (Herbst *et al.*, 1999; Littlejohns, Wyatt and Garvican, 2003; Goodison, Borycki and Kushniruk, 2019a). (Patel, 2006b) argues that IS failure should be seen as a process failure rather than solely a project failure. More recently, Nyame-Asiamah and Kawalek (2020) views IS failure as a result of complex interactions between individuals and various factors. He suggests that IS, designed by 'reflective designers' (professional IT specialists), often fails to incorporate organisational knowledge and emergent factors due to their detachment from the organisational reality. This separation leads to IS artefacts that inadequately address organisational needs and nuances, contributing to the higher rates of IS failures observed in various sectors. According to Brennan (2005):

> *'A clutch of software companies lies at the heart of NPfIT. They will share the responsibility for delivering the software that will drive the NHS. Between them, they employ thousands of software programmers, analysts, and designers.' The diagram below (Figure 2) illustrates each project element, the relevant contractor; the main IS application, and the sub-contractor.*

The National Programme for IT (NPfIT) introduced a comprehensive and intricate approach to IT modernization within the NHS, making it a significant chapter in the history of healthcare technology. Operating under the overarching framework of Connecting for Health, NPfIT aimed to standardize IT infrastructure and services across NHS trusts. This involved the implementation of electronic health records (EHRs), picture archiving and communication systems (PACS), and electronic prescribing systems

(EPS), as detailed in Chapter 1.1 in its' localities and connecting through a single spine called N3.

Due to its extensive geographical coverage and the decentralized decision-making structure of NHS trusts, Connecting for Health heavily relied on software suppliers to develop, deploy, and maintain the necessary IT infrastructure and applications. These suppliers varied in size and specialization, ranging from large multinational corporations to smaller, niche firms. Each supplier brought unique expertise and technology solutions to the NHS IT ecosystem in various geographical areas of the NHS, as illustrated in Figure 2.

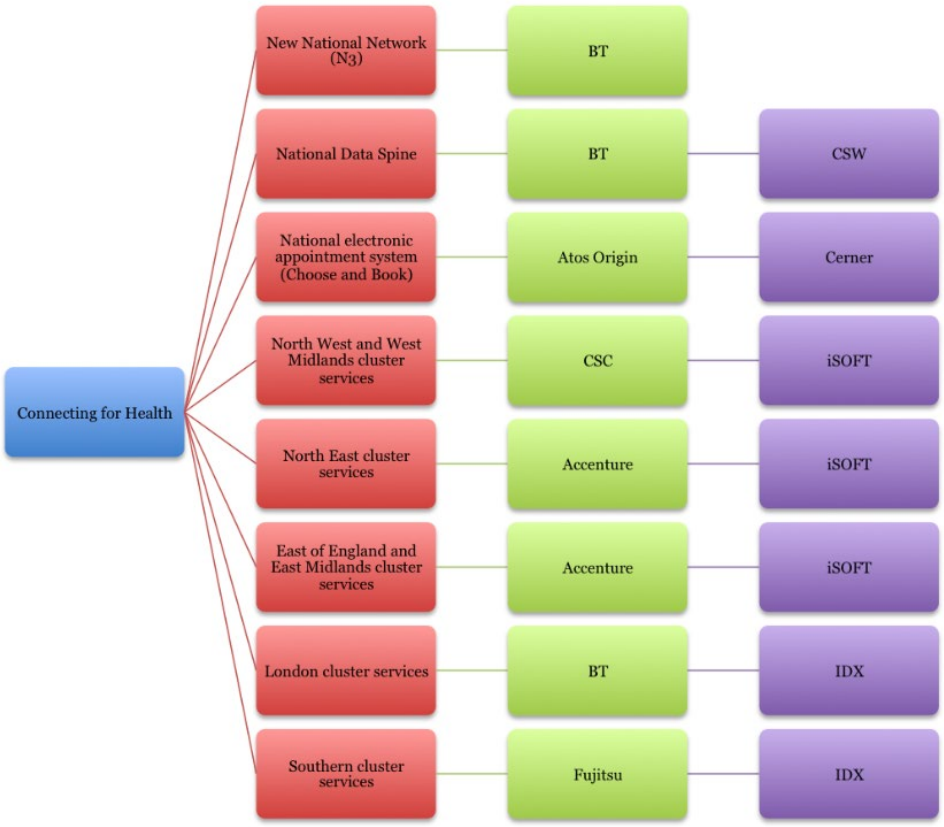

Figure 2: NPfIT Structure in April 2005

Source: Campion-Awwad *et al.* (2014)

Therefore, these are specified and structured ISs, designed and based on logical formalisms for specific organisational contexts ignoring tacit knowledge, intuition, informal interactions, and adaptability. Consequently, this is the main reason why ISs were introduced into the NHS, which does not fully reflect the actual organisational reality experienced by people.

Specified and Structured ISs have been introduced into the NHS in anticipation that staff members would and should accept new IS designs (Wilegoda-Wickramage and Patel, 2010) regardless of considering the socio-organisational conditions, giving attention to the System Design Life Cycle, and the emergence that occurs during the IS implementation process. Structured IS designs on the other hand, are better suited to static organisational conditions and stable business processes than complex and dynamic organisational contexts because ISs cannot withstand and adapt to changes in organisational reality, such as changes in IS user behaviour and workflows. Therefore, the implementation of structured IS in dynamic organisations such as the NHS will lead to a gap between the IS and the organisational reality (Heeks, 2006; Heeks, 2017; Jiang and Wallace, 2017; Jiang, Hong and Chen, 2019; McCarthy *et al.*, 2021), termed the design-reality gap. It is argued that the design-reality gap leads to ubiquitous outcomes, which may eventually lead to failures.

Further, the literature reveals that IS implementation in the NHS is a bureaucratic exercise (Sahay and Walsham, 2017; Brennan, 2022), which relies on project management principles without considering the emergence of organisational reality. and Chhetri, Du and Mengel (2023) asserted that project management is a paradigm failure that couldn’t attend to complexities in contemporary organisations and makes

no use of available modern techniques and learning. Current project management frameworks and guidance (i.e., PMBOK and PRINCE 2) do not adequately focus on organisations' complexities and emergence (Thomas and Mengel, 2008; Luo, Zhang and He, 2020). Instead, such frameworks rely on linear and structured management techniques. Therefore, IS failure can be demonstrated as an implementation failure (Herbst *et al.*, 1999; Sauer, Gemino and Reich, 2007; Wijayati and Achadi, 2023). argue that the NHS's structure, culture, organisational size, and bureaucracy make IS implementation harder (Sahay and Walsham, 2017).

Collen (1995) and Berg (2001) highlighted that IS implementation in healthcare is more vulnerable than in any other industry. Bureaucratic and rigid structures in the NHS and ever-changing procedures and care pathways make IS designs challenging unless they integrate emergence into their design. These challenges continually change over time (Sligo *et al.*, 2017b).

Finally, a deeper sociological and organisational understanding is essential for the successful implementation of information systems. Such understanding would provide a stronger foundation for developing ISs that are more closely integrated with nuanced work practices, contexts, and organisational routines. However, due to their 'ontologically structured' technical training and detachment from the actual healthcare context, IS designers and IT specialists have often overlooked these aspects in practice. NHS IS project managers, who rely on traditional project implementation techniques, have similarly neglected these considerations.

Informal relationships among staff members are common, according to the literature (Snowden, 2002), and are defined as identifiable, self-conscious, relatively stable units of interacting members whose relationships are not officially prescribed by statutes and rules (Fiellin, 1962; Battaglini, Sciabolazza and Patacchini, 2020;

Battaglini, Patacchini and Rainone, 2022). Such relationships are based on goodwill and trust, which adhere to the structure of individual actor relationships (Snowden, 2002; Oh, Chung and Labianca, 2004; Ghorbani and Azadi, 2021).

Ontological differences between a traditional view of organisations are the main reason for overlooking emergent behaviours in organisational research. The complex interrelationships and informal relationships within the NHS organisational context, along with the resulting complexities, have not been adequately considered by researchers. This oversight stems from various assumptions about organisational ontology. Emergence, an inevitable aspect of organisational reality that has often been overlooked, plays a significant role in shaping organisational dynamics. Informal groups are spontaneous and demonstrate unplanned interactions between their members (Fu *et al.*, 2019), resulting in a fluid organisational reality. Additionally, informal behaviour is not bound by organisational formalities; it is unregulated and unpredictable. It is believed that 'under certain conditions, these informal groups have the potential and could self-organise to conform to the IS and the organisational context to enhance IS implementation.' (Wilegoda-Wickramage and Patel, 2010). A recent study carried out by (Cresswell *et al.*, 2017) supports that users highlight engagement in some, while other less engaged groups developed resistance and unsanctioned workarounds if systems were perceived to be inadequate.

It is this proposition that the current research seeks to argue and empirically investigate. Thus, this research focuses on the existence and self-organisation of informal relationships and their effect on IS implementation. The research attempts to explain IS implementation in terms of (1) Design-reality gap, (2) Complexity Theory, (3) Theory of Deferred Action, (4) the existence of informal relationships, and (5) their ability to form Complex Adaptive Systems (CAS) in HCOs.

1.4 Research Question

Given the complexities outlined in the research problem, it becomes evident that understanding the interplay between technological implementation and organizational dynamics is crucial. The challenges faced by the NHS in bridging the design-reality gap underscore the need for a nuanced approach that not only addresses the technical dimensions of IS but also considers the human and informal aspects that influence successful implementation. To delve deeper into these issues, this research will explore specific questions designed to guide the investigation into how informal interactions, organizational emergence, and adaptive processes can be better integrated into IS design and implementation.

How can Information System implementation in the NHS be improved by enabling the emergence of Information System designs?

Emergence in organisations is an intrinsic aspect of organisational reality. It is ubiquitous and unpredictable. Nevertheless, IS implementation in the NHS is a bureaucratic process that largely ignores emergence. ISs for the NHS are designed for specific organisational contexts and supplied by the vendor organisations affiliated with the NPfIT (2002-2011) based on highly structured IS development and project management formalisms (Campion-Awwad *et al.*, 2014). This emphasis on formalism means that IS designers and developers are separated from the actual organisational reality of so-called ‘users’ in the NHS. IS designing techniques and methodologies focused only on the identifiable and definable structure of organisational entities, i.e., business processes, workflows, etc. As a result, such designs do not reflect or conform to organisational emergence, i.e., tacit knowledge, intuition, and adaptations.

As a result, a gap exists between the formal IS design and the actual organisational reality, causing fundamental ontological implementation issues.

It is argued that the design-reality gap leads to the emergence of increased informal interactions between staff members. Individual dissemination of knowledge, skills, and experiences leads to actions and behaviours that influence IS adaptations. This brings tacit knowledge, intuition, informal interactions, and adaptability to the context and is not considered in structured IS designs and implementations.

It is argued that a new type of organisational management, such as diffusion management, could enable and promote successful adaptations emerging from informal group interaction, thus recognising and underpinning localised CAS actions and behaviours.

The research question seeks to understand how enabling such emergent behaviour in IS designs can improve IS implementation.

1.5 Secondary Research Question

How do informal relationships as Complex Adaptive Systems affect IS implementation in the United Kingdom National Health Service?

Informal relationships are intrinsic to organisational reality and do not encompass organisational formalities. It has been argued that the design-reality gap influences informal groups and increases the interactions and cohesion between individuals similar to a CAS (McDaniel Jr, 2007). Since informal relationships are the antithesis of organisational formalities, their influence on bureaucratic IS implementations is an important aspect of IS success.

Because specified IS designs do not consider emergence, which is ubiquitous and unpredictable, localised actions play a significant role in adapting the IS, workflows, and organisational actions to meet the organisational objectives. The research attempts to understand the process of how complex informal interactions lead to the adaptations of ISs and affect IS implementation.

The investigation of informal behaviour during IS implementation will fill a significant knowledge gap regarding how the design-reality gap influences informal behaviour, based on their existence and evolutionary process within HCOs; factors and dynamics of informal groups, and the extent to which they influence IS implementation.

This is also expected to improve understanding of how to design ISs compatible with complex social interactions and incorporate deferred action to improve the overall outcome and success of IS implementation.

1.6 The Aim and Objectives of the Research

The below research aim has been formulated to answer the primary and secondary research questions. The research aim articulates what the study intends to achieve and provides a clear direction for the investigation. It transforms a broad problem statement into a targeted goal, offering a pathway to address the identified issues. Consideration has given to each key areas in the research problem and how effectively those could be addressed.

After careful consideration of the research questions following aim was developed:

To explore how the design-reality gap in IS implementation within the NHS influences informal interactions among staff and to develop a model that supports successful IS adaptation by leveraging these informal interactions.

To operationalize the research aim, it is essential to break it down into specific, measurable research objectives. These objectives delineate the steps needed to achieve the overall aim, providing a roadmap for the research activities. This process is essential for effectively addressing the research questions and the aim. Firstly, the objective must unravel the dynamics of informal groups during IS implementation. This entails elucidating how the implementation and utilisation of information systems (IS) can naturally evolve from the intricate social dynamics within the NHS. It is imperative that the objective delineates the emergence, dynamics, and behaviours of these informal relationships. This involves delving into the nuanced dynamics of informal relationships within the NHS and their implications for IS implementation.

Secondly, the objective should facilitate Understanding the Impact on IS Adaptation. This entails contributing to addressing the research problem by examining how informal interactions drive the adaptation of IS. By comprehending the mechanisms through which informal relationships influence IS adaptation, this criterion offers valuable insights into fostering the development of agile IS designs that can respond to the evolving needs of the NHS.

Thirdly, the objective must address Bridging the Design-Reality Gap. This involves exploring how informal relationships shape, and are shaped by, the misalignment between IS designs and organisational realities during implementation. By uncovering these mechanisms, this criterion offers insights into enhancing IS implementation outcomes within the NHS.

Finally, the objective should aid in Developing a Model of IS Adaptation. This criterion contributes to addressing the research problem by synthesizing the findings into a comprehensive model that elucidates the IS adaptation process within the NHS. Grounding the model in the Theory of Deferred Action, this objective provides a theoretical framework for understanding the intricate interplay between informal relationships and IS implementation as a Complex Adaptive System (CAS).

Taking into account all four requirements necessary to address the aforementioned research questions, the following research objective has been developed.

The research objective is to understand the informal interactions amongst NHS staff members during IS implementation as a CAS, to develop a model that demonstrates the IS adaptation process based on the Theory of Deferred Action.

1.7 Structure of the Thesis and Order of Presentation

Chapter 2 provides a comprehensive review of the literature pertinent to this research. It delves into the challenges of Information Systems (IS) implementation within the NHS and Healthcare Organizations (HCOs), examining key theoretical frameworks such as complexity theory, the theory of deferred action (TODA), and concepts like complex adaptive systems (CAS). Additionally, it explores related concepts including the design-reality gap, routines, rounded solidarity, and the concept of utility. The chapter also addresses the epistemological and ontological considerations inherent in IS implementation research.

Chapter 3- Building on the insights from the literature review, this chapter introduces the Informal-Interactive Deferred Adaption Process (IDAP) model. The model is designed to address the limitations of traditional IS design by incorporating the

emergent and informal interactions that are often overlooked in structured approaches. Through detailed analysis and integration of multiple theoretical perspectives, this chapter explains how the IDAP model can bridge the design-reality gap and contribute to more sustainable IS implementation in complex organizations like the NHS.

Chapter 4- Outlines the methodology employed in this study, which combines ethnographic interviews and participant observation. It discusses the ontological and epistemological stance of the research, details the research design, justifies the chosen methodology for data collection and analysis, including the use of NVivo, and addresses ethical considerations. Moreover, it rationalizes the selection of the interpretivist approach as the philosophical epistemology guiding the research.

Chapter 5- In this chapter, the collected data is systematically analysed to uncover key themes and patterns that emerge from the implementation of IS within the NHS. The findings are presented in relation to the theoretical frameworks discussed earlier, with a focus on how informal interactions and emergent behaviours influence IS success. The chapter offers a detailed account of how the IDAP model functions in practice, highlighting the ways in which it helps to mitigate the design-reality gap and enhance system sustainability.

Chapter 6- This chapter delves into the implications of the findings, connecting them back to the research questions and the broader theoretical context. It critically interprets the results in light of the IDAP model, exploring how the integration of informal and emergent processes can lead to more effective IS design and implementation. The discussion also considers the broader impact of these findings on IS theory and practice, particularly within complex healthcare organizations like the NHS.

Chapter 7- The final chapter synthesizes the key insights from the study, drawing conclusions that highlight the contributions of the research to both theory and practice. It reflects on the effectiveness of the IDAP model in addressing the challenges of IS implementation in emergent organizations. The chapter also offers practical recommendations for policymakers and practitioners in the NHS and other similar contexts, emphasizing the need for IS designs that are flexible, adaptive, and reflective of organizational realities. Additionally, the chapter outlines potential avenues for future research, building on the foundations laid by this study.

Chapter 2: Literature Review- An Introduction to Emergent Organisations

2.1 Introduction

The preceding chapter established the foundation for the research by providing the background and articulating the research problem, aim, and objectives. Building upon this groundwork, the current chapter is dedicated to a thorough critical review and evaluation of existing research concerning Information Systems methodologies, IS project management, frameworks for IS implementation, organisational complexities and design processes. This review is framed within the context of complexity theory, the design-reality gap framework, the theory of deferred action, and the concept of emergence within organisational dynamics.

In particular, the chapter delves into a comprehensive analysis of the structured IS implementation process within the National Health Service (NHS). The focus is on scrutinizing the emergent informal interactions generated by structured design and IS implementation processes, leading to complex adaptive behaviour. This examination aims to elucidate the specific organisational shifts that must be acknowledged to facilitate the successful implementation of IS.

Drawing upon the theoretical underpinnings of complexity theory, the design-reality gap framework, the theory of deferred action, and emergence in organisations, the analysis unfolds the intricate dynamics of the structured IS implementation process. It sheds light on the manifestation of the design-reality gap and the resulting manifestation of Complex Adaptive Systems (CAS) among NHS staff members, exploring their profound impact on the implementation of IS.

These CAS are characterized as self-organizing informal groups, marked by multifaceted informal interactions. The subsequent exploration of these dynamic elements is essential for a nuanced understanding of IS implementation within the NHS, unravelling the intricate interplay between formal processes and emergent, informal dynamics.

Given that complexity and emergence are intrinsic aspects of organisational reality, literature has been reviewed and critically evaluated to study emergence in organisational environment, contextual complexities, existing IS implementation models and formalisms, and IS success. Section 2.2 focuses on concepts of IS success and measuring IS success. The importance of adaptable IS in emergent contexts is discussed and various IS implementation methods are analysed in Section 2.3. An effort has been made to showcase the gaps in existing IS methodologies. These methodologies have certain metaphorical positioning. Section 2.4 and 2.5 discuss the ontology and epistemology of contemporary IS implementation methodologies and their suitability for reflecting complex organisational contexts. The term ‘complexity’ is then defined in terms of a number of theories and concepts, and various complexity theory concepts are assessed in Section 2.6 in order to find an appropriate theoretical viewpoint to support IS implementation in HCOs that takes into account emergent informal group behaviours and to create the IDAP theoretical framework process that is discussed in Chapter 3.

One critical aspect that highlights in the chapter is that IS design formalisms, and implementation techniques assume rationality and linearity. Further, they are focussed on abstraction of organisational reality. Hence, they are contrasted with complexity that illustrates in emergent organisation. It is argued in the chapter that emergence in organisations is multifarious and intrinsic to organisational life. The

mixture of contradictions and the notion of emergence and its impact during IS implementation are discussed in Section 2.7. These are key to in IS design and implementation. The theory of deferred action is used as the theoretical basis of the research framework in Section 2.10, demonstrating how local informal responses during IS implementation can enhance the sustainability of the IS.

Section -I: The Literature Review

2.1.1 Literature Search Strategy

The literature search was conducted twice during the research process: initially in 2011 and again in 2023 due to the extended duration of the research. This dual approach aimed to ensure the ongoing validity of the research literature, the research problem, rigour, the credibility and relevance of the findings.

This section focuses on the renewed literature review carried out using a systematic approach. The research problem relates to the behaviour of informal groups, their involvement in IS implementation and their success, a topic that arose from the researcher's experience as an IT expert in the NHS. The researcher also reviewed books and journal articles about IS implementations. Consequently, the research began with some prior knowledge and specific keywords in mind. This preliminary knowledge helped shape the initial search queries, focusing on topics such as informal relationships, the design-reality gap, and complexity. Section II of this chapter describes the unsystematic process in detail.

2.1.2 Renewed Literature Search in 2023

The purpose of the revised screening strategy and literature search was to enhance the existing literature by conducting a more systematic search and updating the references. This was done to ensure the inclusion of logical and relevant arguments in the chapter. Specifically, the literature review strategy aimed to explore the following areas:

- Literature related to considering health organisations as Complex Adaptive Systems (CAS) based on the latest research.

- Literature related to the Design-reality gap during Health Information System (HIS) implementations.
- Literature related to Informal interactions during HIS implementations.
- Literature related to Information Systems (IS) implementation, success, failures, and theorization.
- Literature related to the Theory of Deferred Action (ToDA) in the context of IS implementations.

These areas were all developed from the research problem statement.

2.1.2.1 Search Strategy

The research problem encompasses four major research areas: Complex Adaptive Systems, Information Systems implementation in healthcare organisations, informal interactions, and the Theory of Deferred Action. Due to the multidisciplinary nature of the study, no single search criterion covering all key areas yielded a substantial number of results. This also highlights the existence of a knowledge gap.

The search logic has been divided into smaller queries (multiline searches) to optimize the search and retrieval of literature. Database-appropriate syntax, including parentheses and Boolean operators where necessary, has been utilised. Variations in search terms have also been considered as needed. Moreover, spelling differences in British English and other English variants have been taken into account when searching for terms like "Organization," and using plural words has generated more output, such as "Systems" instead of "System."

The literature search was conducted across six knowledge search engines: Google Scholar, Emerald, Springer, IEEE, JStor, and ScienceDirect, using five distinct

search criteria. The list of keywords and Boolean operators used for the search is as follows:

Query 1: Health "Information Systems" "Informal Relationships" "Complex Adaptive Systems"

Query 2: "Design Reality Gap" AND "Information System" AND ("Health Care Organisations" OR "Health Care Organizations")

Query 3: ("Informal Groups" OR "Informal Interactions") AND "Complex Adaptive Systems" AND ("Health Care Organisations" OR "Health Care Organizations")

Query 4: ("Information Systems" OR "Information system") AND Implementation AND "Theory of Deferred Action"

Query 5: "Information Systems" AND Implementation AND (Success OR Failure) AND Health and NHS AND "Complex Adaptive Systems"

It was noted that each search portal behaved slightly differently to the exact same query as there were slight differences in how each search engine processes input logic. Attention has been given to apply the same logic according to search engine's input criteria. Although it was not necessary, but to determine the popularity and trend of research in each search logic over time, each result was obtained for three different periods: without a timeframe, until 2013, and in 2017 and onwards. These results included duplicates and only demonstrates the continued interest in these subject areas by the research community.

SEARCH LOGIC	PORTAL NAME	ALL	2013<	>2017
1	GOOGLE SCHOLAR	157	101	58
2	GOOGLE SCHOLAR	41	18	6
3	GOOGLE SCHOLAR	57	29	21
4	GOOGLE SCHOLAR	88	39	28
5	GOOGLE SCHOLAR	879	586	366
1	EMERALD	7	6	4
2	EMERALD	33	27	21
3	EMERALD	3	2	2
4	EMERALD	8	2	2
5	EMERALD	29	20	11
1	SPRINGER	46	42	13
2	SPRINGER	88	73	24
3	SPRINGER	19	17	10
4	SPRINGER	11	4	4
5	SPRINGER	175	166	15
1	IEEE	0	0	0
2	IEEE	1	0	0
3	IEEE	538	215	140
4	IEEE	1	0	0
5	IEEE	0	0	0
1	JStor	0	0	0
2	JStor	0	0	0
3	JStor	29	13	4
4	JStor	1	0	0
5	JStor	13	3	2
1	SCIENCDIRECT	1	0	0
2	SCIENCDIRECT	31	20	12
3	SCIENCDIRECT	58	36	22
4	SCIENCDIRECT	1	1	1
5	SCIENCDIRECT	22	14	11
	Total	**2337**	**1434**	**777**

Table 1Literature Search Outcome

On a separate note, Springer search allowed to filter searched literature based on the content type, subject area and subdiscipline. Therefore, additional filters were applied for each query to capture the most relevant literature to this investigation. There were no exclusion criteria as the aim was bring literature as much as possible due to the multidisciplinary nature of the research, apart from anything older than last 5 years. Such method was used by Urréchaga *et al.* (2022, p. 861). Also, the search as carried out in May 2023. Therefore, 2017 was chosen as the cut-off year.

Query Number	Query 1		Query 2		Query 3		Query 4		Query 5	
Portal	**Inclusion**	**Exclusion**	**Inclusion**	**Exclusion**	**Inclusion**	**Exclusion**	**Inclusion**	**Exclusion**	**Inclusion**	**Exclusion**
Google Scholar	2017 and after	N/A	2017 and after	N/A	2017 and after	N/A	2017 and after	N/A	2017 and after	N/A
Emerald	2017 and after	N/A	2017 and after	N/A	2017 and after	N/A	2017 and after	N/A	2017 and after	N/A
IEEE	2017 and after	N/A	2017 and after	N/A	2017 and after	N/A	2017 and after	N/A	2017 and after	N/A
JStor	2017 and after	N/A	2017 and after	N/A	2017 and after	N/A	2017 and after	N/A	2017 and after	N/A
Science Direct	2017 and after	N/A	2017 and after	N/A	2017 and after	N/A	2017 and after	N/A	2017 and after	N/A
Springer	2017 and after AND Content Type: Referenced work	N/A	2017 and after AND Subdiscipline: Information System Applications	N/A	Subdiscipline: Health Informatics AND Content Type: Referenced work	N/A	2017 and after	N/A	Subdiscipline: Health Informatics AND Subdiscipline: Health Informatics	N/A

Table 2: Literature query strategy

The results were exported to '.RIS' format and loaded into a predefined 'groups' created based on search portal name and query number on EndNote, resulting in a total of 777 records after removing 188 non-relevant papers prior to the screening process. The groupings help to identify the source query of each paper if needed. After removing duplicates, a unique set of literature (n=551) was obtained for the next stage of screening according to the PRISMA method.

2.1.2.2 Screening Process

The screening process involved utilising NVivo, software that facilitates the rapid labelling of research papers according to user-defined criteria, unlike EndNote. The screening process consisted of two steps. Each research paper underwent a keyword search, and its title was assessed for relevance to the research problem. For instance, if the title contained the phrase 'complex adaptive systems,' an additional keyword (e.g., 'informal behaviour') was sought to enhance the likelihood that the research pertained to both CAS and informal behaviour. If a title contained

more than one keyword in the research topic, then it was tagged as ‘Include’ in NVIVO. However, if the title contained only one keyword, an attempt was made to evaluate the paper's relevance by skimming through its abstract. This process determines whether a paper is relevant, and if the paper was deemed irrelevant, it was labelled as ‘Exclude,’ specifying the subject area to which the article pertained. Papers that were neither explicitly relevant nor had any relevant keywords or abstracts were rejected, indicating the subject area to which they belonged. However, every effort was made to include a paper if it contributed to the knowledge position of this research problem. In some instances, a full research paper is scanned to determine the relevance to the research before excluding a paper.

The screening strategy also helped eliminate duplicate research papers (four cases) and republished research papers over time (three cases). During the removal of republications, only the most recent publication was retained. Additionally, non-English papers (five cases) and non-peer-reviewed articles were excluded from the process. However, if a research paper was indirectly related to healthcare but contained valuable references to the research area, it was included for further reading. This approach aimed to strengthen the argument and understanding of the research theme.

At the end of the screening process, 61 research papers were identified for retrieval. Each paper was retrieved, saved, and loaded into EndNote, and then moved to NVivo. Then, a detailed screening was carried out by going through the entire research paper on NVivo. For some research papers, this is the second time a full test screening was performed. However, only 53 papers were able to be retrieved in full within the resources available from the university. Subsequently, a thorough full-body review of these papers led to the selection of a mere 12 articles for inclusion in the review. However, one article was removed as two papers came from

same study. Another paper was excluded because it focused on IT adoption at the strategic level.

The table below demonstrates the exclusion and inclusion criteria.

Exclusion Criteria	**Inclusion Criteria**
Not Relevant	Research studies
Duplicated	Published after 2017
Non-English	Available on Jstor, ScienceDirect, Springer, Emerald and Google Scholar
Re-Publications	English papers
Unable to Retrieve fully	Papers searched using Query mentioned on section 2.1.2.1
Non research papers	

Table 3 Exclusion and inclusion Criteria

This result in 10 research papers included in the literature review. It is worth noting that despite conducting separate queries to explore key interest areas relevant to the investigation, the number of articles directly pertinent to the research themes was considerably low. This outcome can be attributed to a significant research gap prevalent within the field of study.

The below matrix critically evaluates the quality of the selected research papers, focusing on various methodological aspects such as research aims, sample selection, data collection techniques, ethical considerations, and analysis methods. Only medium- or high-quality studies were included based on their adherence to rigorous academic standards.

Evaluation Criteria

1. Clear Research Aims: All papers were assessed based on the clarity of their research aims. The stronger studies were those where the objectives were clearly defined, helping to guide the study's design and analysis. For instance, papers such as Greenhalgh *et al.* (2018) provided clear research questions,

helping to focus their ethnographic and action research on the practical implications of technology adoption in healthcare.

2. Sampling Strategy: The sample type, relevance and size were key to determining study robustness. Studies with well-defined, appropriate sampling methods—such as Sidek and Martins (2017), which used purposive sampling with 11 in-depth interviews—were rated highly.

3. Data Collection Methods: Data collection methods were carefully considered in the evaluation, particularly the transparency with which these methods were explained. High-rated papers demonstrated a clear and rigorous approach, such as Muhammad and Wickramasinghe (2018), where semi-structured interviews were supplemented by thematic analysis. Studies with less detailed descriptions, such as Soliman and Saurin (2017b), which employed a systematic literature review without explicit data collection methods, were rated lower.

4. Ethical Considerations: The ethical rigor of each study was another key criterion. Papers that followed established ethical guidelines, such as Greenhalgh *et al.* (2018), which obtained multiple ethics approvals for their research, were deemed more reliable. Studies lacking detailed ethical procedures, like Iivari (2017b), were rated with caution.

5. Analysis and Findings: The strength of data analysis was assessed through the clarity of the findings and the methodological transparency. High-quality studies, such as Richardson (2019), demonstrated the use of thematic analysis with clear justification for how the findings were derived. Studies that did not provide enough detail on data analysis or ignored contradictory data, like Walraven *et al.* (2019), were considered less robust.

6. Contributions and Relevance: Lastly, the relevance and contribution of the research were evaluated. Papers that made significant contributions to the field, such as Ali (2020), which applied a deferred model for evaluating security systems, were rated highly for their innovative approaches. Conversely, studies with narrower scope or less practical impact, like Baryashaba *et al.* (2019), were rated lower.

The matrix highlights the strengths and weaknesses of each study based on systematic evaluation criteria. The studies that received higher ratings tended to have clear, well-defined aims, robust sampling and data collection methods, and thorough ethical consideration. The contributions of these studies to their respective fields are substantial, making them valuable references for further research. By focusing on these key aspects, this analysis ensures that only high-quality research with substantial methodological rigor is included in the review.

Author & Date	Design	Aims	Sample Type & Size	Data Collection	Ethics	Tests & Analysis	Summary of Findings	Limitations	Quality Rating	Themes
Iivari, J. (2017) *Endogenously Emergent Information Systems. Vol. 22. Cham, Goluchowski, J., Pankowska, M., Linger, H., Barry, C., Lang, M., and Schneider, C. (eds.): Springer International Publishing.*	Theoretical: Literature analysis	To analyse the concept of "emergence" in the context of information systems (IS) and discuss its implications for IS research.	Not clear	Not clear	N/A	N/A	The paper discusses the concept of "design for emergence" (endogenous emergence) vs. "design by emergence" (exogenous emergence).	Theoretical	Mediu m	IS design for emergence
Sidek, Y. and Martins, J. (2017) *'Perceived Critical Success Factors of Electronic Health Record System Implementation in a Dental Clinic Context: An Organisational*	Qualitative research: Interpretive Grounded Theory approach	To identify the perceived critical success factors of EHR system implementation in a dental clinic context.	Theoretical and purposive sampling, 11 in-depth interviews	In-depth semi-structured interviews	University of Sheffield's ethics procedure	Constant comparative method	The study identifies critical IS success factors, including the design-reality gap.	The study was limited to a single dental clinic in Brunei's capital.	High	Critical IS success factors; design-reality gap

Author & Date	Design	Aims	Sample Type & Size	Data Collection	Ethics	Tests & Analysis	Summary of Findings	Limitations	Quality Rating	Themes
Management Perspective.' International Journal of Medical Informatics, 107, pp. 88-100.										
Sligo, J., Gauld, R., Roberts, V., and Luis, V. (2017) *'A Literature Review for Large-Scale Health Information System Project Planning, Implementation, and Evaluation.' International Journal of Medical Informatics, 97, pp. 86-97.*	Theoretical: Literature review	To provide background for understanding the complex, nonlinear, and unpredictable nature of HIS implementation.	367 articles	N/A	N/A	N/A	Factors contributing to IS success include strong leadership, HIS champion-led initiatives, end-user involvement and communication, sufficient time and resources, and ongoing feedback processes.	Theoretical	Mediu m	IS success and complexity
Soliman, M. and Saurin, T. A. (2017) *'Lean Production in Complex Socio-*	Literature review	To examine how Lean Production addresses the complexity of	94 papers	N/A	N/A	N/A	The study acknowledges that contextual factors (e.g., IT use) increase the	The study was limited by inclusion and exclusion criteria, as well	Mediu m	Lean production in complex socio-technical systems

Author & Date	Design	Aims	Sample Type & Size	Data Collection	Ethics	Tests & Analysis	Summary of Findings	Limitations	Quality Rating	Themes
Technical Systems: A Systematic Literature Review.' Journal of Manufacturing Systems, 45, pp. 135-148.		socio-technical systems.					complexity of socio-technical systems.	as database selection, which may have excluded relevant studies. Additionally, no method was available to accurately assess the 'leanness' and complexity of the systems reviewed.		
Greenhalgh, T., Wherton, J., Papoutsi, C., et al. (2018) *'Analysing the Role of Complexity in Explaining the Fortunes of Technology Programmes: Empirical Application of the NASSS*	Ethnography and action research	(1) How can we improve the development and implementation of health and care technologies? (2) How can we support the customization and use of such technologies in different settings? (3)	Six case studies followed for up to three years, using a combination of purposive and snowball sampling to identify 45 stakeholders.	Qualitative interviews, observation, document analysis, ethnography, video recording of remote consultations	Ethical approval obtained from multiple institutions, including NHS research ethics committees	Thematic analysis combined with quantitative data (e.g., uptake and usage rates) and longitudinal methods (e.g., repeat interviews, data trends)	Findings show that strong leadership and good managerial relations are key for technological innovation. Manual routines were replaced by computer-based routines. Informal solutions	Limited to the initial two program sets carried out.	High	Technology adaptation and adoption in complex organizations

Author & Date	Design	Aims	Sample Type & Size	Data Collection	Ethics	Tests & Analysis	Summary of Findings	Limitations	Quality Rating	Themes
Framework.' BMC Medicine, 16(1).		How can we ensure that patients' needs remain central in technology-supported service innovations?					addressed technological complexities.			
Muhammad, I. and Wickramasinghe, N. (2018) *'Critical Issues in Implementing and Adopting National e-Health Solutions: Lessons from Australia's MyHealth Record.' Proceedings of the 51st Hawaii International Conference on System Sciences.*	Phenomenological study	To evaluate MyHealth Record implementation and adoption.	14 semi-structured interviews, snowball and chain sampling	Semi-structured interviews	Ethics approval obtained	Thematic analysis	Key factors for IS success include patient focus, patient activities, and patient empowerment. Users resist new technology implementations, and allowing an opt-in approach lowers IS success rates.	Limited to participants involved in MyHealth Record implementation.	High	IS implementation critical success factors
Baryashaba, A., Musimenta, A., Mugisha, S., and	Qualitative interviews	(1) How acceptable and useful is	10 purposively selected	Quantitative questionnaire	N/A	Quantitative analysis	IS adoption depends on job performance	Limited to one hospital in Uganda. The	Medium	IS implementation and adoption

Author & Date	Design	Aims	Sample Type & Size	Data Collection	Ethics	Tests & Analysis	Summary of Findings	Limitations	Quality Rating	Themes
Binamungu, L. P. (2019) *'Investigating the Adoption of an Integrated Hospital Information System in Rural Uganda: A Case of Kisiizi Hospital.'*		Stre@mline as an Electronic Medical Records system at Kisiizi Hospital? (2) What factors affect its adoption?	samples from a population of 93				improvement, ease of learning and use, support from management and peers, and availability of organizational and technical infrastructure.	system was implemented in other hospitals.		
Richardson, K. (2019) *'Factors Affecting Progress of the National e-Health Strategy in the NHS in England: A Socio-Technical Evaluation.' PhD Thesis, University of Chester.*	Socio-technical strategy incorporating elements from grounded theory and management theory	(1) Which IT adoption theories are relevant to this research? (2) What factors affect the adoption of national government e-health strategies? (3) What lessons can inform future e-health strategies?	22 semi-structured interviews	Semi-structured interviews	Ethical approval from University of Chester and relevant committees	Thematic analysis	Key factors include middle-out implementation, adequate funding, improved interoperability, governance, and engagement.	Limited to 18 interviews due to budget and time constraints.	High	Information system implementation
Walraven, P., Wetering, R. v. d., Versendaal, J., and Caniëls,	Multiple case study	How does co-evolutionary IS-alignment manifest in EMR	17 retrospective interviews and	Retrospective interviews and	N/A	Thematic analysis and triangulation	Comparison of three hospital IT systems with the COISA Model.	Study limited to hospitals that implemented a new EMR	High	Co-evolution of IS in health

Author & Date	Design	Aims	Sample Type & Size	Data Collection	Ethics	Tests & Analysis	Summary of Findings	Limitations	Quality Rating	Themes
M. (2019) *'Using a Co-Evolutionary IS-Alignment Approach to Understand EMR Implementations.'*		implementations ?	document analysis	document analysis				between 2015 and 2018.		
Ali, G. (2020) *'A Deferred Model for Evaluating and Improving the Dubai Metro Train Security Management.' PhD Thesis, Cardiff Metropolitan University.*	Case study	(1) What are the current planned actions of the Dubai Metro security system? (2) What emergent situations impact Metro rail security? (3) What deferred actions can improve security?	30 participants	Focus groups, document analysis, in-depth interviews	University of Cardiff	Thematic analysis	Security management structures are in place for improvement and development.	Limited to case surroundings.	High	Theory of deferred action

Table 4 Empirical Research Matrix

2.1.2.3 PRISMA Diagram

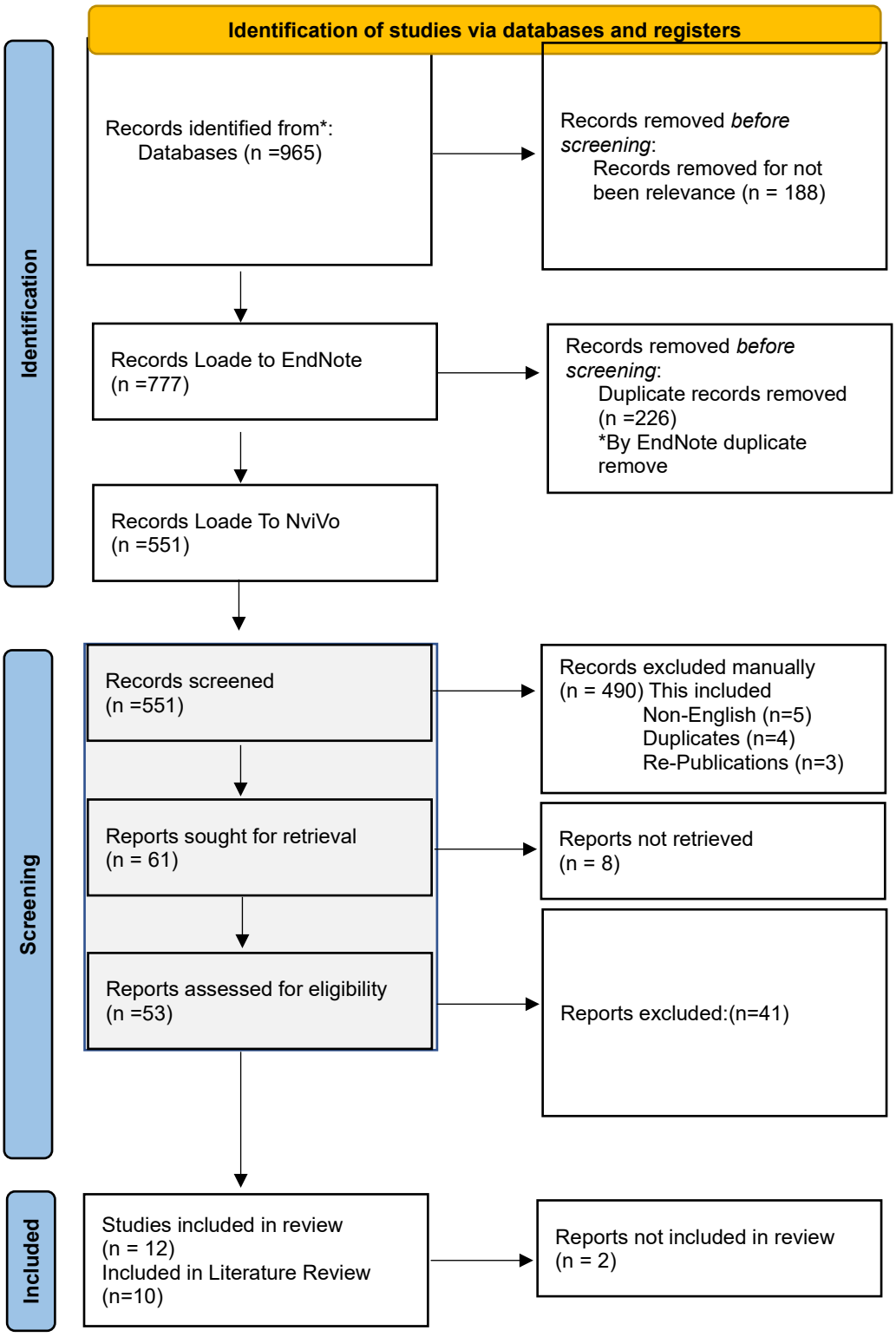

Figure 3: PRISMA Diagram

Exclusion Reason	No of Articles
Adaptive Decision Making	1
Care provisioning	1
Care systems development	1
Data Analytics	1
Decision Support systems	1
Data Governance and Quality management	1
E Government	1
E Learning	1
E-Health	1
Electronic Payment system	1
Health and Social care	1
Health Care Communication	1
Health Policy	2
HIT Acceptance	1
HIT Resilience	1
ICT development	1
Information Society, Cryptographic Data Architecture	1
Information usage affects	2
Interoperability	1
IT Governance	1
IT Infrastructure	1
IT projects	1
Leadership	1
Modular Architecture	1
No ethical approval, No formal data collection, only Telephone conversations	1
Organisational behaviour	1
Patient Safety	1
Quality Improvement	1
Simulation of Health care	1
Social and Health Care	1
Soft System methodology	1
Technology acceptance and Adoption	1
Telehealth	1
E Government	1
Primary care	1
Industrial systems	1
Care management	1
Resource management	1
ERP implementation	1
Total	**41**

Table 5: Exclusion of Literature and Reasons

The CASP (Critical Appraisal Skills Programme) appraisal tool has been used to assess the quality and rigor of qualitative research papers and theoretical papers. CASP is more commonly used in the field of healthcare and evidence-based medicine. This appraisal assesses research validity, relevance, and applicability to inform decision-making and practice. Additionally, a summary of each research paper been displayed in a matrix to provide a summarised view of each research paper.

2.1.3 Analysis

A critical analysis was conducted on ten selected research papers to 1. gain insights into the current state of literature and knowledge pertaining to the research problem, 2. to evaluate the literature review conducted in 2011. Hence, the following analysis provides not only an up-to-date overview of the literature related to the research problem but also provides reassurance to the reader about the relevance of the research gap.

The global drive towards digitizing the health sector by implementing information systems and information technology aims to increase efficiency, reduce costs, and improve quality and safety without compromising accessibility or equity (Sidek and Martins, 2017; Sligo *et al.*, 2017a; Greenhalgh *et al.*, 2018; Baryashaba *et al.*, 2019). The literature recognizes healthcare organisations and IS implementations as complex (Sligo *et al.*, 2017a; Soliman and Saurin, 2017b) and emergent (Iivari, 2017a; Sidek and Martins, 2017; Soliman and Saurin, 2017a), with unique characteristics. This complexity arises due to interconnected social, clinical, cultural and technical issues within the health organisational environment and the need for highly specialized professionals to work interdependently (Sligo *et al.*, 2017a). This

results in higher IS failures and low adoption rates in the healthcare sector (Sligo *et al.*, 2017a) compared to other industries.

The implementation of IS in the healthcare context often leads to the emergence of novel features that were not initially anticipated, given the complex and socio-technical environment (Greenhalgh *et al.*, 2018). In literature, emergence can be viewed as both exogenous and endogenous (Iivari, 2017a). This doctoral thesis does not differentiate between the origins of emergence, as it is challenging to pinpoint the exact source of emergence due to its complexity. Instead, this research considers IS design, implementation, and contextual complexities and emergence that occurs due to the complexity as integral components of a unified process.

All the research papers reviewed in this literature approached IS implementation based on socio-technical theories (Sligo *et al.*, 2017a; Greenhalgh *et al.*, 2018; Muhammad and Wickramasinghe, 2018). Whether it is Actor Network Theory (Muhammad and Wickramasinghe, 2018), CAS(Blandford, 2019), complexity(Soliman and Saurin, 2017a), NASSS(Greenhalgh *et al.*, 2018), or Co-evolutionary IS-alignment (COISA) (Walraven *et al.*, 2019; 2020; 2022a), the core principle in each theory is to view the IS implementation as a combination of social, cultural, political, technological, and economic phenomenon. This represents a gradual evolution of various viewpoints on IS implementation theories, which focused solely on project-oriented aspects in the 1990s and 1980s.

Significant interest exists in the literature regarding the factors that define and influence the successful implementation of IS (Sidek and Martins, 2017; Greenhalgh *et al.*, 2008; Baryashaba *et al.*, 2019). Researchers have been attempting to answer this question since the 1980s. some of the literature is dedicated to exploring the meaning of IS success and the contributing factors ((Sidek and Martins, 2017; Baryashaba *et al.*, 2019). For example, in the case of the

Brunei Healthcare Information and Management System (Bru-HIMS), a grounded theory approach revealed critical factors for IS success, including system usability, emergent behaviours, requirements analysis, training, change management, and project organisation (Sidek and Martins, 2017).

However, some research papers view IS implementation beyond the factorial analysis. For an example how organisations and their contexts change and evolve over time. These literature assumes the initial IS implementation and designing conditions change, and the initial organisational contexts become obsolete (Greenhalgh *et al.*, 2008; Ali, 2020) over the time. Walraven, Wetering and Helms (2020); (2019; 2022a) and Greenhalgh *et al.* (2018) view this changing organisational context and organisational response to IS as a continuous process. They assume that the adaptation of IS is an inevitable consequence of users' attempts to minimize the design reality gap by making changes to the IS and its context. Thus, this assumption was not exclusive. However, this makes IS sustainable. Both COISA and NASSS models relying on continuous evolution of emergent properties of complex interactions as a result of IS implementation.

A prerequisite for emergence is the design reality gap. Although the design reality gap was considered in the literature (Sligo *et al.*, 2017a; Greenhalgh *et al.*, 2018; Baryashaba *et al.*, 2019), it was not viewed through the lens of IS designers' perspectives and how those evolve over time. All of these studies view IS implementation only as a management problem, not as a design problem. This is why both the COISA and NASSS models involve reflective designers as stakeholders, working with users to evolve the IS and work practices. The two models didn't examine users' ability to change local processes, at least informally at the beginning. Although (Walraven, Wetering and Helms, 2020) highlighted that

users informally built communication channels to reduce process gaps, how informal interactions lead to adaptations was not discussed in detail.

However, how the design reality gap begins; the role of the reflective designer, what values users can bring into the system as local response and emergence of new ways to address inconsistencies were not focused on in the literature. In that sense, IDAP process described in section 3.7 provides more detailed demonstration of evolution in user response than categorizing the phenomenon as an emergence in IS implementation (Greenhalgh *et al.*, 2018). No doubt that emergence brings changes to the care pathways, and some are initiated informally and then receive formal attention (Walraven, Wetering and Helms, 2020). For example, according to (Walraven, Wetering and Helms, 2020), cardiac nurses develop their own communication channels with first aid nurses because they share many work processes and patients which were not in formal care pathways. This needs to be explained theoretically rather than considered as a 'complex phenomenon' and as a design problem.

Furthermore, the research papers considered IS as highly specified and structured, but there was no attempt to understand the problems related to traditional IS designing processes, i.e., ISD or SDLC (Walraven, Wetering and Helms, 2020). Therefore, to adapt the IS, these researchers rely on reflective designers who are relying on reflections derived by third parties using various formalisms, e.g., flowcharts, diagrams, etc. These formalisms are abstraction processes that ignore tacit knowledge, situational knowledge, informal relationships, etc. This contributes to the design-reality gap and is yet to be explained.

Greenhalgh *et al.* (2018) argued that the use of the PRINCE2 project management methodology used by UK health authorities is suitable for complicated situations, not complex contexts such as IS implementations. This is because the abstraction

of reality by the PRINCE2 methodology allows the NHS IS implementation to be divided into manageable work packages. (Greenhalgh *et al.*, 2018) do not describe how abstraction affect IS designs. IDAP takes the position that, as a result of the abstraction process, which is fundamental to PRINCE2 formalisms, critical organisational properties such as tacit knowledge, situational knowledge, informal relationships, and social capital are being ignored. Use of abstraction formalisms relies on measurable and scalable properties in reality. This results in a highly specified and structured IS design implementation methodology. Oversimplification and abstraction processes not only make the IS ‘specified’ but also create implementation problems.

The COISA (Walraven *et al.*, 2019; 2020; 2022b) model and NASSS framework (Greenhalgh *et al.*, 2018) rely on the assumption that CAS behaviour, in combination with action designers, reflective designers, and engineers, will make the changes to the structured IS and its care pathways to make the IS work. They view IS adaptation as a management led formal phenomenon. Apart from the above two models in the literature, some viewed IS implementation based on cause-and-effect relationship. These types of research tried to look for a goldilocks formula for an IS success. For an example, Sidek and Martins (2017) relied on the design-reality gap, which ignores the elements’ ability to interact and adapt over time. Similarly, Actor Network Theory-based research carried out by Muhammad and Wickramasinghe (2018) lacks how adaptations could be integrated into IS designs and what informal relationships play there.

Therefore, the question arises: how can both IS design and implementation be adaptive, as Greenhalgh *et al.* (2018), and (Walraven *et al.*, 2019; Walraven, Wetering and Helms; Walraven *et al.*) suggested, what role design reality gaps play, and how this can be explained from an IS 'designer' perspective? This knowledge

gap can be explained by IS user becoming an IS designer (Ali, 2020). Users have detailed domain knowledge in local contexts, what changes and solutions they should brought into the design processes. The Theory of Deferred Action (Ali, 2020) demonstrates how this was achieved in the Dubai railway security system. ToDA is an Action Design Theory that recognizes the power of rational thought among IS users and their ability to act 'on the spot' as 'action designers', enabling them to adapt IS to suit their needs and change local work practices. This eliminates the shortcomings of the traditional reflective designing process and reduces the designing time lag and situational knowledge gap demonstrated in COISA model and NASSS model. Be it IS changes, process changes or changes to routines, users have the first-hand knowledge what needs to happen in business sense and allowing them to make changes to IS and business process would make the adaptation seamless.

The table below summarizes the theoretical position of each research paper's concepts. These are the concepts behind the IDAP process. However, the IDAP takes into consideration IS implementation as a 'designing process' problem and explains in detail how the design reality gap occurs and what underpins adaptations.

Author & Date	IS success	IS Implementation	Complexity In IS Implementation	Emergence as a result of IS implementation	Deferred Action in response to emergence	HCO as Complex Organisation	Prince2 as an Abstraction method	Design reality Gap	User Involvement	Incremental design	CAS	Informal Intercations	Theory Of Deferred Action	Adaptive Solutions
Iivari, J. (2017)		✓	✓	✓							✓			
Sidek, Y. and Martins, J. (2017)	✓	✓	✓	✓		✓		✓	✓					
Sligo et al., (2017)	✓	✓	✓	✓		✓		✓	✓	✓	✓			✓
Soliman, M. and Saurin, T. A. (2017)		✓												
Greenhalgh, T., Wherton, J., Papoutsi, C., Lynch, J., Hughes, G., A'Court, C., Hinder, S., Pro	✓	✓	✓	✓		✓	✓	✓		✓	✓			✓
Muhammad, I. and Wickramasinghe, N. (2018)	✓	✓	✓			✓			✓	✓	✓			
Baryashaba, A., Musimenta, A., Mugisha, S. and Binamungu, L. P. (2019)		✓						✓	✓	✓				
Blandford, A. (2019)	✓		✓			✓			✓		✓			
Walraven, P., Wetering, R. v. d., Versendaal, J. and Caniëls, M. (2019)	✓	✓	✓	✓		✓					✓			✓
Ali, G. (2020)		✓	✓	✓	✓			✓			✓	✓	✓	

Table 6: Summary of Literature and Underlying Concepts

In summary, there has been a continuous research gap in terms of understanding IS implementation and success based on ToDA, complexity theory, and CAS. Much research has been carried out to demonstrate how CAS underpins the organisational contexts, its interrelationships with various elements and agents, and how these elements hold together as one unit and evolve. However, how these agents in CAS use their experiences, common sense and interactions to adapt formal design has not been demonstrated. The IDAP model uses both CAS and ToDA to demonstrate how formal designs are adapted by staff members to make them sustainable, and how some of these informal actions and workarounds are acknowledged by the management and become formal actions or policies.

Section -II: Non-systematic Literature Review

This section delves into the non-systematic literature review, providing a broad overview and critical evaluation of the literature in year 2011 on Information Systems success, informal behaviour, complexity in business organisations, and IS implementation in HCOs. This non-systematic review and the systematic literature review carried out in 2023 described in the previous chapter complements to each other and in combination provides a wider range of sources, including seminal works, theories, and empirical studies to develop a solid and succinite research question.

This initial literature search, conducted in 2011, employed a mixture of systematic and targeted/unstructured search approaches. No quality appraisal was carried out. Consequently, the strategy was not entirely systematic. Hence considered as an unsystematic. The objectives of the strategy were twofold: to understand IS success and the role of informal interactions during IS implementation, central to the initial research idea, and to develop a comprehensive and succinct research problem statement. This method was important as there is no single knowledge base exists across the areas covered by the research problem.

Given the researcher's prior exposure to the literature on IS success and implementation, there was a foundational understanding of the complexities involved in IS implementation and design processes. This knowledge provided background on challenges such as design limitations, operational constraints, infrastructure issues, and complex informal interactions. It also helped design the search queries below for a systematic review. Additionally, the literature from targeted materials, researcher's experiences and findings with the systematic

literature search gave a comprehensive picture of the research extent (please see Figure **4**). The search period was limited to 2006-2011.

Query 1: Health "Information Systems" "Informal Relationships" "Complex Adaptive Systems"

Query 2: "Design Reality Gap" AND "Information System" AND ("Health Care Organisations" OR "Health Care Organizations")

Query 3: ("Informal Groups" OR "Informal Interactions") AND "Complex Adaptive Systems" AND ("Health Care Organisations" OR "Health Care Organizations")

Query 4: ("Information Systems" OR "Information system") AND Implementation AND "Theory of Deferred Action"

Several platforms, including Emerald, IEEE, JSTOR, Google Scholar, ScienceDirect, and Springer, were searched using Athens and Shibboleth accounts provided by the university. The table below demonstrates the results from each query.

Search Logic	Google Scholar	Springer	Emerald	Science Direct	IEEE	Jstor
Query-1	31	1	8	0	0	0
Query-2	7	0	0	1	21	0
Query-3	13	0	3	2	0	1
Query-4	31	5* (1 used)	5	0	1	1
*Four duplicates of Patel, N.V. (2006). Theory of Deferred Action.						

Table 7 Query Results

Considering the above Table 7, it is evident that no comprehensive knowledge base covers all aspects of this research problem. This justified the importance of conducting a literature search in individual. A total of 127 research papers were initially extracted (after removing 4 duplicates) and loaded into EndNote. Once in EndNote, an additional search was conducted to identify duplicated papers. After

removing 29 duplicates, the remaining 98 papers were screened for relevance based on their titles and abstracts. A total of 82 papers were excluded as irrelevant. The table below provides detailed reasoning for the exclusion of each paper.

Row Labels	Count of paper
Bio medical application	1
bio-terrorism	1
Care provisioning	4
Community action	1
Community health provisioning	1
Data mining	1
Decision support systems	2
Disaster management	5
Disease surveillance	1
E- government	1
E services	1
Ecosystem	1
Editorial Page	1
Emergency and terrorism	1
Government	2
Government Policy	2
Health care delivery and provisioning	1
Health care Integration	1
Human resources	1
ICT	1
Imaging	1
Information security	1
Information sharing	1
Innovation diffusion	1
Integration and Software Engineering	1
IS evaluation	1
IS modelling	1
IT management issues	1
Journal analysis	1
Knowledge management	3
Land administration	1
Leadership	2
Machine Learning	1
Management	1
Manufacturing and supply	1
Medical Imaging resources	1
Mentoring	1
Methods	1
Military Strategy	1
Modelling	1
Networks	2
Nursing	1
Nutrition	1
Obesity management	1
Organisational change	1
Organisational management	1
Organisational improvement	1
Patient consent	1
Performance of HIS	1
Philosophy	1
Planning	1
policy government	2
Psychological care	1
Quantum science	1
Research	3
Risk	1
simulation	2
Systems theory	1
Team Collaboration	1
Telemedicine	2
Water Management	1
Web based IS designing	2
Grand Total	**82**

Table 8 Exclusion Criteria

This led to a list of 16 research papers. After removing 4 duplicates, where the same paper was published multiple times, and one low-quality paper related to India, 11 research papers remained. No CASP or any other quality method was used in 2011. The researcher's personal judgment to exclude the paper was based on its poor English, inconsistency, and lack of coherence. Hence, this was another reason why the 2011 review was not a complete systematic literature review.

1. Heeks, R. (2006). "Health information systems: Failure, success and improvisation." International journal of medical informatics 75(2): 125-137.
2. Karim, N. S. A. and M. Ahmad (2010). An overview of electronic health record (EHR) implementation framework and impact on health care organizations in malaysia: A case study. 2010 IEEE International Conference on Management of Innovation & Technology.
3. McDaniel Jr, R. R. (2007). "Management strategies for complex adaptive systems sensemaking, learning, and improvisation." Performance improvement quarterly 20(2): 21-41.
4. Nyame-Asiamah, F. and N. V. Patel (2010). "Informing knowledge management systems design and evaluation with the theory of deferred action." International Journal of Technology, Knowledge and Society 6(2): 191.
5. Patel, N. (2006). Organization and systems design: Theory of deferred action, Springer.
6. Patel, N. and A. Ghoneim (2011). "Managing emergent knowledge through deferred action design principles: The case of ecommerce virtual teams." Journal of Enterprise Information Management.
7. Patel, N. V. (2010). "Strategic management of complex IT systems." International journal of information technology and management 9(2): 109-131.
8. Patel, N. V., et al. (2010). "Theory of deferred action." Journal of Enterprise Information Management 23(4): 521-537.
9. Patel, N. V. and R. Hackney (2010). "Designing information systems requirements in context: insights from the theory of deferred action." International Journal of Business Information Systems 6(1): 44-57.
10. Sobo, E. J., et al. (2008). "Behind the scenes in health care improvement: The complex structures and emergent strategies of Implementation Science." Social Science & Medicine 67(10): 1530-1540.
11. Wilegoda-Wickramage, A. S. and N. V. Patel (2010). UK National Health Service information systems implementation: Emergence of and in informal groups. 2010 IEEE/SICE International Symposium on System Integration, IEEE.

Table 9 List of Journal Papers and Other Materials

Each paper was analysed for relevance and examined for the critical theories underpinning the research and their reference theories. Backward referencing was carried out to obtain literature related to these underpinning theories was then incorporated to solidify the theoretical foundation. Further targeted searches were conducted on IS implementation at the national level, similar to the NPfIT in the UK, resulting in a collection of research papers selected based on the mixed search strategy.

The diagram below elucidates how the integration of both unstructured and systematic literature reviews contributed to the development of key concepts and theories in this research. This visual representation provides an indicative overview of the conceptual framework described in Chapter 3 and theoretical underpinnings that emerged from the research.

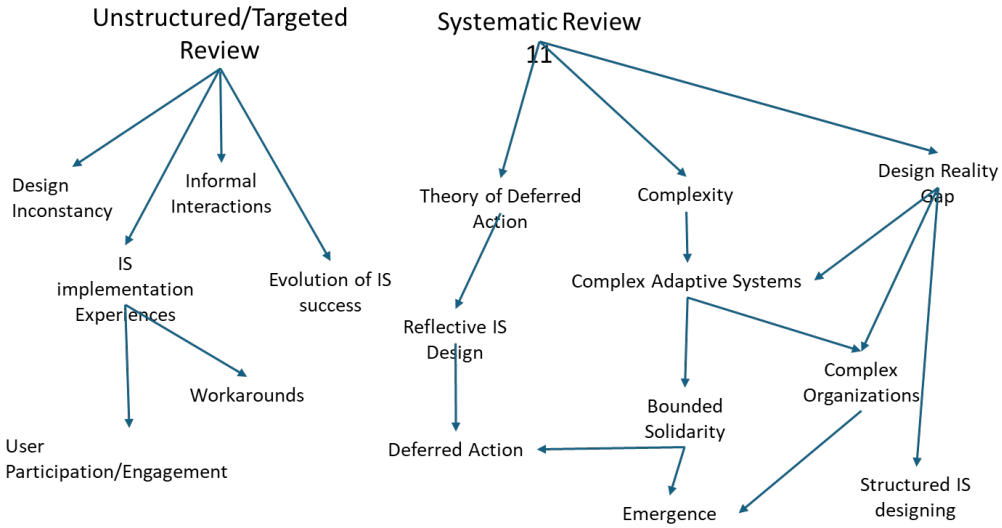

Figure 4: Flow of Theories and Concepts Related Systematic and Unsystematic Review

Additionally, a backward citation search and an unstructured review without strict systematic processes were helped to identify seminal research papers related to each key theoretical or conceptual area. The whole literature review (combining both structured and unstructured) carried out in 2011 resulted 41 research papers in total. As a result, concepts such as social capital and utility in microeconomics (see 2.5.1 Concept of Utility in CASs), were integrated into the theoretical framework detailed in Chapter 3. Building on this foundation, the subsequent content from Chapter 2.2 onward delves deeper into the theoretical literature for comprehensive analysis.

The combination of 2011 analysis (combination of unstructured and systematic) and systematic literature review carried out in 2023 with quality appraisal tools provided a solid foundation for the research.

2.2 Critical Evaluation of IS Success

The definition and characterisation of IS failure have undergone a paradigm change during the past thirty years, as well as a development. This transformation is driven by improvements in organisational research ontology and IS design and development technologies, which have also led to a shift in the investigational methodology and epistemologies of IS research, favouring qualitative approaches.

Until the late 1980s, the focus was to characterise IS success measured mainly by user satisfaction (Al-Fraihat, Joy and Sinclair, 2020). Although the definition of ‘user satisfaction,’ though, has no consensus among academics and researchers and remains elusive. However, generally, it refers to the attitude held by users (Al-Fraihat, Joy and Sinclair, 2020; Karim and Ahmad, 2010). Thus, in reality it fails to be bound by positivist measurements using Likert-type scales. It can be argued that failure to define user satisfaction as a measurement of IS success occurs because the search, like the proverbial search for the lost key under the lamppost, is being done using the inappropriate positivist ontological perspective and research methodology. Since the beginning of IS research, 'satisfaction' has been regarded by many scholars as the key concept. Saarinen (1996) and Muslih, Wardhiyana and Widianto (2021) judged IS success based on satisfaction with decision-making and efficiency, whereas Davis (1989) tested satisfaction against perceived IS acceptability and utility. Additionally, according to other positivist research like Muhammad and Wickramasinghe (2018), user satisfaction is the result of a person's overall positive and negative responses to a group of variables that directly impact the effectiveness of an IS deployment. A more comprehensive analysis carried out by Keikhosrokiani *et al.* (2020) find user satisfaction underpins many factors i.e., Information Quality, Service Quality, System Quality, Trust, Anxiety, and mHealth Literacy and ‘Success of Human Interaction ’. However, all these studies underpin

one positivist ontological position, that is the researcher assumes the organisational context is deducible.

Given that people adapt to these structured implementations of IS in the living organisational context through their informal interactions, the ‘success’ of IS depends on how effectively this flexibility is incorporated into the design of the IS and how successfully the users utilised these features in various contexts. This conceptualisation addresses the social and organisational shortfalls of measuring IS success as much broader than user satisfaction and should include quality or financial cost-benefit analysis. Plus relying on parameters such as ‘beliefs,’ ‘user perception,’ ‘attitude,’ ‘organisational factors,’ and financial impact is generally biased towards individuals, their perception, and their environment (Galletta and Lederer, 1989; Pearlson, Saunders and Galletta, 2019).

This subjective nature of user satisfaction leads to one person’s failure being considered a success by another. Similar resistance is the view that the timing of evaluation as today’s IS success might be tomorrow’s IS failure, and vice versa. Doubt has been cast on user satisfaction as an indicator of IS success. User satisfaction does not directly relate to IS success or at least not the main factor (Saarinen, 1996; Al-Fraihat, Joy and Sinclair, 2020), nor do financial impact or net benefits. Such measures often contradict the purpose of IS implementation, as ISs are introduced to achieve organisational objectives, which incur necessary costs. Hence, researchers consider measuring IS success using positivist parameters to be an ontological and epistemological misrepresentation of the actual experiences of organisational actors.

Defining IS success primarily based on user satisfaction raises many questions beyond user satisfaction. The 6-factor extended the complex-dependent variable

model by (DeLone and McLean, 1992; 2003) defined after analysing 180 research papers period 1981–1987. It is still used and widely referred in the literature (Jeyaraj, 2020). The updated model published by DeLone and McLean (2003) is referred by more than five thousand papers after 2019 according to the Google scholar. This is a clear indication that, the level of interest in 'user satisfaction' within the academia. They argued IS success as a process outcome and developed an empirical model to show that user satisfaction is a contextual measure that inextricably depends on IS, information, and service quality. As a result, the richness of context becomes an important concept in the implementation of IS, and along with it, the problem of informal groupings and their intentional interactions ought to be obvious. Delone and McLean's process model in Figure 5 combines information, service, and system quality in IS implementation. However, it still considers user satisfaction as the ultimate goal. The basis of the idea is that high-quality systems, services, and information promote user pleasure, boost IS utilisation, and produce overall advantages.

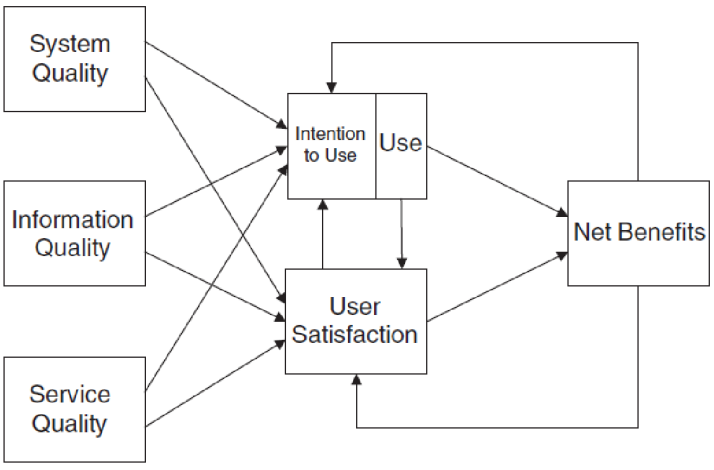

Figure 5: Updated D&M IS Success Model

Source: Delone and McLean (2003 pp. 25)

There are several positivist paradigm-specific criticisms. The model distinguishes between personal and organisational impact (DeLone and McLean, 1992; 2003) and does not make explicit that different stakeholders in an organisation may have different conclusions about the success of the same IS. Since ISs are used to enhance and improve patient outcomes, which are not often measured in terms of net benefits, it is unlikely that 'net benefits' would be successfully measured, at least in HCOs. Similarly, DeLone and McLean (2003) define system usage and satisfaction as fundamental to IS success. In a similar study by (Keikhosrokiani *et al.*, 2020) extended the above model. However, both 'satisfaction' and 'intention to use' are contextual, and context is acknowledged as a non-positivist parameter. Positivist research epistemology does not consider the context, its' interrelationships and values in its data collection toolbox. Such shortcomings occur because the model has positivist roots. Traditional IS development and implementation research has not considered emergence and complexity as intrinsic organisational aspects.

Even viewed internally within the positivist paradigm, user satisfaction lacks theoretical rigour, conclude Rahimi and Vimarlund (2007), based on evaluating 61 published articles on IS evaluation. This lack of theoretical rigour means it is impossible to determine 'IS success,' which suggests that the term is subjective even among researchers. This could be taken as 'evidence' of 'interpretation' applied by so-called positivist researchers. Rahimi and Vimarlund (2007)and Rahimi *et al.* (2022) argue that the 'user satisfaction' term has a counterproductive effect during IS implementation and raises other problems in measuring IS investment based on parametric studies and lacking transferability of the findings, which makes IS evaluation problematic. In a more recent publication by Tummers *et al.* (2021) highlighted user satisfaction was not that significant in determining IS success. The paper highlighted many usage problems such as poor system

usability; problems with user training; infrastructure and functionalities of the ISs as the critical issues.

Successful IS development implementation not just based on ‘user satisfaction’, but also depends on selecting an appropriate Information System Development Methodology (Pearlson, Saunders and Galletta, 2019). The generic Information Systems Development Methodologies (ISDM) assume business organisations as static and unchanging organisations. Once the ‘user requirements’ are established, no local changes are foreseen, and there is no satisfactory mechanism for making organisational requirements changes should they arise, except through centrally designed feedback processes. This result, in turn, means that there is one measure of ‘user satisfaction’. Relying on organisational; bureaucracy to collates any comments then filtered to identify further IS change requirements. Secondly, consideration of organisations as stable entities, are fundamentally erroneous assumption. Though this is not explicit in the text of researchers’ published articles, they all assume that organisational processes, procedures, and routines do not change over time. This concept is a fundamental weakness of ISDM.

On the contrary, Patel (2006b); (2009); Baptista *et al.* (2020); (Sobo, Bowman and Gifford, 2008)and Nyame-Asiamah (2020) argue that organisations are emergent and that such emergence is an intrinsic feature of organisations and is manifested as the need for organisational change. In emergent organisations such as HCOs, user satisfaction is an ‘ideal’ factor to be achieved; however, it is difficult to achieve due to continuous environmental changes (Truex, Baskerville and Klein, 1999; Greenhalgh *et al.*, 2018). Hence, the concept of user satisfaction is practically difficult.

Denolf *et al.* (2015) identified five critical factors for IS success in their model in Figure 6 below. This is one of the key models developed recently and referenced by more than 100 journal articles since 2018. The model based on structure, project strategy, management processes, information systems, and people. They posited that complexity affects IS success and that by reducing complexity, e.g., reducing the number of stakeholders, such as suppliers in the supply chain, the likelihood of IS success is better. The model considers the complexity of interactions between actors but not the concept of complexity as propounded in complexity theory. In theory, the ontological position of complexity is not a deduced conclusion; complexity is the first principle. Such complexity occurs between human and non-human factors, including organisational and technological processes. Hence, the premise of the present research is that complexity in an organisational context is a given and not something that can be deduced. Therefore, taking steps such as reducing the number of actors in particular IS implementation contexts does not reduce complexity or make management decision-making less complex.

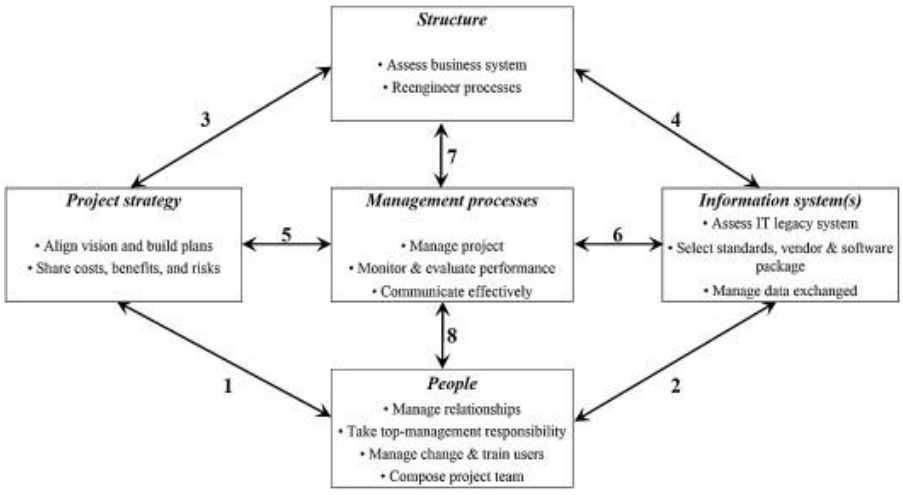

Figure 6: Critical Factors for IS Success

Source: Denolf *et al.* (2015)

In early studies (Bailey and Pearson, 1983; Kleist, 2003), ISs were something that 'users' participated. Whereas, ISs were no different from other machines an organisation uses, ISs are now the organisation itself (Wani *et al.*, 2017; Tummers *et al.*, 2021). The ubiquitous use of organisational IS means that the boundary between IS and organisation no longer exists. ISs are now integral to the ways people work in organisations and how organisations achieve their purpose. In that sense, ISs are crucial aspects of organisational culture and its' reality. With time (Astuty and Pasaribu, 2021), ISs have become an integral part of organisational architecture (Kaplan and Harris-Salamone, 2009; Rahimi and Vimarlund, 2007; Sundeep and Arunima, 2017) This belief has changed the very ontology of organisations and people compared to the 1980s and how they produce and use information and knowledge to perform work and achieve organisational purposes. This diminishes the importance of the traditional concept of 'user satisfaction (Tummers *et al.*, 2021) . In more recent research by (Wani *et al.*, 2017), there has been a transition in the role of IS User over the decades. The research says, '*IS user base transitioned from the specialist users in the first era (1950s–1960s); to other employees (other than the specialist IS users) of the organisation in the second era (1960s–1980s); personal computing in the third era (1980s–1990s) and the enterprise and networking focus in the fourth era (1990s–2000s). The fifth era started in the 2000s and is called the 'customer-focused era.' In the customer-focused era, technology is more customisable, and users are the customers.*' (Wani *et al.*, 2017). Therefore, today's user is not the 1980's IS user. More and more customers are the users. Their expectations, behaviour, and operational contests are vastly different compared to then.

Similarly, other studies like Berg (2001) and Al-Fraihat, Joy and Sinclair (2020) viewed IS success as a multidimensional concept that includes effectiveness,

efficiency, organisational attitude, commitment, and worker satisfaction. Their description of ‘success’ and its parameters are contextual and, as such, agreed upon by developers and adopting organisations. But like the research mentioned before, IS achievement is seen as a technological panacea. In terms of benefits, infrastructure, expenses, internal and external pressure, IT sophistication and support, satisfaction, compatibility, organisational scale, connections, and more, it considers a variety of criteria to determine whether an IS initiative is successful (Herbst *et al.*, 1999; Irani *et al.*, 2005; Zhou *et al.*, 2018; Al-Fraihat, Joy and Sinclair, 2020)

Ontologically, such measures of IS success and technological fixes are positivist because they assume that IS designer, as complete outsider, fully understands infinite relationships, interactions, and outcomes in a given context. Such a prescriptive list of factors supports a positivist ontology. In contrast, it is assumed in the current research that emergence is an intrinsic feature of organisational reality. Heeks (2006); (2017) supported this assumption of the notion of a design-reality gap, which refers to the gap between IS and contextual characteristics of the situation in which IS implementation occurs (Section 2.8 discusses this in more detail). The shortcoming of Heeks’s design-reality gap concept is that it does not acknowledge the emergence and emergent organisations in considering IS implementation. Especially, how the design reality gap could be able to evolve over the time. System integration approaches have similar shortcomings, as discussed in Section 2.3.2.

Furthermore, often the research studies focus solely on factors related to IS implementation, neglecting the influence of informal relationships and their intricate interactions. Existing studies on IS implementation factors often assume linear cause-and-effect relationships, overlooking the impact of informal relationships on

IS success and failure within complex organisational contexts. Informal aspects within organisations do not adhere to linear cause-and-effect patterns. Given that informal relationships are integral to organisational dynamics, their significance cannot be understated. Winslow et al. (2019) argue that informal relationships play a crucial role in maintaining structure, resilience, and continuity within social organisations. For an example when skills gaps and incompatibilities arise, individuals tend to gravitate towards one another, suggesting that similar dynamics may be observed within informal organisational structures during the implementation of IS in corporate settings.

According to the literature, HCOs introduce ISs to achieve an operational and strategic advantage by maintaining patient records, processing orders, medicine/prescription management, medical image processing, sharing laboratory results, connecting different service points, and monitoring organisational performance regimes that provide competitive advantage. Globalisation, changes in business corporations, healthcare reforms, formation of alliances, the emergence of wireless technology, and changes in public awareness of IT have all affected IS introduction and success in HCOs. These developments have changed the organisational ontology of healthcare organisations over the years. Therefore, IS success is a complex result of many exogenic and endogenic factors.

Over the decades, ISs have become a prominent feature of organisational reality, especially in the healthcare setting. Their implementation success varies, even within the HCOs (Kaplan and Harris-Salamone, 2009; Zhou *et al.*, 2018; Sligo *et al.*, 2017a; Jeyakumar *et al.*, 2021). However, due to the advancements in and sophistication of risk tools and design techniques, the benefits of IS implementation outweigh the risks (Irani, Ezingeard and Grieve, 1998; Eldabi *et al.*, 2002; Wyatt and

Wyatt, 2003; Sligo *et al.*, 2017a). As a result, IS implementation has become an integral and essential feature of organisational architecture (Jeyakumar *et al.*, 2021).

However, the IS design techniques and implementation methods assume that the 'specification' of organisational reality is possible. Such methods are structured and result in highly structured organisational reality in IS implementations, which deviates from actual organisational reality. ISs are provided by the vendor companies attached to the NPfIT (Williams *et al.*, 2020; Brennan, 2022). Such ISs designed by IT and software engineering experts deviate from the realities in HCOs (i.e., NHS) based on a linear software engineering process model. Consequently, it is argued that they do not reflect the emergence of tacit knowledge and intuition. In response, NHS administrators try to meet the reciprocity by designing ISs to perform more specific tasks or adjust the context to suit the IS. That makes IS implementation in the NHS highly specified and non-responsive to organisational emergence and change.

2.3 Critical Evaluation of IS Implementation Strategies

According to the literature, IS implementation can be categorised into five main approaches according to their epistemological position: (1) project approach, (2) system integration approach, (3) behaviouristic approach, (4) system adoption. This section critically evaluates these approaches in terms of principles and theoretical understanding.

Project management is a prominent approach in IS implementation and consists of various methodologies (Cadle and Yeates, 2004; Trigo and Varajão, 2020; Verner and Sarwar, 2021). However, the project approach assumed a 'structured' nature of

organisation reality, which is mundane in positivism. The other approaches rely on positivist techniques for IS implementation, hence non-compliant with organisational emergence. Once implemented, system adoption is based on innovation diffusion. All adoption methods try to reduce the knowledge gap amongst IS users through training and development; however, it overlooks the informal interactions, and users' ability to adapt IS and the workflows. The system integration approach has the same shortcoming, ignoring the emergence in organisational reality (Patel, 2006b; Ali, 2020; Nyame-Asiamah, 2020). The below sections evaluates each strategy in detail.

2.3.1 Project Approach

Contemporary Information Systems implementation primarily relies on project management techniques (Cadle and Yeates, 2004; Trigo and Varajão, 2020; Verner and Sarwar, 2021). This project perspective defines the success of IS implementation based on the achievement of project objectives (Sauer, Gemino and Reich, 2007; Pereira, Varajão and Takagi, 2022). It views IS implementation as an exercise designed to introduce external artefacts into organisations to enhance the efficiency of their processes.

According to Cadle and Yeates (2004) and Pereira, Varajão and Takagi (2022), a project is defined as 'a management environment set up to ensure the delivery of a specified business product to meet a defined business case or objective.' However, this 'project' approach does not account for the emergent properties that arise during the IS development lifecycle and its implementation.

Projects themselves are artefacts. All human-designed artefacts exist in four design dimensions: Structure, Emergence, Space, and Time (see page 91 for details). Projects and implementation approaches are typically specified and structured,

relying on abstractions produced based on formal methodologies (Patel, 2006a; Ali, 2020; Nyame-Asiamah, 2020).

This perspective highlights that the project approach in Information Systems design primarily addresses only one known dimension: the specified static structure. This reliance on assumptions, estimates, and structured formalisms such as economic models and flow diagrams means that these approaches are abstractions of reality. As a result, such IS designs often fail to capture the dynamic and emergent nature of organisations, where informal communications and interactions continuously reshape the meaning and significance of people's actions. The literature identifies four main types of IS project management approaches, each serving different purposes in IS implementation. However, all of these approaches share the same ontological limitations, as discussed above.

In practice, several methods underpin project implementation of ISs. One popular model is the Waterfall Model (Royce, 1970), depicted in Figure 6, which is based on the formalization of the IS implementation process (Stepanov, 2021). This model, widely used by practitioners and cited over two and a half thousand times since 2017, divides the implementation process into stages. Each stage involves verification and validation before progressing to the next stage. This approach can lead to successful project outcomes in stable organisational contexts if a thorough ‘requirements/gap analysis’ is conducted at each stage. Structured Systems Analysis and Design Method (SSADM) and the ‘V Model’ are extensions of this method (Cadle and Yeates, 2004).

However, a critical question remains: how does the structured project approach facilitate the ubiquitous and spontaneous developments that occur during the IS development lifecycle?

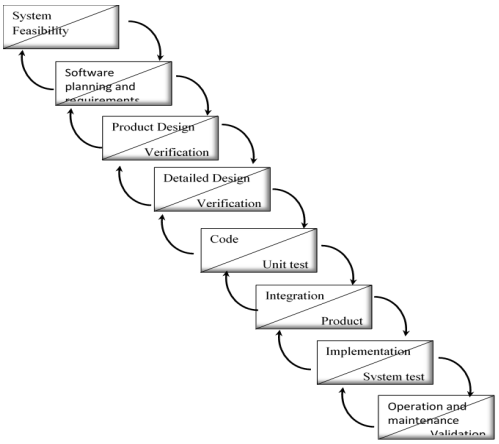

Figure 7: The Waterfall Model of System Development Cycle

Source: Cadle and Yeats (2001), pp. 52

The Waterfall model has a structured quality management approach through continuous verification and validation at each stage. However, it is still not able to account for emergent situations. However, due to its capacity to 'Control' the implementation which is one of the important requirements in bureaucratic organisations, the waterfall method has been employed in numerous IS implementations since the 1970s.

The Spiral Model (Figure 8) underpins the need for continuous IS development in organisations, especially when the requirements are unclear or subject to change (Stepanov, 2021). However, this leads to higher financial costs, as specified systems have limited validity in dynamic organisational contexts. Therefore, the practical use of this model during IS implementation in the contemporary NHS is limited. It, too, does not account for emergent organisations.

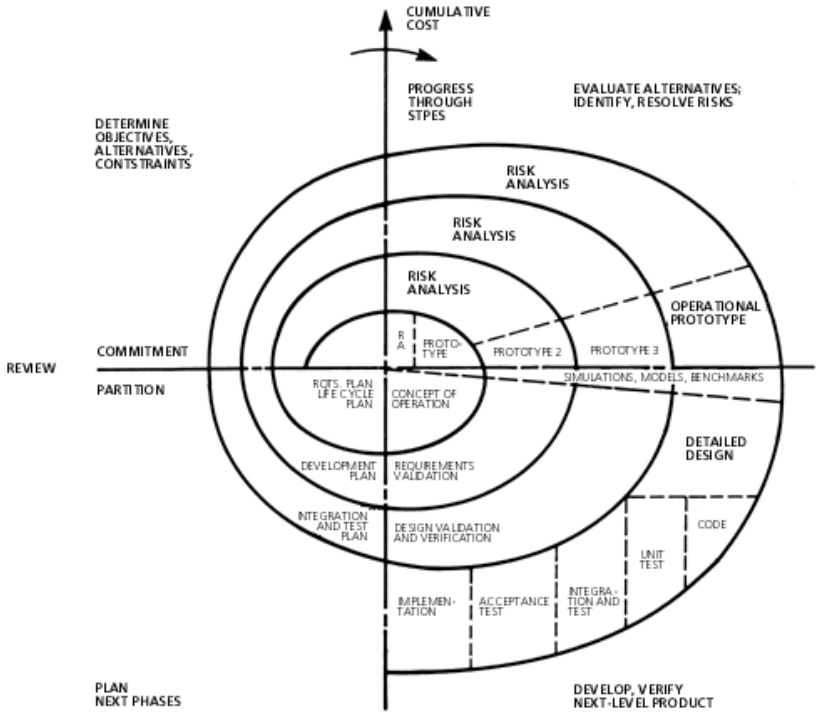

Figure 8: Boehm's Spiral Model

Source: Boehm (1995)

The step-by-step approach makes the IS delivery and testing manageable in dynamic organisational contexts, as the project consists of a series of phases over time (Cadle and Yeates, 2004; Pereira, Varajão and Takagi, 2022). The incremental model (Figure 9) is commonly used in business organisations when the functionalities of IS are introduced in various phases due to the poor clarity and unfavourable conditions at IS adoption or the changing nature of the business organisations. The incremental model has practical values and brings quick fixes within the short term in organisations (Jiang, Hong and Chen, 2019). However, the involvement of planned action and a higher degree of specification make the IS more reactive to the changing organisational context and emergence. Critically, accommodating such emergence is only during the developmental stage, not the crucial implementation phases. ITIL and Prince 2 implementation and development

framework stemmed from this model and tried to achieve a certain level of ‘compromises’ during implementation through the ‘feedback’ process.

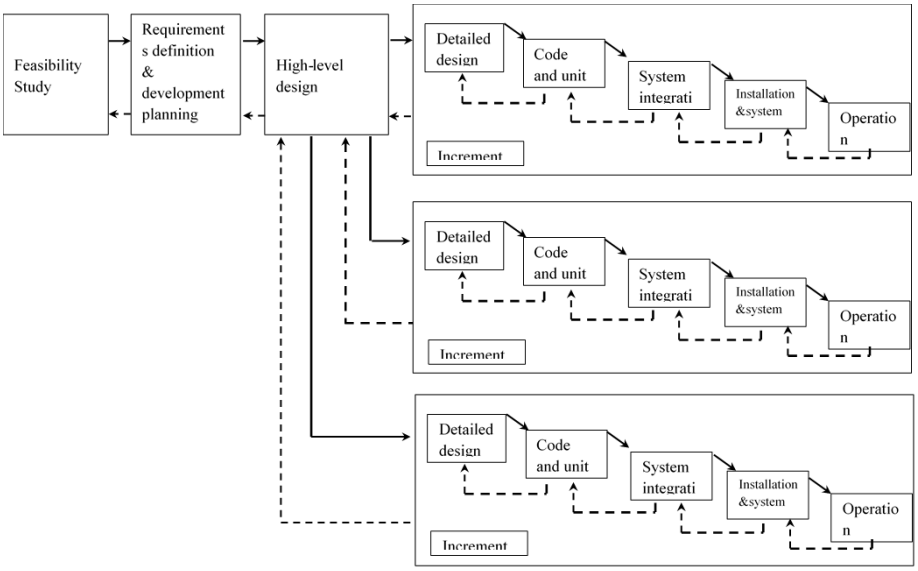

Figure 9: The Incremental Model

Source: Cadle and Yeates (2004)

The ‘V’ model (Figure 10) is a variant of the Waterfall model and is commonly used in organisations where external IS vendors deliver software as it can define stages in procurement and the software delivery for validation. Hence, it is used in bureaucratic IS implementations, where IS acceptances can be validated against original requirements specifications. However, contemporary designers and engineers are adaptable and duty-conscious to design IS products according to specifications. Therefore, the ‘V’ model is an overkill, and its value is questionable in large projects in today’s environment.

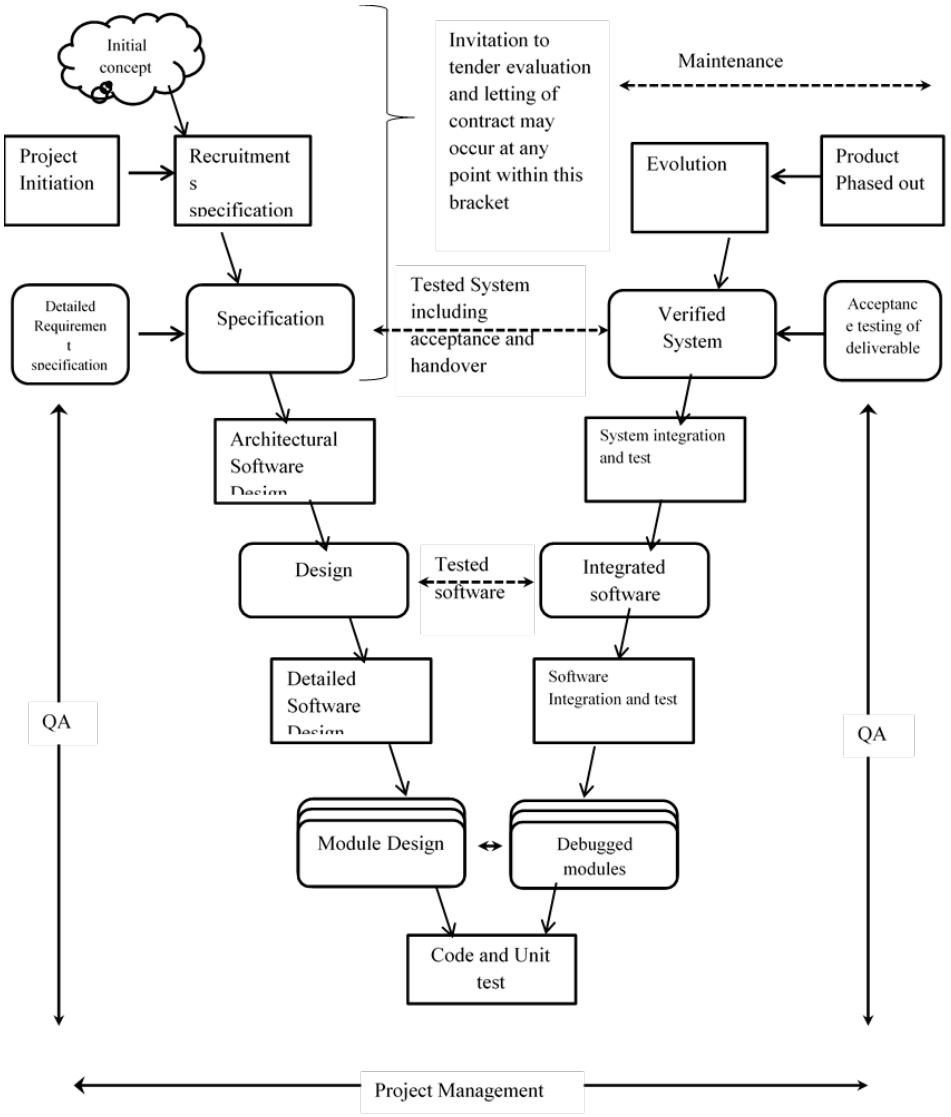

Figure 10: The 'V' Model

Source: Cadle and Yeats (2001), pp 54

What underpins the above project management methodologies is the positivist epistemology. Formalisms for creating and implementing are predicated on the idea that reality exists independently of the creator and users. Consequently, such approaches do not capture organisational reality's qualitative and subjective aspects, such as tacit knowledge, intuition, and informal adaptations.

Secondly, project approaches are ontologically reductionist. Project perspective allows factorial analysis of complex organisational and IS development issues by

dividing them into manageable stages (Tan, 2001; Rahimi and Vimarlund, 2007; Pereira, Varajão and Takagi, 2022). This abstraction of organisational reality to derive factorial explanations leads to ignorance of complexity and emergence in organisational reality once these designs are implemented in business organisations.

Thirdly, the literature supports an alternative people-centric view of IS implementation projects, involving human, organisational, and technological fit. The definition of ‘fit’ varies according to the theme and the researcher’s perspective. However, it underlies the designer’s aspiration to make the IS ontologically and epistemologically consistent with organisational reality. Concepts have been developed to support such a ‘fit''. For example, Sauer, Gemino and Reich (2007); Walraven *et al.* (2019); Walraven, Wetering and Helms (2020) defined IS implementation based on a fit between three components in the IS implementation process: the ‘IS,' ‘Project,' and ‘Supporters’. However, it lacks complex and informal interactions in organisational context and their emergent behaviour.

Fourthly, recent studies by Wijayati and Achadi (2023) as well as Jeyakumar *et al.* (2021) emphasize the importance of a structured approach to Information Systems (IS) project implementation. They identify 'expectation failure' as a significant concern in IS project failures, where there is a disconnect between stakeholder expectations and the actual performance of the IS. This misalignment underscores the limitations of purely project-based methodologies. However, these studies overlook the dynamic nature of organisational change during IS implementation.

Traditional project management techniques, rooted in positivist approaches, often fail to account for the organisation's capacity to adapt and generate unforeseen outcomes. They rely heavily on rigid requirements specifications, which may not

encompass emergent phenomena that can arise during implementation. Consequently, the applicability of project-based frameworks in managing IS projects is once again called into question in this research. Organisations ability to adapt to internal and external stimuli affects IS implementation and success (Saarinen, 1996; Kheybari *et al.*, 2020). The structured nature of project management neglects this important fact. That is, structured and specified IS and structured implementation processes do not accommodate adaptations. Project implementation of IS tries to achieve success by making the context adaptable to suit the IS design. This has been witnessed in IS implementation projects in health organisations (Maguire and Ojiako, 2007; Segal *et al.*, 2022). Heeks (2006); (2017) and Nyame-Asiamah (2020); (Nyame-Asiamah and Kawalek, 2020) proposed using incremental designs and modularisation to address the issue (Jiang, Hong and Chen, 2019).

This means, the project view has significant flaws in its ontological stance and formalisms that neglect important elements of organisational reality during the designing and implementation processes. These inconstancies reflect IS project failures described in chapter 1.

2.3.2 System Integration (SI)

The second IS implementation strategy is focused on integration of systems according to section 2.3. Berg *et al.* (1998); Greenhalgh *et al.* (2017) and Yen *et al.* (2017) argue, that system design, implementation, and evaluation is a socio-technical process where work practices are conceptualised and integrated with computer-based IT systems to develop functionally hybrid (i.e., Human-IS) system that improve and enhance patient care. Therefore, the concept of systems integration (SI) is defined as the integration of different systems (such as social

systems and technical systems) that achieve social goals in organisational reality (Hasselbring, 2000; Greenhalgh *et al.*, 2017).

Hasselbring (2000); Segal *et al.* (2022) analysed IS implementation in terms of successful system integration. SI theorists argue that IS implementation is not only about conceptual or technical gaps, but to integrate the business organisations/departments to enhance effective collaboration (Sligo *et al.*, 2017a). To achieve SI, they highlight standardisation of business processes as the way forward, e.g., standard forms, terminology, policies, and procedures. Though SI acknowledges socio-technical epistemology, standardisation and formalisation are still present in technically based IS, and it is antithetical to emergence. This is mainly because organisational reality is dynamic and emergent. Therefore, SI is a missed opportunity to deeply explore the interfaces between the social organisation and the technical IT systems that compose organisational IS in their actual context.

However, SI is one aspect that makes structured designs fit into organisational complexity or reduces the design-reality gap (explained in Section 2.8). The true success of IS implementation is not profound in SI because IS is still unable to support the organisational architectural changes (i.e., business, application, technology) over the time, and it does not adequately address how it integrates with organisational systems as SI theorists argue, i.e., Anderson and Aydin (1998) and Greenhalgh *et al.* (2017). As proposed in the current research, it is essential to consider how IS design, and implementation strategies adapt to organisational uncertainty (especially the unexpected behaviours of information groups), which triggers the interactions between the social and technical elements within the complex organisational reality. Therefore, SI may be capable of achieving structural integration between different systems/planes, i.e., Human, Organisational, and Technological (HOT). However, achieving functional/practical integration based on

SI is still challenging. According to Patel (2006b); Ali (2020); Nyame-Asiamah (2020), emergence takes place on HOT planes, which are key components of the SI method but are not taken into account by the SI approach. No doubt that integration of architecture is organised and attainable with current formalisms. The main issue, though, is functional integration while implementing IS in the face of emergence.

2.3.3 Behaviouristic Approach

The third IS implementation strategy is based on human behaviour. This 'social/softer aspects' of IS implementation focus on user behaviours, user interfaces, group pressure, power, and expertise threat (Jaspers *et al.*, 2004; Wu *et al.*, 2008; Greenhalgh *et al.*, 2017; Nyame-Asiamah and Kawalek, 2020). This view regards IS implementation as requiring explicit recognition of individuals, groups, and sociality from a sociological perspective.

Parallel studies have established that cognitive engineering should be utilised to design systems compliant with the fundamentals of human behaviour (Jaspers *et al.*, 2004). There has been growing shift arguing that IS implementation should not just be a techno-centric exercise but a sociological exercise (Heeks, 2017; Pérez-Cantó, Maciá-Soler and González-Chordá, 2019; Rahimi *et al.*, 2022). To achieve this IS implementation requires profound knowledge and practical consideration of the complex behavioural process to make IS designs sensitive to externalities.

However, structured formalisms are applied in the tools, techniques, and methodologies used to develop new IS (Nyame-Asiamah, 2020), neglecting sociological elements of organisational and organisational dynamics and human

behaviour. This because modern formalisations of IS design rely on a structured design process. Because it is easier to design in favour of linear linkages between pieces and their cause and effect relationships, adaptations and emergence that take place in the real organisation are not addressed during the abstraction phase. (see discussion in 2.10.1 in detail).

The IS methodologies highlighted in the previous two sections illustrate that emergence and adaptations are the fundamental challenges to IS success, IS design and their implementation. This is because of the reliance on structural approaches that do not acknowledge organisational emergence.

2.3.4 System Adoption (SA) Approach

The fourth IS implementation strategy is focussed on adoption of systems within organisational context. The system adoption (SA) approach consists of IS adoption and diffusion of innovation in organisations. Wu *et al.* (2008) and Greenhalgh *et al.* (2017) argued that IS adoption is the process of an organisation's decision to acquire technology and make it available to the users, assuming that the acquired technology would slowly diffused into the organisational reality. Rogers (1995) defined diffusion as ‘the process by which an innovation is communicated through certain channels over a period of time amongst the members of a social system’ (p.5) and suggests SA requires a more comprehensive definition. However, this main assumption of SA fails to acknowledge actual organisational behaviour and complexity.

The SA approach underplays organisational culture, complexity and the knowledge gap, which are vital to technology diffusion (Sahay and Walsham, 2017; Astuty and

Pasaribu, 2021). This means that SA reflects a long-term organisational change, assuming the organisational actors would evolve in a way they would embrace the technology in a positive manner over the time. Regards the people and organisational inertia and the role of emergence that plays within business organisations. According to literature, 'IT adoption fails to identify emergent issues that could damage the prospects of implementing IT in the first instance' (Nyame-Asiamah, 2013, p. 23; Nyame-Asiamah and Kawalek, 2020).

All four IS design and implementation strategies lack 2 key important properties. One is they assume organisational reality as static and secondly, they disregards the complexity and emergence that occurs in organisations.

2.3.5 Need for Adaptable IS

The NHS is an evolving organisation. Organisational dynamics play an essential role during IS implementation and in considering IS success. The introduction of new standards, and changes to management practices, treatments, drugs, and patient safety regulations lead to changes in the workflows of the NHS (Faulkner-Gurstein, Jones and McKevitt, 2019) and the routines of individuals (Feldman, 2000; Pentland and Feldman, 2005; Frantz, 2021). According to the NHS website, since its establishment in 1948, the organisation has undergone several changes in service provision, standards, and accountabilities. Some of these are structural changes, while others are operational and functional changes (Faulkner-Gurstein, Jones and McKevitt, 2019). The Keogh Mortality Review and Robert Francis (QC) report in February 2013, highlighted structural issues within the bureaucracy of the organisation (i.e., a culture of secrecy and defensiveness), mistakes, and the importance of adaptations, are a couple of examples of how the organisation has

evolved more quickly in recent years than it had in the past to meet changing national needs.

In addition to the changes in the bureaucratic structure of the NHS, individual learning behaviour also plays a significant role in shaping the organisational reality of the NHS. McDaniel Jr (2007); McDaniel Jr, Lanham and Anderson (2009) argue that staff behaviour as CAS and their ability to learn from past mistakes play a significant role in shaping the organisational reality. The learning process consists of information exchange and making changes to individuals' behaviour (Section 2.6 discusses the behaviour of CAS in detail). Therefore, it's crucial to consider the impact of a person's learning while interacting with the IS and how it reflects at the organisation level.

Maguire and Ojiako (2007) and Nyame-Asiamah and Kawalek (2020) highlight that IS implementation in the NHS has been difficult due to the emergent nature of the care pathways and workflows in the NHS. Section 2.7.1 discusses this emergent nature of organisations in detail. For an example, changes to care pathways and workflows influence individuals' routines and behaviour. The tasks performed by care workers or clinicians change often. Such changes mean existing ISs need to produce different and even new information. So, often these changes result in modularisation and incremental designs of IS, whereas changes to care pathways mean that the NHS sends an 'army of specialists' to change the IS and intelligence processes. To implement these changes in the NHS relies on top to bottom strategies (Brennan, 2022).

In a summary all the above issues highlight one point. That is the emergence is a design and implementation problem in HCOs regardless of the various methodologies used. Therefore, IS designers and implementation managers should

understand and accept the dynamic and ubiquitous nature of HCOs and reflect it in their designs, which, in practice, is not the case until now. Hence, reliance on structured formalisms and subsequent abstractions, making these designs 'specified' and unresponsive to emergence.

2.3.6 IS Implementation and Organisational Complexity

This research aims to investigate the implementation of IS in the NHS and argues that the NHS organisation intrinsically reflects the increase in complexity and its quality emergence. It is argued that bureaucratic structures in the NHS and dynamic organisational processes generate emergence in clinical procedures, standards, management practices, and care pathways that make implementing specified and structured IS designs challenging. Hence, IS implementation needs to account for the complexity and emergent organisation. Furthermore, focusing on patients as human beings creates more nuanced IS design problems in HCOs, making IS implementation more vulnerable than other industries (Collen, 1995; Berg, 2001; Greenhalgh *et al.*, 2017). However, in practice, project managers and management experts try to reduce the vulnerability of IS through (1) contextual adaptation of IS (rather than vice versa), (2) modularisation, and (3) the introduction of incremental design (Heeks, 2006; Heeks, 2017; Jiang and Wallace, 2017).

Similarly, according to the literature, classical management theorists regard business organisations as a form of entity in which policies and regulations govern the actions and behaviours of staff members. However, organisational actions are not entirely formal. Despite formal bureaucracies, informal institutions exist in business organisations (Fu *et al.*, 2019). The reason for this situation is that behaviour of staff members is not wholly governed by organisational policies, directions, and regulations, but is also affected by their relationships and aspirations.

This is because of the degree of freedom the staff members have and are conscious enough to assess and respond to (McDaniel Jr, Lanham and Anderson, 2009; Fu *et al.*, 2019). This fundamental characteristic allows staff to conduct business formally and informally.

The introduction of IS changes the ‘status quo’ of the formal-informal organisation. At a given time, organisational reality (the status quo) reflects its implicit and explicit interactions; formal and informal; prescribed and described authorities, directions, behaviours, and actions, which either function or operate to achieve objectives. Changes in the ‘status quo,' as witnessed during IS implementation, affect the functional capacity of staff members as individuals, who then, as CAS, adjust and adapt their behaviour to maintain the status quo (Mitchell, 2009; Turner and Baker, 2019), resulting in organisational emergence.

The research invokes Patel’s (2006b; 2009) theory of deferred action to study and understand organisational emergence and CAS adaptive behaviours. The theory is an ‘Action Design’ theory that symbiotically connects the abstract ‘design’ to reality. In terms of the designer perspective, it enables the designer to understand and integrate the IS into the context by making IS adaptable to reflect the emergent organisation.

2.4 Ontology of IS Implementation

Ontology is defined as the theory of being or the theory of reality. According to Zúñiga (2001), ontology is ‘the conceptual background that is presupposed in and corresponds to a description of a domain of objects, in addition to the description

itself.' What underpins this statement is the subjective and metaphorical nature of ontology.

The ontological definition of 'organisational reality' is subjective and may differ from one IS designer to the next. This reflects (1) the ontological differences between software engineering, organisational management, and organisational actors, as well as (2) how researchers and designers perceive reality differently and how this affects IS applications (Haux, 2018).

Therefore, successful IS implementation consists of project implementation ontology, engineering ontology and management ontology. These ontologies are distinctively different. Fox, Barbuceanu and Gruninger (1996) suggested that engineering ontology (i.e., concerning IS design) is based on specific criteria, i.e., generality, competence, perspicuity, transformability, extensibility, granularity, scalability, and minimality. In contrast, classical management ontology is based on goals, work processes, authority, position, and communication (Fox et al., 1993).

Therefore, there is a problem: the extent of the relationship between IS design and IS implementation ontology and management and engineering. According to the literature, researchers often regard IS implementation as a management exercise, engineering ontology, or sociological exercise. No doubt that an IS is an engineered design, an artefact, made to achieve organisational objectives. It is a transitive verb in operation but remains unfulfilled because it is an engineered artefact. Hence, ISs have engineered artefacts that facilitate the management of organisational processes and act as an interface between human elements and organisational processes.

Complexity theorists view an organisation as an emergent entity. Patel (2006b, p. 8); Greenhalgh *et al.* (2008);Ali (2020); Nyame-Asiamah (2020) describes an

organisation as social action where participants pursue predetermined objectives as corporate identity, individuals have intentions and beliefs, people work in groups or collaborate with other organisations and partners, and where there are power relationships to ensure that an action is directed to achieving objectives. Moreover, in terms of the IS designer and project manager perspective, business organisations do not behave linearly. They are complex and emergent entities. These entities and their structures exhibit continuous transformation characteristics (Truex, Baskerville and Klein, 1999; Greenhalgh *et al.*, 2008). Moreover, HCO management more favourably reflects complexity theory as its (1) knowledge intensiveness, (2) a vast number of sub-specialities, (3) interoperability (4) integration, (5) complex interactions, and (6) emergence. Therefore, successful IS implementation should have a symmetry with IS ontology and complexity in health organisations designed and implemented according to organisational reality.

Another ontological characteristic of IS implementation is the consideration of space, emergence, time, and structure (SEST). IS implementation research is a design and process investigation. Ontologically, SEST is the preliminary design dimension of reality (Patel, 2006b; Ali, 2020; Nyame-Asiamah, 2020). Any artefact, design or ‘thing’ exists and evolve within those 4 design dimensions. However, specified artefacts like IS are designed without considering the impact of time and emergence and not considering how emergence impacts space and structure. As previously argued, the information system development method assumes that the organisation environment and contexts are relatively stable. However, this assumption does not mean that context and conditions are static. Changing organisational processes can withstand and continue without significant changes to their structure and processes. Therefore, Yen *et al.* (2017) argue that the lack of adaptability and functional changes of HCOs will cause IS to fail. Hence, any IS

design operating in an emergent organisation like HCO should incorporate SEST, which is presently not the case.

Furthermore, management ontology models and organisational behaviour, which in actuality reflect SEST, are currently disparate software-engineered models that only model structural artefacts. From designers' perspectives, ISs are designed to produce solutions for formulated or structured problems. Hence, ISs are inherently unresponsive to natural organisational conditions. They only provide solutions to static problems that do not require adaptive solutions. Hence, structured solutions and rationalisation of IS designs are inherently incongruent with actual and emergent organisational reality; hence, more changes will not reflect people's actual work and need for information. In relation to IS design, reflexive designers view organisational reality as the 'application domain' and use formalisms to construct rational relationships between various elements or entities in the application domain. Therefore, IS design and development are purely rational (Patel, 2006b; Ali, 2020; Nyame-Asiamah, 2020). It is an abstract representation of actual organisational reality, in which people interact with organisational objectives and generate a sense of their actions. In order to reflect this reality, the development of complex, adaptable IS designs must have a better understanding of how to incorporate complexity theory, and emergence into IS implementation is necessary (Patel, 2009).

2.5 Epistemology of IS Design and Implementation In Organisations

All social organisations are complex 'living systems'. Because living systems naturally learn and adapt (Gell-Mann, 1995). System's 'existence' depends on their ability to respond to externalities. Each agent or element in the system is unified and directly or indirectly related to at least one other system element. The feedback

process built into the structured system enables entities to learn and adapt to a certain limit. Thus, the ability to learn and adapt make living systems significantly different from non-living systems. Unlike non-living systems, living systems can analyse the surrounding environment and respond based on their historical experience (Gell-Mann, 1995; Mitchell, 2009; Turner and Baker, 2019). Responding to environmental changes through learning adaptations is fundamental to living systems (Waldrop, 1993).

In some cases, the cumulative effect of different elements, their interactions, and their adjustment/responses is formulated as a single entity called CAS (Turner and Baker, 2019). In the IS implementation process, the informal interactions between various groups in the NHS come from CAS. As described in Chapter 3.4, this type of CAS is no different in commercial organisations or other organisations. There are complex informal interactions and feedback processes in organisations, extending beyond organisational formalities.

IS design and implementation formalisms and abstraction processes do not recognise these properties in organisations, i.e., adaptations and emergence, because the formalisms are based on the epistemology of reductionism (Herbst ***et al.***, 1999; Heeks, 2006; Irani and Love, 2008; Heeks, 2017). The abstract process of IS design and implementation is based on rationality and linearity, which differs from the emergent and adapting organisational reality.

Hence, ignorance of tacit knowledge, intuition, emergence, adaptations, and organisational dynamics by the reflexive designer happens due to a technical and epistemological problem; since IS designers rely on technologies and formalisms that assume an ontology of structure, rationality, and linearity, or basing the design on a structure of the SEST as the primary design dimension. This is a problem with

IS design formalisms (Patel, 2006b; Ali, 2020; Nyame-Asiamah, 2020). Also, reflective designers build IS from descriptive and analytical data models according to their perception of 'actuality,' not the perception of 'users' or the real organisational context. One's actuality is significantly different from the organisational reality due to its subjective nature. Actuality is not the reality. It is a simplified version of a reality (Patel, 2006). Use of CAD for IS design as suggested by Chakrabarty (2022) promotes structured designs.

Ignorance of complexity, adaptability, and emergence of social organisation by IS designers and implementation managers reflect their underpinning epistemological assumptions. This one of the reasons behind positivist research are embedded in IS designing and IS implementation in the industry. Mostly, research based on positivist epistemology only considers linear relationships in the literature. In general, this positivism does not look beyond the verbatim meaning of complexity. For example, Herbst *et al.* (1999) mentioned complexity among the soft-hard factors and actors that determines IS success, but they do not consider complex interactions and emergence (Herbst *et al.*, 1999; Wyatt and Wyatt, 2003; Hemsley and Debono, 2022).

Also, positivist-based research relies on objective, reductionist, and reproducible interpretations that test hypotheses. Therefore, it is impossible to effectively study the complexity of systems through Newtonian/Cartesian empiricism (Fu et al.,2019); complex systems are ubiquitous in nature and do not succumb to reductionism.

Instead, individuals' behaviour in CAS can be observed and understood through a naturalistic study by observing or describing their experiences. This can be achieved by understanding he nuance actions, behaviour, values and etc and interpret through the eyes of these individuals. So, the ontological position of the current

research is that emergence in social systems can be understood through qualitative methods such as interviews and observations (Khoumbati, Themistocleous and Irani, 2006; Ali, 2020; Nyame-Asiamah, 2020), and experiencing understanding, and interpreting phenomena by the researcher in the natural context. However, the amount of such rich qualitative situations and context is 'captured' during the IS designing process is questionable due to the limitations of standard designing formalisms and ISDMs.

IS software in commercial organisations is designed by software code writers based on mechanistic assumptions or organisational reality. These structured designs are specified artefacts, as they are built to cater to specific tasks or to solve a well-structured business problem, which have been understood as linear models of reality underlying cause and effect relationships. For instance, IS functionalities are designed to simplify selected functions in workflows. i.e., 'search' functionality, etc. Hence, it is a question of determining the limitations of such functions modelled into a predefined IS model to represent organisational reality. Hence, such mechanistic IS are inherently inconsistent with the rich, living organisational reality and are more likely to deviate from their intended objectives. Even if all actions required to operate in a workflow is identified, then how paratactical and useful it is to bring those functionalities into an IS. Hence, what makes an IS natural and how much living aspects should be integrated into structured designs to achieve desired results is a question worthy of investigation.

2.5.1 Concept of Utility in CASs

The theoretical framework (IDAP model) described in Chapter 3.7 explains that individuals' behaviour based on utility. The classical economics definition of 'utility'

is used in this research to demonstrate individual's responses during IS implementation. Some researchers argue that individuals always try to maximise their utility in terms of IS experience (Browning, 1998). However, this research does not use the utility of one's behaviour as a quantitative variable in economics. Instead, it is regarded as a quality of satisfying individuals in the rich context of their work.

Economists define 'utility' as the amount of usefulness or want satisfaction derived from consuming a particular good (Browning, 1998). Axelrod (1997, p. 59) asserted that the location of the utility construct in an individual's cognitive map-the closeness and direction of associations between relevant objects and the utility variable determines decisions. The underlying assumption by Axelrod (1997)is the rational decision-makers attempt to achieve maximum utility.

The IDAP model described in the Chapter 3 assumes that individuals in a CAS always try to achieve a higher level of satisfaction or higher utility. Individuals in a stable CAS have relatively defined and established processes and functions. These individuals are emotionally happy or satisfied or accustomed to the context they are dealing with. However, any changes to the status quo affect individuals' level of utility. Consequently, individuals' actions focus on restoring or increasing the previous level of utility.

2.6 Complexity Theory

Complexity is a diverse and complex concept. According to Manson (2001) and Turner *et al.* (2019), there are three different streams of complexity: (1) algorithmic complexity, (2) deterministic complexity, and (3) aggregate complexity. Algorithmic complexity deals with mathematical and information theories, deterministic

complexity invoke chaos and catastrophic theories, and aggregate complexity explains how individuals' interactions and behaviour create systems with complex behaviour. Such as motor traffic flow in urban areas The complexity concept invoked in this research is related to aggregate complexity. The next chapter details the IDAP process and describes how individuals who intend to maximise utility through interactions create complexity.

The foundation of the complexity paradigm is built on two prominent theories, namely network theory and chaos theory. These theories elaborate on the following characteristics of complexity: (1) the existence of decentralised structure, (2) the existence of networks of elements, (3) information processing based on simple rules, (4) adaptation based on evolution and learning, and (5) sensitivity to initial conditions (Gell-Mann, 1995; Holland, 2000; Mitchell, 2009; Turner and Baker, 2019).

2.6.1 Comparison of Complexity Theory vs. Organisational Management

There are significant differences in the interpretation of the organisations. Traditional management and complexity-based management explain the organisation's behaviour. In addition to the orthogonal ontological differences between them, their epistemological positions are also fundamentally different. Complexity theorists, such as Johnson (2011) and Greenhalgh *et al.* (2018), define complexity as how agents' interaction with simple rules produces ubiquitous outcomes. This is different from how traditional/classical organisational management, based on the explanations of Max Webber and Maslow Henri Fayol (Goldman and Van Der Linde, 2008; Goldstein, 2011), considers organisations as bureaucratic, structured social entities and assumes individuals' behaviour as rational and subjected to motivation.

Second, the definition of organisation based on complexity theory are ontologically different from classical management theories. Ontology of the classical management theories views organisations as socially designed and assumes organisation is an intrinsic feature of society. It views organisation as a structured entity concerning how relationships, power, and actions lead toward organisational output Patel (2006b); (2009). In contrast, complexity ontology observes organisation based on the orientation of sociology, history, and anthropology and seeks contextual explanations that generate historical relevance to explain the specific features of the organisation (Geertz, 1973; Tsoukas and Hatch, 2001). The critical point is that the complexity perspective does not seek universal generalisations. Instead, it seeks local and contextual rules that create a complex organisation (Morçöl, 2001; Turner and Baker, 2019). So, it is argued that complexity theory-based local definitions provide a better foundation for IS design and implementation at a level.

Thirdly, in the complexity theory perspective, organisational behaviour is interpreted based on interaction, learning, and adaptation, where action and learning are decentralised at the individual level (Miller, Zhao and Calantone, 2006). Complexity theories underpins individuals' capacity to learn from previous experiences and reflect on their actions, and interactions and behaviours make the whole system adaptable. In contrast, traditional management perspectives view organisation as a structured and formal process. This is fundamentally different to complexity theory. It is posited that organisational reality is neither formal nor a linear nor a random process. Regardless of the theoretical standpoint, emergence plays a significant role (Folke, 2019) in how structures emerge and plays a defining role in an organisation's existence. This is an example of stock market crashes and IS project failures (Mitchell, 2009; Greenhalgh *et al.*, 2018).

Complexity theorists view organisation as a decentralised entity. They believe that organisation adaptability begins at the individual level. Then adapt to the environment collectively. This means organisation is how the 'micro-level', i.e., individuals' behaviour and interactions, reflect at the 'macro' level. This is contrary to the traditional management concept developed based on bureaucracy and hierarchy. Power and authority flow from top to bottom in the traditional management concept, not bottom up. As such complexity based concepts able to explain nuances that occurs in organisational reality, for an example local work arounds and informal interactions.

In addition, epistemologically, complex events can be understood based on randomness and the deterministic nature of self-organising elements (Morçöl, 2001; Turner and Baker, 2019).Conversely, traditional management relies on planning, motivation, and power (Stoner and Freeman, 1992). Thus, in an operational environment, the whole effort of the management is to handle the randomness and ubiquitousness of organisational reality. Hence, organisational reality can be better explained by complexity theory. Complexity describes organisational reality as emerging, learning, and adapting to situations. Complexity is epistemologically appropriate to understand and explain organisations; ontologically speaking, it reflects the actuality of organisational behaviour.

2.6.2 Evaluation of Complexity Theory in Business Organisations

Complexity theory, rooted in natural science studies of phenomena like the behaviour of bee and ant colonies, natural selection, and evolution, provides insights into the interactions within business organisations. These studies conclude that simple rules lead to emergence and complexity through interactions, and there are

varying degrees of interaction among elements in complex organisations (Holland, 2000; Luo, Zhang, and He, 2020). In this research, it is essential to adopt a theoretical perspective that can explain the informal interactions crucial for the implementation of Information Systems (IS).

Research based on chaos theory examines homeostatic features, patterns, and the probabilistic nature of elements (Turner and Baker, 2019). However, no organisation behaves purely randomly or chaotically; they are regulated by formal structures to maintain order. Therefore, an analysis based on chaos theory is not suitable for this research. Chaotic systems cannot produce repeatable results, making statistical procedures and simulation techniques necessary for understanding their behaviour, such as in weather predictions (Gell-Mann, 1995; Mitchell, 2009; Turner and Baker, 2019) and crowd behaviour (Basori et al., 2021). While some elements in organisations are dynamically sensitive to subtle changes in initial conditions, akin to the butterfly effect (Gleick, 2008), the complexity within organisations is less extreme. Therefore, applying chaos theory to demonstrate IS implementation is questionable.

There is a dichotomy in the definition of complexity, which is based on either (1) structure or (2) relationships and interactions. Cooke-Davies et al. (2007) define complexity based on structure and information processing with simple rules, studying how order, structure, patterns, and novelty arise from seemingly chaotic systems. Opposite behaviours and structures emerge from simple basic rules. Simple components and limited communication collectively lead to sophisticated, unexpected outcomes. This is relevant to IS implementation, where learning and changing each element in the system, similar to the behaviour of a single ant or bee, results in adaptations in a social organisation, improving the chances for existence and sustainability.

Research papers, such as those by Stacey and Griffin (2005) and Somrani (2019), define business organisations' complexity as their response to changes. The concept of a ‘complex responsive process of relating’ demonstrates how language is used for conversation and negotiating social status and power, showing how one emergent event leads to another. The IDAP model proposed in Chapter 3.7 follows the same notion of continuous emergence, demonstrating how one interaction leads to another, which is fundamental to complexity.

Human behaviour is critical in classical organisational management theory, which focuses on altering human behaviour to achieve business objectives. However, individuals’ behaviour is not always formal or organisation-oriented. Miller and Page (2007) argue that in complex systems, elements maintain a certain degree of independence, and the formal aspects of the organisation often aim at achieving organisational objectives. Classic management theories have traditionally overlooked this non-formal or informal behaviour due to their ontological assumption of separating business organisations from their social characteristics. Informal aspects dominate organisations and play a significant role in organisational reality. For example, informal communication can be assertive and highly impactful.

Stoner and Freeman (1992) and King and Shaw (2022) highlight the prominence of informal communication in all organisations. Classical management fails to recognize its presence and effect on organisational reality, leading to crude generalizations, simplifications, and a lack of consideration for adaptability and emergence. Traditional management perspectives are thus not successful in understanding emergent organisational reality and IS implementation.

Example of Aggregate Complexity in Business Organisations

Example: Traffic Flow in Urban Areas

Urban traffic flow is an excellent example of aggregate complexity in business organisations. Each driver makes individual decisions based on various factors such as traffic signals, road signs, the behaviour of other drivers, and personal schedules. These individual actions and interactions lead to emergent patterns like traffic jams and flow waves.

- Individual Drivers (Micro Level): Each driver decides when to speed up, slow down, or change lanes, influenced by personal and environmental factors.

- Interactions and Behaviours: One driver's sudden braking can cause a chain reaction, leading to a ripple effect of braking and slowing down among following vehicles.

- Emergence of Traffic Patterns (Macro Level): From these individual actions, complex traffic patterns emerge, such as phantom jams and oscillations between smooth flow and congestion.

Similarly, in business organisations, individual actions and interactions can lead to emergent behaviours and outcomes that are complex and often unpredictable. Understanding these interactions can provide insights into improving IS implementation and organisational effectiveness.2.7 Emergence as a Concept

It has been previously argued that modern organisations are complex systems. The key feature of complex organisations is their ubiquitous nature, i.e., emergence. Researchers like Richardson (2004); Folke (2019) and Nyame-Asiamah (2020) say emergence is a characteristic of complex systems. The earliest definition of emergence dates back to Aristotle's concept of holism (Corning, 2002), which defines: 'The whole is something over and above its parts and, not just the sum of them all...'. This signifies that 'more is different' (Kogut, 2007) or outcome is different

from the cumulative input of its elements (Lissack, 1999), which questions the fundamentals of reductionist positivism and linear concepts on which traditional organisational studies are based.

For understanding IS implementation in organisations, complexity, emergence, and CAS are appropriate lenses with the interpretivist epistemology to allow for peoples' attachment of meaning to their actions. Definitions of emergence vary according to epistemology. In addition to the mainstream definitions, complexity is regarded as a method that provides 'an opportunity to understand things beyond the machine culture (Tasaka, 1999; Jobbágy, 2020); dynamic and fundamental and reductionist theories cannot explain such as traditional organisational behavioural studies.

Emergence is a systemic phenomenon or issue of new properties in systems that were not in the system's original specification (Standish, 2001; Somrani, 2019). These properties often supervene existing properties, which produce ubiquitous elements that original project plans did not anticipate. Once they emerged, the new properties led to unexpected outcomes and unprecedented consequences at a much larger scale, like the 'butterfly effect' (Gleick, 2008). It is a classical demonstration of complex systems' ubiquitous, aggregate and spontaneous behaviour (Tasaka, 1999; Jobbágy, 2020).

The critical concept of emergence is the non-existence of direct relationship between structure and its results. Traditional implementation methodologists attempt to design IS, business, and management processes to tackle emergence. Thus, emergent outcomes are not structurally related to their systems. Kogut (2007) provides an example of the emergence of virtual communities reflecting emergence; social communities and Facebook groups are examples of emergence. Similarly, temperature and pressure are also examples of emergence that appear in nature.

Therefore, traditional management theory or positivist epistemology cannot describe ubiquitous events, and traditional ISDMs cannot be used for design.

Further, it is vital to understand what impacts it has on systems. How that emergence acts as a phase transfer under certain conditions (Somrani, 2019). He argues that emergence is significantly important, as it acts as a phase transfer and permanently changes how elements in a system operation and its properties change at the elementary level. This leads to evolution in systems. This is why Goldstein (1999) refers to emergence as: 'the rise of the novel and coherent structures, patterns and properties during the process of self-organisation in complex systems' (pp 49). As observed in living organisms like ants and bees, self-organisation is a key characteristic of complexity. Researchers like Corning (2002) state that emergence is an outcome of 'self-organising' processes. What this means is that the Self-organisation is the process that leads to the emergence and survival of living systems.

2.7.1 Emergence and Staff Interactions in Organisational Context

As previously argued, emergence is a ubiquitous outcome of complex interactions between individuals. Not just individuals, but individuals' interactions with its context, processes, objects, and systems. Due to the complex interactions, business organisations are full of emergence. Hence, they are often called emergent organisations (Tasaka, 1999; Lissack, 1999; Lissack and Letiche, 2002; Miller and Page, 2007; Patel, 2009; Jobbágy, 2020). Characteristics of emergence in organisations are (1) spontaneity, (2) bottom-up approach, (3) new product development, and (4) emergence as a response to a rapidly changing market (Tasaka, 1999; Jobbágy, 2020).

Interactions are fundamental to emergence. Staff interactions provide the foundation for emergence in business organisations. Interactions are multifarious. Interactions could happen between individuals or between groups of individuals. These could be informal or formal. According to Fertner (2008), organisational decisions are often made on a micro/individual level, but the result is expected at a macro level/collective behaviour. Hence, organisational decision-making is an emergent process. This collective-responding process makes the organisations exciting, creative, and powerful (Lissack, 1999). Correspondingly, the structure of the NHS and the departmentalisation across the UK, i.e., as NHS trusts and CCGs, and their ability to make local health provision decisions shape the NHS's behaviour at a national level. However, the NHS has been regarded as a bureaucratic organisation due to bureaucratic structures governing the chain of command from the DoH to the community level. However, it is argued that the NHS tends to involve the workers to boost bottom-up decision-making. For instance, bottom-up decision-making powers have been improved by the Clinical Commissioning Groups (CCGs) established per the 2010 NHS law.

Thirdly, social organisations are sensitive and responsive to changes (Elwyn, Greenhalgh and Macfarlane, 2018) and adapt accordingly to make them relevant. These changes are both external and internal to organisations. The continuous restructuring of the NHS in response to the changes in the health needs of the British public by successive governments reflects how sensitive the NHS is to internal and external changes. These changes include diagnostic or clinical process changes, economic pressure, and integration with other services enforce process changes.

(Tasaka, 1999) and Jobbágy (2020) state that the organisational environment is dynamic and rapidly changing. In order to support our argument, the research would like to put forward Heylighen (1989) argument. He states that emergent systems

have to be both intrinsically and extrinsically stable. Apart from having sudden changes in the market environment, these business organisations operate in a relatively stable environment. Hence, organisational reality in business organisations is not chaotic and unpredictable at the macro level. This challenges the emergence of a ‘complex’ practical design (Patel, 2009; Ali, 2020; Nyame-Asiamah, 2020).

Although the function of the NHS has led to its classification as an emergent organisation, certain factors limit its emergent behaviour. The primary factor is bureaucracy, which is the antithesis of emergence. Bureaucracy has been defined as a power structure designed to accomplish large-scale administrative tasks by systematically coordinating the work of many individuals (Blau *et al.*, 1956), which develops formal and structured systems.

In general, NHS behaviour is governed by DH regulations and the NHS annual operating framework, which provides key direction for NHS organisations. These are based on the NHS constitution, which defines the purpose of the NHS. However, because of the NHS's departmentalisation, geographical distribution, and the authority of local trusts to make local decisions, the NHS is reflected as an emergent organisation at the trust level. This prevents or limits the NHS’s ability to operate as a fully emergent organisation at a national level.

Hence, the NHS is an emergent organisation from an IS designer perspective. In parallel, Allen (2019) demonstrated similar views on the behaviour of HCOs based on the complexity in care processes. Hence, traditional IS implementations based on stable processes are not viable in the NHS. IS experts build structured ISs on a stable, low-maintenance basis to achieve long-term objectives.

2.8 Design-Reality Gap

This section reviews the 'design-reality gap' (Heeks *et al.*, 2020) constructed, and this research proposes how it can be enhanced by juxtaposing it with the theory of deferred action. The 'reflexive designers' and professional IT specialists who design ISs are separate from the work of the NHS, and their artefacts represent organisational, procedural knowledge in a single design dimension space with a knowable structure, as 'health IS'. This type of IS design is termed 'structured design' (Patel, 2006b; Ali, 2020; Nyame-Asiamah, 2020). Structured designs are rational as their design philosophy underpins cause and effect relationships. Thus, do not reflect organisational reality and context, which is emergent and dynamic. This is because the 'designing' as a practice relying on abstracting of the reality. This abstraction process ignores important formal and informal aspects of organisational day to day life. Such as the emergence caused by informal interactions, values, tacit knowledge and other forms of informal interactions, values and statues embedded in the organisational culture.

The gap between structured design and actuality occurs due to the above two reasons. Namely, because of the emergence and the use of abstraction process during the IS designing. Heeks (2006); (2017) defines the 'gap' between the IS and reality as the 'design-reality gap'. The concept has been widely used in academia. According to Google scholar search, there are more than 525 citations of the concept since 2017. The concept has been used to evaluate IS implementations around the world. For e.g. used to evaluate IS implementation in Ethiopia; (Ayoung and Abbott, 2021) used to understand ICT implementation and Ghana are some of them.

In literature, design-reality gap has been Some critics suggests an incongruence between the design and reality and that this gap determines the IS success or failure (Littlejohns, Wyatt and Garvican, 2003; Ayoung and Abbott, 2021). Heeks (2006); (2017) representation of design–reality gap has been built on the multi-factorial concept of ITPOSMO (information, technology, process, objectives, skills, management systems, and other resources). It is an extenuation of actor-network theory and the traditional project's understanding of IS implementation, and it is expected to build a bridge between the project's perceived objectives, design, and context (see Figure 11).

As discussed above, the general notion of IS success or failure is a parametric comparison of specific characteristics against perceived project objectives (Belassi and Tukel, 1996; Córdoba, 2008; Irani and Love, 2008; Wijayati and Achadi, 2023). However, Heeks (2006); Heeks (2017); Trigo and Varajão (2020) broaden this concept by demonstrating it as a phenomenon, but Heeks' conceptualisation of IS failure in terms of a 'gap' is incomprehensive because it does not acknowledge the emergence and complexity that define an organisation and its context.

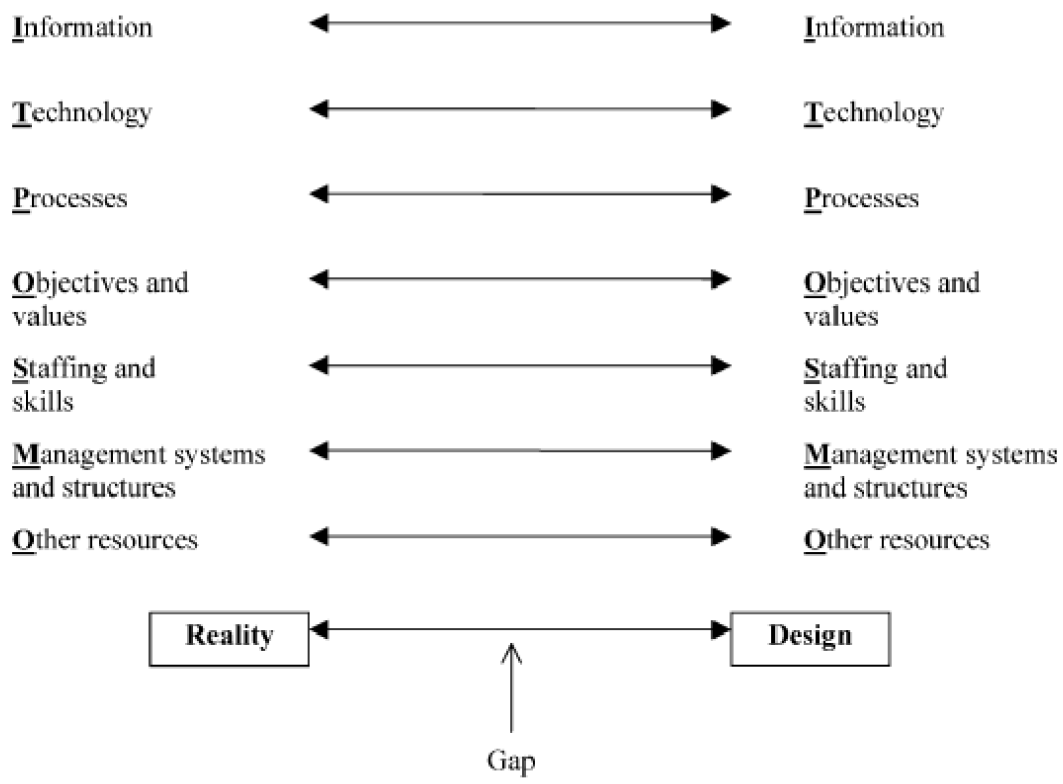

Figure 11: The ITPOSMO Dimensions of Health Information System Design Reality Gaps

The research interprets the design reality gap in view complexity. Complexity theory defines ‘emergence’ as a ubiquitous outcome of the interaction between elements in a system; hence, failure or success of a complex IS implementation project is a status quo measured against the project's perceived objectives. When an organisational concept or a theory ignores the emergence, it neglects the effects of complex interactions and systems’ ability to learn and adapt (Heeks, 2006; Heeks, 2017; McCarthy *et al.*, 2021). This is why understanding, and recognition of the organisational complexity is far more important, which is lacks in traditional project management. This enables the recognition of the adaptive nature of business organisations. Especially the changing care pathways and organisational contexts of healthcare organisations. Considering the emergent characteristics in organisational reality and its effect on IS success, this research suggests enhancing

the design-reality gap by using emergence (E) as an additional parameter. Hence, the revised design-reality gap model becomes ITPOSMO-E. The addition of E is significant because it recognises the complexity and uniqueness of emergence.

2.8.1 Critical Evaluation of Design-Reality Gap

The concept of the design-reality gap suggests that if the gap between the proposed IS, and its context could be eliminated, IS implementation will be successful. However, this assumption is questionable as its' consideration is limited to space and structure as the main ontological design dimensions. Therefore, not compliant with emergence.

The design-reality gap is an inherent consequence of specified designs because system designers design artefacts based on specified information from reductionist design techniques and methodologies (e.g., ISDMs). Secondly, the whole designing process that uses various axioms and methods aims to simplify and abstract reality. For an example using flow diagrams. OOD concepts are there to serve this purpose. Heeks (2006); Heeks (2017) and McCarthy *et al.* (2021) proposed to improve IS designing by introducing ethnography as the investigative strategy and the use of 'hybrid agents' to capture detailed accounts of the organisational context. Because he understood ethnography captures the nuance, local, implied views, data, and information. However, that does not recognise IS failure's 'core issue' as a specified design problem. It adds another layer of specification, albeit a qualitative layer. The design-reality gap is epistemologically and ontologically built by considering only 'structure' as the design dimensions.

Hence, Heeks (2006); Heeks (2017) and McCarthy *et al.* (2021) do not recognise (1) IS design as a process and (2) the existence of emergence, time, and space during the design and implementation of IS. This results in incongruence between the design and reality. Heeks (2006); Heeks (2017) and Jiang, Hong and Chen (2019) further proposed modularisation and incremental system design to close the gap, presuming the gap is static. However, incremental system design is still a specified design or planned action and would not close the gap. Due to the complexity and emergence in organisational context, the expected gap cannot be filled. Also, it requires more design input and may not be economically viable to continue and hard to achieve (see Figure 12).

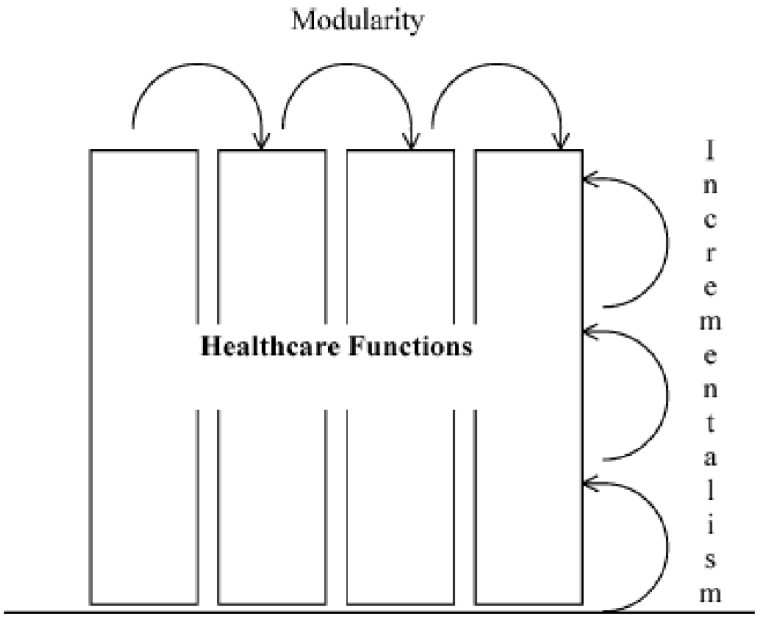

Figure 12: Modularity and Instrumentalism for Healthcare Projects

Source: Heeks (2006, p. 129)

In addition, . Heeks (2006); Heeks (2017) and McCarthy *et al.* (2021) emphasised recognising cultural and organisational differences in implementing IS. According to contemporary cultural studies, culture is the norms and values that exist amongst a collection of individuals (Currie and Guah, 2006; Katrini, 2018). Therefore, culture is

an emergent property and reflection of various properties of elements and behaviour in a system, and it is time-limited and contextual. Like in any society or organisation, the beliefs and values of staff members in the NHS kept changing over time (Mark and Scott, 1991). It is necessary to reflect on, extract, and integrate cultural properties, so that cultural artefacts perform better in actual situations. This ability to respond to the emergence makes these societies sustainable (Mitchell, 2009). According to Kaplan and Duchon (1988) and Folke (2019), agents' local response to the environment requires continuous systems design and organisation design to be continuous. It can be done by considering IS design rather than as an independent artefact.

This continuous design process is explained in the theory of deferred action. The theory of deferred action incorporates 'emergence' into traditional designs/actuality (Lynch, 2022). Deferred action is the response to the emergence in the actual context of a formally designed system. Therefore, the deferred action reflects the planned action's emergence over space and time. Thus, deferred action can harness the 'emergence' present in reality into the formal design (Patel, 2006b; Ali, 2020; Nyame-Asiamah, 2020). This 'process theory' facilitates the design of artefacts such as the design of IS by individuals to act rationally to achieve organisational objectives.

2.9 Formal- Informal Relationships in Organisations

Business organisations are social entities full of people. Therefore, interactions are an inevitable reality. However, there are interactions, communications, and exchanges of values outside of organisational formalities. Such informal interaction is an inevitable phenomenon in HCO context, and the these interactions are a

crucial factor in successful IS implementation (Wilegoda-Wickramage and Patel, 2010; Jiang and Wallace, 2017). Therefore, people's collective influence on IS implementation through informal structure plays a vital role in IS success. According to the literature, existing definitions of informal relationships include (1) structure, (2) existence, (3) emergent features, and (4) the level of affiliation to formal organisations. The below chapters delve into these in detail.

First, Hayes (1981) defined informal relationships as those in which membership is optional, voluntary, or payment of a membership fee is not a requirement. Therefore, informal relationships are inevitable, and the emergent outcome mutually benefits individuals in informal relationships. What important is that these communications, interactions, and transactions sit outside the formal organisation. Helmke and Levitsky (2012) described the structure of informal behaviour related to formal organisations. They defined informal organisations as informally created and communicated behaviours outside sanctioned channels. The outcome of informal interactions is not always limited to informalities. Stoner and Freeman (1992) argued that informal organisations are a given and complimentary to formal organisation. They argue that informal organisations extend throughout the formal organisation and improve the capacities of individuals.

It is important to understand how the informal structures fit into the rest of organisation. Granados, Mohamed and Hlupic (2017) and Wang and Ahmed (2003) explain how informal relationships fit into the organisational structure by introducing 'informal structure' as the fifth dimension in addition to (1) hierarchy, (2) function, (3) dimension of inclusion and centrality, and (4) prime type structure, i.e., organic and mechanistic structures. These informal relationships generate new knowledge, preserve knowledge and support formal structures in business organisations. This

enables knowledge-based organisations to innovate and share knowledge (Figure 13).

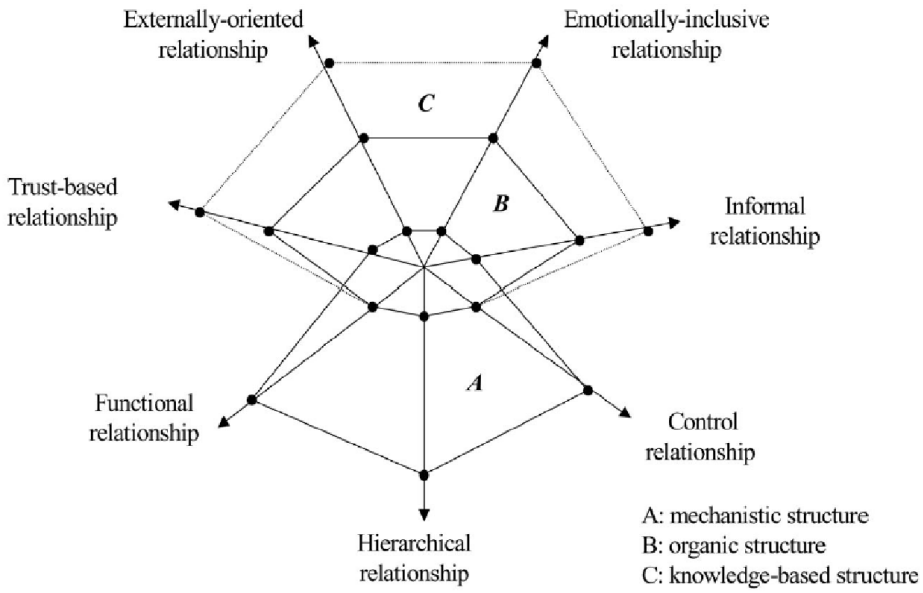

Figure 13: Developing Dimensions of Organisational Structure

Source: Wang and Ahmed (2003, p. 60)

This definition further supports the idea that the existence of the informal organisation is innate and believes that informal organisation is not the antithesis of the formal organisation; rather, it is complementary to it. This is also compatible with Lauth (2000) view that business organisations are hybrids of informal and formal structures. More recent studies further analyse this in the view of human resource management and incorporate positive outcomes of informality within business organisations (Khandakar and Pangil, 2021). In most instances informal interactions are critical and supportive of formal organisation and that brings knowledge management (Patel and Ghoneim, 2011), learning, safety and comfort (Fu *et al.*, 2019).

One critical question is why individuals get involved or the underlying currency of informal relationships. Oh, Chung and Labianca (2004); Fu *et al.* (2019) argues the

existence of social capital amongst the informal group members as the key to these relationships and extend it by introducing ‘group’s social capital.’ A group’s social capital is defined as the ‘configuration of a group's members' social relationships within the social structure of the group itself as well as in the broader social structure of the organisation to which the group belongs, through which necessary resources for the group can be accessed’ (Oh, Chung and Labianca, 2004, p. 861). The concept views an informal organisation as a unit, and a collection of individuals and group’s social capital is an aggregate impact of individuals’ social capital. This complimentary dual relationship in organisations, i.e., formal and informal structures, keeps the relationship between the hierarchy in an optimal state and plays a key role in organisational reality.

2.10 Theory of Deferred Action

The theory of deferred action (ToDA) is an action design theory that describes how the design of systems and organisations adapt to emergence (Patel, 2006; Nyame-Asiamah, 2020). ‘Deferred action’ is defined as the place within planned action in response to emergent locales. It synthesises planned action and emergence (Patel, 2009). According to Patel (2009) and Nyame-Asiamah (2020), agents’ local responses create emergent situations. Emergence is unexpected and unable to plan such an eventuality. Emergence is much broader than a ‘risk’. Therefore, unable to include it in any advance plans. However, ToDA highlights the possibility of enabling and preparing the agents and systems in such circumstances. In IS implementation, the user response does not encompass the user's response. It includes formal aspects and the emergence between the user and externality. Deferred models can use the power of rational thought (planned action) but also recognise that complex

systems and organisational systems reflect complexity, emergence, and unpredictability (Ullah, 2014, p. 130)(Figure 14) of interactions.

Construct/Modality	Description and interrelation with other modalities
Planned action (p)	This accounts for human rationality or teleological system design. Plans are necessary for effective and efficient organisation and to build enduring structures and processes that result in some quality product or service.
Emergence (e)	Emergence is constant in social systems and affects and inhibits teleological systems design (pure planned action). An emergence creates unpredictable situations or locales. It is sudden and expected and makes the situation unpredictable.
Deferred action (d)	Deferred action is the response to the effect of emergence on the planned action. It is self-organising action by people. Deferred action takes place within planned action to account for an emergent locale. It enables people's local interactions and response to emergence, which could not be predicted when planning.

Figure 14: Relationships Amongst Design Dimensions

Source: Ullah (2014, p. 130)

Patel (2005); (2006b) and Nyame-Asiamah (2020) argues that to be sustained in emergent organisations., IS implementation has to be a continuous process. This is because reality is dynamic and evolving. Structured or specified actions in organisational reality cannot reflect on emergent situations due to their underpinning rationality. For example, an IS is designed based on business process analysis. However, business processes change over time. In the NHS, care pathways and service delivery change often. Hence, the gap between design and reality widens with time. Patel (2009, p. 2) argued that the specified design is sustainable if they consist of deferred design. Deferred design is a comprehensive planned action and

deferred actions capable of achieving formal objectives. This is by enabling the staff members to behave and interact to generate value to respond to emergence.

Figure 15 illustrates the interrelationships between planned action, emergence, and deferred action for various systems in Patel's theoretical schema. The structure and design of a specified system can operate within two dimensions of the ontological design (i.e., structure and space). From the users' perspective, the reality is four-dimensional: structure, emergence, space, and time. However, this discrepancy makes specified designs prone to failure if there is deferred action carried out by the local agents that consists of local knowledge and corrective measures to sustain the design.

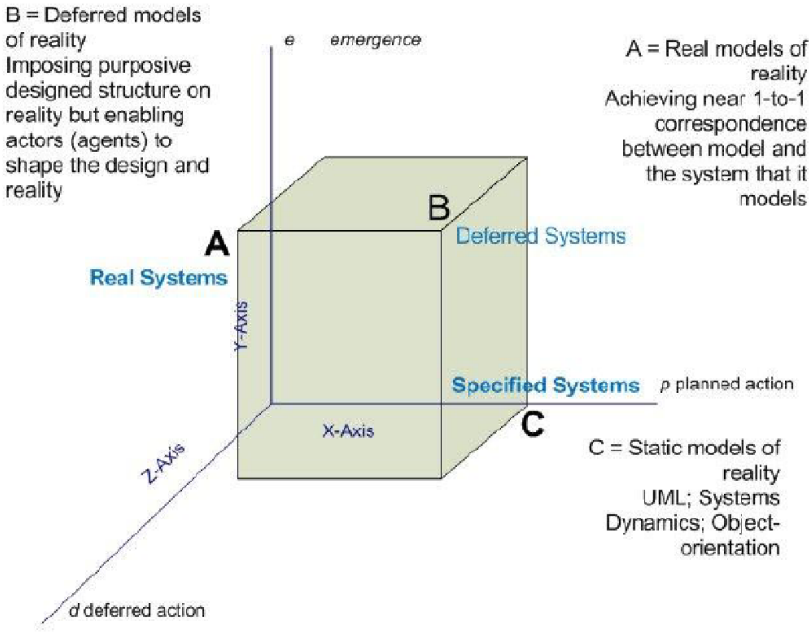

Figure 15: Theory of Deferred Action

Source: Patel (2006b); (2005)

The simplifications/abstraction of reality creates design problem during the designing phase. As explained previously, IS failure in the NHS is a (1) design problem linked to a (2) complex-behavioural problem. Therefore, the actual

problems are IS ‘designing as a practice’, and the ‘formalisms’ used. ‘Formalisms are the techniques and methods that contain precise rules and symbols for creating structural rules to achieve set objectives’ (Patel, 2006b, p. 242). Reflexive designers use formalisms to design the IS artefact to address organisational problems, usually concerned with information needs. Designers develop a ‘logical’ model through abstraction from the rich organisational setting. Abstraction is a logical and conceptual process that makes assumptions and contains axioms. For example, a logical workflow model makes definitions and is modelled as ‘classes’ in object-oriented design. The abstraction process relies heavily on the ‘structure’ element of SEST. Therefore, the abstract structure is suitable to satisfy the reflective designer’s view, but it does not reflect reality (Figure 16). Hence, the design does not respond to the reality of organisational emergence.

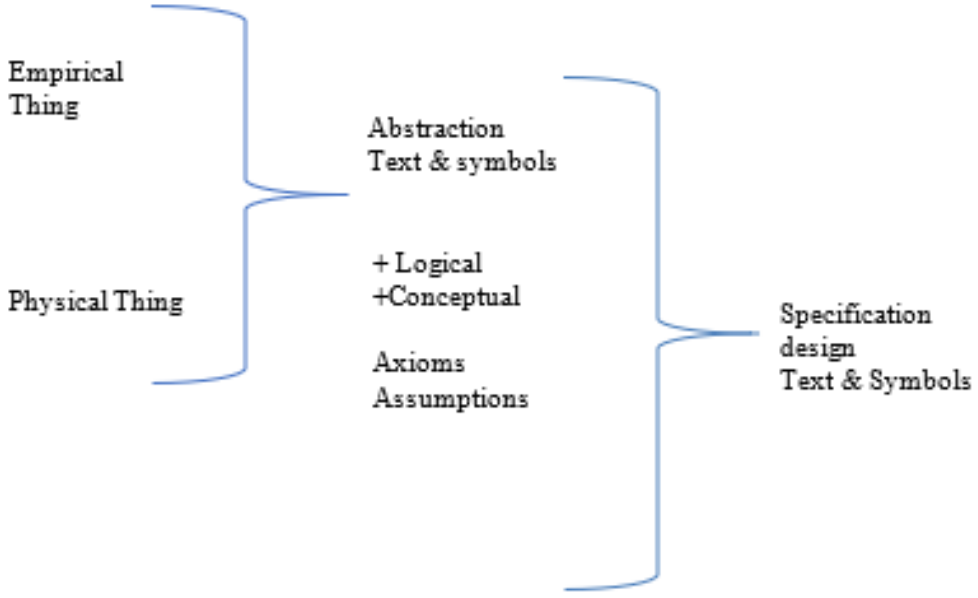

Figure 16: Objects of Abstraction in Specification Design

Source: Patel (2006b, p. 26)

In reality, to achieve sustainable development, IS artefacts must respond to the emergence of organisations, but they are designed using structured formalisms as described. Also, emergence is an enviable but ubiquitous property of complexity. Therefore, the argument is that ‘designing as a practice’ needs to integrate complexity into artefacts, i.e., IS designs and behaviour of information relationships as CAS. According to the theory of deferred action, CAS exists as a natural entity and system and in a symbiotic artefact system (that is, a system with human-computer interaction). Because informal relationships and their behaviour as CAS are inherent to reality, this need to be encompassed in IS designing so the IS can be evolved.

The proposed solution is based on the assumption that formal design can incorporate emergences through deferred action because deferred action reflects the need to respond to emergence, space, and time elements of reality and the structure element in the planned action. According to Patel (2005); (2006b; 2009), reflexive designers and ‘action designers’ can design deferred action together. The action designer is the organisational actor who is actually experiencing organisational reality, and the reflecting designer is the one design based on reflection. Therefore, both reflective and action designer can contribute to the deferred design. Since action designers are involved in the processes continuously, deferred action design is a continuous process.

Deferred action is the counteraction by organisational actors to the emergence that occurs in reality, and, according to Patel (2005); (2006b); Nyame-Asiamah (2020); Patel and Hackney (2010); (2009), artefacts can be designed to enable such local action to enhance IS implementation. Action designers or organisational actors carry out such local action in situ when required. This local action can be enabled, supported, and included in the planned design based on the help of action designs

and reflective designers. Once embedded into an IS, deferred action adapts to reflect organisational emergence objectively. Therefore, deferred action becomes an attribute of the IS artefact and can be categorised as an antithesis to emergence. It helps to design IS artefacts to achieve organisational objectives in the presence of emergence.

From another angle, Patel's(2006b) gDRASS matrix (Figure 17) depicts how emergence and deferred action behaves in three different planes in the system (i.e., human, organisation, and technology). It is assumed that each plane has its set of differed and emergent behaviours. For an example, within the human plane, interactions of humans may end up in emergent outcomes. Also, humans can interact with each and adapt their behaviour to these emergences. Which are the deferred actions or behaviours.

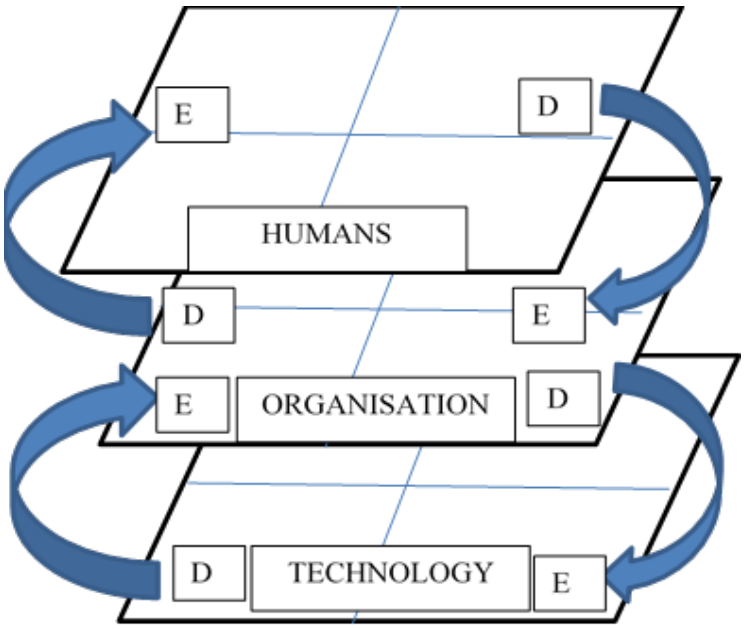

Figure 17: gDRASS Matrix

Source: Patel (2006b, p. 140)

The gDRASS matrix integrates human action (human) organized within an organisational framework (organisation) utilising technology (Patel, 2006), while also considering how the behaviours within each domain influence one another. It forms the foundation of the deferred model, which facilitates human rationality (planned action) to effectively navigate complexity alongside technology and respond to emergent situations within their context.

Adaptations occur at each level in response to emergent phenomena, leading to deferred actions. These deferred actions subsequently manifest as emergent phenomena in subsequent layers. Due to the structured and specified nature of organisational and technological frameworks, changes in human behaviour often occur unexpectedly.

Consequently, technology and organisations, as rational and specified entities, are essentially designs. However, such designs, even those crafted by IT experts, are often ill-suited for real-world conditions. Patel (2006),Patel and Hackney (2010) and Nyame-Asiamah (2020) argue that these designs lack compliance with reality.

Nevertheless, adaptations enable responsiveness to external changes in human, organisational, and technological developments, ultimately leading to the evolution of the system. The catalyst for adaptation lies in the deferred actions at each layer, encompassing not only the technological plane but also the human and organisational planes through diffusion management.

Deferred action transforms specified solutions into deferred solutions, which are rooted in the belief that Reflective and Action designers can modify the behaviour of agents and their interactions in response to context, thereby driving design evolution. Patel (2006) categorizes designs into four distinct categories (refer to Table **10**) to elucidate this concept further.

Type	System Description	Organisation Description
Autonomous	Systems behaving independently of their human reflective designers	The notion is that some structure can be set up to facilitate self-organising agents.
Deferred	System architecture is designed by reflective designers whose actual operational functionality takes shape in context through behaviours determined by the action designers	Structure is designed by reflective designers whose actual operations take shape in context through behaviours determined by action designers.
Real	Systems architecture and operations are designed and enacted in emergent actuality and in real-time	Organisational structure and operations are designed and enacted in emergent actuality and in real-time.
Specified	Reflective designers design System Systems architecture and operations for business works.	Organisational structure and operations designed by reflective designers for business workers.

Table 10: Definition of Key Terms in ToDA

Source: Patel (2006b); (2005)

Based on the emergence and diffusion management degree, the above four designs can be categorised into a matrix as shown below in Figure 18.

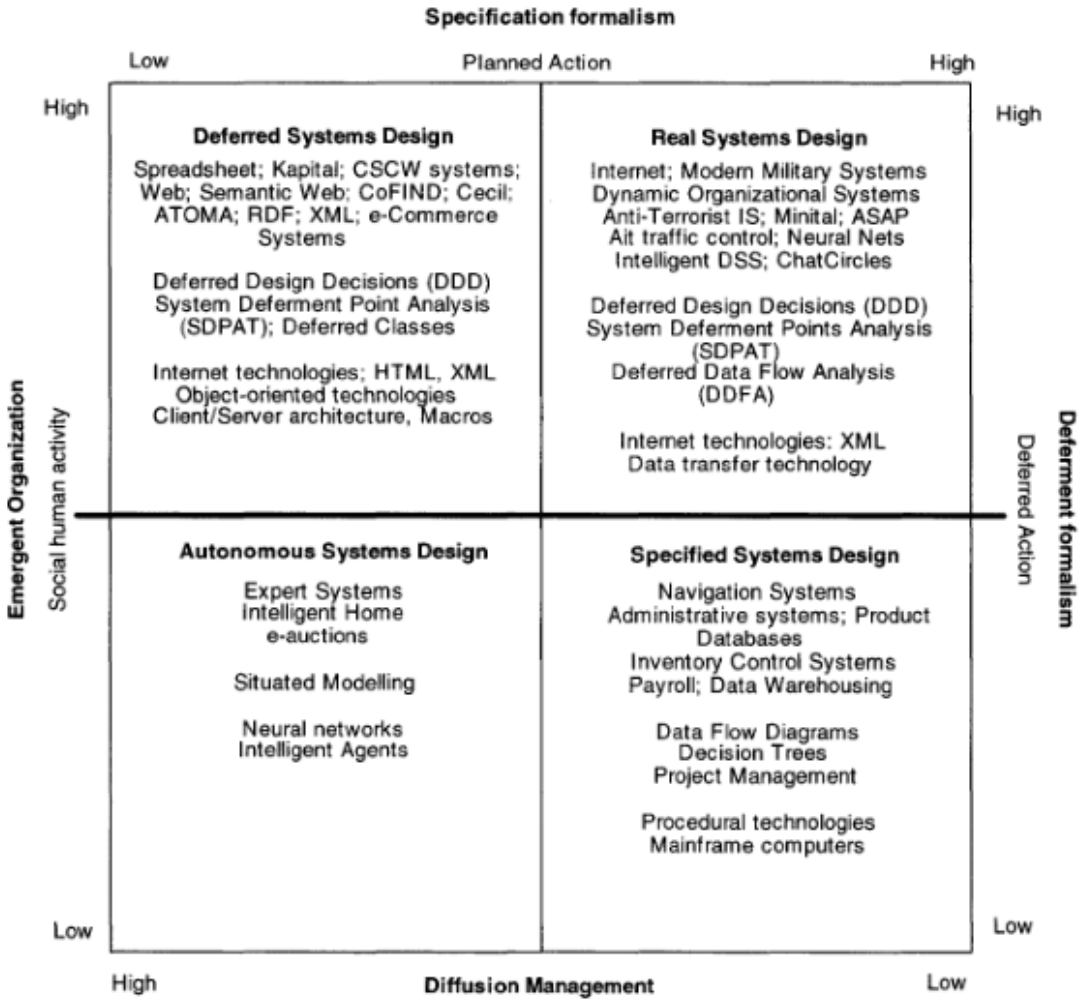

Figure 18: The populated gDRASS matrix

Source: Patel (2006b, p. 214)

2.10.1 Structured Designing Process

The basic concept of structured designing is that scientific methodological formalities and structures can improve IS design and success. Researchers believe that the analysis of organisational reality through structured knowledge can help the IS design practitioner achieve organisational goals by making the IS specific and precise, based on formalisms in each stage in the system development life cycle (SDLC) (Patel, 2005). The archetypical structured process is the structured systems analysis and design method (SSADM), which partly covers the SDLC process. The

method only covers three different components: (1) structure, (2) documentation, and (3) technique (Patel, 2005) (see Figure 19).

It is argued that the designer systematically analyses business transaction data, data flows, processes, and business logic to develop data entry-relationship diagrams, data flow diagrams, and logic processes in process descriptions (Patel, 2005, p. 65). The generic problem with the structured approach is the absence of an analysis of data for emergent organisations, namely CAS. It cannot capture actors' behaviour and change over time in actual settings. The positivist epistemology and ontology that underpin the current design formalism are deeply ingrained and unable to capture actors' capacity for learning and adaption. Additionally, because the system analyst's ontology is positivist, the staff members' intuition and tacit knowledge are misrepresented and neglected. Intuition and tacit knowledge are subjective and implicit in actors' behaviour. Hence, it cannot be captured through quantitative and structured analysis. Therefore, IS failure is preliminarily a design failure.

Heeks (2006); (2017); Heeks *et al.* (2020) suggested using hybrids as the solution to understanding implicit knowledge, intuitions, and 'tacitness,' as they could understand the world of the developer and translate it to the world of the user. 'They can, therefore, play a key role in the improvisation of both design and reality and help to improve success rates. They may do this by acting directly to alter HIS design or current user realities. Alternatively, they may do this by enabling others, particularly through a 'translation' or 'interpretation' role that helps communication' (Heeks, 2006; Heeks, 2017; Heeks *et al.*, 2020).

The theory of deferred action suggests a similar solution by designing for the ‘action designer.’ Therefore, it enables action designers to make the IS adaptable, enhancing its outcome (Figure 19).

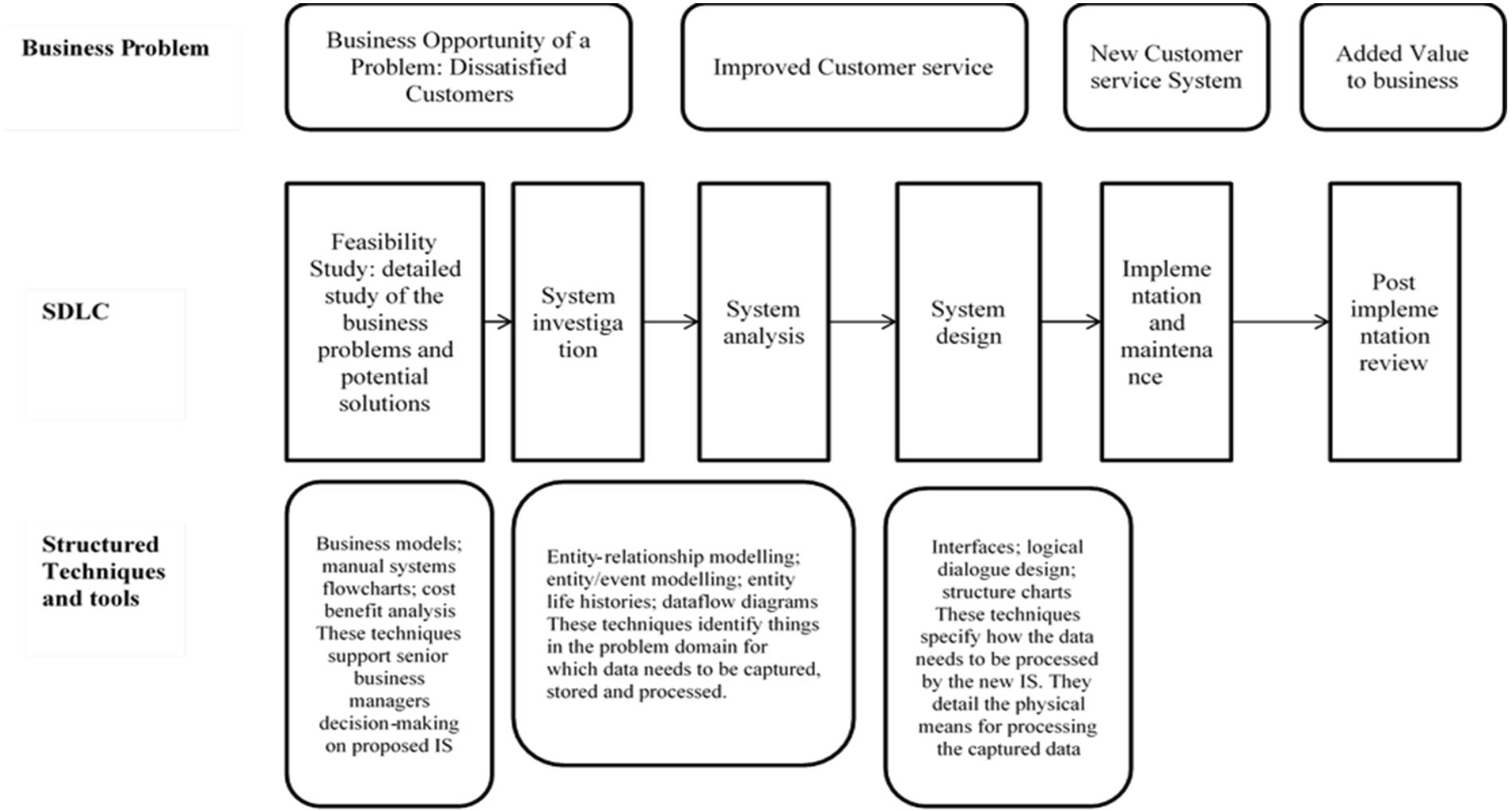

Figure 19: Structured IS Modelling Techniques Within System Development Life Cycle

Source: Patel (2005, p. 71)

2.10.2 Sustainable Solutions

Information System sustainability is achieved by ensuring that the system successfully adapts to the emergent realities of an organisation. The proposed IDAP model supports this process by making structured designs more reflective of deferred solutions, as illustrated in Figure 20.

Sustainability is more likely when designs approximate natural systems, which are inherently responsive to emergent changes in reality. As Patel (2006b) argues, designs must incorporate all SEST dimensions to achieve sustainability. In the context of IS design and implementation, this can be accomplished by introducing deferred action, which enables systems to adapt to emergent conditions.

The IDAP model also suggests that informally driven internal mechanisms allow IS and workflows to adapt based on the learning and experience gained in real-world situations. To ensure the continuation of adaptive behaviours, diffusion management should support the actions and behaviours that lead to successful adaptations. These adaptive actions resemble deferred actions, which IS designers can leverage to create a deferred IS that enhances sustainability.

Finally, actors within the organisation tend to steer designs toward those that resemble natural systems. Deferred design represents an intermediary state between specified solutions and natural solutions. According to the IDAP model, specified solutions can be transformed into deferred solutions through the informal interactions of organisational actors, as depicted in Figure 19.

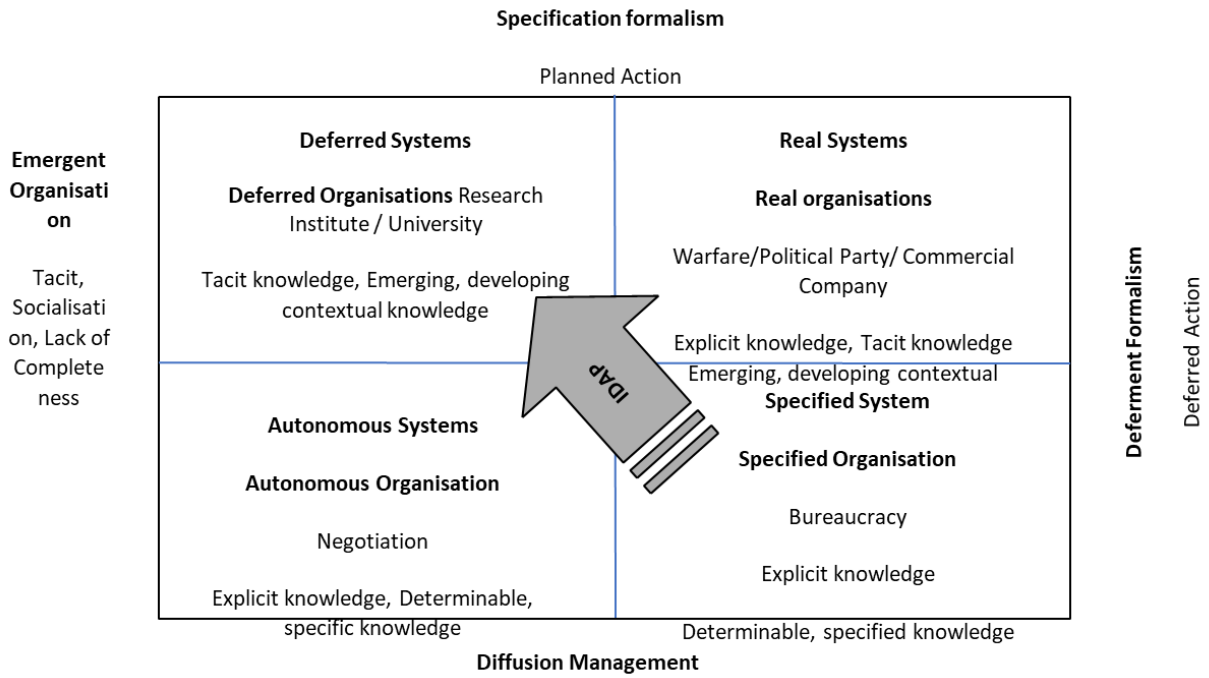

Figure 20: An Adapted model of Cohered organisation and systems design for sustainment

Source: Patel (2006) p. 196

2.11 Summary

This research critically evaluates the existing approaches related to IS evaluation and implementation, focusing on complexity and emergence as they pertain to organisational reality. The study questions the validity of widely used structured IS design and implementation methods, especially given the role of emergence, informal relationships, and evolving organisational ontologies. In practice, positivist assumptions and traditional project management fail to acknowledge the complexity and emergent nature of organisations, leading to the inadequacy of 'user satisfaction' and other positivist models as measures of IS success. These models have increasingly been replaced by holistic approaches that recognise the

importance of tacit knowledge, innovation, and the adaptability of organisational reality.

Structured IS designs and implementations are suitable for well-defined contexts and simplified realities, but they fall short in capturing the emergent and complex nature of real-world organisations. As a result, the application of traditional IS design and implementation frameworks often exacerbates the design-reality gap due to misalignments and unanticipated user responses. This gap underscores the need to view organisational emergence as both a design and interpretational challenge.

The theory of deferred action provides a solution by integrating local actions those that emerge in response to the complexities of actual organisational realities into IS designs. By addressing the design-reality gap through deferred action, these local adaptations can be effectively incorporated, leading to improved user satisfaction and more successful IS implementations.

Building on these insights, Chapter 3 will introduce the Informal-Interactive Deferred Adaption Process model, a novel approach designed to bridge the design-reality gap. This model aims to provide a more sustainable and adaptive framework for IS implementation within complex organizations, and its theoretical underpinnings and practical applications will be explored in detail.

Chapter 3: Informal-Interactive Deferred Adaption Process

3.1. Introduction

This chapter describe the theoretical framework which plays the role of a scaffold upon which this entire thesis is built. It presents a structured foundation of concepts, principles, and theories that provide a lens through which researchers view and understand their topic of this investigation (Varpio *et al.*, 2020). Essentially, this chapter defines the ‘why’ and ‘how’ of this study by offering a structured set of assumptions and principles related to exiting theories in literature that guide research endeavours. This means, either graphically or in narrative form the main things to be studied the key factors, concepts, or variables and the presumed relationships among them (Miles and Huberman, 1994).

Beyond its role in guiding the research, the theoretical framework also plays a crucial part in framing the study (Varpio *et al.*, 2020). It enables researcher to position their work within a broader intellectual context. In this research, the contextualization is within the domains of complexity, CAS (Complex Adaptive Systems), and TODA (Theory of Distributed Agency). This contextualization lends depth and relevance to the research, clearly demonstrating that it is not conducted in isolation but is intricately connected to a larger body of scholarly work. Consequently, it can highlight gaps in existing theories, offer a lens for what data needs to be collected, interpreting data objectively, and enhance the overall credibility of the research (Varpio *et al.*, 2020).

Varpio *et al.* (2020) further emphasize that ontologically the theoretical framework serves as a bridge between both objective deductionist and subjective inductive

approaches. In objective deductionist research, often associated with a positivist perspective, researchers first formulate a series of hypotheses rooted in established knowledge and subsequently test these hypotheses through data collection. This approach assumes that reality exists independently of the researcher's involvement, as exemplified by laboratory experiments (Varpio *et al.*, 2020). In contrast, the subjective inductive approach takes a different route, where the theoretical framework is developed or refined based on the data. Examples of research methodologies following this approach include classical ethnographic research and grounded theory research, such as the works of Mattarelli, Bertolotti and Macrì (2013) and Pekkola *et al.* (2019).

It's worth noting that while this research falls under the category of Subjective Inductionist, it adopts a more focused or 'focused ethnography' approach, as described by (Andreassen, Christensen and Møller, 2020). This approach is commonly employed in health sector research, where researchers are typically experts in their field. It involves shorter-term research, the deliberate selection of theoretically relevant locations, purposive sampling of interviewees, and the use of open or semi-structured questions that are closely linked to existing theories. As a result, this research exhibits elements of a positivist- objective deductionist approach, particularly in its pursuit of theory testing within the framework of a Subjective Inductive research paradigm.

This chapter is conceptualising the informal-interactive deferred adaption process (IDAP) to provides the appropriate focus to carry out the research[1]. This type of theory testing with qualitative approach is common in health care context (Greenhalgh *et al.*, 2018). IDAP model combines major theories and underlying

[1] Please refer Chapter 4 for the testing of hypothesises underpinning IDAP

propositions that depicts typical IS implementation process in the NHS. The IDAP model counters the issues and problems with IS designed and implemented according to the specification and structured approach to IS implementation. The IDAP model explains the human desire to enhance systems such as specified designs by adapting them to real situations through deferred action.

3.1.1 Conceptualisation of IDAP

IDAP is a conceptual framework and an essential step in the research process. Conceptual frameworks serve two purposes. A conceptual framework describes the key constructs for observation and explaining phenomena and sets up the assumed relationships between them, both of which are necessary for the research design (Miles and Huberman, 1994). Further, according to Saunders, West and Usher (2010), a conceptual framework fulfils an important epistemological step by linking the existing knowledge and the subject under investigation.

The following four observations serve as the basis for IDAP conceptual framework:

(1) structured IS implementation leads to a design-reality gap

(2) a design-reality gap disrupts individuals' organisational routines

(3) interdependencies lead to adaptations that require deferred action

(4) diffusion management mechanisms support deferred action.

Complexity theory and the theory of deferred action underpin this model, which itself is informed by complexity and other related concepts, i.e., emergence, CAS

behaviour, informal groups and interactions, organisational routines, and the concept of utility and satisfaction.

The chapter describes and explains the following points: (1) the existence and behaviour of informal groups within organisations; (2) dynamics and the emergence of the design-reality gap and how that increases interdependencies between IS users; (3) how structured IS leads to 'increased informal relationships' or known in the literature as a complex adaptive system (CAS), a state where individuals' complex interdependencies play a crucial role in adapting the behaviour of staff members, workflows and IS; and (4) how interdependencies lead to a collective response and how that can be theoretically explained in terms of the theory of deferred action.

The proposed conceptual framework is expected to advance research on how informal interactions between organisational players lead to deferred action to fit an IS into the actual environment in which it will be used. It is suggested that in order to achieve the intended modifications of the externally imposed structured IS, their CAS behaviour adheres to the IDAP paradigm. This framework has implications for 'reflexive' IS developers and implementation managers' practice and is expected to enable IS designs and implementation projects to follow the IDAP model process.

3.2 Informal Relationships and Structured IS in Emergent Organisation

Due to the emergence of organisational reality, the sustainability of specified and structured designs is questionable. However, in reality, reflective designers and practitioners make an effort to realise the intended goals by creating even more organised solutions in response to the emergence. These include formalities, i.e.,

organisational planning, management decisions, guidance, and directions, implemented throughout the organisational hierarchy to make the structured IS successful.

However, the degree of success is minimal. The main cause is the discrepancy between the design and its implementation. The reflective designers used various abstraction and simplification techniques to create structured and specified designs. Thus, the organisational reality is dynamic, which underpins the design reality gap. However, how could this be reduced? Heeks (2006); Heeks (2017); McCarthy *et al.* (2021) and Jiang, Hong and Chen (2019) suggest modularisation and incremental designs reduce the design-reality gap as a solution is an aspect of the structured paradigm. The literature suggests that emergence is an inevitable phenomenon in business organisations, and IS adaptation is necessary for sustainability (Patel, 2006b; Nyame-Asiamah, 2020).

Informal relationships play an essential part in reality in any organisation. IS research focuses on organisational IS implementation ignoring informal groups and their interactions (Irani, Ezingeard and Grieve, 1998; Irani *et al.*, 2005; Wyatt and Wyatt, 2003; Fernando *et al.*, 2004; Khoumbati, Themistocleous and Irani, 2006; Rahimi and Vimarlund, 2007; Gopal *et al.*, 2019; Verner and Sarwar, 2021; Irani *et al.*, 2023). Consequently, IS implementation research overlooks how self-organised informal relationships lead to emergence and warrant system adaptation The IDAP model explains the impact of informal interactions on the implementation of IS. The following sections explain its theoretical foundation and key concepts.

3.2.1. Emergence of Informal Groups

Individuals connect with ‘society’ through complex-multi-structured connections, wherein individuals share knowledge, skills, future disasters/hazards, or psychological aspects such as empathy, sympathy, and comfort, and express personality, cultural, and religious factors with other individuals (Elwyn, Greenhalgh and Macfarlane, 2018; Winslow *et al.*, 2019). Correspondingly, transferring knowledge and skills also play a crucial role in business organisations, such as HCOs.

The emergence of informal partnerships is situational and dependent on external variables. Similar to formal connections, they are goal-oriented but more intricate and pervasive in behaviour. Membership or connections in informal organisations are optional and selective, in contrast to formal organisations.

This is because there is a higher tendency to build relationships between individuals who share a common situation. Jones and Gerard (1967) and Fu *et al.* (2019) looked into the underlying reasons that initiate informal relationships and highlighted that, in many social situations, individuals are more likely to get into a discussion and interact with individuals with similar interests. This behaviour is due to the individual’s inherent tendency to reflect (reflective appraisal) and compare (comparative appraisal) themselves with others.

Reflecting and comparing with others makes individuals more aware of their surroundings and empowers them to adapt. As a result, some researchers contend that people's information-seeking behaviour in IDAP builds informal ties and paves the way for greater social cohesion. Additionally, persons' coherence and believability strongly relate to information-seeking behaviour (Moschis, 1976; Fu *et*

al., 2019; King and Shaw, 2022; Maiolini *et al.*, 2023). What underlies this is that informal interactions are also influenced by an individual's demand for information, knowledge, skills, affiliation, and dependence on credible information sources to make them aware of the context and adapt accordingly, which makes IDAP realistic.

IDAP shows the informal interactions between people in an organisational context. The model illustrates how informal groups function and impact the adoption of new information technologies in organisations. In corporate organisations, informal ties facilitate training, information transfer, and skill exchange. Contextual knowledge and situational experience shared during informal learning have greater accuracy and credibility while providing freedom for learners (Viberg, Andersson and Wiklund, 2021), which specified and structured designs neglect. Such informal behaviour underpins organisational actors' tendency to look to their colleagues for help with IS related issues rather than formal training or support from IT help desks.

The IDAP model posits that disruption of organisational procedures (formal and informal) during the IS implementation reflects a state where a formal organisation is less effective. Therefore, informality emerges as a countermeasure. Heeks (2006); (2017) claims that organisational IS assistance and training cannot keep up with demand in the initial phases of implementation initiatives. Formal processes and standard operating procedures have very little effect in this situation. In corporate organisations, these circumstances arise during IS implementation efforts.

Moreover, informal relationships provide strong support to individuals (Winslow *et al.*, 2019). This is effective due to their closeness to social reality, especially in unstructured, informal situations. For an example in finding data collection forms, create reporting templates. The informal arrangement spans beyond formal work

sometimes. Staff members share knowledge, information, psychological and physical support with their colleagues when needed. Therefore, informal arrangements bring solutions, comfort, confidence, and continuity to the organisational reality.

Hence, the IDAP model argues that informal relationships compensate for deprived formal structures in the IS adaptation process. Three key factors influence the formation of informal groups described in the IDAP model, which are categorised according to structural and functional orientation: (1) individuals' physical proximity (Abercrombie, 1989; Jobbágy, 2020) and how that influence informal relationships, (2) frequency of interactions (Levine & Moreland 2006) that leads to effective ties with one another, and (3) having a standard frame of reference and being behaviourally interdependent (Stoner and Freeman, 1992).

Generally speaking, proximity and uniformity are vital factors that help to form and develop informal relationships (Maiolini *et al.*, 2023). The homogeneity of the population and the proximity between individuals affect the formation and existence of informal relationships. According to Maiolini *et al.* (2023), this enables people in informal groups to connect and responds more rapidly to any potential changes to established or existing patterns or routines in the company organisation (Frantz, 2021; Wenzel, Danner-Schröder and Spee, 2021).

The second factor is the difference in function because informal groups are driven by trust and mutual consensus. Within informal groups, 'Trust' serves two functional purposes: (1) bonding (inclusive) and (2) bridging (exclusive) (Realo et al., 2008). It enables individuals to work closely with their group members and expand their resource base by connecting with outsiders. This allows access to outside resources (Oh, Chung and Labianca, 2004; King and Shaw, 2022). According to Fu *et al.*

(2019) and Maiolini *et al.* (2023) employees from the same culture or ethnic group are more likely to interact informally inside multicultural organisations. This enhances people's capacity to ‘bond’ with similarly inclined co-workers while ‘bridging’ with members of various groups. This behaviour is significant for bringing new information and knowledge from the outside into the organisation during IS implementation.

Trust has a subjective and objective form that is both subjective and contextual. Markerink (2016, p. 34), argues that trust is the ‘willingness to rely on an exchange partner in whom one is confident. The firm belief is that the responsible party is reliable, competent, honest, sympathetic, fair, benevolent and helpful.’ Finally, trust is the basis and enabler of informal relationships in an organisational context. Considering the number of staff in the NHS and their demography and professional affiliations, the IDAP model assumes that individuals in similar contexts and with the same professional backgrounds have a greater tendency to form themselves into informal groups. Maiolini *et al.* (2023) extend this argument by suggesting that individuals in proximity with similar traits form stronger bonds. Informal relationships can be useful when bureaucracy hinders personnel from seeking creative solutions since they are external to organisational formality, such as regulations and protocols.

The IDAP model argues that informal groups operate better through local actions and adaptations because intuition, tacit knowledge, social capital, and adaptive knowledge are all contextual realities, which are the basis for deferred action. Helmke and Levitsky (2012) and Viberg, Andersson and Wiklund (2021) emphasised that informal institutions sometimes impact formal outcomes by

providing incentives to follow formal regulations in order to support their claim. The 'utility' or happiness people obtain in this situation serves as the incentive.

3.3 Informal Behaviour and Complex Adaptive Systems (CAS) in HCOs

The IDAP model is the view that complexity arises when staff interdependencies become important. This behaviour is comparable to how a flock of birds behaves when they organise themselves without an organiser and coordinate themselves without a coordinator. The interdependencies give complex, unpredictable, and changing patterns (Mitchell, 2009; Turner and Baker, 2019). Consequently, CAS emerges when the complex interrelationships between individuals become significant, and individuals benefit from their relationships during IS implementation. It demonstrates how open, decentralised systems operate and exist when a formal organisation is weak. Correspondingly, the IDAP model assumes that the same phenomenon will occur during the IS implementation in organisations.

Individual staff members make sense of such informal groups as objects of subjective reflection (Mead, 1934). Being self-conscious allows them to maintain a certain degree of freedom and form personal viewpoints of the events happening in organisational reality, i.e., IS implementation. Hence, an individual can work according to the organisational formalities but still maintain personal-level interaction unrelated to the organisational formalities or maintain views or behaviours unrelated to formal policies and statutes. Regardless of IS implementation or lack thereof, such interactions and behaviours are part of organisation reality and play an essential role in IS implementation. The IDAP incorporates existing literature conclusions concerning informal behaviour, i.e.,

individuals' interactions are similar to CAS due to trust, mutual aspirations, and structural and functional similarities. Due to informality, adaptability, and emergence, informal groups have higher interdependencies and tend to operate as CAS.

According to the literature, informal groups and informal behaviour share a number of essential traits. They both exhibit (1) structure, (2) relationships, (3) collective behaviour, and (4) adaptability. The CAS structure comprises a network of components and interactions that make up complex collective behaviours (Mitchell, 2009; Turner and Baker, 2019). These interactions are based on (1) complex information flow and processing and (2) adaptation through learning and evolution.

CAS consists of self-organising individuals who can adjust according to others' actions, which leads the system to adapt as a whole (Gell-Mann, 1995; Holland, 2000; Turner and Baker, 2019). Through order-to-disorder-to-order, informal interactions between people and their collective response help the 'whole' achieve goals and improve the environment. As a result, 'state of the system' transition sequences and emergence are similar. This adaptability is crucial to CAS (Kariippanon *et al.*, 2020). In stressful situations, informal groups can compensate for the formal organisation and move towards more economical solutions to maximise resource utilisation. The reason is that individuals' inherent nature seeks support from sources they trust and are free of charge when encountering work problems, as occurs during IS implementation.

This type of CAS is, by nature, an informal arrangement. CAS does not involve any membership fees or statutes. CASs are a voluntary interdependence system, based on 'trust,' that benefits individuals from their relationships. The research argues that organisational context during IS introduction leads to a state of 'common fate' that

leads to bound solidarity (Turner and Baker, 2019). Members of the group depend on one another more and more for support, resources, and information as a result of the environment's uncertainty. A study by Aguilera and Massey (2003) and Leschke and Weiss (2020) on behaviour and functioning in unfavourable conditions supports this fact. Due to the implementation of ISs, individuals face the same external conditions. However, due to personal characteristics, the degree of influence on the individual may differ (Aguilera and Massey, 2003). Situational pressure causes CAS to behave as an independent unit to survive and achieve its objectives (Leschke and Weiss, 2020).

CAS is a rational yet informal organisation of individuals. Individuals in CAS are conscious and rational. They can collaborate and reach a consensus; simultaneously, they conflict and compete with each other in highly complex ways (Stacey and Griffin, 2005; Sobo, Bowman and Gifford, 2008). The interaction leads to a specific outcome, eventually becoming the basis for another interaction at a given time. These interactions are neither always fair nor democratic.

Additionally, CAS does not adhere to the standard decision-making procedure, which entails preparing and taking action, and the majority of decisions are conscious rather than democratic (Innes and Booher, 2010). This is accomplished by continuously assessing the environmental factors and modifying how they interact (Holland, 1998; Turner & Baker 2019). Therefore, CAS is a process of continuous learning and adaptation.

Consequently, emergence is an unpredictable effect of the interrelatedness of purposes and the various means of social action (Patel, Eldabi and Khan, 2010; Nyame-Asiamah, 2020). It is the hallmark of complexity (Mitchell, 2009). It is a visible, contextual, and specified outcome of complex interactions (Gell-Mann, 1995; Mitchell, 2009). As previously stated, CASs are based on unofficial connections within the organisation. They possess the natural capacity to learn, adapt through time, and modify their structure. CASs functions both within SEST and externally to a formal organisation.

Structured systems, i.e., ISs in organisations like the NHS, are not adaptable to specific formal organisations. Hence, such normative design endangers the organisation's sustainability over time because it cannot adapt to changes in context and environment (Patel, 2006b). In actual organisations, no specified design would follow the linear model of its design formalism. Hence, no such design would ever achieve intended targets unless its elements were sufficiently flexible to adapt to the 'unexpectedness' of actuality. The theory of deferred action arguably fulfils this by incorporating situated action to counter such organisational emergence in formal contexts.

3.5 Deferred Action as a Solution to Emergence

Traditional planning and specified designs that are structured do not make natural designs. Hence, structured artefacts do not last long in emergent organisations. It is their intrinsic design and implementation incongruence. When people work together

to make meaning of their job, this basic contradiction becomes a crucial element that restricts the efficiency of structured IS.

‘Reflexive designers,’ or expert IT people, design structured ISs. Such a structured design is a rational and reflexive process. According to (Patel, 2006b), rationality cannot be organised first because of the positivist epistemology of the design process and the assumed ontology of the application domain. Based on Bhaskar (1978) description of realism, he argues that reality and its generative mechanisms exist independently of the observer; in this case, the observer is the reflexive designer. Causal powers in nature (i.e., reality) cause elements to act. Reflexive designers can only see the phenomena of causal forces. Hence, IS designers can only witness and experience emergence and cannot see the mechanisms and the causal powers that cause the phenomenon. Hence, the artefacts they design are incongruent or ‘specified’ and, therefore, non-responsive to organisational emergence.

Reflexive designers design specific systems based on the perceived structure of reality, anticipating a linear relationship among planned goals, actions, and outputs. Designing artefacts based on intuitive knowledge is problematic because it does not consider organisational actors’ rationality, intuition, and tacitness (Patel, 2006b). Moreover, these designs are one-dimensional if emergence, space, and time are neglected in favour of structure. Theoretically, emergence might result in unanticipated outcomes when structured designs are implemented in real-world settings. This frequently results in long-lasting IS accomplishments and work outputs. In order to improve the outcomes, (Patel, 2006b; 2009) advocates incorporating deferred action into the formal design. However, deferred action is not the antithesis of emergence; instead, it enables individuals’ local action or response

to emergence by making the elements adaptive and resilient to ubiquitous events. Consequently, deferred action can counter the diversion of planned output from emergence (Figure 21).

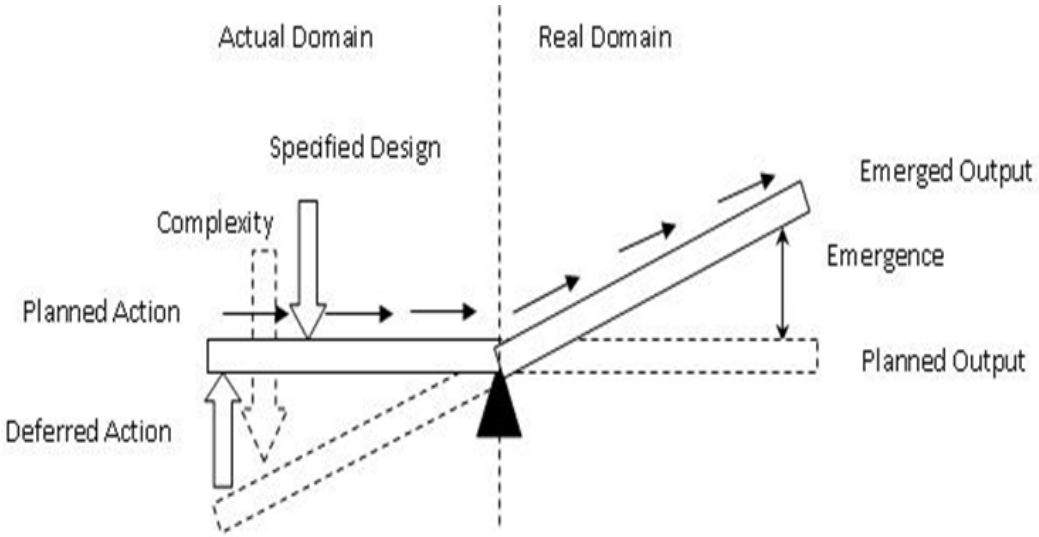

Figure 21:Planned Action, Planed Output, and Emergence in IS Designer Perspective

The above illustration indicates the epistemology on which the IDAP model is based (see section 3.7 for details). It demonstrates how the introduction of planned outputs, the stipulated IS, and the resulting necessity for deferred action have resulted in complexity and emergence in the actual field. Structured IS implementation initiates a series of emergent events that enhance the context by the deferred actions of organisational actors, producing a system that is well-adapted to the actual organisational context rather than an abstracted one.

3.6 Design Variants

Business organisations are social constructions. They are a conscious and rational synthesis of planned action, objectives, processes, and actors (Patel, 2006b; Nyame-Asiamah, 2020). The literature indicates that there are two types of human behaviour in commercial organisations: formal and informal. The dichotomy is founded on formal governance systems, such as rules, regulations, and other formalities that constitute the basis of conventional management practices (see sections 2.9 and 3.3). However, traditional management thinking does not consider individuals informal and complex behaviour, as informal behaviour is beyond its philosophical remit (see sections 2.6.1 and 2.7.1).

This means that design methodologies, processes, and techniques derived from the traditional management school of thought and, assuming ontological cause-effect relationships in social organisations, cannot design natural systems. Such approaches do not recognise informal organisations or incorporate them into structured designs. Patel (2006b) suggests that design should be about ‘internal interrelations between things in design itself and external to it and naturally and socially occurring things.’ Externality plays a vital role in purposefully designed artefacts. However, in traditional design processes that do not consider emergence, the artefacts and context are assumed to be linear models (Chakrabarty, 2022). Therefore, reflexive designers design ISs and expect them to operate in a ‘planned to operate,’ which is different from the reality of actual organisational life. Hence, designs are ‘specified’ and highly structured. This is the ‘gap’ that the IDAP model depicts as beginning at the beginning of the design process.

Patel (2006b)argues that organisation is a social behaviour in which participants pursue predetermined objectives as corporate identity, while individuals in shifting

local contexts have intentions and beliefs. Individuals work in groups or collaborate with other individuals as a team, cooperate with partners, and negotiate power relationships to ensure that actions are taken to achieve objectives (Patel, 2006b). This includes individuals' formal and informal behaviours and relationships in business organisations. Hence, if those are sustainable, it is necessary to incorporate informal behaviour and emergence in organisational and system designs.

As discussed in Chapter 2, reality is a social construction in the SEST dimensions of design. Building a machine-like reality model can only provide abstract reality, generally based on structure and, therefore, not natural (Patel, 2006b). This is why most IS designs are not suitable for reality. These structured IS designs lead to a gap between the artefact and the reality, eventually leading to design failure. Reflexive designers tried to answer this by formally incorporating emergence through 'modularisation' and 'incremental designs.' However, as described in section 2.8.1, modularisation and incremental designs are also structured designs, designed to operate within a certain actuality, hence, subjected to emergence.

Specified design is not sustainable in business organisations. Patel (2006b) defines the process of achieving sustainability as the ability of the designed artefact to continuously extend its life by adapting the structure and operation in response to the emergence in its design dimensions, i.e., structure. According to the theory of deferred action, such adaptation can be achieved by enabling local action or deferred action in response to organisational emergence. Such local action draws on situational intelligence, tacit knowledge, intuition, social capital, and trust, which keep the factors of production (if in a manufacturing context) in alignment with the

standard output (Figure 22). Deferred action acts as a cushion and make sure the context stable within the organisation.

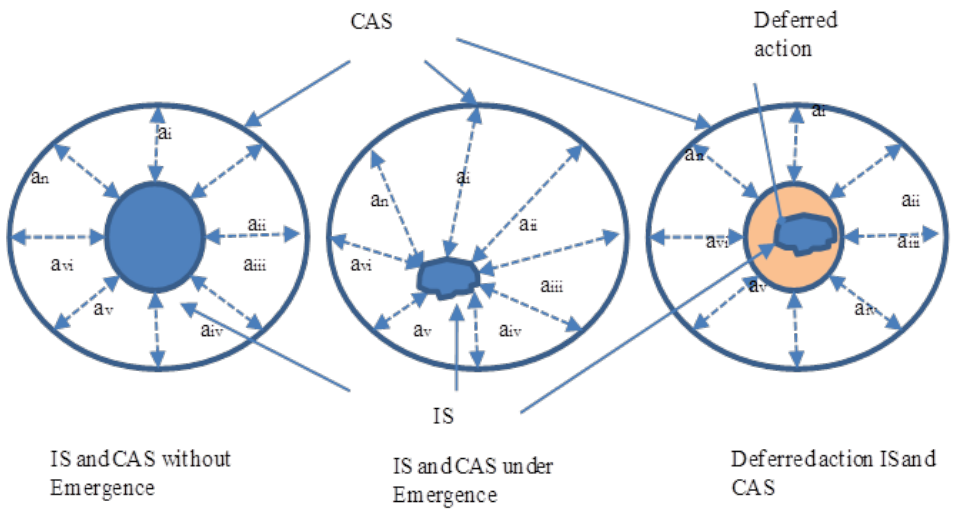

Figure 22: CAS, IS, and Emergence in SEST

Deferred action is a way to achieve formal objectives by facilitating a mechanism to enhance the outcome of artefacts. This theoretical understanding leads to the invention of 'deferment formalism' to enable the interrelation of design between formal design and actual action. Deferment formalism consists of 'specification formalism' to achieve formal objectives and enables organised action or deferment formalism to be a component of formal design. Normative formalism permits only predetermined actions. Deferred action covers the deference between actual organised action and predetermined action, which cannot be covered in structured approaches. It does so by facilitating situated action. It is not the planned action. Hence, 'Deferred Action is the necessary pragmatism of human action to achieve formal objectives. Pragmatism distinguishes deferred action from planned action' (Patel, 2006b).

ISs designed to incorporate deferred action can achieve sustainability. The theory of deferred action encapsulates ‘natural changes required’ into specified IS design. Embedding deferred design overcomes the deficiencies of a specified design. This makes it possible for ISs to change in response to the emergence. Deferred action makes it easier to create dynamic, focused, and flexible IS that are based on planned skeletons made to deal with emergence. Therefore, the proposed IDAP model suggests designing and implementing IS according to the theory of deferred action to respond to staff members' informal behaviour.

3.7 IDAP Theoretical Framework

Implementing IS in a business organisation is a process. The IDAP model demonstrates an informally driven adaptation process based on five propositions. IDAP model assumes that IS design and implementation are reflexive designs intended to achieve predetermined objectives based on specification formalisms (Patel, 2006b). Specification formalisms cover business model design, manual system flowcharts, cost-benefit analysis, dataflow, and workflow diagrams as integral aspects of the IS development life cycle and the use of IS project design and implementation technologies, e.g., SSADM and Prince2.

Specification formalisms are the ‘prescribed methods for creating structural forms and operational details to achieve set objectives’ (Patel, 2006b, p. 243). Hence, the IS artefact is an abstraction of particular actuality at a specific time. Patel defines actuality as the ‘ontological current status of reality’ (Patel, 2006b). Hence, it is a snapshot of the reality of at given space-time. IS designers use these formalisms to design IS to suit the ‘application domain,’ i.e., organisational reality.

Structured abstraction is one of the main issues with such reflexive design. The 'structure' of various aspects, in reality, is significantly incorporated into the abstraction process. Abstraction simplifies reality based on various assumptions. At dimension level, the specification formalism, time, space, and emergence are 'off-design' (Patel, 2006b). Consequently, structured designing processes do not facilitate and contain user rationality, intuition, routines, relationships, and tacitness in designs, which are features of an actor's actual reality (Patel, 2006b; Frantz, 2021). Consequently, at a given point in time, a gap exists between the structured designs (Heeks, 2006; Heeks, 2017; McCarthy *et al.*, 2021) and their reality because (1) of the emergent nature of organisational reality and (2) emergence, space, and time are off the design in structured IS (Patel, 2006). Therefore, specified IS does not respond to actual events in organisations. As previously argued in sections 3.1.1 and 3.1.3, specifically informal participation is off-design in specified IS because (1) it has not been considered as part of organisational formality (i.e., organisational policies or statutes) and (2) space, time, and emergence are off-design properties of structured IS.

Proposition 1: Implementations of Structured IS inhibits informal participation of organisational actors in implementation and leads to the 'Design-reality gap'

HCOs are complex emergent systems. Like any other natural system, the elements within HCOs have complex formal and informal interactions that result in emergence. Actions and behaviour are the foundation of organisational function and life. Behaviours and actions are formal and informal and repeatedly occur in HCOs over time. According to the complexity theory, they are relatively stable entities. Becker (2004, p. 644) defines these as routines. Given the importance of routines

in organisations, Feldman (2000); Pentland and Feldman (2005); Frantz (2021) argue that routine procedures are fundamental to organisational emergence and, as posited in this research, are particularly important during IS implementation. However, due to the structured process and the abstraction of formalism in the design and implementation of IS, informal personal routines and their complex behaviour have not been reflected or considered in structured designs. Further, by its nature, NPfIT itself has been bureaucratic and structured within the NHS.

Secondly, as described in sections 3.1 and 3.2, the implementation of structured ISs in HCOs influences users' informal interactions that intrinsically exist within organisational reality. Despite the use of IS, there are unofficial interactions in HCOs because of the staff's self-consciousness. Organisational formalities do not limit these connections. The argument emphasises how the IS and organisational reality gap is caused by specific designs created using structured formalisms. Empirical research has shown that informality becomes prominent when the formal organisation has become ineffective. Informal relationships exist in organisational reality. It is assumed that the design-reality gap disrupts the routines of staff members in the HCOs, leading to an increase in informal interactions.

Further, it is assumed that an increase in informal interactions between individuals is related to the design-reality gap during IS implementation in HCOs. This is done through communication and relying on each other to get information, share skills, support, comfort, etc. As discussed in section 3.5, the increased number of informal relationships amongst IS 'users' leads them to behave as a CAS, which eventually influences the adaptation, workflows, policies, and diffusion management, as discussed in section 3.5.

Proposition 2: Structured IS implementation influences informal behaviour during IS implementation.

Sub Proposition 3: 'Design-Reality gap' influences interdependences amongst users

It is proposed that the gap between the IS and the organisational reality creates an environment where individuals are compelled to seek support from each other. This arises because individuals are obligated to succeed in their job roles, but the limitations imposed by the design-reality gap provide them with no other opportunity.

The disruption of organisational routines resulting from IS implementation leads to a state of 'common fate' in HCOs, which Sensenbrenner and Portes (2018) highlights as bounded solidarity. As previously argued, uncertainty forces group members to increasingly provide comfort, information, assistance, and resources, which are essential to achieve organisational formalities for which they are responsible. In order to operate as a single entity to live and accomplish their goals, organisational actors interact more frequently as a result of the adoption of structured IS, much like CAS.

The IDAP model posits that interactions between staff members in HCOs are trust-based. Trust is the enabler in informal interactions. Staff members behave in ways that individuals seek knowledge, experience, and skills from trusted sources, who they believe are experiencing or experienced the same as them, or how their contribution will improve or enhance the context. The collective effort of individuals leads to testing new actions and behaviours. Behavioural trials and errors rise through such informal interactions and lead to change and innovation in the context of IS implementation.

Proposition 4: Interdependencies amongst IS users influence IS adaptation.

The IDAP model describes transforming a specified organisation into a deferred organisation. Correspondingly, specified IS needs to be transformed into deferred IS. Currently, IS that are implemented in the NHS are structured and specified. The problem with the specified IS is their inability to respond to organisational emergence. Structured IS design and implementations lead to emergence that results in IS adaptations. Individuals tend to work towards natural design (Patel 2006). By doing this in the framework of HCO, people attempt to improve the IS implementation to fit their intimately understood context.

Deferred action is the local action by actors in response to the emergence in the actual organisational environment. Making structured ISs adaptable can help organisational actors improve the outcome of the planned objectives or the results of structured IS. It enables HCOs to achieve their formal objectives, requiring a diffused management process. This entails modifying the behaviour of organisational actors and operational elements, such as workflows, routines, and the introduction of new feedback mechanisms, such as super user groups, as well as including diffusion management, which is the crucial management change required to support deferred action.

Proposition 5: Deferred Action influences IS implementation outcome

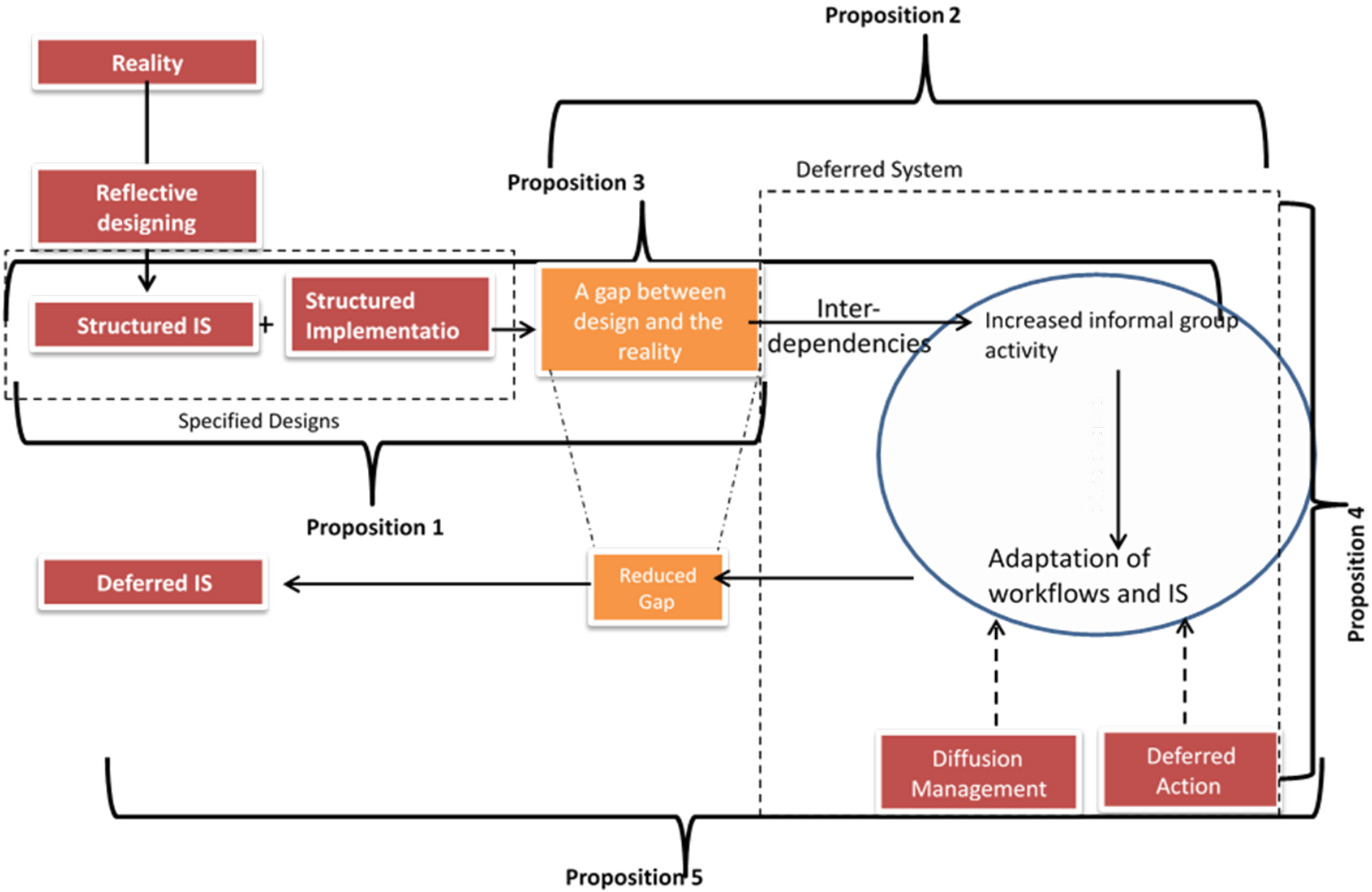

Figure 23:Informally-interactive Deferred Adaption Process (IDAP)

3.8 Theoretical Claims

The concept of the IDAP process has been derived and underpins 1. Complex Adaptive Systems 2. Theory of deferred actions. It bridges the behaviours of complex agents with Systems design theories. As described in chapter 2.10.1, designing is an abstraction process and art of using various tools, axioms, assumptions, and theories to create an artefact to change or alter reality. It is a structured process. The stability and predictability of the underlying design concepts depend on structured principles, assertions, and assumptions. Every design is designed in anticipation of an acerating outcome. However, designing as action and its outcomes occur in two different domains. One design in actuality with the help of tools and creativity, but these designs have to exist or operate in reality. The reality and actuality separates based on the design dimensions. Actuality is structured and predictable. However, the reality is much more complicated due to emergence. ToDA provides a theoretical basis to develop an artefact that could respond to emergence. As described in chapter 2, Emergence is ubiquitous in the world around us. ToDA-based deferred designs enable an artefact that could adapt and adjust to the changing realities.

The importance of ToDA is as below. IS systems are not just designed by humans but also operated and used by humans, and these interplays are non-deducible in nature. For example, in a society or business organisation, one's behaviour is different, unique, and non-deductible. If you remove a staff member from a factory floor, it will operate as usual and most probably produce the same. In organisations, informal relationships influence individual behaviour in addition to formal bureaucracy. Such behaviours and more complex and nuance. Individuals help each other in difficult situations. Their behaviour can be explained based on the CAS

and how deferred designed can utilise the self-organising behaviour to improve IS sustainability.

3.9 Summary

The IDAP model comprises a series of emergent processes that transform structured ISs designed for a specified organisational reality based on structured formalisms into a deferred IS. It has been argued that structured IS implementation leads to a design-reality gap because it is incongruent with organisational emergence. The design-reality gap influences individuals' utility in a given context, increasing their informal interactions to find local solutions. Trust and many other factors between individuals and their informal interactions drive the process to deferred IS by making work arounds, as depicted in the model, based on the individuals' natural tendency towards making designs closer to their 'natural system'. On the individual level, this process underpins the individuals' strive to increase their level of satisfaction, i.e., utility at a given point of time, by interacting with other colleagues informally to make their environment more favourable. Each emergent event instigates a series of informal interactions that lead to further emergence, which eventually increases the level of satisfaction, enhances the IS design and makes it more responsive to the emergence (see Figure 24).

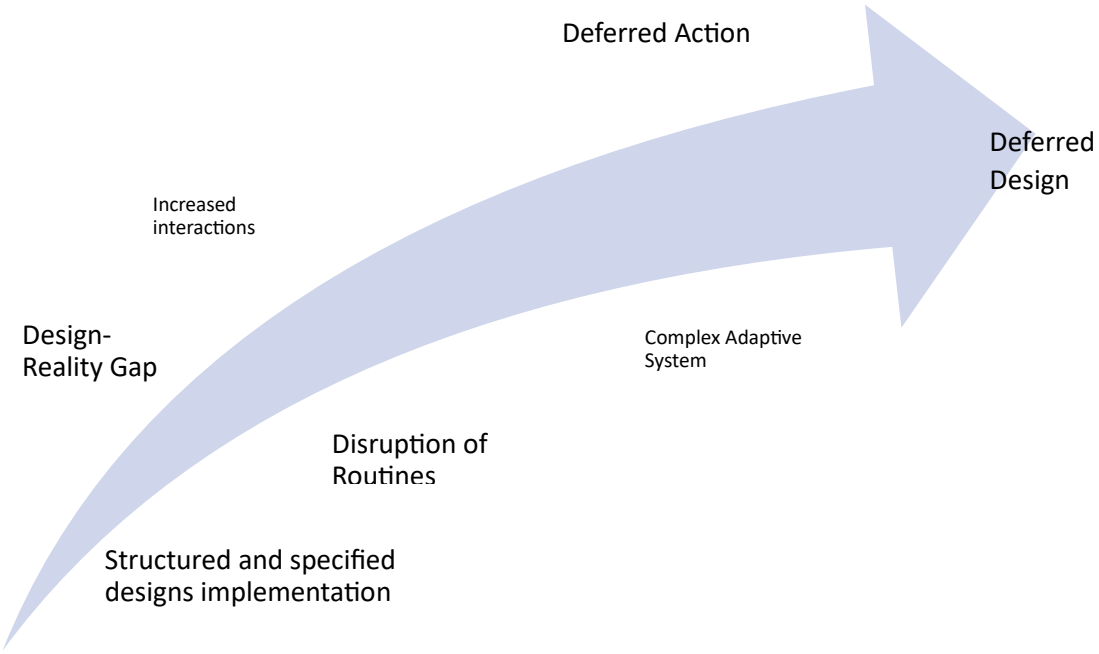

Figure 24 IDAP Model as a Series of Emergence

Chapter 4: Methodology

4.1 Introduction

This research concerns historical information system (IS) implementation projects introduced to GP practices and secondary care hospitals by the United Kingdom (UK) National Health Service (NHS), specifically those systems developed by SystemOne,[2] EMIS-WEB,[3] and Mede Analytics.[4] This chapter presents and justifies the research methodology devised for this study. The selection of a research methodology is a rational choice of the researcher (Eldabi *et al.*, 2002; Myers, 2019). It justifies the approach and the researcher's data collection and analysis methods which were chosen to explore the nature of informal relationships within complex adaptive IS systems, such as those deployed within the NHS. Research methodology reflects the researcher's ontological and epistemological stance and translates into practical aspects, that is, those procedures and practices that govern how research is conducted (Marczyk, DeMatteo and Festinger, 2010; Sarantakos, 2012).

To ensure the rigour, validity, and accuracy of data collection, the researcher based each and every step in the research on solid methodological principles (Eldabi *et al.*, 2002)). Prior to this, efforts were made to align the ontological and epistemological position of the research with the chosen research question (Myers, 2019), including consideration of the researcher's personal research 'position'. Hence, this chapter explains the justification for using the ethnographic interviews and participant observation method to investigate how structured IS

2 The Phoenix Partnership (Leeds) Ltd., UK.
3 EMIS Group plc., UK.
4 MedeAnalytics International Limited, UK.

implementations are affected by the emergence of informal groups within the NHS. Moreover, in addition to the theoretical and personal positioning, the chapter explores similar research in the literature and evaluates their methodological status and contribution to this research. Specifically investigating the suitability of the interpretive approach to investigate the research problem; the use of ethnographic interviews to understand information interactions and emergent behaviour; the use of NVivo to analyse the data, and evaluate thick description to analyse the data in this research.

4.1.1 Ontological and Epistemological Considerations

The notion of ontology refers to the researcher's claims and assumptions about reality (Moses and Knutsen, 2019, p. 1) in relation to the contexts and interactions of the research participants. Blaikie (1993, p. 6), pp. 6) suggests that ontology is 'the claims or assumptions the social enquiry makes about the nature of social reality.' It is about how each element and its' contexts and relationships exist and evolve based on certain conditions relevant to the researcher. It is the theory of being *in* a context: in this research, this context comprises people (employees), their places of work, and the information systems that they use in their everyday work.

Ontology describes (1) assumptions, propositions (Martin, 2014), and individuals' interpretation of social reality, that is, their recognition of aspects of the social world as either external, independent, or given and objectively real or socially constructed and subjectively experienced; (2) how individuals interact and behave in society; and (3) how beliefs of the researcher influence the structure and processes of organisational research (Martin, 2014; King, Brooks and Horrocks, 2018). Also, ontology focuses on problems concerning 'being human' in reality. Hence, in

summary, researcher's ontology closely relates to the possibility of (1) objectification of the research problem; (2) discusses the researcher's role as a participant and interpreter of the context, (3) limitations, and (4) shapes what counts as 'knowledge' during the research process and the 'contribution' of the research.

The fundamental understanding of reality can be broadly categorized into two main ontological perspectives: realist and interpretivist. Realist ontology posits that reality exists independently of human cognition(Johnson and Duberley, 2000, p. 180; King, Brooks and Horrocks, 2018). Scholars like (Johnson and Duberley, 2000, p. 180; King, Brooks and Horrocks, 2018) have discussed this perspective in detail, emphasizing the detachment of the observer from the observed context within the realist tradition (Martin, 2010). (Martin, 2010). The realist approach is prominent in physical research, for instance physics and laboratory tests, and assumes an objective reality. The assumption that there is a reality independent of the researcher makes the researcher disengage from its context. Indeed, the 'position' of the researcher, and the relationship between research participants and the research itself is considered minimally within realist research.[5]

In contrast, the foundation of interpretivist ontology is the presumption that reality is unstructured, diverse, and socially constructed (King, Brooks and Horrocks, 2018), where the researcher is an integral part of the whole. Interpretivism considers and acknowledges the complex nature of reality. This is why an interpretative research approach may be of value in healthcare-related contexts: interpretivism opens up the possibility of exploring nuanced and subjective aspects of healthcare delivery, including the employee experience, wider sociocultural influences, and ethical considerations. Furthermore, the overarching influence of law (for instance, data

[5] The concept of *critical realism* is discussed later in this chapter.

protection legislation) and extant organisational policies all serve to orchestrate employee behaviour. This makes the IS implementation in HCOs a unique exercise. Researchers have shown that intangible factors, such as financial issues, legal constraints, clinicians' IT literacy, confidence, and willingness (or lack thereof) to learn IT add into the complex reality then it significantly affects IS success(Greenhalgh *et al.*, 2008; Greenhalgh *et al.*, 2018), further justifying the use of an interpretative, rather than wholly realist, research approach.

The interpretivist approach also recognises the researcher's subjective interpretations of 'being in a certain context,' as a meaningful and sufficient account of the reality researched. Hence, the interpretivist researcher is also a subject in the study.

In interpretive research, the researcher's 'position' also plays a role in shaping the study's methodology (and findings). The researcher's background, experiences, values, and subjectivity may all influence how research questions are framed, methods chosen, data selected, and findings interpreted. As such, recognizing and addressing the researcher's position is an essential aspect of reflexivity, a concept central to interpretive research (Hammersley and Atkinson, 2019; Stenfors, Kajamaa and Bennett, 2020).

In terms of this research, the researcher is known to the GP Practices as he was aware of the socio economics, and known local IS issues to a certain extent, including their gender, race, ethnicity, class, and cultural background. Therefore, the researcher was not novice to the context and the area. However, the researcher tried to interpret the experiences through the eyes of the user and the interpretation was carried out without entangling with his own biases. Section 6.8 Reflexivity of the Researcher described this in detail.

Moreover, reflexivity demands self-awareness and critical reflection by the researcher on their own perspectives and biases as well as their role in the research process (Guba and Lincoln, 1989). Doing this is important to enriching the credibility and validity of their research. Therefore, the researcher strictly accepting the ontological position of ethnographic research, while distancing himself not to become a participant and bias.

This enables the researcher to provide a detailed interpretive account of the context containing respondents' stories and the researcher's mental interpretations of those stories based on his extensive experience in the NHS.

Extant research also serves to demonstrate the utility of interpretative approaches to IS-related research. For instance, Scott *et al.* (2005) study at Kaiser Permanente, Hawaii, to assess the experience of implementing an electronic medical record system used semi-structured interviews to identify critical events in the system implementation, the impact of organisational culture and leadership, and the effects on clinical practice and patient care processes as perceived by the IS users (Astuty and Pasaribu, 2021). A similar study conducted by Hendy *et al.* (2005) used case studies and 23 in-depth interviews to understand the sociocultural challenges of implementing the NPfIT. More recently, Afrizal *et al.* (2019) carried out a qualitative form of research was conducted in an urban area of Banten Province from February–April 2018.

Such interpretivist studies allow the researchers to obtain detailed accounts of individuals' interactions with the IS and each other concerning NPfIT. Furthermore, the interpretivist approach means establishing a deep connection with the subjects in their context, describing the research subject, its' existence, evolution, interactions and relevance to the researcher. Such a 'thick description' of social

behaviour (Geertz, 1973) reveals implicit rules and conventions that underpin social life (Avis, 2005), which is difficult to obtain in a realist study because the researcher is required and trained to disengage from the subjects and reality.

Most social research adopts the interpretive approach (Martin, 2014) because it enables the researcher to 'immerse' in a social setting and provide a subjective account of reality through experiencing and interacting with subjects in their context (Orlikowski and Baroudi, 1991; Myers, 2019; King, Brooks and Horrocks, 2018). Additionally, interpretivism enables researchers to understand reality intimately by establishing trust and friendships, issues or reciprocity with subjects (Johnson, Strange and Madden, 2010), which is impossible to understand in realist studies. Van der Geest and Finkler (2004) discussed the evolution and socio-cultural aspects of research in the healthcare context and analysed specific social characteristics that influence healthcare.

In addition to the two main ontological standpoints described above, researchers e.g., Roci *et al.* (2022) use social simulation and critical approaches. In terms of understanding human behaviour, simulation is becoming increasingly popular. Agent-based simulation (ABS) and cellular automata studies have emerged as new research paradigms. North and Macal (2007) regard it as the 'third way of doing science' as Axelrod (1997). Wu *et al.* (2008) demonstrate group behaviour in e-government projects based on ABS; North and Macal (2007) also used ABS to develop artificial customers in supermarket environments using NetLogo and Swarm. In a more recent study by Roci *et al.* (2022) used simulation to analyse IS implementation in manufacturing sector. Section 4.2.4 will discuss more details of this approach.

4.1.2 Ontology of IS Design and Implementation in Health Organisations

According to the literature, organisations are emergent (Lenz and Kuhn, 2004; Truex, Baskerville and Klein, 1999; Sindhwani *et al.*, 2019). The ontology of IS implementation in the NHS can be discussed by combining (1) the ontology of IS designs and their implementation approaches and (2) the ontology of health organisations as emergent organisations (Iivari, 2017a; Sidek and Martins, 2017; Soliman and Saurin, 2017a).

Information systems (IS) implemented in the NHS organisation are designed strictly for a specific and formal purpose, namely, to store health data, monitor patient outcomes, and increased the efficiency of care pathways; combined, all of these should contribute to improved patient outcomes (Greenhalgh *et al.*, 2017; Brennan, 2022). Each IS has specific objectives to achieves and a type of users to serve. Therefore, these are termed 'specified systems' implementation (Patel, 2006b). This means that the (1) ontology of IS design and implementation within business organisations is stemming from a realist's perspective, and (2) the IS model is based on organisational workflows which is based on abstraction of reality. This result the IS is not sensitive to any changes and does not reflect the emergent organisation. This invariant model of the IS and organisation imposes on actors and their work and deviates from the organisational reality.

Looking at this in a different angle, Patel (2009) highlights reflective designers assume that organisational reality is 'set and specific' design-specified artefacts. Reflexive designers adopt the realist epistemology, which assumes that (1) there are causal relationships and (2) that organisations are structured entities. The result is a static IS artefact, whereas the actual organisation ontology is emergent.

The irony is that the assumed ‘design’ ontology behind specified IS is opposed to the actual ontology of organisational life and the need for artefacts such as IS. Heeks (2006) and Heeks (2017) argues this is the ‘design reality-gap.’ This altogether questions the use of positivist epistemology and its assumed ontology in designing IS artefacts because of the lack of success and suitability in actual organisational contexts (Bassey, 1998; Bassey, Mulligan and Ojo, 2022). (Sections 2.8 and 2.8.1 discuss this in detail.)

‘IS success’ has been measured by ‘user satisfaction’ (DeLone and McLean, 2003; Keikhosrokiani *et al.*, 2020) and the successful attainment of project objectives. Bailey and Pearson (1983) defined user satisfaction as: ‘the sum of one's positive and negative reactions to a set of factors affecting the success of an information system.’ ‘Satisfaction’ is subjective by nature because it has a value component. This value is generated collectively in a context. Therefore, satisfaction is correctly described based on the interpretive paradigm. Thus, IS researchers’ epistemology is predominantly positivist and seeks to ‘measure’ satisfaction by collating individuals’ experiences and perception of the IS.

4.1.3 Ontology of Complex and Emergent Organisations

Organisational reality is complex. Complexity, in reality, is based on two foundational concepts: (1) non-linearity and (2) emergence (Holland, 2000; Turner and Baker, 2019). Structured approaches cannot model the reality of complexity and emergence due to the inability of deduce into smaller components and ubiquitousness. Because complexity underpins that ‘the whole is different from the sum of its parts’ (Kaplan and Maxwell, 2005). For an example, it is impossible to determine the individuals’ percentage contribution towards IS success. Secondly,

even the same organisation, IS implementation outcome might be different under different times and circumstances. This nature of organisational reality prevents positivist researchers to create a formula that leads to IS success. This is why Patel (2006b) considers emergence as intrinsic aspects of reality, in addition to space- -structure and time.

According to the literature health organisation like the NHS is complex and emergent, and complexity and emergence are fundamental to the existence and maintenance of the organisation and its structure (Lenz and Kuhn, 2004; Sindhwani *et al.*, 2019). Hence, without a doubt complexity and emergence form the focal concepts of this research. This position was not a choice for the research but imposed upon. The theoretical basis of complexity is holism (Corning, 2002). HCOs are holistic organisations. Care and recovery are outcome of collective effort of clinicians, technology, support staff, researchers, pharmacists and many others. Such holism in complex contexts means that the perceived causality between variables at the micro-level cannot provide an understanding of emergent reality at the macro-level (Agar, 2004).

IS implementation is not a smooth process. According to the literature, users resist IS implementation. Khoumbati, Themistocleous and Irani (2006) reveal how clinicians resisted IS implementation assuming the system would be difficult to use. Hence, it is crucial to understand their behaviour. Not all behaviours and interactions in hospitals are formal and follow organisational policies. Informal groups in an organisation behave similarly to CAS and demonstrate emergent behaviour with no explicit causal relationship (Book, 1045: in Anderson & Kogut B, 2007 pp8-10; Lissack, 1999). Such informal behaviours are part of organisational reality that needs to be investigated under this research. For an example, how personal and

informal relationships affect organisational decision making and processes. In particular how these affects IS implementation and use. It is an assumption that informal behaviour leads to CAS during IS implementation. If so, then, how individual elements collectively interact with their technical designs, and at the same time, consciously interact with each other to achieve specified objectives, needs to be understand as part of the study. Given these CASs give rise to changing and hard-to-predict patterns (Irani and Love, 2008) based on information processing and adaptation via learning and evolution (Mitchell, 2009) the research's ontological position must be compliant with this reality. Complex agents in health care organisations collect information on other staff members, organisational behaviour, politics, and technology in an organisational environment and react. Either use of an IS or ignore an IS by staff members are collective, conscious and evolving decisions. These are link to the survival, continuity of their service and existence in organisations.

4.2 Epistemological Stance

According to Popper, 'Epistemology is the logic of scientific discovery, which is a logical statement about the choice of methods' (Popper, 2015). Epistemology concerns knowledge about facts, things or phenomena and how to do things (Martin, 2014). Epistemology determines the research methodology for an investigation and is the philosophy for the knowledge generation process. Epistemology informs methodology for generating knowledge and justifies what constitutes proper knowledge (Sarantakos, 2012).

A researcher's ontological and epistemological position governs the methodological approach adopted and the data collection and analysis method used to examine the

phenomenon of interest and suggests the research methodology (Marczyk, DeMatteo and Festinger, 2010; Sarantakos, 2012). Epistemology also provides systematic criteria to construct a theory to understand phenomena, test its reliability in positivist research or, in the case of qualitative research, to evaluate its credibility, dependability, confirmability, transferability and reflexivity(Stenfors, Kajamaa and Bennett, 2020) (Stenfors, Kajamaa and Bennett, 2020); these concepts are returned to later in chapter 6.8 Reflexivity of the Researcher.

According to King, Brooks and Horrocks (2018), the classification of methodologies into a paradigm is based on:

1. Assumptions that the methodology makes about the world.

2. The kind of knowledge the methodology aims to produce.

3. How the methodology conceptualises the role of the researcher in the research process.

Hence, two epistemological traditions exist for the dyadic philosophies of knowledge: (1) positivistic and (2) phenomenological or interpretive (King, Brooks and Horrocks, 2018; Saunders, Lewis and Thornhill, 2009). Interpretivists argue that in sociological research, the knowledge of reality is socially constructed because researchers interpret reality based on their subjective judgments. Hence, data and information about the phenomenon under investigation are not the only factors determining research's knowledge generation. Interpretivist researchers interpret the data according to their preconceptions and interactions with the subjects, and their context affects the outcomes and even shapes the reality. By contrast, positivists believe that reality is the external condition of the researcher, and knowledge can be generated by externally observing and experiencing the

phenomenon under investigation. Hence, measurement and objectivity focus on positivism (Williamson, 2006), and subjectivity and interpretation are the core principles of the interpretive approach.

The research on complexity and CAS in social sciences, management, and IS starts from the methodological epistemology informed by the interpretive approach, because interpretivism acknowledges the complex social interrelationships between actors and their deep contexts. In contrast, the positivist approach based on the realist paradigm does not recognise actor's subjectivity but assumes that actors are objects analogous to physical objects. Hence, the positivist approach generates testable hypotheses, seeks verification and reproducible results, and pursues objective knowledge (Pope and Mays, 2020). However, researchers cannot use positivist methods to study complexity, emergence, and informal groups. Complex features (such as emergence and CAS) cannot be tested as hypotheses or verified and reproduced. Hence, it is problematic to investigate complexity in systems and organisation using positivism, which is based on Newtonian/Cartesian empiricism (Mikulecky, 2001).

However, the epistemological dyadic is not final, as there are other epistemologies for social scientists. These approaches do not fit neatly into either positivism or interpretivism. For example, critical realism, which originates in Marxism, and simulation use a realist approach and interpretive stance. Simulation has been categorised as a positivist approach due to its ontological and epistemological origin (see section 4.2.4.1).

Nyame-Asiamah (2013) adopted critical realism to study local actions in knowledge management. The main principle of critical realism is that the researcher adopts the subject's stance, usually experiencing oppression, and seeks an answer for

emancipation. Critical realists ask ‘What could it be?’ rather than ‘What is it?’ as Thomas (1993). According to Orlikowski and Baroudi (1991, p. 6), critical realism exposes ‘what are believed to be deep-seated, structural contradictions within social systems, thereby transforming these alienating and restrictive social conditions.’ Consequently, this paradigm may be important in understanding the system’s capacity to improve rather than test a framework based on positivism.

4.2.1 Interpretive Approach

In contemporary society and organisational research, the interpretive approach is the preferred epistemology (Orlikowski and Baroudi, 1991), and it has gained attraction from IS researchers. This is mainly because interpretivism collates rich qualitative data unique to a particular situation and context and includes the subjective validity of individuals and the researcher’s systematic and rigorous application of methodological appropriateness, a shift that is reflected in contemporary Information Science research (for example, (Sidek and Martins, 2017; Sligo *et al.*, 2017a; Greenhalgh *et al.*, 2018; Baryashaba *et al.*, 2019).

For interpretivists, knowledge is a socially constructed outcome interpreted by the participants based on their beliefs and values (Saunders, West and Usher, 2010). Therefore, interpretivist explanations and interpretations, i.e., knowledge, are culturally sensitive, valuable, unique, and subjective. This means interpretivists’ views of reality have many versions and pluralities (King, Brooks and Horrocks, 2018). This enables the researcher to capture the different views of certain phenomenon. An ideal method to investigate IT issues (Sidek and Martins, 2017; Sligo *et al.*, 2017a; Greenhalgh *et al.*, 2018; Baryashaba *et al.*, 2019). Because organisational reality is a description of different subjective accounts by many

individuals, staff members. Therefore, for an interpretive researcher, reality and the study are inseparable (Weber, 2004), and a researcher's account of reality is unique to the researcher. Researchers believe that this interpretive perspective helps to understand how IS users behave and how their informal relationships affect specified IS implementation, as interpreted by the researcher.

Data collection in an interpretive study depends on a researcher's experience, insight, knowledge of the context, observation, and 'sense' of a particular phenomenon or subject. Researchers judgmentally interpret the data. One can argue that the interpretation is unique to the subject and the researcher and biased. Consequently, compared to positivity study, society's general rules and external structures are not the expected outcome (King, Brooks and Horrocks, 2018). However, an interpretive study provides an 'in-depth' and 'rich' account of the 'context', and the meanings individuals attach to their actions and others' actions to draw the underlying reason for issues and problems. Applied to this study, such issues in understanding IS implementation in the NHS, care and medicine, and organisational actors' response to IS in the context of their set organisational routines and ways of working.

The interpretive researcher expects to develop a profound understanding as they immerse into the subject's life and context, becomes an integral part of the reality under investigation and becomes familiar with the actions and behaviours of the subjects, and experiences their stress, concerns, joy and, etc. (Oates, 2006). Therefore, the researcher argues that the interpretive definition of social reality is highly subjective (Burnell and Morgan, 1979; Collis *et al.*, 2003; Lindlof and Taylor, 2017). This is not a disadvantage as once the researcher immerses into an organisational setting, what he/she witness and experienced can be interpreted

more subjectively and meaningfully. This is useful to understand complex phenomenon like IS implementation.

Moreover, interpretivism generally study a limited number of subjects, focusing on improving the validity and insight of highly subjective research (Crouch and McKenzie, 2006). According to Hammersley (2016): an 'ethnographic study sample can be described as purposeful or purposive as the participants have specific knowledge or experience of interest to the researcher.' The definition of 'sample size' has positivist roots. However, the number of subjects under study in interpretivism research depends on (1) the number of participants in the group or subculture under investigation and (2) the 'gate keepers' or informants (Fetterman, 2019). Other factors (such as time, access, and finance) significantly determine participants. Chapter 4.7 describes data collection strategy in detail.

Moreover, interpretivists do not seek to arrive at general laws or theories. General laws are theories are not applicable to complex systems. Hence, there is no need to study many subjects as in positivist research to determine general knowledge. The selection of subjects for a study is a critical decision which the researcher takes during the research process. Hence, Hammersley and Mairs (2004, pp. 4-6) argue, 'Within qualitative research, the study sample is identified both at the start of the study and during the emergent research design; it may not be possible to fully specify the number of participants required at the start of the study.' Therefore, it is a subjective decision based on data saturation. This research interviewed 17 participants and data collection was stopped when there are no new themes emerged.

The present research argues that the researcher is not immune to the organisation reality of the subjects under study. Rather, they are an integral part and actively

contribute towards it. He or she has understanding and in-depth knowledge of the topics and settings because of their position within the organisation. Furthermore, it is argued that subjective knowledge and understanding of social organisation are essential for socially acceptable design. This researcher's position is expected to provide a deep and rich understanding of the subjects' behaviour, acceptance of IS implementation, the formation of informal groups, and consequent emergence. As the researcher is familiar with the NHS organisation by their membership of it, it will enable them to become familiar with the behaviour of IS users and their actions and become familiar with the context, enabling a deeper understanding of the meanings they attach to their actions. Such meanings exist in the minds of the subjects. What important is the reflections of the researcher at every stage and aware of his presence in the setting and try to minimise possible disturbance or alter the cause of actions under investigation.

4.2.2 Why Not Positivist Approach is Used

Positivism is a naturalist approach to understanding reality (King, Brooks and Horrocks, 2018) and the development of general laws to explain a phenomenon or event (King, Brooks and Horrocks, 2018) , and it aims the development of an objective study to understand reality.

Reductionism and deductive reasoning are at the foundation of positivism, which seeks to develop general theories (Popper, 2015) to demonstrate the natural world. (King, Brooks and Horrocks, 2018) explain that reductionism is a way of 'rationalising an approach.' Thus, deducing a causality is rational only where singularity is the basis of the hypothesis. However, such rationalisations are seldom,

as the singularity is not explicit in some natural science areas. Therefore, the development of general laws is not possible in social research.

In methodology, the positivist approach requires identifying and defining variables and systematically testing hypothetical relationships to deduce a general theory. Such reductionism consists of developing (1) sampling techniques, (2) conceptual models, (3) frameworks, and (4) testing hypotheses to prove the cause-and-effect relationship between variables (Williamson, 2006). Positivist research is suitable in the physical sciences, where phenomena exist naturally without the researcher's involvement, e.g., physical forces, electromagnetism, blood circulation, etc. However, when human actions are researched, positivist research unable to recognise the value of these actions.

Positivists acquire knowledge through questionnaires, mathematical modelling, experiments, econometrics, and simulations (Myers and Avison, 2002; Esposito *et al.*, 2020). Interpretivist techniques include conversations, experiences, and senses. Due to singularity, such methods are suitable in naturalist research; however, such application in social research is contentious.

Hence, the question for this research is how this method is suitable to investigate human behaviour, i.e., informal group behaviour during IS implementation. Since the subjects form a social organisation within its form into unpredictable informal groups, it is impossible to identify significant variables and form hypotheses for testing if it were even possible to test such hypotheses in complex NHS environment.

Also, the phenomena and variables in social research are not discrete, and there is no obvious causal relationship. Social organisation is living and contentious entity. The purpose of interaction and the method of achieving goals and accomplishing

work are social constructions. The meaning of both the purpose and methods of working exist in the minds of organisational individuals. They have their professional methods, ethics and boundaries. For an example, doctors' working methods and objectives are different to nurses and administrators. Further, these individuals assign their meaning to their actions and the actions of others and that these meanings have meaningful value. Hospital settings are complex social constructions. Therefore, the positivist ontology which holds that reality exists objectively and independently of human experience (King, Brooks and Horrocks, 2018) doesn't correctly reflect care setting.

4.2.3 What About Simulation

There is a growing trend toward using positivist methods like simulation, especially in complexity theory-based research, to understand the behaviour of self-organising agents (Gilbert and Troitzsch, 2005; Basori *et al.*, 2021). According to the literature, simulation has been widely used to understand human behaviour (Roci *et al.*, 2022), including staff behaviour (Wu *et al.*, 2008); supply chain optimisation and logistics (Cooper, Lambert and Pagh, 1997); consumer behaviour; crowd behaviour and market behaviour (Basori *et al.*, 2021); traffic congestion (Mahmud *et al.*, 2019); spread of epidemics (Ganyani, Faes and Hens, 2021); and growth and decline of civilisations and human immune system (Fertner, 2008).

Simulation has also been used in group formation and social network effects such as CAS (North and Macal, 2007; Roci *et al.*, 2022). Also, Fisher and Christie (2000) researched simulating the emergent behaviour of complex software-intensive organisations. The essential characteristic of such agent-based simulation is that it enables the researcher to model reality by designing agents to behave in a certain way by giving certain attributes, mimicking the behaviour of human agents operating

in specific contexts, and analysing their effect at the macro-level (Ganyani, Faes and Hens, 2021; Gilbert, 2019; Mahmud *et al.*, 2019). Consequently, simulation in social research has opened a new domain to model undesirable and complex social reality to minimise ethical and socio-technical restrictions on the researcher (Esposito *et al.*, 2020; Gilbert, 2019). As a result, some researchers (North and Macal, 2007; Axelrod, 1997) argue that agent-based simulation is the 'third way,' in addition to traditional inductive and deductive reasoning.

However, such reductionism and simplification of reality have ontological defects (Gilbert, 2019). The foundation of simulating social reality is the establishment of conceptual models (Law, Kelton and Kelton, 2007) that describes the rules on how agents interact with each other in different contexts. According to Robinson (2019); Esposito *et al.* (2020), such modelling is an over-simplification of reality; the development of conceptual models has defined as 'a non-software specific description of the simulation model that is to be developed, describing the objectives, inputs, outputs, content, assumptions and simplifications of the model. This results in reductionism similar to positivist studies. Such reductive simulation does not represent social reality; instead, it is an attempt to 'mimic' the conditions experienced by individuals and does not include the learning and experience of the researcher. Hence, it is an incomplete representation of reality (Robinson, 2019); Esposito *et al.* (2020) .

4.2.4 Other Quantitative Methods?

In addition to the simulation, many social science researchers also use positivist methods, such as statistical techniques often called quantitative methods to investigate IS/IT implementation in an organisation (Esposito *et al.*, 2020).

Quantitative techniques have been used to evaluate the cost-effectiveness of IT/IS investment and user satisfaction (Herbst *et al.*, 1999). However, it is commonly believed that the entire and complete impact of IT/IS implementations are tangible and accessible to statistical measures. For example, by introducing ISs, communication and control can be improved, capabilities can be enhanced, and competitive advantages can be obtained.

Table 11 summarises and compares the interpretive and positivist approaches based on seven dimensions. However, in reality, such distinctions are not explicit as other traditions, such as pragmatists, use mixed methods to understand social and socio-technical reality. It is argued that mixed methods enable understanding of context subjectively and objectively (Onwuegbuzie and Leech, 2005).

Domain	Interpretivist Approach	Positivist Approach
Ontology	Believe in multiple versions of reality	Believe in one version of reality
Method	Insight may be non-quantifiable. Tries to capture various properties and values and their inter relations, Hermeneutics and ethnographic methods	Cause and effect, Statistics and content analysis
Orientation	Subjective, Depending on the researcher's opinion	Objective and value free
Type of data	Qualitative and rich in contextual detail	Quantitative and rich in statistical value
Validity	Defensible knowledge claims	Certainty: data truly measures the reality
Reliability	Interpretive awareness: research recognise and address implications of their findings	Reliability, research claims can be re produced
Theory of Truth	Truth is an intentional fulfilment. Interpretation of research object match lived experience of object	Correspondence theory of truth: one to one mapping between research statements and reality

Table 11:Comparison of Interpretivist and Positivist Approaches

Source: Weber (2004)

4.3 Why Interpretive Approach Suits Research on Social Reality

This section explains how the interpretive approach is suitable for understanding complexity in social organisations and investigating the emergent phenomenon experienced and interpreted by organisational actors. Methodological analysis and justification for acknowledging that complexity and emergence are inherent in organisation reality and the daily experience of organisational actors. Moreover,

emergence is a crucial generative aspect of organisational actors' meanings of their actions and the actions of others, including those who introduce IS into organisational actors' work.

Emergence in the NHS is unexpected, challenging to predict, and ubiquitous (Truex, Baskerville and Klein, 1999; Lenz and Kuhn, 2004; Sindhwani *et al.*, 2019) and has irreducible properties (Randles, Zhu and Taleb-Bendiab, 2007). IS implementations make its reality even more ubiquitous. Due to its irreducible, it is impossible to simulate and predict emergent phenomena such as the formation of informal groups through microanalysis, nor can it be reduced to holism (Dyson, 2012). Emergence needs to be experienced or understood rather than having a piece of prior explicit knowledge. Hence, it could be categorised as posterior knowledge (Martin, 2014).

According to Stacey and Griffin (2005), individuals in social reality will form groups and have plans and actions to achieve their personal and group objectives. However, being in a group means individuals cannot pursue their plan in isolation nor plan their actions, rather, they inevitably become involved in group identity and behaviour. Hence, individuals' objectives are intrinsically tied to their colleagues' fundamental objectives. This is fundamental to informal groups. According to Elias (1971) and Stacey and Griffin (2005), this leads to an individual-level action-reflection-action process, which influences each other in-group identity. Consequently, complexity is best described as such individual group tied behaviour, and emergence in such a social group is difficult to predict, such as the researcher externally, but rather it needs to be internally experienced.

Interpretivism can better identify and investigate the ontology of the emergence of social groups than positivism. Interpretivism argues that social reality is the construction of situations in which individuals interact. According to interpretivism,

this social world exists outside of individuals' subjective minds. Furthermore, Burnell and Morgan (1979, p. 260) state that 'the social world is no more than the subjective construction of individual human beings who, through the development and use of common language and the interactions of everyday life, may create and sustain a social world of inter-subjectively shared meaning.' Therefore, interpretive knowledge is invaluable.

4.4 Ontology of IS Implementation in the NHS

Patel (2006) argues that reflective IS designs develop information systems based on process analysis. Reflexive IS designers, who are typically 'off-site' experts, do not share the same social world as the end-users as described in Chapter 2. These designers create systems using mathematically derived design formalisms and methods, such as entity-relationship or object-oriented models. According to Patel, these formal models of social organisations are limited to the dimension of space (S) within his SEST model (Patel, 2006, p. 160). Consequently, such designs are not interactive and fail to adapt to the dynamic and evolving social environment of an organisation. They are suitable only for stable, static workflows of little significance to organisational actors. For an example, GP ISs could not cater mothers who bring more than one child for seeing a doctor at the time of the research. These ISs were designed to cater one appointment for one patient only.

Healthcare IS users have distinct needs compared to other organisations. Healthcare professionals are ethically and professionally responsible for providing the best patient care, a consideration often overlooked in reflexive designing. Therefore, this research focuses on the specific needs of healthcare workers from IS. It is argued that the use of IS in healthcare is a socially constructed process

requiring an interpretive methodology. This approach questions organisational actors, their work context, purpose, and the meanings underlying their work. Latour (1987) emphasizes understanding people within their rich contexts. Consequently, the researcher asks specific questions about individuals, their knowledge, and experiences as part of the 'problematization' process (Latour, 1987) that arises from their presence in the environment as IS users. Interpretivism posits that the researcher's role is crucial to understanding social reality (Creswell and Poth, 2016; Martin, 2014). Therefore, actors' experiences in a social context provide a subjective interpretation rather than a physical perception of the 'real' material world.

Nyame-Asiamah (2013) further asserts that a researcher in a specific research context is an integral part of the study and is inherently linked to the subject of investigation. This perspective aligns with the concept of deferred action, where the researcher, being immersed in the context, can comprehend the emergence experienced by actors and the resulting deferment process, which leads to adaptations to emergence.

4.5 Justifying Interpretivism

Scientific philosophers and social scientists who study social reality have questioned the validity of a natural event test model based on Newtonian empiricism. Positivist epistemologies and research methods, while suitable for capturing linear and causal relationships in nature and testing variant theories, fall short in studying the complex interactions of individuals and groups in social organisations. Such interactions are inherently non-linear and imbued with deeply held values and meanings (Patel, 2007; Patel, 2003; Morçöl, 2001). The positivist approach, which assumes social reality is independent of the actors within it (Agar, 2004), cannot adequately study

such non-linear social interactions or understand 'emergence,' the phenomenological outcome of complex individual interactions.

To maintain the ‘linearity’ rooted in positivism, social researchers often create controlled environments and impose strict assumptions that differ significantly from actual social reality. This artificial approach has been criticized by scholars such as Tajfel *et al.* (1971) and Henshel (1980), who argue that it inadequately represents social phenomena. Popper (2015) highlights that this criticism is particularly relevant in social sciences and anthropology, where replicating social phenomena in laboratory conditions poses significant epistemological challenges. This critique is also pertinent to research on IS implementation, where understanding the emergent and holistic nature of phenomena is crucial. Consequently, there has been a growing interest in qualitative approaches that research natural conditions to understand emergence and complexity. This research builds on this tradition.

Quantitative methods based on positivism have been used to evaluate IS implementation but are limited because they cannot capture the complexity and emergence of human behavioural interactions (King, Brooks and Horrocks, 2018). These methods are useful in specific areas of IS evaluation, such as understanding user satisfaction, linear relationships in organisations, and testing IS functions in controlled environments. However, due to their positivist ontological stance, they fall short in capturing the emergent and complex phenomena inherent in social systems.

Emergent systems, such as societies, social organisations, and informal groups, are complex, unstructured, and diverse (King, Brooks, and Horrocks, 2018). Understanding this complexity requires an empirical approach that reflects the natural context through interpretive epistemology and qualitative data collection and analysis methods. These qualitative methods must capture the meanings people

attach to their experiences and the descriptions of social structures, events, and processes (Avis, 2005). Interpretivism and qualitative methods enable the study of social phenomena holistically rather than isolating individual factors.

Successful IS integration in organisational work is complex and time bound. Longitudinal qualitative methods (Currie and Guah, 2006) have been effectively used to investigate emergence in healthcare (Greenhalgh *et al.*, 2018; Greenhalgh *et al.*, 2008), particularly in IS introduction, distributed decision-making, and system inconsistencies. The integration of analytical software packages for qualitative data analysis (Jackson, 2020) has significantly improved the validity and acceptance of qualitative research methods over the past decade. These methods are now widely used in IS evaluation, especially in the health sector (Lynch, 2022). This has enhanced the effectiveness of ethnography as a qualitative method in capturing the socio-organisational aspects of IS implementation in specific contexts (Iyamu and Shaanika, 2019; Kaplan and Maxwell, 2005).

Therefore, qualitative ethnography is well-suited for studying the complexity and emergence of informal groups in IS implementation from both ontological and epistemological perspectives. It can reflect the holistic nature of IS implementation in the NHS and the emergence of informal groups in response, as it aligns with the ontology of complexity and emergence.

By adopting an interpretive methodology, this research aims to provide a deeper understanding of the socio-organisational dynamics that influence IS implementation. This approach not only addresses the limitations of positivist methods but also offers a more nuanced and contextually rich perspective on the interplay between technology and social systems within the NHS.

4.5.1 Ethnography and Theoretical Justification

Ethnography is suitable for studying deep-seated social phenomena, and its ontology is pluralistic and suggests subjective relativism. Interpretivism is a suitable epistemology to use to investigate such situations. Hence, ethnography could study people in natural and socio-technical settings (Schensul, Schensul and LeCompte, 2012; Sobo, Bowman and Gifford, 2008; Brewer, 2000). The ethnographic study draws out social and cultural patterns hidden in peoples' actions and meanings that inform their actions in living communities, institutions, and other social settings (Geertz, 1973). Such a pattern indicates persistent behaviour and can inform organisational design suitable for IS implementation.

It is argued that ethnography is philosophically closer to a paradigm than a method (Hammersley and Atkinson, 2019). Therefore, particular research methods used in realist and positivist research could be used in ethnographic research, i.e., to study the theoretical framework. In this research, the theoretical framework combines complexity theory and the theory of deferred action, which can be studied using ethnographic methods. Therefore, ethnography is used to investigate and understand the CAS behaviour of informal groups in the NHS during IS implementation.

Ethnographic research is based on the historical experiences of people as individuals and as social groups. The research seeks to explain and understand the meanings that people attach to their behaviour in the context of their present life and the environment they expect in the future. Therefore, the researcher has several issues that he can focus on, as shown in Figure 25.

Meaning	Social life is meaningful.
	Social actors engage one another and the environment in light of interpretation and understanding.
Context	Social actions and identities make sense in context.
	Phenomena cannot be analyzed separate from social and cultural context.
	Local cultures and subcultures must always be kept in mind.
Process	Social life involves changing, rather than fixed, structures.
	Identities are changeable.
	Meanings may be renegotiated or redefined.
Knowledgeable actors	Social actors are knowledgeable of their own culture.
	Social actors possess social competence and skill.
	Social actors use tacit knowledge to draw from in everyday life.
Rational actors	Social actors behave in a rational manner.
	No universal or context free criteria for rationality exists.

Figure 25:Fundamental Ideas of Ethnography

Source: Goodson and Vassar (2011, p. 2)

Although the ethnographic methods is simple compared to others, it still effectively captures the mundane relationships of phenomena (Miles and Huberman, 1994; Kline, 2022) and generates a subjective interpretation of daily social life (Miles and Huberman, 1994; Kline, 2022) . Ethnography has been used successfully to describe the subjective narratives of the complex interactions between individuals from different organisations, i.e., police officers, juveniles, probation officers, and parents (Das, 1983). In more recent study by Kline (2022) used ethnography to investigate health and immigration field. This study not just focuses on individuals but how different systems and organisational establishments operate. Ethnographic research techniques effectively represent the multiple and plural facets of reality, where a certain phenomenon is reflected in different accounts and means (Hammersley, 2016) by highlighting paradoxes, inconsistencies, and discontinuities in peoples' and community's behaviour (Hammersley, 2016).

Ethnographic studies enhance the understanding of complexity in social interactions and the efficiency of individuals' actions and have been used for healthcare organisation research (Goodison, Borycki and Kushniruk, 2019b). The diversity of

different kinds of data, is in ethnography to enable the researcher to provide a detailed description of the people, groups, and communities studied. Hence, a researcher's self-reflection could positively contribute to the research outcome, as such self-reflection is the researcher's engagement and dialogue with the context of the study. In one such example in Krieger (1983), ethnographic research on the lesbian community relied on different accounts of the data obtained by participant observation, interviews, and especially the researcher's diary that resulted in a literary interpretation of the community hidden patterns. Such multiple subjective and interpretive data sources enable the researcher to understand the holism of the situation obtained from different perspectives and viewpoints. This is crucial because different means of data have inherent richness and limitations, but they also provide a kind of triangulation favoured in positivism. However, in interpretivism, such multiple data sources are used to reveal multiple subjective situations, rather than determine objective reality (Iyamu and Shaanika, 2019).

To understand IS implementation, one needs to have this kind of knowledge and understanding of the daily working life of the NHS. Through subjective observations and interviews, ethnography captures the mysterious, hidden, or evasive phenomenon in everyday society (Leibing and McLean, 2007). It is proposed that complexity and emergence lend themselves well to such observations using the interview method for data collection. Furthermore, ethnographically informed interviews will enable the researcher to understand and gain rich insight into information flows, forms of information, and how individuals respond (interact) in reality (Drazen *et al.*, 2012), as individuals, in social groups, and organisationally; all aspects of IS that can be better investigated ethnographically (Klein and Myers, 1999). The use of ethnographically informed interviews to investigate IS

implementation can reveal the dilemmas, frustrations, routines, relationships, and risks of daily organisational life (Myers, 2019).

Such an integrative interpretivist approach is not new in healthcare (O'Reilly, 2009). Furthermore, post-modernist approaches that go beyond the almost simple subjectivity of ethnography have been used to unravel the impact of new technologies on work practices and organisational change (Mattarelli, Bertolotti and Macrì, 2013), especially in terms of the socio-technical perspective.

The longitudinal ethnographic approach provides valuable insights into how certain phenomena develop over time. In such studies, the researcher immerses herself in the situation for extended periods. Through personal experience of actors and engaging in dialogue, they understand why certain behaviours occur, and the underlying meaning actors attach to them. Ethnographic data collected through longitudinal methods reveal learning and adaptation in complex systems. Hence, as proposed for this study, it has been widely used in IS research in the NHS (Currie and Guah, 2006). In light of the above, it is evident that there is a growing trend in recognising these values of ethnography as a method in IS research.

4.5.2 Justification of the Approach

The study of IS implementation in complex healthcare organisations like the NHS requires an appropriate research methodology. The focus of this research on GP practice is suitable for an ethnographic research approach. Savage *et al.* (2017) argues for greater use of ethnography research in healthcare. Ethnography enables accessing the beliefs and practices of healthcare professionals, allowing these to be studied in the context of the GP practice.

Leung (2015) states that qualitative research in GP practice contributes as significantly as quantitative research, in areas such as psycho-social aspects of patientcare, health services provision, policy setting, and health administrations – as facilitated by health IS. IS implementation requires formal organisational implementation, but it is posited in this research that it gives rise to problems and informal groupings' experiences and reactions to implementation. However, informal groups and their potential for self-organising, as united entities in response to implementation, gives further rise to the design-reality gap during the IS implementation. As this study seeks to understand such informal groupings and their experiences in GP practice the ethnographic methodology is appropriate. Ethnography can provide rich understanding of the design-reality gap between formal organisational IS and the local reality of professional healthcare staff using it in context; the implementation of IS results in the emergence of informal interactions of staff members and how their localised actions influence the success of IS implementation in the NHS, on which ethnography can shed light.

As a branch of anthropology, ethnography is a qualitative research methodology where the researcher observes people and places of interest directly in situ. The researcher's interest is to study the viewpoints of the subjects of the study. Ethnography is a type of social research that investigates closely behaviour of people in a particular social situation and seeks to understand their own interpretation of their actions and behaviours; particularly the meaning they attach to such actions and behaviours. The result of an ethnographic research study is a written account of natural everyday behaviours of the subject group of interest that explains their actions, behaviours, and the meaning they attach to them (Hirsch and Gellner, 2020).

The use of ethnography in this study of the introduction of information systems in healthcare is justified for several reasons. As the study seeks to examine the introduction and use of new information systems, the routine ways in which healthcare professionals deal with patients is necessarily disrupted. One main reason for deploying ethnography is that it can shed light on the contextual barriers to healthcare improvement(Sobo, Bowman and Gifford, 2008). It can reveal the routine of healthcare professionals; it can show what happens and how it happens when they interact with their patients and need to use information systems to access patient data (Haines *et al.*, 2022).

Ethnography provides an in-depth understanding of healthcare professionals in healthcare research. Since the primary methods used by ethnographers include interviews, participant observation, and fieldwork, they enable the collection of rich data that can generate an in-depth understanding of healthcare professionals' actions and behaviours. Such data collection methods enable the capture of healthcare professionals meaning and ideas attached to their actions and behaviour.

A highly relevant reason for using ethnographic research is that it can provide valuable insights to product design teams (Persaud and Murphy, 2021). Since the study focuses on the implementation of healthcare information systems the findings of the study would be useful to NHS product design teams. Ethnography is commonly used in healthcare to provide valuable insights to product design teams. Ethnography can generate deep insight into the actuality of IS usage and professional healthcare professionals' experiences that other traditional research methodologies do not provide, especially positivist approaches. Similarly, ethnography is used because it can determine how to improve care and care

processes using information systems. Focused ethnography such as the current study of primary care by GP practices can provide meaningful and useful information.

An ethnographic study is uniquely suited to provide a specific cultural perspective. This study of GP practices is such a specific cultural perspective since the groups studied constitute a blend first and second-generation immigrant people from different cultures working in the context of the host UK. NHS and its complex organisation and its information systems. Such a focused ethnographic study can explore specific cultural nuances and perspectives held the sub-groups of people studied across the GP practices. The IDAP model reflects such a context-specific study and provides a problem-focused framework for which ethnography is suitable.

In Chapter 4.2.1, we delve into the valuable impact of the researcher's prior experience within the research setting on the efficacy of data collection. This experience plays a pivotal role in enhancing the depth and richness of data description. Given the researcher's intimate knowledge of the organisational environment, the data can be presented in a more personal and comprehensive manner. In some instances, the researcher's ability to exhibit positive and amicable gestures was instrumental in thawing initial reservations and fostering openness within the research setting.

Nonetheless, it is imperative to emphasize the importance of self-discipline in maintaining a delicate balance. The researcher must exercise caution to prevent overextending actions that might compromise their neutrality and shift them from an observer to an active participant. Therefore, a judicious approach is required to navigate this delicate equilibrium.

In conclusion, ethnography research methodology is appropriate for this research into the implementation of IS in healthcare, as it promises deep insights into the experiences and behaviours of participants, their actions, and the meanings they attach to them, whilst identifying contextual barriers to successful IS implementation.

4.6 Assessing the Quality of Qualitative Research

In general, qualitative research approaches like ethnography lack consensus about how to assess validity. A key issue in ethnographic research is to observe and gather data accurately about subjects as they work in organisations. LeCompte and Goetz (1982) address issues of reliability and validity with reference to their counterparts in experimental design. Validity and reliability of research findings of ethnography encompasses the whole process of observing subjects and gathering information about them in their workplace as well as the rigorous design of the study itself. So, validity in ethnography involves the study design, data collection methods, data analysis techniques, and presentation of findings. The presentation of findings is a written account that accurately reflects the context and the richness and depth of subjects' actions, behaviours, and meanings they attach to their actions. So, validity requires careful and close attention to potential 'contamination' of these research methods as well as the resultant data and taking measures in the study design to mitigate against it. In sum, validity seeks to ensure the research measures accurately what is intended to be measured.

Various approaches to ethnographic validity have been proposed. One is to judge the quality of the written account given by the researcher and the form in which it is written, rather than the contents (Leung, 2015). The written account encompasses the research methodology design and deployment and the written account itself. So,

validity means justifying the appropriateness of the processes, tools, and data used in relation to the research question. For this investigation the research question focuses on emergence and how it can be factored into IS design for successful implementation; consequently, the tools and processes required to collect valid data to achieve the research objectives need to be capable of capturing emergence. Emergence is a quality of the social groups of healthcare professional composing the GP practice. The GP practice context of the social groups of healthcare professionals is significant. The context sets and delimits their actions and their effects on patient care. Thus, ethnographic tools like in-depth interviews, in-situ periods of observation, and note-taking are suitable for capturing events, actions, behaviours, and meanings of subjects in their context.

The design and implementation of qualitative research can be made valid and rigours by following best practices (Johnson, Adkins and Chauvin, 2020). The research design, methods, and conclusions need to be replicable, explicit, public, and open to critique. ~~Crucially, they all need to be free of bias~~. The research design is explicitly elaborated in this chapter which is public and open to critique by the research supervisors and the examiners, as well alas other researchers who may read this dissertation. This chapter has set out the interpretative research epistemology adopted, and the qualitative ethnographic research methodology based on it has been elaborated. Readers can access both to review and critique. The research question has been stated clearly and focused on investigating the effect of emergence on the implementation of IS. The research question examining the effect of emergence on the successful implementation of IS in GP practice is supported by a strong conceptual framework - the informal-interactive deferred adaption process (IDAP). Crucially, both of these contribute to the selection of the interpretive research epistemology and appropriate qualitative research methods –

interviews, structured observation, and field notetaking. Collectively, this approach enhances the trustworthiness of the research and its findings and minimises the researcher's bias which is inherent in qualitative research methodologies.

Rigour concerns the quality of the research design, data collection and analysis methods, and conclusions (Johnson, Adkins and Chauvin, 2020). Such rigour is achieved when each element of the research methodology is transparent and systematically reported. These have been detailed in Section 4.3 to explain the appropriateness of ethnography to study complexity and emergence and in Section 4.6 to study informal groups. Rinaldo and Guhin (2022) argue that the ethnographic interviews are an especially useful for accessing different cultural modes. The appropriateness of using interviews to collect rich contextual data about the participants behaviours and experiences of their interaction with the IS implementation has been elaborated in Section 4.7 and 4.7.1. The use of fieldnotes has been explained in Section 4.9. Fieldnotes reflect the researcher's reflexivity and help to check bias when analysing the collected data. Rigour concerns data analysis too. The thick description data analysis techniques have been explicitly stated and explained in Section 4.8.

This research used researcher reflexivity and rigorous peer review to strengthen the rigour (Johnson, Adkins and Chauvin, 2020). The IDAP model was iteratively developed to ensure the conceptual framework was strong. The process involved reading complexity theory, emergence theory, and the theory of deferred action to identify constructs pertinent to the social groupings forming the GP practices where the fieldwork was to be conducted. These constructs were identified using the design-reality framework literature that is specifically developed for IS development and implementation. Throughout this process the research reflected on his own

views and opinions by discussing them with the research supervisors and colleagues at work. These discussions helped to identify crucial ideas and concepts that needed to be incorporated into the conceptual framework and exclude potential biases.

The significant challenges in securing the validity of ethnographic research have been addressed carefully in the research design. As ethnographic research is subjective, it is possible the researcher's interpretation of the collected data and information can be influenced by their own assumptions and biases. To reduce bias in the interviews the interview was designed with reference to the pre-developed conceptual framework, which was derived deductively from the relevant theoretical and empirical literature (Bergelson, Tracy and Takacs, 2022).

A pre-developed conceptual framework can indeed serve as a means to reduce bias in qualitative research by offering a structured lens through which to interpret data. In qualitative research, where subjectivity is an inherent concern, the use of a framework provides a systematic way to guide the research process, ensuring that the analysis remains aligned with the theoretical constructs and the research objectives (Bergelson, Tracy, and Takacs, 2022). This pre-development stage, particularly when it is derived deductively from existing literature, can minimize the risk of the researcher imposing personal biases on the data. It allows the researcher to draw upon established theories, ensuring that interpretations remain grounded in academic rigor and that the data is not interpreted based on personal inclinations but rather within the context of recognized theoretical perspectives (Blouin, Day and Pavlov, 2011).

However, it is essential to acknowledge that the application of a pre-developed framework may also introduce its own biases if not approached with reflexivity. The

danger lies in the potential for the framework to create a tunnel vision, whereby the researcher feels compelled to fit data into pre-established categories or constructs, thereby excluding emergent patterns that do not conform to the framework's predefined boundaries. This limitation is especially critical in fields that require exploration of complex, emergent phenomena, such as emergence theory and the study of informal interactions in the NHS context. By over-relying on a rigid framework, the researcher might overlook insights that are not initially anticipated by the model, leading to a form of 'confirmation bias' (Peters, 2022).

To mitigate this, it is imperative that the researcher remained reflexive throughout the study, continuously questioning the appropriateness of the framework as new data emerges. Plus, the data has been reviewed with the supervisor to understand the emerging themes and their relevance to the research. Engaging in such reviews, iterative adjustments to the framework, and reflecting on researcher's own assumptions and potential biases are crucial steps in ensuring that the framework serves as a tool for enhancing, rather than restricting, the research's validity and comprehensiveness. Therefore, while a pre-developed conceptual framework can provide structure and reduce potential bias, it must be employed with a flexible, open-minded approach that allows for the emergence of new insights that might fall outside its predefined scope.

Such challenges can be managed by improving the credibility of ethnographic research. The research methodology detailed in this chapter articulates the steps taken to ensure validity, reliability and rigour of the research design. Additionally, credibility of the research has been strengthened by using triangulation of interview data, observation, and field notes. The use of such multiple sources of data strengthens the validity and reliability of the data and subsequently the credibility of

the ethnographic account is improved. Credibility is also strengthened through the researcher reflexivity and being transparent. The researcher's epistemological and ontological stance have been detailed to offer full transparency to the reader. Further credibility is gained through the detailed account of the research design, data collection methods, and the written account and the report is honest and accurate (Johnson, Adkins and Chauvin, 2020).

4.7 Data Collection Strategy

Ethnographic research recognises the researcher's knowledge and utilisation in ethnographic research design (Crang and Cook, 2007). Also, it is believed that the researcher's field knowledge would be helpful in understanding key actors and 'gate keepers' (Fetterman, 2019). Hence, the initial contact points would be selected according to the researcher's experience and judgement, considering the individual's importance in the social context and impact on the IS implementation.

4.7.1 Why Interviews Were Chosen as a Method of Data Collection

As noted earlier, this theoretical framework aims to understand the emergence of informal groups during IS implementation based on the theory of deferred action. The theory of deferred action consists of observable aspects of IS design and implementation, the planned action, emergence, deferred action, and deferment formalism (Patel, 2006b). To observe these design dimensions in the setting of organisational actors, an in-depth questionnaire has been designed (Wilegoda-Wickramage and Patel, 2010). The resulting data is expected to reveal the richness of the settings, individuals' interpretation, and informal groups' emergence resulting from IS implementation. The accounts of individuals are expected to identify and

substantiate the ‘formation of CAS,’ reveal ‘emergence,’ and identify ‘deferred action’ arising from the impact of IS implementation.

Ethnographic interviews were designed. The researcher has developed a questionnaire that has been approved by the NHS Research Ethics Committee. It has been used only as a guide to steer the interview process and explore the following areas:

1. Expectations and experiences of IS
2. Context of interactions between the staff and their social network
3. Structure and cultural patterns in the system
4. Agents/subjects behaviour towards outside changes
5. Complex interaction
6. Formation of complex interactions and form CAS
7. Behaviour in the complex Adaptive system
8. Nature of relationships between members in CAS
9. Uncertainty leads towards bounded solidarity
10. Formal and informal response to IS implementation
11. Adaptation

The interview questions sought to elucidate the behavioural patterns of the respondents, the development of CAS, and formal and informal modifications to the implementation of IS. Also, some questions were directed at understanding how

individuals understood the IS, their expectations, their experiences during the processes of IS implementation, and how they responded to it.

No single specific IS implementation project was studied. The main reason is that the General Practices, and the Foundation trusts in the NHS are independent contractors commissioned by the Primary Care Trusts (PCT) in England. According to the NHS structure, the GPs and the Secondary Care Trusts can decide on selecting any IS provided by the Local Service Provider (LSP). Further, the researcher's prior knowledge and acquaintance with the context helped theorise the context under investigation and design and carry out the data collection (Hammersley and Atkinson, 2019). Crucially, the prior knowledge guided the selection of key individuals, i.e., gatekeepers and individuals who could make a valid contribution. The researcher's experience and previous engagement with the subjects helped gain access and collect data with less bureaucracy. Also, understanding the research context helped him cross-check the accuracy of the comments made by the subjects.

4.7.2 How Research Sites Were Chosen

Multiple sites were selected for this study to enhance the transferability of research findings, addressing the limitations of traditional single-site ethnography. Traditional single-site ethnography is often considered effective for studying homogeneously conceived conceptual units (Nadai and Maeder, 2005; Marcus, 1995). However, by incorporating a broader definition of 'locality' through multi-site ethnographic research, this study ensures that findings are more representative of the geographically dispersed NHS system as a whole (Marcus, 1995).

The selection criteria for research sites included accessibility, simplicity, unobtrusiveness, permissibility, and staff participation (Brewer, 2000). Participants were drawn from ten different Primary Care General Practices, one Inpatient Ward and a rehabilitation ward in the Central and North West London Mental Health Trust. According to Wood (1997), the items and places within the research settings provide valuable references to individuals' experiences, which enhances the credibility and quality of ethnographic data (O'Reilly, 2009). Therefore, interviews were conducted in natural settings, such as offices, to facilitate a more authentic exchange (Schensul, Schensul and LeCompte, 2012; Crang and Cook, 2007). Each in-depth interview lasted approximately an hour, allowing for detailed and comprehensive data collection.

Luton Primary Care Trust (PCT) was a pivotal site, providing healthcare services to Luton Borough's diverse and transient population in Bedfordshire, UK. With a population of 203,201 as of the 2011 census, Luton is known for its multiculturalism and socioeconomic diversity, which presents unique healthcare challenges and opportunities. In 2011, there were 29 GP practices in Luton, and data were collected from nine of these practices, including two single GP practices and several with multiple partners. These practices primarily used EMIS, SystemOne, Vision, and Synergy as their main information systems.

Central and North West London NHS Foundation Trust (CNWL) was another significant site, offering a wide range of mental health, community, and specialist services across London and its surrounding regions. Data from CNWL were collected from two distinct sites within the Hillingdon Borough: an Inpatient ward and a Rehab ward. The trust employed a unified information system for appointment

booking, patient administration, and clinical data recording, with the Jade information system implemented since 2005.

The multi-site approach in this study aimed to capture a wide range of experiences and interactions within the NHS. By selecting diverse and representative sites based on specific criteria, the research addressed the complex realities of IS implementation across different healthcare settings. This approach not only enhanced the generalizability of the findings but also provided deeper insights into the informal group dynamics and adaptive mechanisms within the NHS. The careful selection and contextual understanding of each site laid a solid foundation for comprehensively understanding the research context and the nuanced interactions within these healthcare environments.

4.7.3 Interview Method

Seventeen NHS employees were interviewed. Among them were four gatekeepers. They held critical roles, such as positions indicating their leading positions within their organisations and their role in influencing the success of the IS implementation. Their roles in the organisational context influenced how others would receive the introduction of IS. The actual organisational context was formed and shaped by them, as was the formation of the informal groupings.

As noted earlier, the interviewees were identified by the researcher's internal insight into the NHS. In the first instance, the researcher reflected on his experience to identify IS usage situations. This was a critical first step because actors' work needed to be done unhindered by organisational change caused by IS implementation. Perceived hindrance indicated issues arising or emerging. This

then formed the second step, identifying the issues by the organisational actors. These issues focus on the work to be done and the lack of appropriate meaning for the new IS. The focus on meaning was critical because it is significant to organisational actors' work. This formed the third step. The meaning actors assign to their behaviours is based on their understanding of their behaviour and colleagues' behaviour and the use of IS artifacts for their work. Thus, this involved understanding the informational needs of organisational actors based on their work and the suitability of the IS artefact.

The interview method is used in ethnography because it enables analysing, meaning that subjects attach to their actions (Fetterman, 2019; Cresswell, Williams and Sheikh, 2020). It enables an understanding of why actors take specific actions and how they organise their actions and the actions of others. This results in understanding the in-depth meaning of their actions. The interview method is used in ethnography to identify expert knowledge of actors, actors who influence the behaviour of others according to a shared meaning of their work. The interview method is also helpful for recording and analysing actors' subjective perspectives and collecting biographical life data, meaning their lives in the organisational context in which they work. Interviews result in an in-depth understanding of actors' behaviour and provide large qualitative sets of data to understand the causes of certain behaviours and the context in which they happened (Cresswell, Williams and Sheikh, 2020).

The semi-structured interviews focus the dialogue on the actors, their work, the issues arising from the new IS artefact, the meanings they seek from them, and their understanding of the new IS and its relationship to their work. Their work happens in a particular context and situations unique to their patients and their need for

patient information. This enables interpretive research to explain organisational actors' actions and meanings 'according to their subjective frame of reference' (Williamson, 2006).

Semi- structured interviews lead to openness (Karatsareas, 2022). This is because semi-structured questions are often open-ended, allowing participants to delve into their thoughts and ideas in detail, share their perspectives on the topic, discuss their experiences, and express themselves in their own words, free from a strictly structured framework (Karatsareas, 2022). This enables the respondent to be more open. Also, the researcher was then able to pursue revealing directions of questioning, depending on the information received from the interviewee's responses. The resulting data is significant because it provides context- and situation-specific and meaningful because it is focused on the respondent's actual organisational experiences of the IS artefact. Hence, a structured, in-depth interview is more valuable that other interview variants. The interviews were based on relevant questions that enabled the researcher to explore interesting themes arising from interviewees' responses. This format allows a researcher to use follow-up questions flexibly and question reordering to explore and obtain the required data. This provides context-rich data and enables the researcher to access the context.

The researcher created the trust to obtain the honest experiences of the interviewees. He avoided sensitive questions that might make the interviewee feel insecure about themselves or their job. For example, there were no questions about their superiors or their decisions. By obtaining interview data about their organisational life experiences, it is possible to establish logical relationships and check internal validity (Cresswell, Williams and Sheikh, 2020). As the interviewees kindly agreed, the interviews were conducted in their offices. This was a conscious

choice to preserve the professional and organisational context of the respondents, thereby being in context, rather than engendering a sense of separation from work in the new IS.

4.7.4 Recruitment of Participants

Within the GP practices, the primary contacts were the Practice Managers. This was because the practice manager served as the intermediary between the primary care trust, the commissioners, suppliers, doctors, nurses, receptionists, accountants, and all other stakeholders. Thus, the role of the practice manager inherently included gatekeeping responsibilities. Consequently, it was decided to conduct interviews with the practice managers as part of the research, as they possessed a comprehensive understanding of the IS implementation. However, the remaining staff members with relevant experience were observed as part of the participant observation. Additionally, other staff members were generally not directly involved in the IS implementation or did not extensively utilise the IS, unlike the Practice managers. In each GP practice, receptionists were primarily or secondarily responsible for using clinical IS. However, their involvement was typically limited to the appointment booking module, while secretaries primarily focused on care notes entry.

In the context of the secondary care ward IS research, all staff members were engaged with the IS, either in its implementation or its daily use. This encompassed Centre managers, nurses, HCAs, art therapists, community workers, each of whom had a unique and comprehensive perspective to offer.

The following table demonstrate the duration of each interview and the geographical type of their practices.

GP Practices

Practice ID	Job title	Minutes	Location
Practice 1	Practice Manager	134	Town centre
Practice 2	Practice Manager/GP	125	Suburb
Practice 3	Practice Manager/ GP	78	Town centre
Practice 4	Practice Manager	146	Semi-Rural
Practice 5	Practice Manager	90	Suburb
Practice 6	Practice Manager	78	Semi-Rural
Practice 7	Practice Manager	95	Rural
Practice 8	Practice Manager	118	Semi-Rural
Practice 9	Practice Manager	70	Suburb

Central and North West London NHS Trust

Site	Job Title	Minutes
Rehab ward	Activity Coordinator	54
Rehab ward	Care Coordinator	69
Inpatient ward	Caseload Manager.	56
Rehab ward	Centre Manager	65
Rehab ward	Clinical Secretary/Admin	60
Inpatient ward	In patient Administrator	52
Rehab ward	In patient HCA	55
Inpatient ward	Inpatient HCA	80

Table 12:Duration of Interviews and Practice Location Type

Furthermore, Appendix-I furnishes a detailed account of individuals, including their behaviour, along with excerpts from their interview responses. This elucidates the extent and diversity of coverage achieved during the data collection process.

4.7.5 Determining the Sample Size and Undertaking the Field Work

In qualitative research, the size of the sample is not as critical as it is in quantitative research, as the focus is on exploring the research question in depth rather than

aiming for statistical generalization (Carlsen and Glenton, 2011). The selection of participants is guided by the objective of the research and is often based on the relevance and insight they can offer, rather than obtaining a random or representative sample. As such, the selection process prioritizes participants who have relevant knowledge, involvement, credibility, and the ability to provide useful perspectives of the matter under investigation (Cleary, Horsfall and Hayter, 2014). Plus, how the research approach and engage with the participants to understand the phenomenon under investigation. Hence, the sampling process is influenced by two key factors: theoretical considerations and the natural circumstances that affect both the number of participants and the appropriateness of the data collection methods. This is deeply tied to the qualitative researcher's goal of gaining a thorough understanding of the phenomena under investigation, particularly in relation to social action theories, not to generalise across different contexts.

The number of participants needs to strike a balance. Too few participants may not allow for enough depth or breadth to adequately explore the topic (Cleary, Horsfall and Hayter, 2014), while too many could lead to overwhelming amounts of data that are difficult to manage (Sandelowski, 1995). Therefore, the number of participants is determined by data saturation and practical considerations such as accessibility, time constraints, and financial resources (Cleary, Horsfall and Hayter, 2014). Striking this balance is crucial for maintaining the research's focus and feasibility.

In this study, the focus is on deferred action theory and how structured information systems designs lead to deferred solutions through informal interactions among users within the NHS context. Reviewing relevant literature on this topic, the sample sizes for qualitative studies vary depending on the approach. For example, a phenomenological study by Muhammad and Wickramasinghe (2018) involved 14 participants, while grounded theory studies, such as one by Sidek and Martins

(2017), may include 11 participants to offer broader insights into underlying principles. Ethnographic studies, which explore the culture of a group, typically involve a larger sample size, with extensive data collection methods. Greenhalgh *et al.* (2018), for example, conducted 400 hours of ethnographic observation, 165 semi-structured interviews, and reviewed 200 documents. Case studies, such as the one by Ali (2020), might involve around 30 interviews. This means that, there is no standardized rule for sample size in qualitative research. Instead, it should be determined by the adequacy and appropriateness of the data to address the research objectives effectively.

The second factor that contributed towards sample size was the concept of data saturation, which finds its roots in grounded theory research. As Charmaz (2006) suggests, data collection can cease when a category or theme becomes saturated. In other words, when new data no longer yields fresh insights or unveils additional properties of the phenomenon under investigation, you have likely achieved a sufficient sample size. This approach emphasizes depth and richness of data over predefined participant numbers.

When it comes to how the interviewees are selected, purposeful sampling is a widely adopted strategy in qualitative research, particularly for identifying information-rich cases related to a specific phenomenon of interest, especially when resources are limited (Sidek and Martins, 2017). Various purposeful sampling methods exist, with criterion sampling being commonly used in implementation research. This method involves the identification and selection of participants or groups who possess knowledge or expertise related to the phenomenon under investigation. Bernard (2002) adds that, in addition to their expertise, individuals should also be willing and capable of articulating their experiences and emotions in a clear, communicative, and reflective manner. Therefore, researcher plays a critical role in choosing the

right method, designing sampling methodology and then identification of suitable participants.

~~In contrast, probabilistic sampling is employed to enhance the generalizability of research findings by reducing the potential for bias in participant selection and accounting for the possible influence of both known and unknown confounding factors.~~ Below table shows number of interviews conducted by different research articles in the renewed literature review.

Research Paper	Sampling Type	Number of Interviews
Sidek and Martins (2017)	Theoretical and purposive sampling.	11
Muhammad and Wickramasinghe (2018)	Snowball and chain sampling	14
Baryashabaet al, (2019)	Purposive sampling	10
Richardson, K. (2019)	Purposive sampling	22
Walravenet al, (2019)	Purposive sampling	17
Ali, G. (2020)	Purposive sampling	30
Walraven et al., (2020a)	Purposive sampling	10

Table 13: Sampling types and interviews

Although the researcher was not directly involved in the IS implementation, due to established working relationships, he was aware of certain issues faced by most GP Practices. The IS implementation was planned in two stages. In the first stage, initial training was provided for the urban GP practices, followed by the rollout of the new IS within 3-5 months. Subsequently, training was conducted for the remaining rural and suburban practices, with IS implementation also targeted within 3-5 months,

along with necessary support to facilitate the transition from the old system to the new one. However, due to IS development delays by the developer and infrastructure issues, some practices had to wait for over a year from their training date for IS implementation. Given this background information and the interconnections among GP practices, the sampling processes had to be in compliance with these challenges. This was verified against the project planning documents.

Based on the researcher's experience, GP practices could be categorized into three groups, taking into account their connections, involvement in various PCT projects, level of coordination, and the services they provided.

The first group comprised urban practices that considered themselves as the 'elite.' This close-knit set of GP Practices, whose practice managers were of White British descent, had a higher number of registered patients. Typically located in the town centre, they offered additional services to their patients for extra payments from the PCT. Their contracts, known as APMS contracts, were performance-based, unlike the GMC contracts at the time. They assumed leadership roles in all initiatives within the Practice Managers group.

The second group was situated just outside the town centre or within the town centre but was not actively involved in the Practice Managers group. They did not regularly attend meetings but maintained contacts with the leading practices in the town centre. These practices also provided additional services, but their patient list sizes were not as extensive as their counterparts in the elite practices. Notably, the principal GP in this group was not always of White British descent but enjoyed a strong reputation within the local health communities due to active participation in health events.

The third group exhibited limited participation in Practice Managers events and consisted primarily of rural or semi-rural practices. They maintained close relationships with local communities, and their practice managers were known for their strength and independence. They made decisions autonomously and did not lag behind the elite practices. Instead, they directly liaised with the PCT to participate in various events and programs.

Below diagram demonstrate the position of each GP practice in relation to its connections with GP Practice Managers meeting and their connections with each other.

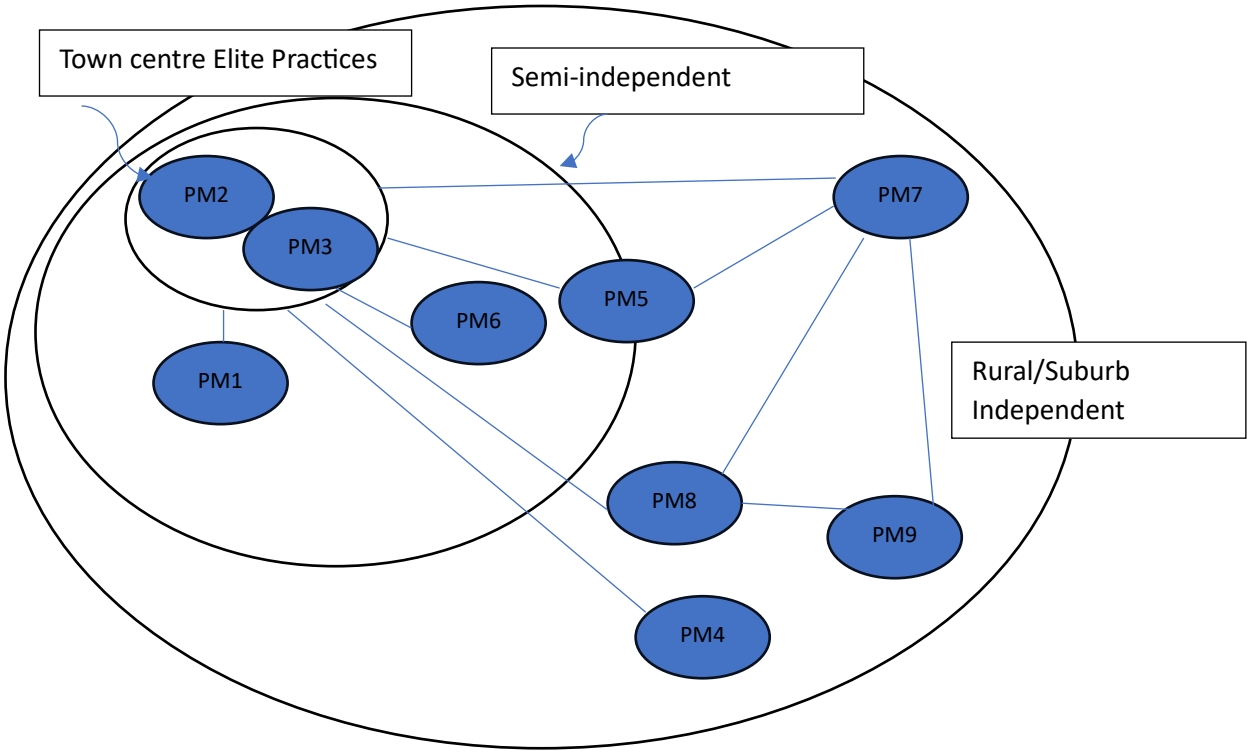

Figure 26:- Practice Managers, Their Practice Geography and High-level Relationships

An invitation letter was dispatched to all 29 GP Practices within the Luton PCT at that time. Among them, five GP practice managers responded: two from the Elite practices, one from the rural independent category, and two from practices closely affiliated with the elite practices. Additionally, another four practice managers were selected based on the information they provided during the interview process.

Consequently, this sampling approach was purposeful, incorporating elements of snowball sampling.

The duration of in-depth interviews ranged from 1 hour and 15 minutes to 2 hours and 15 minutes on average. The invitation letter was addressed to the practice managers for the purpose of conducting in-depth interviews. Of the nine who replied, two practice managers were also practicing GPs and were concurrently fulfilling the role of practice managers. Interviews were conducted with each of them, lasting between 1.5 to 2 hours, at their respective workplaces.

Regarding data collection for the secondary care research, Hillingdon borough was chosen due to its proximity to the university and a decision made by the NHS organisation. To encourage participation in the research, a leaflet was placed at the main communication point, typically the kitchen. Furthermore, an email was sent by the management to all staff members, informing them about the research and requesting their cooperation and participation. During the ward meeting, the ward manager also mentioned the research to all present. Eight staff members responded positively and provided informed consent to participate in the research, and interviews with them were conducted during their office hours.

4.8 Data Collection Methodology and Analysis

The interviews were recorded using a voice recorder and transcribed into NVivo alongside the participant observation data. Rather than adhering strictly to the verbatim content, data coding was approached with a focus on collective meaning, aiming to extract the essence of the information. This entailed the systematic breakdown of the data into more manageable segments, followed by the assignment of descriptive codes that encapsulated the core concepts within each interview or

participant observation segment. After the initial coding phase, related codes were systematically grouped together, with a keen eye on identifying commonalities, disparities, and recurring themes. The constant comparison method was employed to meticulously examine these similarities, differences, and recurring concepts by comparing newly acquired data with the previously coded material. These patterns, whether similarities, differences, or recurring concepts, were then meticulously defined. These defined themes underwent repeated scrutiny, including a comparison with data obtained from other sources, such as participant observations. Notably, the refined themes were triangulated with those derived from participant observations, resulting in a distinctive set of themes that directly pertained to the research objectives.

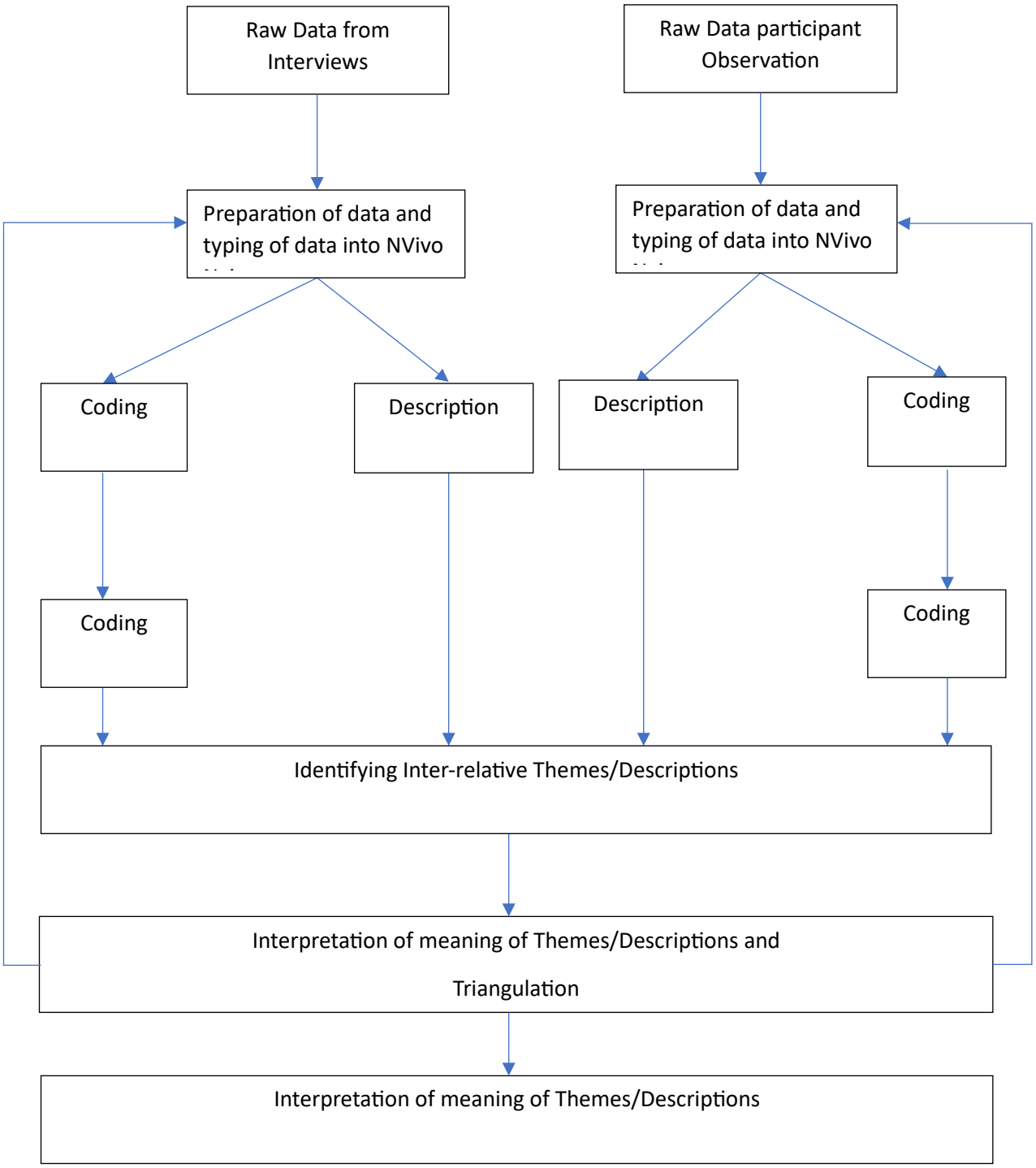

Figure 27: Data Analysis

4.8.1 Documentary Analysis

The analysis of documentary materials in this project was constrained to the documents provided to stakeholders and those accumulated or crafted by the

project implementation teams. These encompassed various forms of communication, such as emails dispatched to practice managers and doctors, as well as records from the technical subcommittee meetings. The aim was to gain insights into the organisational structure, communication protocols, bureaucratic elements, power dynamics within the IS implementation program, methods of interaction with GP practices, data collection procedures, requisites, and business processes. Additionally, the level of engagement in the implementation and planning stages, as well as the execution of training activities, were examined.

The following is a list of the scrutinized documents:

Initial documentation pertaining to the establishment of the IT implementation steering group.

- The first two sets of minutes from the steering group meetings.
- Minutes from the technical implementation subcommittee.
- Emails dispatched to practice managers concerning training.
- Care pathway analysis

It is important to note that due to data limitations and the restricted number of analysed documents, the information was not input into NVIVO. Instead, these data served to enhance and corroborate the findings obtained from interviews and participant observations. For instance, interviews revealed that the IS implementation training spanned over a year, and the examined documentation elucidated the causes of delays, encompassing administrative, design-related, and infrastructure issues. These findings were prominently featured in Chapter 5, alongside other qualitative insights.

4.8.2 Participant Observation Method

Participant observation is carried out to collect data on how the staff members interact with the IS and patients and the context objectively. The researcher acted as an observer rather than a participant by following a fine line. On many occasions, the researcher made the difficult decision not to intervene but to observe the situation. The researcher used a field notebook to capture the contextual details and the behaviour of the staff members. These data include the environment of the GP practice where the staff members work, the surrounding environment, their clothes, how they talk, and anything the researcher finds helpful in cross-validate the findings of the interviews.

Participant observations were carried out over 2 weeks period in CNWL and 5-6 hours every day visiting and shadowing the individuals. The work started 8.30 am in the morning and attending the hand over meeting in the kitchen. Then, various other individuals including receptionists were observed. However, no participant observations were carried out inside the patient area.

In GP practices, participant observations were carried out in reception are and the administrator rooms and practice manager rooms over one week period. Mostly the admin rooms were shared by practice secretaries, administrators and sometimes by Practice managers. Therefore, it was easier to understand their interactions in-between. During the participant observation, following a wide range of information and aspects of the observed context.

1. **Behaviour and Actions:** Observe and documented the actions, routines and behaviours of the participants, this included doctors, nurses, psychologists and care coordinators. This includes what they discuss, how they do things, when they do and why in relation to the IS and care pathways. Also, both verbal and non-verbal

communication communicative acts were documented. This included what the dressed, their language in between them, how they addressed each other and etc in order to give cultural perspective to their communicative acts.

2. **Interactions and Relationships**: Noted the interactions between individuals or their groups. Especially at daily handover meeting or exchanges at the admin rooms. Example, leaving a new patient registration from on administrator's desk initiate a new task for the administrator. However, it was always reinformed by verbale or in written confirmation from the one who left it at the first place. Observed how people relate to each other, including their body language, tone of voice, and the dynamics of their relationships.

3. **Context and Setting**: Noted down the physical environment and setting in detail. Document the location, layout, decor, and any relevant objects or artifacts. For example, some administrators still keeping their long dysfunctional desktop computers which could hardly use. Also, considered how the physical environment influences their behaviour in terms of proximity.

4. **Roles and Status**: Identified, described the roles and statuses of the participants. Who holds positions of authority, leadership, or influence. Also, how others demonstrate and behave in front of power.

5. **Language and Communication**: Recorded conversations, dialogues, and any unique language or terminology used within the group or community. Note any patterns of communication or linguistic nuances. For example, some Asian administrators calling their Practice Managers as 'didi'.

6. **Emotions and Feelings**: Attempted to understand the emotional states of the participants. Documented expressions of joy, frustration, tension, enthusiasm, and any other emotions that may be relevant.

7. **Rituals and Traditions**: If applicable, documented any rituals, traditions, or ceremonies that taken place within the observed context. Understand their significance and how they contribute to the culture. For an example going for shopping and cafes.

8. **Conflicts and Tensions**: Noted any conflicts or tensions that arise during the observation. Document the nature of these conflicts and how they were resolved or managed. Tensions at GP practice reception halls were noted and used in Chapter 5.

9. **Patterns and Trends**: Looked for recurring patterns, routines and trends in behaviour or interactions. Some consistent routines or norms shaped informal group's behaviour and key to the care processes.

10. **Own Experiences**: Personal reflects were noted after each session. Personal observations and reactions provided valuable insights into the context. Especially giving meaning to some nuance behaviours and actions of the participants.

11. **Time and Duration**: Recorded the duration of each observation session and the times at which those were conducted. This can helped identify where informal and formal relationship intertwine with each other.

12. **Triangulation or confirmation**: Whenever possible, corroborated the observations with qualitative interviews, existing documents, to ensure the reliability and validity of findings. This was done with the documented analysed as part of the study and also corroborated against ethnographic interviews.

4.8.3 Data Analysis Technique- Thick Description

The phrase ‘thick description’ originates from the metaphysical philosopher Gilbert Ryle’s intellectual work (Ponterotto, 2006). A ‘thin’ description would provide a

superficial description, e.g., a golfer practising shots to the green. A 'thick' description would ascribe meaning to the action of practising. The behaviour occurs because of the context of the golf course and the game of golf. Crucially, it ascribes thinking and intentionality to the practice. The golfer is practising in anticipation of a future, real golf game and expects that the practice will improve his chance of winning the game. Intentionality about the present and future is thus ascribed to the practice.

Geertz (1973) referenced Ryle, noting that ethnography does not consist of the data collection techniques but rather the 'intellectual effort' that results in 'thick description.' Whereas Ryle used the term 'thick,' Geertz added the word 'description,' resulting in the widespread use of the data analysis technique now known as 'thick description.' He believed that anthropological writing is the researcher constructing other people's reality. As Denzin then notes:

> '*A thick description … does more than record what a person is doing. It goes beyond mere fact and surface appearances. It presents detail, context, emotion, and the webs of social relationships that join persons to one another. Thick description evokes emotionality and self-feelings. It inserts history into experience. It establishes the significance of an experience, or the sequence of events, for the person or persons in question. In thick description, the voices, feelings, actions, and meanings of interacting individuals are heard.*'
>
> Denzin (2001, p. 83)

The interviews were conducted and transcribed. The recording was transcribed shortly after the interviews to ensure that the fresh experience of the researcher was recorded. Interviews were done in person. Data collected by participant observations and ethnographic interviews shows how individuals behave during IS implementation, especially their interactions through informal connections to make

the IS and the organisational context more meaningful and productive. Given the context and interactions between the staff members, finding a suitable analysis method that sits within the ethnographic domain was challenging. The data collected through participant observations and interviews is a significant detailed account of what was happening during the IS implementation. This provided an opportunity to understand how complex interrelationships lead to emergent phenomena occur. Non-deducible phenomena such as complexity and emergence can be understood by analysing actors' experiences using their own detailed account of events and context.

In addition, a thick description is simple enough for a non-specialist to understand the analysis. It takes the reader on a research journey through the researcher's view. It presents detail, context, emotion, and the webs of social relationships that join persons to one another. Thick description evokes an emotionality and a sense of self in the situation (Denzin, 2001, p. 83). The complex relationships and staff's local actions could be understood by taking the reader on a journey where he could see the situation through the 'eyes' of the respondents.

4.8.4 Use of Fieldnotes

The research used data collected on field notes. Field notes were taken during the participant observation as in other ethnographic research. Each note depicts a detailed account of what was observed, experienced, and felt during the research data collection. This made it considerably richer and detailed than what was observed and heard throughout the research or what was learned via interviews. Also, the notes were taken with an objective in mind, not with an empty mind. Therefore, it describes why, where, who, what, when and then the cumulation

reflects how a certain event occurred. Dinesh (2016) used a similar method to analyse the refugees in various conflicts. If the ethnographer relied on interviews only, it would have missed vast amounts of contextual information in addressing why a certain event happened and how it happened. A combination of field notes and interviews have provided detailed insight into not just what happened but why and how a certain event evolved. This was achieved by objectively taking notes at the action's time with respect to Spradley (2016) guidance, i.e., space, actor, activity, object, act, event, time, goal and feelings.

It was a challenge to determine what 'what' links to the IS implementation at the time of note taking, however, researchers captured almost everything that happened at the time of the participant observation. For example, the researcher was unsure how 'number of times staff members come and go from the Practice manager's office' would help the research. But such records about nuance behavioural patterns, trends and properties helped understand the power dynamics within the GP practices.

Note-taking was performed overtly but not disrupted or at least to have minimal disruption to the field dynamics properties and actors. Unlike Humphreys (1975), who performed covert note taking on homosexual behaviour was not considered. Staff members were told as such prior to the observations. However, assured that notes are taken to record the event and the actors without their private information. For example, to identify each staff member by a code rather than their names. Also, notes were completed before the researcher left the GP practice for the day to minimise any chances of missing valuable data. For example, it was difficult or not practical to take notes when the researcher 'shadowed' participants. Having dedicated time at the end of the day helped to complete the notes, and secondly, it

was an opportunity to revise the experience to make sure what was captured ‘make sense’ to readers. This is, according to Geertz (1973, p. 19), ‘turns it from a passing event, which exists only in its moment of occurrence, into an account, which exists in its inscription and can be reconsulted’.

The reflections of notes were used to strengthen the findings of the interviews. Rather than using just a narrative with direct quotes, field notes were used, similar to a dialogue explaining the context with different views. The aim was to enrich the qualitative experience and readability. The style was similar to Walsh-Dilley (2020) paper on ‘Resilience compromised: Producing vulnerability to climate and market among quinoa producers in Southwestern Bolivia’ or classic Gheertz’s approach. The writer brings a third- or fourth-person’s view to the discussion, enabling the reader to get a deeper ethnographic experience by immersing in the research context through the eyes of the researcher.

4.8.5 NVivo Data Analysing Tool

The quality of qualitative data analysis relies heavily on comprehensive data collection, reliability, and the interpretability of the data analysis. As Coffey and Coffey and Atkinson (1996) have noted, unlike quantitative data analysis software that uses statistical codes, no specific software performs qualitative analysis automatically. Thus, the quality of qualitative analysis, even when using software packages, depends on the skill and artistry of the researcher. This makes NVivo particularly suitable for analysing ethnographic data, as it facilitates the generation of thick descriptions that capture the nuances communicated by interviewees and interpreted by the researcher, which was one of the key reasons why NVivo was used in this research.

NVivo supports researchers by providing a range of tools for data management, idea management, querying data, and reporting and modelling data (Jackson, Bazeley and Bazeley, 2019). It is important to note that NVivo is a data organisation tool rather than a data analysis technology. It can be used to efficiently organize and interrogate data sets, allowing the researcher to slice, dice, and re-join data to build conceptual understanding, particularly useful for hypothesis testing similar to this research. By automating data handling, NVivo enhances the efficiency of qualitative data analysis, enabling researchers to perform a full set of data analysis procedures and make their interpretations, compared to manual analysis. This structured and methodical approach helps researcher work methodically, leading to rigorous analysis (Jackson, Bazeley and Bazeley, 2019). section 4.8 Data Collection Methodology and Analysis and the Figure 27: Data Analysis in page 210 discuss this in detail.

Qualitative data is rich in contextual descriptions of participants' actions and their meanings as articulated in their responses to interview questions and behaviour patterns captured during the participant observations. This data, which contains detailed information, relationships, behaviours, routines, and attributes of events collected during interviews, participant observation, and document analysis, can be recorded in NVivo and then analysed as part of the data collection methodology and analysis. Furthermore, NVivo provides easy and quick access to the data, allowing researchers to construct conceptual knowledge based on the richness of their own experience generated during the study. As Geertz (1973) stated, this process of conceptualization requires interpreting the data to build a deep understanding of the social phenomena under study, in which NVivo facilitates immensely.

NVivo also allows for the speedy and efficient coding of data, which is a critical part of qualitative analysis. Coding involves organizing the data into categories that represent different themes or concepts. This process helps researchers identify patterns and relationships within the data, which can then be used to develop theories and insights. NVivo's visualization tools, such as word clouds and charts, aid in identifying these patterns and presenting the data in a clear and understandable manner.

In conclusion, NVivo is a powerful tool that enhances the efficiency and rigor of qualitative data analysis compared to manually coding and managing data, which takes a considerable amount of time and effort and could lead to errors. By providing robust data management and analysis capabilities, NVivo enables the researcher to conduct thorough and methodical qualitative analysis, leading to deeper insights and a better understanding of the research problem.

4.9 Limitations of the Study

Ethnographic research usually does not require the practical application of the acquired knowledge. If it were the study's case, then for this study, the ethnographic method would be a limitation. However, the key issue of this research is related to critical praxis because the research involves practical issues of IS implementation in NHS organisations.

Each research must answer the question or for whom the resulting knowledge is intended. While ethnography certainly results in describing IS implementation richly in its context, for the case of this research, it may rightly be expected that we move beyond the need of the ethnographic researcher and his academic community,

where he seeks to demonstrate a contribution to knowledge. As Enslin (1994, p. 552) comments:

> *We must actively consider ways to close the gap between those who write, those who read, and those who are written about.*

This means, the research contribution should apply to other NHS organisations, possibly to other business organisations. In another word, this is about the transferability of findings. This would typically be considered a limitation in qualitative research. However, qualitative research, especially 'Thick' description, is rich in situational knowledge. Situational knowledge is specifically applicable to the particular location in space and time it arose. To improve the transferability the research findings, data was captured from a diverse array of NHS organisations, which represent various socio-cultural backgrounds of GP practice and hospitals. The resulting knowledge represents the cultural, structural, and functional diversity of the NHS, organisational context, and the characteristics of the NHS staff members.

Secondly, a logical argument could be levelled that ethnography's fundamental precept is that social life, as in organisational life, involves changing structures and is not fixed. Therefore, any resulting knowledge will become outdated at some point. Social structures change, but the pace of change is arguably imperceptible for the present actor, and any resulting knowledge is indeed timely for intervention if so desired.

Thirdly there is memory loss to some degree in any qualitative research. The researcher has memory loss as a result of the delay between questioning

respondents and writing down notes. Voice recording and filed notes were taken to minimise the impact.

4.10: Ethics and Privacy

It is the overarching duty of the researcher to protect participants, practise safely, and uphold the integrity of the data that are collected, stored and analysed. Ethical considerations and privacy protections were paramount to ensure that the research was conducted with integrity, respect for participants, and adherence to legal standards. This chapter addresses various aspects of process ethics, including governance, application procedures, approval processes, consent forms, GDPR compliance (*Regulation (EU) 2016/679 of the European Parliament and of the Council*, 2016), and data storage, all of which were crucial for maintaining the credibility and ethical standards of the research project.

Before starting the research project, the researcher carefully evaluated potential harm to anyone involved, which was discussed and highlighted in the IRAS application (page- 450). Comprehensive information was provided to reviewers, ethical board members, and participants to help them fully understand the scope of the research. R&D approval was obtained (page- 445) from Central and North West London NHS and from the university (page- 446). Further research vetting was carried out a form of a pre-engagement check (page- 449). Participants were informed about the research's purpose, approach, data collection, and processing methods. The head researcher made contact details available for any complaints or ethical issues, which were to be addressed through the university ethics board (page- 447). Prior to interviews, participants were informed about the research's

purpose, intentions, and goals, and permission to record the interviews was obtained.

Confidentiality of all research subjects was strictly maintained, including data related to race, ethnicity, religion, politics, health, or sexual orientation. Personal data were collected solely for the study and not for any other purpose, ensuring no extraneous personal data were gathered. Data relating to informal relationships acquired during the research were strictly utilised for academic purposes and treated as confidential. All data were carefully managed according to the Article 5 (*Regulation (EU) 2016/679 of the European Parliament and of the Council*, 2016) to prevent unauthorized use, a practice that extended to doctoral studies supervised by any research team member. Participants or their institutions could request to view all related data before management began, and any data considered objectionable were destroyed upon justified request. The details related to the data protection is described in section 4.11 Data protection

The researcher exercised extreme caution to prevent deductive identification of participants, particularly concerning gender, ethnicity, and age, which could lead to such identification. Although genders of participants were disclosed at the practice level in Chapter 4, revealing gender, age, and ethnicity at the PCT level could lead to deductive identification. According to Sim and Waterfield (2019), the researcher made efforts to prevent external disclosure by ensuring no information was provided that could lead to deductive identification of participants. This was particularly important in the Luton PCT area, which has an ethnically diverse but small population.

Internal disclosure, where participants might describe others, was not actively prevented, but measures were taken to avoid identifying these individuals. To

mitigate this risk, the researcher chose not to reveal the genders of participants in certain sections to prevent the combination of detailed information from allowing readers to deduce their identities.

Appendix-I provides a comprehensive overview of the participants involved in the study, including excerpts from their statements that illustrate their behaviour and character. This section also outlines how the research encompassed various types of NHS staff members who interacted with the IS and its implementation, underscoring the importance of exercising caution to prevent deductive disclosure.

When conducting fieldwork as a lone worker within the NHS, it was crucial to prioritize safety and adhere to the organization's ethical practices. This involved ensuring that the researcher's whereabouts were communicated to NHS management at each research location, both before and during the research, so that someone was always aware of the researcher's location and expected return time. A mobile phone was carried at all times to maintain a line of communication in case of emergencies or unforeseen situations. Additionally, when entering mental health wards, the researcher adhered to the policy of signing in and out as required.

The research took a careful and thoughtful approach to the philosophical standpoint of ethics, which was essential given the diverse cultural backgrounds of the participants. The researcher's ethical stance was shaped by two key philosophical positions: moral relativism and consequentialism.

Moral relativism played a crucial role in this study. It's the idea that what is considered right or wrong can vary depending on cultural or societal norms (Wreen, 2018). By adopting this position, the researcher acknowledged that different communities have different moral standards in terms of their behaviour and dealing with patients. This perspective allowed for ethical judgments to be made with a deep

respect for the cultural norms of the participants, ensuring that the research was culturally sensitive and considerate. For an example, how food played a vital role in dealing with each other was understood with respect to their respective cultural backgrounds.

In addition to moral relativism, the researcher also embraced consequentialism. This philosophy judges the morality of actions based on their outcomes (Wreen, 2018). Closer to utilitarianism, which suggests that actions should aim to maximize overall happiness or well-being. This was particularly relevant to the NHS's original mission of providing free healthcare to everyone. By evaluating actions based on their consequences, the researcher aligned with the NHS's goal of enhancing the well-being and health of the population.

In summary, the research was guided by these two ethical positions: moral relativism and consequentialism. Moral relativism helped navigate the multicultural context of the study with sensitivity and respect for different moral norms. Consequentialism provided a framework to assess the ethical implications of actions based on their outcomes, aligning with the NHS's objective of promoting public health. Together, these philosophies ensured that the research was conducted ethically, with a focus on cultural sensitivity and positive outcomes for all participants.

4.11 Data protection

Consideration has been given to protecting the data's confidentiality, protection, and security. To ensure data security, conversations, discussions, and notes were saved directly into an NHS-accredited secure laptop. Prior to the interview, respondents were given an information sheet about the research, demonstrating benefits to the

organisation. Also, the Ph.D. supervisor's contact number was given if anyone needed information or to make a complaint. Additionally, respondents were assured that the information they provided would only be used for the intended research and any personal reference information would not be published. (For further information on ethics and data protection, please refer to the NHS information governance procedures and research ethics.)

4.12 Data Quality Assurance

Reliability and validity are paramount to the success of any research. All necessary steps were taken to increase the procedural trustworthiness and trustworthiness of interpretations. The researcher uses the help from standard open ended questions as a guide. So, each respondent had the same approach. Thus, no closed-ended questions were asked. This enables the respondent to express their feelings and experiences in detail. If closed-ended questions were asked, the researcher could have led the response in a certain direction which affected the reliability of the research. During the analysis, researcher looked for similar stories or experiences to the same question. However, different respondents saying similar things on different occasions or providing consistent answers doesn't necessarily mean data is reliable. In qualitative research, trustworthiness in practice doesn't mean all respondents view an incident the same way because events look different from different perspectives. Therefore, the researcher tried to collect enough underlying evidence to understand why different respondents came with different experiences and were confident enough to change the researcher's view based on the findings. Also, as a good practice, the investigator disclosed his expectations for the study, preconceptions, values, and orientation, including any theoretical commitments.

This condition has been achieved by offering a written information document about the research. Further, cultural sensitivity, deprivation, and religious and ethnic sensitivity related to the research locations and the respondents have been considered. Cultural values of the individuals play a key role in analysing the data and understanding why and how the respondents arrive at certain conclusions. Further, as with any other qualitative researcher, research is an experience that affect the researcher, his views and the research planning. Although the researcher developed a theoretical framework, which is not a classical qualitative approach, testing it increases rigour and provides a solid understanding, new knowledge, and a reference line. The researcher was open to any changes in interpretations and findings and to review the research approach and the line of inquiry. The theoretical framework has been considered as a line of inquiry. Not as the model of truth. Therefore, the researcher aimed to carry out rigorous research and was willing to accept disproving the theoretical framework, which is still a valid contribution to the existing knowledge. During the analysis and interpretation stage, personal biases, how did the investigation affect the researcher, what parts are difficult, are there any surprises? And any evidence makes the researcher's mind change was considered. The investigator's responses to those questions enrich the rigour, provide substantive interpretations, and may represent an important source of information in their own right. Finally, to improve the coherence, and internal consistency, comprehensiveness of the elements is to be interpreted, and the relations between elements; and usefulness in interpretations were considered. Interpretation and analysis were to be produced not in isolation, but some rational relationships with findings, which will provide confirmations, supplementation, elaboration, simplification, and superseding of existing literature was considered and discussed

in detail. This enables the reader to compare the research findings with the literature as he reads through the thesis.

4.13 Resources and costs

Research has been planned in partial fulfilment of Ph.D. research. Hence, there were no costs from the NHS CNWL other than time spent by staff members as interviewees. It utilised 55 staff hours over a 4-week period. Also, the researcher tried everything possible to reduce the disturbance and reduce the inconvenience to the staff members during the process. Although ethics approval has been received from the West London Consortium (Appendix-II) to carry out interviews, the reluctance of the managers to release staff caused significant delays. This was mainly due to staff operating on a rota basis and a lack of staff to cover planned activity per day.

4.14 Conclusion

This chapter explained different methodological, epistemological, and ontological perspectives used by IS researchers. They have been critically evaluated based on suitability in this research. Primary emphasis was placed on selecting the effective approach in explaining and describing the situation of IS implementation, and crucially capable of describing the complexity and emergence of informal groups in organisational contexts.

The discussion focused on evaluating two ontological positions, i.e., realist and interpretivist, to select the most suitable one for this research. It was argued that the

interpretivist approach is more suitable as it considers the subjects' contributions in shaping their reality and is most accessible by using the ethnographic research method. Interpretivist approach is appropriate because it enables the researcher to gather information about individuals, groups, and their context and the IS artefact they use. Additionally, it enables accessing the rich context in which they experience the IS artefact for their work, deeply endowed with significance and meaning. Furthermore, the work, the IS artefact, and individuals' actions reflect the complexity and result in the emergence that the ethnographic method can make accessible for the researcher. That enables the researcher to draw a holistic picture of the issues around IS implementation in a healthcare organisation. Finally, the ethnographic interview is the most suitable data collection method because it makes accessible individuals' actions, behaviours, relationships, values, experiences, thoughts, attitudes, beliefs, and knowledge, and crucially the meaning they attach to all these. Also, it may be mentioned that the interpretive approach has been dominant in qualitative research in management, social science, and organisational and information systems investigations (Myers, 2019; Orlikowski and Baroudi, 1991).

Chapter 5: Findings

5.1 Introduction

The previous chapter detailed the research methodology and the processes used to collect relevant data for this research project. This chapter presents the combined findings from ethnographic interviews, documents analysis and participant observations conducted across nine GP practices. The ethnographic research involved observing daily work operations, interactions among participants, and reviewing various documents, emails, and other relevant evidence to derive meaningful interpretations.

The data gathered allowed the researcher to understand how informal groups evolve as Complex Adaptive Systems (CAS) and make changes to address the Design-Reality Gaps in IS design and implementation. This process, depicted in the IDAP model's five propositions, helps align the IS better with user activities, ultimately aiming to deliver the best possible patient care.

This account refers to the IDAP model's propositions and its constructs composing a complex adaptive system. Participants' views, actions, and meanings are linked to specific propositions, labelled as 'Proposition 1' or 'Propositions 1-3,' for example. When participants' views align with the constructs of the IDAP model, terms such as design-reality gap, informal group activity, deferred action, and emergence are italicized for clarity.

To enhance readability, the chapter is divided into two sections:

Section 1: Organisational Setting

Proposition 1 of the IDAP model focuses on the informal participation of organisational actors. This subchapter provides a detailed description of the organisational settings of the GP practices investigated, discussing the characteristics of the surrounding neighbourhoods, the physical environment of the practices, and, most importantly, the people and their relationships. This contextual background helps readers understand the research setting and connect it with the ethnographic findings. Especially, to understand the reason behind people's behaviour or at least bring some meaning to their actions. For instance, understanding the difference between working in an old, converted house versus a purpose-built, open-plan office provides insight into the nature of informal relationships in these settings.

Additionally, this subchapter includes the personal feelings, behaviours, and beliefs of the researcher during the study, with efforts made to minimize the researcher's influence on the context.

Section 2: Research Findings Related to the Theoretical Framework

This subchapter discusses the research findings in relation to the theoretical framework described in Chapter 3, specifically the IDAP model. Propositions 1, 2, and 3 of the IDAP model explain the impact of formally designed IS on the emergence of informal groups during implementation and their efforts to adapt the IS to their local needs. This subchapter illustrates how top-down IS implementation can lead to a lack of user engagement, which exacerbates the design-reality gap and affects informal relationships negatively.

The findings also highlight how complex realities within the GP practices lead to deferred actions and subsequent IS adaptations. This section emphasizes the dynamic nature of informal group activities and their critical role in bridging the gap between formal IS designs and practical, real-world applications.

It aims to provide a comprehensive overview of the findings, showcasing how informal groups within GP practices adapt to and influence IS implementation. By understanding the organisational setting and linking the findings to the IDAP model's propositions, this chapter illustrates the significant role of informal relationships and adaptive mechanisms in addressing the design-reality gaps and enhancing IS effectiveness.

Section I: The Organisational Setting: How Things Work as the Researcher Saw It

This account reveals data and information that supports the IDAP model. The data and information from participants reveal the relevance of the IDAP model, its five Propositions in section 3.7, and the four constructs in section 3.1.1 pertaining to complex adaptive systems and deferred systems. The experiences of the GP practices' staff cohere well with each of the Propositions of the IDAP model. Their experiences, behaviours, actions, the meanings to derive from them reveals that a formally imposed technical structure, the formally designed IS, does not cohere well with their own local communities (Proposition 1). It shows that GP practice staff value and uphold their community and its structure above the formal technical requirements of using a formally imposed IS. Their local community physical conditions like buildings and offices and behaviours resist the expected technical (IS) performance, giving rise to a new form of socio-technical system, one with the IS being implemented and the local communities of practice; thus, resulting in deferred IS via deferred action resulting from the emergence of informal groups.

Their behaviours and actions reveal that their local reality (*Reality*) is often contrary to the requirements of the reflective designers (*Reflective designing*). Their interactions with patients and their families require them to adapt their local situation rather than comply with the formal IS (*Structured IS*) and formal IS implementation (Structured Implementation). Their actual situation then takes priority for them and their patients, resulting in a IS implementation gap (A gap between design and the reality). These are the constructs underpinning Proposition 1 of the IDAP model.

This research seeks to explain and understand how participants informally solve everyday challenges using IS to deliver the best quality patient care. The actual

informal activities of the participants are a rich blend of cultures interacting amongst themselves through the individuals and groups in the GP practices. This is explained in the IDAP model as the *interdependences* caused because of the *design-reality gap* and the contextual needs of IS users. This results in increased *informal group activity* and ultimately *emergence*, the key construct underpinning complex adaptive systems. This then concludes in *adaptation of workflows and IS* as explained in the IDAP model. Sometimes, North Indian, South Indian, Pakistani, African and White-British cultures blend their daily GP roles and activities with the formal NHS GP administrative structures and informational processes. The participants engage with their roles and duties, using IS through informal groupings, which is accounted in Propositions 2 and 4. These informal groupings are rich in their blended culture, reflected in their dress, how they greet and address each other using South Asian and Indian familial modes, how both patients and staff share family stories, and their overall loyalty to GP practices. They use this informal blended culture to enact formal NHS GP practice roles as explained in Propositions 1 and 3. The informal blended culture and the formal NHS GP practice structure offer another layer of interesting engagement with IS, constituting a unique and *complex adaptive system* encompassing all the five Propositions.

This first-hand ethnographic account provides clear first impressions of the people working in the GP practices observed, coupled with descriptions of their 'society' and 'culture' as they go about their work in the implementation of new IS. Moreover, the researcher's interpretation is significant in providing a comprehensive account. The researcher's feelings ('soft data') and their perception of being accepted or alienated are critical aspects of the interpretation.

In providing the account, the researcher strove to remain aware of possible biases and where such could have occurred. The researcher explained its occurrence in providing this account. To undertake and complete the ethnographic observation, the researcher describes their relationships with the participants and the significantly close relationships with certain individuals who provided deep insight into the society and culture of the participants, their work, and the overall focus on patient care.

The researcher sought relevant and profound cultural information to help explain the introduction and use of IS. Where close informants were involved, the account clarifies how the researcher was aware of potential bias and the steps taken to account for it. The researcher sought not to marginalise any of the observed people to ensure access to all of the available information they could provide.

This account provides a detailed contextual description of the changes brought about by the new IT/IS systems in the NHS, as an organisation. The presence of the researcher, an IT/IS expert, initially impacted the change in the culture of the observed GP practices. However, the researcher adjusted their involvement as soon as possible so as not to affect the observational subjects or change the 'community' in the GP practices through their presence and technical skills. However, these did play an important role in gaining access to the community, which is accordingly acknowledged in this account. Staff members did not see the researcher as someone with authority or as representing the management; accordingly, two people claimed, 'You are one of us now.' Also, the recommendation given by the manager, who had a more informal connection, strengthened the researcher's position as an independent person. Despite instinctively wanting to, they did not help anyone when they experienced IT or other informational issues. If the researcher had helped the individuals, the researcher thought the researcher would not

understand their behaviour and the interactions needed to resolve these issues. Therefore, they had to walk on a fine line, not as a participant but as an insider observer.

The researcher believes that they did not marginalise any individuals or groups that the researcher was observing. Nevertheless, they did not interact with clinical secretaries as the researcher assumed they were not directly engaging with the clinical system since most clinical secretaries were typists, typing up doctors' handwritten notes on the clinical system or tidying clinical notes. Some also corrected the notes taken through Dictaphone. All the clinical secretaries were elderly females in the GP practices. However, entering clinical notes is an essential function. The researcher could have observed them understand how they adapt the system, what type of deferred actions they have developed over time, and what type of deferred design decisions they incorporate into their daily routines and activities. However, the researcher interviewed secretaries as part of the formal interview process. Therefore, the researcher did not ignore any critical area completely.

Every interaction, emotion, or reflection implied or explicit provided the researcher with an invaluable emic account of the experience. This account develops an understanding of the GP practices as communities, with a common understanding and informal rules of behaviour, address, and actions. It describes their traditions, both those they bring to work and those at work. The account also details their morals and ethics and how these affected their behaviours, explaining the cultural variations between the GP practices. Descriptions of the informal groups, their composition, who was dominant and who felt peripheral, their ages, power positions, and the reason for the power position are provided to understand how staff managed working with the new IS implementation.

The result is an ethnographer's description of IT users' worlds, their meaning specifically as attached to their actions as they care for patients and record their information on IS (Proposition 1, 2, and 3), their perceived ontology of formal and informal work organisation and interactions with IS (Proposition 3), how they see their work with its IT/IS informational objects and interactions with these objects and between people, and the significance of the IT objects for the individuals and in the groups observed (Proposition 3). They regarded the computer as a significant informational object (Proposition 1), though they continued to use pen/paper, physical notes, files and desks, and even the 'kitchen.' This account describes and explains their interaction with these objects, specifically with IT artefacts, in terms of the deferred design decisions of informal groups emerging to accommodate the new IT systems in their workplaces, as depicted in the IDAP model's Propositions 2, 3, 4, and 5. It provides rich and thick descriptions of the constructs and their interrelationships shown in the IDAP model such as *increased informal group activity*, *emergence and adaptation of workflows and IS*.

Thus, this ethnographic account emphasises the 'communicative acts' of the people in the observed communities, their communicative acts amongst themselves and the IT systems, and their communicative acts to make sense of the new IT systems. The participants showed formal and informal acts regarding the new IT systems (Propositions 1 and 2). In this account, the researcher's 'soft data' (impressions and feelings) about these communicative acts become significant. This soft data itself contributes to reflexivity. Since ethnographic accounts involve reflexivity, personal thoughts and reflections form a part of the interpretation. The researcher was affected by being with the communities, and their views changed the final understanding. The following sections provide a detailed description of the local

environment of the GP practices, the people, their culture, and their working contexts.

The buildings and working space of the participants are relevant to how they worked and the resulting *informal groupings*. This significantly affected their interactions and the interactions between staff and patients. Most GP practices' working spaces and surrounding areas felt residential and lower income, especially those closer to the town centre or GP practices near terraced houses on narrow roads in which it is difficult to pass two cars. The researcher's own car wheels were scratched as they touched the curb when giving space to oncoming traffic during a field study session. The GP practice's front doors open directly onto a small gap between the house and the pavement, on which bin bags and old TV sets were left. Someone had even left a washing machine outside and someone else a fridge freezer.

The houses and the driveways got bigger, moving away from the town centre towards the suburbs. Additionally, peoples' ethnicity tends to change, too. Women wearing headscarves were not seen as frequently in the suburbs as in the town centre. This indirectly reflects the changes in the ethnic compositions in the suburbs and the town centre. Incongruently, the researcher saw expensive cars parked outside the GP practice in the town centre practices. The GP practices in the area except one were all converted residential buildings. They often use an adjacent house to increase the practice space by breaking down the partition wall. This was visible from outside and considering the common entrance. Some GP practices even used the different houses' entrances separately to the GP area, while others utilised them as an entrance and exit.

None of the GP practices had properly built ramps. They were all improvised or fixed in place later. A wooden ramp could be attached to the steps in one GP practice

when needed. A receptionist brought the ramp and helped patients using wheelchairs to come inside. Also, in most GP practices, the patients had to talk through the gap between the reception desk and a glass panel. The researcher asked the receptionist whether patients found it difficult, and she said yes. They also asked whether the receptionist had seen patients bend over to talk through the gap, especially when giving documents to the receptionist, which appeared to be a barrier. However, the receptionist said, ‘No, it is important, as sometimes we get rude patients.’ The researcher had not experienced any violence or rude behaviour during the research. However, patients sometimes stretch the staff's patience out of desperation to get a doctor’s appointment.

One receptionist said that, after installing the glass panel, abusive behaviour had gone down. She said that the staff were safe and that it felt better. An experienced receptionist said they started to feel that patients gave them more respect after the glass barrier was installed. ‘Does that mean patients feel that the receptionists have some authority when they sit behind a screen?’ the researcher asked a practice manager. She replied, ‘They are immigrants from the South Asian continent; I think they might feel the girls have some authority. Otherwise, they see them every day at the market or shops and try to push them to get what they want [an appointment].’

In one Practice, the main admin room of the practice was a small 3m by 3m space. Four staff members worked in this small space, which created an intimate atmosphere for the group. In another practice, three people worked in a similar-sized room. They stored archived patient records in the same rooms, so the women working there had more limited space to move. When the researcher first started the research, it was mid-summer, and the temperature inside was uncomfortably hot. Thus, the researcher felt sympathetic for the women working in such brutal,

cramped, and hot conditions, and they discussed the issue with the practice manager indirectly, and she said: ‘This is not a purpose-built building. This is a house. There is no ventilation in the building, and we cannot install AC because there is no space to install the air pipes.’

The waiting areas in all of the GP practices were small. It seemed they all had problems coping with the number of patients coming in due to limited space in the waiting area. Patients waited for their turn to see a clinician in long lines, spilling outside the reception area in the morning hours. Some GP practices had single chairs and joined chairs to allow the patients to sit inside rather than outside. The overall interaction between the local population and the GP practice is cordial and respectful. However, there is also criminal activity, and several single chairs and a TV were chained to prevent theft. When asked why this was chained, the receptionist said that a patient had taken a TV set and ran away, a few months ago. However, the practice staff were not angry about the situation and did not call the police. The receptionist said that they didn’t know who had taken it, but her laughter indicated she may have known. Still, the relationship between the staff and the patients was cordial and respectful. One staff member said: ‘My patients only let me work here. They have known Dr. Sam (not real name) for a long time.’

In some practices, male and female patients are seated separately. The researcher was not happy seeing patients sitting based on gender separation due to their firm belief in gender equality and equal rights for both genders. However, the researcher didn’t know whether this was voluntary for male patients to give more space by sitting a bit further away so that women and small children could sit comfortably. Also, the researcher did know that knowing some of the doctors because of the researcher’s job in the same area a few years back gave them an advantage. One

could argue that the staff tried to be extra helpful and pretended to offer a better picture because of the researcher's contacts with the practice managers and doctors. The researcher did not think so. Making tea and bringing biscuits broke the ice and reduced the authoritative 'gap' between the staff members and the researcher. They felt that the researcher was one of them, a 'student' rather than someone who knew their practice manager or their principal GP personally. The researcher never used their knowledge in the field or personal contacts to intervene in the setting they researched.

When a patient in a wheelchair could not get into the practice building, the researcher did not step in to help, not because the researcher did not want to, nor because they were being too pedantic, but because the researcher wanted to know their process of dealing with 'access.' If the researcher had intervened, it would not have changed the observational 'setting' significantly, but the researcher wanted to understand their deferred formalisms (i.e., policies and administrative actions) related to their deferred design (improvised ramp). Although this incident is not directly related to the IS implementation, thus, it was highlighted in the chapter to emphasize that the researcher strictly followed the policy to minimise the impact of his presence.

All participant organisations extended whole-hearted support by offering their experiences, sharing all the needed information, giving their valuable time, and providing the requisite access and support. They all welcomed the effort to make patient information more meaningful and valuable and participated willingly. This constitutes their reality. Their cooperation with the researcher contributed much insight. It has helped them understand the realities from their perspectives, what already exists, what should have been included, what is not practical to use, what

is not user-aligned or user-friendly, and many more such nuances. Many of these would appear small and marginal in isolation, but collectively, as part of the interpretation of their use of IS for their work of healing and caring for patients, they mean a great deal to the users in their practical everyday situations.

The researcher's first impressions of the GP practices and their patients are explained, as the society and culture determined the interactions between the GP staff and the staff and patients. The researcher's feelings are mentioned in the context of being accepted by this society, and his first thoughts surfaced to uncover potential biases. The researcher thought that every GP practice is unique. This was because the practice is centred around the practice managers and principal GP. During the interviews with the PG practice managers, the researcher thought they were stern, strict, and very formal. However, the researcher slowly realised that they had a softer side and were respected by everyone, who looked up to them when needed. Still, practice managers are micro-managed often. The researcher did not know whether their observation was biased, but they felt no decision was taken without the practice manager's involvement, even if it was a trivial one like queue jumping.

There are three tiers in a GP practice: the clinicians, the management, and the practice staff. And this determines how the formal IS is used and who is regarded as authoritative (Proposition 1). Clinicians typically deal with other clinicians or the practice manager. Management consists of practice managers and the GPs (Principal), and the rest are the practice staff. The practice manager was the conduit. However, at the end of the research, the researcher realised more remarkable similarities between the practices than they initially thought. There was significantly more social cohesiveness in the GP practices. Staff often went shopping together

and brought specially cooked food from home to share, which the researcher had never thought would happen. That's not to say that the practice manager treated anyone poorly and unprofessionally, but they were firm and strict. The staff accepted practice managers as a relative or even older siblings! That is why they called her 'Didi,' meaning sister in Hindi. Perhaps this was attributed to the fact that most GP practice staff in the area came from a South Asian background, and their behaviour is less governed by any policies.

After researcher's initial experience of making tea, the researcher asked most of the staff before the researcher shadowed them or started observations 'whether they would like tea.' That was their strategy for entering their society. The researcher did not think they were biased, but they disliked the practice managers' certain work ethics and management characteristics. Micromanaging the staff does not help in the longer term, but the staff members accepted such behaviour as they did not have long-term career ambitions.

Researcher believes that the researcher did not create a power imbalance between the existing staff and their superiors. There was no authority gap or power gap involved between the respondents and them. This was the same for those whom the researcher interviewed or the participants in the observation. Participants may have thought that the researcher had 'connections' with the GPs, as one GP came to talk to the researcher. The researcher does not believe that the incident reflects GP's 'power' during the research; no one called him by name (Mr. Amila). Rather, they just called him by name, and he dispelled notions of power plays by making tea and bringing biscuits. On a few occasions, the researcher helped staff members to find 'forms' on the IS, but this created unwanted authority and recognition from the staff members. Carrying out ethnographic research over time offers a time to reflect

on the things that helped them, and the researcher stopped becoming a ‘resource person for the staff members.’ The researcher understood that such relationships hampered their effort to understand their deferred actions and deferred design decisions and decision-making process. Therefore, the researcher did not want to be part of *deferred design decision-making or any deferred action*. It was a fine line that the researcher had to tread, as the researcher had to be very conscious about each action to avoid becoming either a participant or an outsider. So, the researcher worked to become closer to the participants, but not too close; as such, they changed their behaviour and acknowledged that some staff members attempted to develop an informal hierarchical relationship with me. For example, one woman said her son was smart, like the researcher. She attempted to draw them in by drawing intimate parallels between her son, but the researcher neither refused nor accepted her ‘offer,’ as they did not want to get involved in her personal life.

The researcher’s impression was that, once social barriers were breached, the teams accepted them as a ‘student’ rather than as one of them. For example, they said, ‘You are one of us now’ on two occasions. In one GP practice, they offered a shared lunch which the researcher accepted, during which time they had two samosas. They talked about their families, school exams, fashion trends, sons/daughters’ engagement, etc. They asked them about researcher’s family details as well. After lunch, two staff members invited them to sit with them to collect observation data. They were helpful and explained how to find specific ‘forms’ and navigate the clinical system. The participants had *reduced the gap* between the formal IS and their local needs through *deferred action*. They have developed a ‘Shortcut’ making system. For example, this allows the staff members to open a specific ‘form’ easily without having to navigate many windows. Instead, the user can place form shortcuts in one place and open any form from there. The researcher

was surprised and asked who had developed this. One staff member said they suggested it to the IS implementation managers during the implementation, and ‘engineers’ came from the IS company to establish the facility on subsequent IS versions. This *‘diffusion management’* helped the users to use the system efficiently. This is important as most staff members were unaware of the IS's ability to create shortcuts. Such information highlights the varying degree of IS adaptations to make the IS more suitable and sustainable.

Many of their challenges, adaptations, processes, nuanced applications, situational knowledge, and adaptations had many similarities in many cases, but not in all cases. It remains an in-depth analytical task to analyse the data and draw meaningful inferences. This chapter presents the key themes identified through ethnographic interpretivism that emerged to identify the main inferences related to the research.

The account is based on the researcher’s relationships with the participants and his perception of feeling accepted by the participating groups. Specific individuals impacted the quality of the observations, field notes, and cultural information obtained. The researcher feels that the researcher’s ethnicity certainly helps them to mingle with the staff members in the GP practices to understand certain cultural aspects of their behaviour. Also, the researcher believed that their background helped them to understand certain cultural aspects better, such as how informal relationships and certain social aspects are considered as ‘a capital’ or cultural respect for the elderly and how the ‘important people' in the community were allowed to jump the queue and get appointments when needed. The staff members thought the researcher belonged to the Islamic community, and once a staff member talked about her beliefs and used certain Arabic words, the researcher began to believe

them to be religious verses. She attempted to become close, but the researcher clarified that they did not share her faith. This did not appear to impact subsequent observations and information gathering.

For practices in the South Asian community, bringing biscuits for fellow staff members certainly made an impact. In contrast, bringing a pack of biscuits did not negatively impact the mainly white GP practices, but the researcher could not form personal relationships with them through this action. The researcher did not get as many personal comments from staff in predominantly ethnically white practices. However, they gave detailed accounts of what they talked about during breaks and lunch.

Some staff members are family members at GP practices and have strong loyalties. For example, on some occasions, the GP Practice is where the mother, father, sisters, and brothers work in different roles. Most of these GP practices are family businesses where the GPs and practice managers are relatives. In every GP practice investigated, except two, the practice manager was either a relative of the GP or a long-term staff member whom the senior GPs trusted. Sometimes, even their family relationships are explicit as staff members talk to each other, calling their relationships rather than their names in front of the patients.

This familial closeness was more common in the practices owned by South Asian GPs. The interactions between staff members in more business-oriented practices are formal. However, individuals often talk about their family life, attend each other's family parties and chat on Facebook. In four GP practices, it was noticed that the receptionists called the practice manager ‘Didi,’ which in Hindi means older sister or older female cousin[1]. This closeness among the staff members worked in their favour in smaller practices. Accommodating and adapting to each other’s occasional

inconveniences made them complain less. They complained less about the challenges they faced from IS, which were born out of design reality gaps. The researcher's tactful conversations helped them obtain the smaller details of their challenges.

At one point, a receptionist came into the practice manager's room. She wanted the keys to the practice manager's car to bring lunch from the restaurant. The practice manager readily gave the key without hesitation. Later, the researcher found that the receptionist was her daughter. Another staff member said that the individual was 'acting' as a practice manager.

In the staff room, the staff members talk about their previous night-outs, sharing and talking about Facebook photos taken during this time. One staff member showed some photos from his recent Trinidad holiday and talked very nostalgic about his childhood there. Thus, the researcher became very close to their colleagues in practice, and all the staff worked as a team, sometimes even going out for drinks at the local pub.

The researcher was also able to glean specific cultural information. An elderly practice administrator who said that her son was intelligent, like the researcher, was keen to ask questions about where the researcher was from and how long they had lived in the UK. Though the researcher was not happy with the administrator asking for more details about their past personal life, she said she came to the UK from India, Gujarat, when she was a teenager with her parents. She said she joined the practice when she was 24. She spoke very 'highly' of the GPs and working for the NHS. A few others also nodded and said they started at a very young age in practice. This does not seem to be an unnecessary insight, as it showed the researcher that they had to tread a fine line between being a participant and an observer. These

personal touches enabled them to become part of the 'network' within the 'community,' thus understanding their cultural experiences and obtaining objective views of the research theme.

The NHS is a healthcare service organisation; thus, it has its own requirements. Unlike manufacturing, one cannot stop the NHS from repairing it like a machine. It is imperative that the NHS continues the delivery of healthcare to the highest standard of service with a smile, despite carrying the burden of solving many challenges in parallel. This continuously intensive and demanding situation makes it essential to know how the NHS staff adapts to such frequently changing needs. It is important for this research also to map how the staff members perceive and tackle these challenges at individual and collective levels.

The introduction of new IT systems to the NHS changed it as an organisation. It has changed the way the doctors and administration staff work and how patients are treated. This change is at the core of whether IT systems are accepted and the *informal behaviours* of the groups interacting with them. Participants reported:

> *'IS is all about dealing with the workload, communication system. We do things mostly via email these days. No interpersonal communication now and much better then. It affects our relationships with each other.'*

> *'Meeting fewer people, lots of telephone and email. We are looking after our patients through the computers.'*

This is an indicator of the design-reality gap which has had an impact on the culture of the GP practice. The culture now consists of people and 'systems' which has *increased interdependences* as explained in the IDAP model, and the informal

groupings attempt to *reduce the gap*. The NHS can be better described as a 'socio-technical' organisation in which medical professionals and administrative staff interact with all medical machines and IT systems. One participant noted:

'Now it is different due to various systems. However, staff had a chance to interact more with each other than now. Now staff members are very much work oriented as they are being monitored.'

Such monitoring is easy because of the IT system's ability to track people's usage. This monitoring has an additional impact on people's interactions, as they become cautious about what they say and do in the face of the 'evidence' that the IT systems are capable of producing, if required.

IS implementation brought considerable changes to both GP practices and secondary care Trusts. It has led to *adaptations of workflows and IS* usage. A staff member showed the researcher old, clinical records stored in one big dark room. She said that, 'This was one of the busiest rooms. Now we don't come here much unless an old patient returns to the hospital for treatment.'

Further such radical change was visible in the GP practices too that required *adaptations of workflows and IS*. Most GP Practices still keep hard copy clinical records. In four GP Practices, the receptionists were either sitting in the same room or beside the room storing clinical records. The researcher could detect the distinct smell of the old papers in these rooms. The researcher told the receptionists that it is a bit dusty here due to the clinical records stored there. They all agreed and felt the dust. When asked why they could not 'get rid' of the notes, the staff said that

they signed up to become a ‘paper lite’ practice. However, they still need old notes to store as some were not scanned and entered into the IS.

In another practice, the practice manager said they were accredited as ‘paper lite.’ However, she was not keen to get rid of the paper notes. She said, ‘I think I will wait for some time because no one knows whether we need these, but the NHS asked us to get rid of them.’ The researcher felt that keeping all the paper notes made her feel ‘safer’ or perhaps she might be a bit nostalgic about the change happening around her.

Propositions 2 and 3 are reflected in the way staff work. Many staff mentioned that their routines changed due to the IS implementation. They said that now, they log onto their workstations instead of looking into their appointment books or completing the handover of documents at the beginning of the day. The researcher observed that every staff member started their routine by logging into their computers. Some switched on their computers and in the meantime, went to the kitchen to make a cup of tea.

Many said that ‘computers have changed their working life and how they communicate.’ In more prominent GP practices, they have an Instant messenger system incorporated into the IS. One participant called her colleague in the next room, but she did not answer. Then she went to the Instant messaging service and sent a message. She received a reply. She said, ‘See! I told you the one good thing about this new system. We can send messages to each other very quickly.’

> *I came here 24 years ago to summarise health records. No, we cannot compare. It is entirely different then. Now everything is based on*

finance, the government has introduced a target driven system. Therefore, it is not about providing a service, but also the survival of the service we provide, our jobs. It is tough. We have to be proactive and well ahead of the game.

Source: GP-PM&AM-F9

Propositions 2 and 3 of the IDAP model are further reflected in changes to work routines. *Emergence* has resulted in *adaptations to workflows and IS.* The introduction of IS has changed the routines and also culture within the organisations. This led to a culture of computer-centred working and linked to invisible values, i.e., financial values. One clinician explained this situation, saying, 'Now we have to look after the computers.' For him, his allegiance is towards the patients' care, safety, and well-being. However, with the introduction of IS, the critical performance indicators brought a parallel set of values by the management, i.e., financial values and payment by results.

This makes the work less 'social' for some staff members and reduces the frequency of 'ganging up' to visit local pubs for drinks.

The atmosphere was very relaxing and less stressful. Not like now. We talked to each other and went out for lunch and dinner. It was a homely atmosphere. Now it's data, KPIs, and money.

Source: GP-PM-F7

However, this atmosphere improved financial transparency and efficiency.

Personal relationships are much less now. Previously we used a manual system and talked a lot about gossiping. Not anymore. More formal.

Source: GP-PM-F2

We have become more independent and open in finance; it is different. We are very transparent.

Source: GP-PM&AM-F9

This has increased *interdependences* and *increased informal group activity.* Now, it has become a norm to consider looking after the computers as equally important as looking after the patients. The NHS has implemented a culture of KPI-driven health delivery to increase financial transparency and increase efficiency. This idea has been instilled into the minds of every staff member. However, the new norm has brought new challenges. Challenges arose due to varied levels of training, skills, business and care pathways, and the management efforts to install standard IS in this complex organisational reality. Staff members tend to find solutions to these 'common' problems collectively.

Lot of nurses said that they are nurses, they do not know how to look after computers. However, when it comes to dealing with challenges, they worked together and pooled their effort and knowledge to make adaptations to the IS and their work practices. These relationships are based on mutual understanding and trust with each other.

Source: CNWL-INP-ADM3

They understand that IS implementation is a necessity. However, they believe the IS design and decision-making process should be more participatory and expect more opportunities for involvement. However, the resistance to change has diminished with time, and staff members accepted the IS introduction.

Very scary for staff and the clinicians. Not just a skill to improve your ability to do your job but also if you made a mistake or couldn't get into the system. It affects the whole organisation. i.e., without a smart card you can't choose and book.

Source: GP-PM-F8

So, the staff become dependent on *informal groupings*. There is an understanding that one can contact another staff member to get help resolving IS problems rather than contacting the IS Helpline. This is not a written rule, but everybody understands and respects it. So, the response to the planned action starts at the informal level. It seems they did not let the management implant its culture on the local response (as discussed further in 5.3). Therefore, staff members understandably separate their local action from planned action until their local action resolves the problem. They understand that, when they help a colleague, he/she will return the favour at some point in the future. There is no written rule or policy to help a colleague, but everyone does. They do it out of friendship and help and 'bank it.'

The formation of the informal groupings happens in the context of their informal rules of behaviour and address. In GP practices, staff brings ethnic food. They also consider and respect the practice manager as an elder sibling. This was not obligatory, as some 'white' staff members did not bring food from home or join food-sharing clubs. Nevertheless, they enjoyed occasional samosa from their Asian

colleagues. This context meant that the junior staff did not complain when they were micro-managed and tolerated practice managers' actions. When a practice manager overruled a junior receptionist's decision after following the organisational policy, it was clear junior staff was not happy, but she did not protest. She accepted that the practice manager understands 'something more' than her. Therefore, there is an acceptance of managers' 'wisdom.' This was further supported by calling her 'didi,' meaning sister.

Some managers in both organisations informed their staff that they need to be flexible.

> *I am trying to have a better functioning system to make our lives easier and do more in less time, which is possible now with the IS. The workload is increasing. Since we employed a new team, it is very good. We had that problem before, there were people who did not want to challenge and change. Sometimes, it is easier to change when you are 25 years old. But when I recruit new staff, I give them a clear signal, I expect flexibility, if they don't like it, they cannot work here.*
>
> *Source: GP-PM-F5*

This results in observing Proposition 5 and *deferred IS*. Staff typically call the person next to them if they find any issue with the IS rather than the IT helpline. As one person said, the IT helpline is strictly used for password resets, on the whole. Another untold rule is that locally born *deferred design decisions* have been kept away from the management, at least for some time, until such are successful. For example, when the team used a dual recording system (both paper based and IS), which is against organisational policy, they did not inform the central management team. When they created shortcut processes or helped each other resolve some

local problems, they did not inform the managers unless it broke the operational flow. There is an informal rule of checking the computer at the beginning of a team member's shift or day. However, this was not a specific policy, as staff members often switched on their computers and left to go to the kitchen to make a cup of tea and say hello to their colleagues. Therefore, the kitchen plays a pivotal role in offering a 'break' from formal work and as part of the community. Moreover, making a cup of tea allowed 'them' to bridge their differences with each other, as explained earlier. Food plays an integral part in both Asian and western cultures, and there appear to be no significant differences here either.

A kitchen is a place where their professional and private life crossover. The researcher saw staff members adjusting their sarees, Pakistani *shalwar*, denims, and hijabs in the kitchen. Staff members speak Hindi, Bengali, Urdu, or other non-English languages with their colleagues more often than within their workplaces. The staffroom and the kitchen play a pivotal role in informal interactions between the staff. It is where staff members meet, discuss, engage and relax after a stressful shift or where their meetings are held. Staff members discuss their issues and share information and advice on money management, marriage, family life, etc. It is a spacious room with an area of 6 square meters. The kitchen had adequate furniture for at least 4-5 staff members to sit, a kettle, a television, and a fridge freezer. One staff member said, 'Our kettle is always boiling,' to highlight how often the kitchen is used

Culture is shaped by physical location. The kitchen setting is significant in terms of GP practice culture. Initially, the practice staff treated them as an outsider. Mr. 'B' introduced the researcher and explained their research project to all the staff in the

practice kitchen. Everyone said hello and greeted them warmly. However, no one noticed the researcher or cared about their presence.

It was an awkward for a few minutes. It was clear that something had to be done. Mr. ‘B’ said, ‘let's boil the kettle.’ Mrs ‘K’ said ‘Let me switch it on.’ The researcher saw an opportunity to relate, and they said, ‘They will make the tea’. They asked everyone individually who wanted coffee and who wanted tea. Everyone noted their tea-making skills, and they started asking them about their research and what type of help they needed. The researcher bought some biscuits on the second day and again made tea. At that moment, one staff member said, ‘You are one of us now.’ Everyone laughed, but the researcher felt it was a positive laugh to approve the cultural acceptance into the group. At that moment, the researcher felt that they had broken the ice, making it significantly more practical to obtain information about them.

Offering a cup of tea generally reflects respect in many cultures. Offering a cup of tea to someone you have had a disagreement with is a gesture of ‘setting aside their differences.’ The researcher has noticed such tea-offering rituals between practice managers and junior staff members. Once, a junior staff member was ‘slapped on the wrist’ by the practice manager for booking the wrong appointments with a patient. During the discussion, the researcher heard that this was not the first time the junior staff member had done so. However, the staff member mentioned that the patient requested an appointment with the nurse, not with the GP. The incident happened in the morning. At around 3 pm, an elderly administrator came and asked the junior staff member to make a cup of tea for everyone and the practice manager. The way she said this with a smile on her face indicated that she wanted her colleague to set the ‘incident’ aside and move on.

This indicates that their traditions held sway over organisational formalism. Such traditions were evident in their behaviours, dress, and status awareness. Everyone dressed in a very similar manner. No one wore high heels but presented themselves as smart and professional, trying to keep their formal 'status' even in the context of their traditions. This is why care coordinators in the community do not necessarily want to carry portal/handheld computers to record clinical notes. If they do so, others may think of them as 'electricity/water meter readers.' This invokes parallels with 'images' of such operatives in the countries where they came from.

Their discussions are respectful of hierarchy. For example, they consider the practice manager as an important person. Staff members were instilled with the idea that you listen to what you are told. IS implementation meetings were held to tell the staff about new guidelines and instructions. However, practice managers took a group perspective for 'how can we implement this in our team/department?' Until an agreement is researched, everyone listened. As noted by the researcher, this is similar to a sense of 'workplace democracy'. Also, the discussions were about 'how we do it,' not 'why we do it.' Thus, there was a great sense of loyalty between the managers and the staff and also to the authority.

As Proposition 2 of the IDAP depicts informal behaviour impacts IS implementation. The GP practices have a loyalty that is based on informal relationships. This subjective feeling is attributable to their South Asian cultural background, where the role of the family is central to all social and business activities. Thus, their ethical standards stem from their cultural backgrounds rather than organisational authority and formalism. They do not separate formal authority from informal authority.

Closely related to their ideas about authority are their morals and ethics. They consider patients and their needs as the top priority, making every effort to follow

instructions from authoritative bodies and adhere to organisational policies; still, they give top priority to patients based on clinical needs.

Culture is not an exact universal unit. Just as culture varies by nation, region, and organisation, it varies equally within organisations by groups. These subject groups are the modus operandi of the culture of the observed GP practices. In GP practices, such groups consisted of five to nine individuals, dominated by practice managers based on their authority. No subgroups were observed. Both formal and informal groups revolved around the practice manager.

The organisation of people, work, and resources was like a spoke-and-hub structure. The practice manager's age was 50 years old and over. Other staff members typically ranged between 18-30 and 50+. The practice managers project their authority over formal and informal groups. It is difficult to separate what is formal and informal as those are intertwined, but to the insider researcher, with an insight into Asian culture and norms, it was possible to observe the informal ethnic community practices of the groups.

An outsider might hardly see the practice manager as they do not attend to patients unless there is a complaint or another problem. They were well-dressed and professional in their conduct. They often functioned from a cluttered room filled with notes and files. Documents and files were scattered on their desks, waiting to be signed, approved, or acted upon. These documents typically include patient notes, contract documents, performance reports, and finance documents. These practice managers formed a strong backbone for the operational sustainability of these small practices. Most of them had many years of service in the same practice.

Usually, the practice managers were the trusted hands of the GPs. GPs relied on them for many important, regular tasks and procedures. For example, the

researcher's field notes show an atmosphere much like a family home. It has been noticed that some staff bring lunch from home. Interestingly, they often brought a different curry, rice, or naan for lunch and shared it communally. The researcher was offered naan in one instance and enjoyed the taste of the different curries. The kettle was boiling almost all the time, but no particular staff was allocated to make tea. However, elderly staff often volunteered without asking. When asked who typically makes tea, one staff member replied that she made tea for everyone except Dr. John (not his real name) because he prefers coffee. She said she often made tea, but someone else might volunteer to do it if she was busy.

> *I reached there right in time for my scheduled appointment with the practice manager. The receptionist recognized me and showed me in. The small room is cluttered with usual furniture, tables, chairs, racks full of files and papers. The place was hot and small. I felt the whole building was like an oven-it was that hot. The floor carpet was somewhat old. There were piles of documents on the Practice manager's desk. The middle-aged well-dressed female greeted me with a cordial smile. She was cautious, thorough and very diligent. She explained her experiences in great detail. She referred to the GP as mom and dad. During the one and half hours of our meeting, six different people disturbed us. Some were asking advice, and some others were there to request her authorisation for signature.*
>
> *Source: GP-PM-F3*

The situation is not different in other places. The practice manager's room is usually a busy place where staff members seek guidance, advice, approval, or inform staff

members' actions of their 'boss.' The term 'boss' can be used to describe their authority, role, and responsibility to support, supervise, and mentor staff members. However, they never appeared 'bossy' in their behaviour at any time.

It was noticed that, on numerous occasions, staff members popped in and out of the practice manager's room. One would think that this would be a disturbance. However, the practice manager remained the first touchpoint, patiently listening to everyone; as such, they were the 'go-to' person for many routines, usual or special needs, assistance, guidance, and decisions. This leadership style is worthy of note in this particular kind of setting because it is used to manage a large workload in a hectic environment.

The conversations between them were usually cordial, friendly, and supportive. On one such occasion, the practice manager was busy, and engaged in an important task. One of her colleagues requested help in understanding how to run a report on the clinical system. The practice manager showed them how to run the report on the clinical system patiently several times. The new staff member, however, could not understand the process. Still, the practice manager did not show any dislike or frustration on her face.

She explained her role enthusiastically with a spark in her eyes. She played the role of manager, bookkeeper, and main liaison. She looked tired after a daylong of work. No doubt that the whole practice runs on their shoulders for most practical purposes. She started her career in the Practice as a receptionist. She then worked as a secretary and then promoted to the post of practice manager. She said she was well known amongst the Practice managers and commissioners. She mentioned previous managers in the PCT. She described a local service agreement related to enhanced levels of diabetes care, and she mentioned that diabetes care is not just

about managing blood sugar level, HbA1C level, but needs a holistic approach. It was evident how passionate and proud she was of her work. She then ran a report on IS and showed the existing prevalence in the area. Clearly this was not an area of interest, but didn't stop looking at it, as it would harm the rapport with her.

Source: GP-PM-F3

Proposition 3 concerns interdependences. The role of power in any cultural setting is significant. The function of power in GP practises is revealed by observation of the communities of practise. Significant abuses of power were noticed in the GP practises according to the researcher's 'soft data,' which are sentiments and opinions. Before their inception, IT systems had an influence on the relevance of the power holders. Power is concentrated on one or a few individuals in the GP practices. This enables the practice managers to coerce staff. For example, they can discipline or sack individuals deemed incompetent. Secondly, because they are the central locus of operation, practice managers are the source or holders of essential resources. However, in such an environment, informal authority is ultimately derived based on their characteristics and acceptance by the staff members. This is why the researcher often heard, 'ask Jane (not real name), she knows.' This is in contrast to the micro-management of some practice managers in informal groups concentrated around someone they accepted as powerful.

Practice managers and senior GPs listen to junior staff members who are more IT savvy. The researcher witnessed an elderly principal GP closely listening to a junior admin who was also good at computers and agreed with his recommendations.

The practice manager and the principal GP hold the authority. However, the authority is communicated and reflected only in the practice manager. This was why the practice manager was responsible for HR, finance, and operational decisions. Her

power was accepted and tolerated by the others. However, her power was not wholly based on statutes and policies but also based on her knowledge. This is why people always approached her for advice.

Concerning informal activity and emergence depicted in the IDAP model, the practice manager holds formal and informal power within the GP practices. However, the informal authority over the staff members has reduced over time due to the introduction of IS in GP practices. Previously, staff had many informal communications with the practice managers. The practice managers designed aspects of the paper record management process, e.g., patient appointment booking materials. Staff members said, 'Things were relaxed those days.' This gave practice managers unprecedented authority in determining local processes and standards and concentrated significant power around the practice manager.

A great deal of communication is centred around the practice manager. However, informal interactions between staff members and the practice managers decreased after IS implementation. Various informational and organisational policies and processes instead filled it. This led to staff members forming informal groups to accomplish their work. This emergence of informal groups focused on developing workarounds and deferred design decisions to make the structured processes more relevant to their local needs.

One staff member mentioned that the practice manager does not come to her room as often as she did a few years back due to the existence of an instant messaging system, so they have more freedom to work. This means that the level of micromanagement has been reduced and replaced by the need to follow organisational policies and processes as required by IS implementation. This allowed her and her colleagues to work independently without close supervision.

They said it was initially challenging to work with the IS, and they had problems from time to time, they had problems. However, they resolved them as a ‘team.’ The team refers to the informal group of colleagues in the room. There were two receptionists, one administrator, and one secretary. The administrator was a young woman who had recently graduated from university. The established staff members pointed out her as the computer ‘guru.’ Similar groupings were seen in other GP Practices, where senior GPs sought advice and listened to junior administrators good in IT. Such cases showed authoritative power superseded by high knowledge power enabled by the introduction of the IS.

In GP practices, knowledge gives power and respect. This makes the practice manager the central figure of the operation of a GP practice. They have a myriad of responsibilities attached to their job description. They also remain involved in different organisational tasks, making the practice manager’s position unique and influential. Everyone seeks advice from the practice manager, who often remains happy to help. This is a unique, effective skill combined with the required technical skill to manage a practice. This effective skill is unique to practice managers.

In most cases, the practice manager’s involvement is often final. They play an interesting lead role as trouble-shooter and brokers. In one such instance, a patient made a verbal complaint to the receptionist about how an appointment was handled. The receptionist directly requested the practice manager to step in. The receptionist was more than capable of dealing with the situation. However, she wanted her ‘superior’ to deal with the issue.

The researcher was inclined to look deeper into what compelled her to bring the practice manager into the discussion. Later, when the researcher enquired, the receptionist revealed a documented complaint-handling process. She did not want

the patient to ‘feel bad’ for following the policy and appearing formal. She wanted to appear ‘helpful’ to the patient. The patient and her extended family had been registered with the practice for a long time and knew the senior doctors very well.

Receptionists and practice managers are careful in maintaining their relationships with patients as a priority and try to accommodate patients’ needs wherever possible. The receptionist did not disagree or argue with the practice manager’s decision. The practice manager realised her colleague was becoming frustrated and said, ‘She is Mr. Malik’s (pseudonym) granddaughter. She is stressed as she is looking after both maternal and paternal parents. Oh my God, I can’t do that. Well done, Jenny (pseudonym). She [the patient] is happy now.’ She wanted to make an exception to value the patient’s loyalty to the practice. However, she hinted and acknowledged that the receptionist followed the correct process.

The informal activities as depicted in the IDAP model affect the emergence of different ways of interacting with formal IS. It seemed that the practice manager did not want to upset the patient, who lived in a housing complex in front of the GP practice. Therefore, in primary care organisations, policies, management procedures, and roles have blurred boundaries. They value patients and their relationships and celebrate loyalty. Such practices are also common across other GP practices. Being knowledgeable about and accommodating to regular patients is common. The patients also remain comfortable and always expect a little more. The IS user’s needs and comfort for such patients may mean a lot for them, influencing optimum operational success. Hence, observing them, interacting with them, and witnessing their real-life situations helped the researcher immensely.

Hierarchy is a crucial configuration to consider in the informal behaviour of the participants, as it varies between GP practices. The hierarchy within a GP practice

is a blend of formal and informal, professional and familial, cultural and institutional. This blend is heavily influenced by participants' cultural backgrounds, which infuses into the expected professional and institutional hierarchy. The familial hierarchy stems from the indigenous cultures of the participants. These cultures are varied, including South Indian and North Indian ethnicities. These varied cultures are interwoven and further incorporated in the host British medical culture of professional practice. All the staff members (except doctors) report directly to the practice manager, and the PM reports to the Senior GPs. The practice managers have implied authority over Trainee GPs and contract /locum doctors. At one point, at a GP, a locum doctor patiently waited outside the practice manager's room until he got the practice manager's attention.

He remained polite and respectful when he was discussing his contract extension. After he left, the PM said, 'He is a good man. We need to keep him. I need to speak to the doctors.' The locum doctor continued to work at the practice during the subsequent visit. The PM understands the needs of the GP well. They supervise, manage, and guide staff members and remain a valuable bridge between them and the Doctors.

As observed above, the hierarchy in GP practices is infused with a blended cultural type of formal-informal behaviour. Communication and decision-making in GP practices appeared to be relatively informal because of the familial and cultural hierarchies but based on the formal requirements of the NHS practices.

Most GP practices hold weekly meetings. It is an occasion to discuss shared responsibilities, the 'way forward' in dealing with new performance indicators, and any changes to NHS standards. During one such weekly meeting, the GP practice manager mentioned 'PCT' 26 times. Most of the agenda was around new KPIs and

vaccination standards. This particular discussion covered the flu vaccination targets. Each year, the NHS provides flu vaccination through GP practices, recommending that everyone above 35 years old, especially if working with patients, should be given a vaccine (vulnerable people). The Chair of the practice managers meeting explained the importance of vaccinating and mainly highlighted how they can obtain QOF (Quality Outcome Framework) money from the commissioners. Another member suggested they ask the receptionists to talk to the patients about it when they come to the practice to increase the number of patients having the vaccine. They also shared a document comparing new KPIs and old KPIs. These KPIs are issued as part of the QOF and issued by the Commissioners to mention the expectation of various standards and the money available for hitting the targets. It was noticed that the practice managers are very keen to see how much they could earn by hitting targets, and the researcher noticed that few asked how much money their practice would receive by achieving the targets. The Chair said that it depends on the GP practice's patient population and the deprivation in the area. After hearing this, smaller practice managers said their practice was categorised as being in an affluent area many years ago, but now they are classed as a deprived area. Therefore, even if she hits the target, she may not earn enough money. Resume!

Further insight into Proposition about *informal behaviours, emergence and adaptation of workflows and IS* is from meetings. Everyone listened carefully and took necessary notes while drinking tea and eating Indian sweets available in the area. The meeting remained very cordial; however, these weekly meetings are often not carried out formally. Instead, the practice managers and staff often gather in corridors for an ad-hoc meetings.

We do not have that many meetings as our practice is not that much bigger. It is much more effective to have informal networking with Receptions. Occasionally, they have meetings with doctors too. New regulation suggested we have to have two GPs for PLT [Protective Learning Time]. We are seriously concerned about it. Really bad news. PLT is a burden for us. For a smaller, flat organisation like ours, informal networking along the corridor is working well. We have much better personal rapport amongst ourselves. We pass important news and decisions to Nurses, doctors, and HCAs [Health Care Assistants] when we see them in the corridor.

Source: GP-PM-F8

Often, patients talk with receptionists and other staff members about their common relatives and day-to-day things in their communities while waiting for their turn to see a clinician. Some patients called the receptionist by their name (there were no name badges) and asked about the health and well-being of their family and relatives. There was robust cultural cohesiveness between the patients and staff members. Patients and their extended families are registered with one GP, and their loyalty is intensely celebrated. This is achieved by blurring the lines of formalities and being as flexible as possible from the General Practice point of view. To avoid *Design Reality Gaps*, one needs to consider these common cultural complexities in detail to design a successful IS.

Racial elements played a significant role. The receptionist told all the female patients who had an appointment to see a male GP, beforehand. Also, when people attended a walk-in session, they were told that they wouldn't be seen by their regular GP but by a new 'black' GP. The researcher asked why she specified the alternative GP as

‘black,’ The receptionist explained that some patients did not want to see a ‘black’ GP, and they often complained about him. The receptionist showed that GP had had many empty appointment slots not taken, while others could not cater to the demand. The researcher questioned whether subtle racism was present but did not dig deeper as that was not part of the research. Further, such cases were not seen in GP practices outside the town centre and in mainly affluent and less deprived communities. All the GP’s appointments were taken, and the researcher did not observe anyone asking for a doctor of a particular ethnicity.

Practices hire receptionists from the local community. From a practice manager's point of view, this was done ‘to suit the area and serve the community better.’ This strategy has positive effects, as the receptionists speak the same language or have a similar dialect as the patients, which is a major benefit in ethnically diverse communities. Also, it reduces the number of complaints because the patients tend not to complain against their relatives or familiar people and members of the community. Such an arrangement serves the interest of both the community and the GP practice. A further example of *adaptation of workflows and IS* is appointments. On one such occurrence, a patient came with her four children and demanded the doctor see all four of her children because she could not come again, even though she had made only one appointment. The receptionist was initially hesitant and tried to explain that every patient must obtain an appointment as a policy. The patient booking system did not facilitate group appointments. However, it could have been beneficial when treating more than one patient, especially when children are concerned (due to confidentiality and Information Governance). This was the case when the research was conducted.

The discussion between the patient and the receptionist was slightly argumentative but not confrontational. The children started to cry, and it was visible that they were not feeling comfortable. The receptionist could have quickly rejected the request, but she tried to find a way out. She asked the practice manager for permission and offered an extended appointment with a GP. This was another example showing that the staff members were not rigidly following a specific policy. They responded on a case-by-case basis, displaying common-sense and damage mitigation in the best interest of serving the patient.

As further insight into Propositions 2 and 3; however, this affects the practice activity reports as attendance reports are captured based on booking information. Thus, resulting in *deferred IS* supporting Proposition 5 as depicted in the IDAP model. In the above case, the booking information would show one patient, and attendance would remain for four. If such scenarios had been considered at the IS designing stage, the activity reports would have been more accurate, eliminating *Design-Reality Gaps*. As discussed earlier, the problem was that the IS could not record group appointments at that time. In this instance, the doctor treated all the patients, but the appointment was recorded as only one appointment. The issue is, this affects their funding. Eliminating these Design-Reality gaps could help users balance their loyalties to patrons, meeting regulatory needs, the rules, and operational goals of their practices.

Despite these complexities and contradictions, the working conditions within the family-based GP practices were friendly, cordial, and informal. Staff members bring food from home and share it during the lunch break and go for drinks and shopping together after their shift. Staff members shared bonding moments amongst themselves. Nevertheless, the authority was concentrated around the practice

manager. Practice managers often employed their wives (some practice managers are GPs' partners) as practice managers. This reflects how serious and personal the role of the practice manager is for the Senior GPs.

On one occasion, a locum doctor was working in general practice. The locum needed to obtain details of a patient from the practice manager. He waited outside the practice manager's door without entering for a minute or so until the practice manager noticed. This reflects the implied authority of the practice managers. On another occasion, a staff member directly approached the Senior GP as the practice manager was unavailable and mentioned that she needed to finish her day earlier than usual. Although the practice was not busy and scheduled to close at 3.30 pm, the doctor asked her to wait until the practice manager was available and to seek her permission. This highlights that the clinicians do not get involved in operational aspects within the practice, no matter how minor the issue is. This implies the importance of a practice manager's role and clarity about their authority.

Non-clinical roles in GP practices were designed so that an individual staff member could specialise in one area. For example, the receptionist's role is to talk to the patients and mark whether the patient has arrived or made a booking on the system. An admin assistant's role is to open letters in the practice, deliver them to the relevant staff members, and write letters as directed by the practice manager; sometimes, they may also make tea for the guests. Finance-related documents are handled by the practice manager only. On one occasion, the practice manager asked an admin assistant not to open a letter and leave it on her desk after seeing the stamp of the accounting firm on the envelope. This indicates the overarching role of the institutional hierarchy in GP practices. Every task is coordinated through the practice manager. The practice manager is the only person aware of all

organisational dynamics. This is why the practice manager's room usually sees the highest movement of people in and out of it. The practice manager mostly remained the hub of operation of the organisation.

However, considering the average age and academic background of practice managers, it was clear that working with computers was often not their strong point. Most of the practice managers had mastered their skills hands-on over years of hard work and often did not have a formal degree or IT qualification.

Practice managers' strengths were their operational knowledge, experience in the NHS, and the level of trust developed throughout their employment with the GPs. They usually have a hands-on overview of all functional verticals to understand and guide them through situations. They are authoritative but seldom autocratic. They have accumulated their skills through hard work as none of the practice managers has strict working hours. They often start early and finish late. Practice managers are the main link between the GP practice and internal and external stakeholders. It was noticed that they were heavily dependent on data and information collected on paper, creating cumbersome and time-consuming processes to summarise information for management or reporting hierarchically. These could be activity data, HR, or finance data submitted to trusts HQ or commissioners.

The time was 6.15 pm. It was dark and silent outside the building. practice manager was still working, alone. There was a cup of coffee and another empty cup of coffee on the table. She said she needs to provide some reports to the commissioners. She said with understated pride, 'No one else could do it.' Her phone rings and it was from her colleague in another practice. They discussed the report under preparation, and she changed something on her report.

Fieldnotes GP Practices -1

In summary, GP practices value, celebrate, and recognise collective behaviour. The informal behaviour and interactions stem from the staff members' professional obligation for patient care to deal with everyday problems they face with the IS. As noted, different types of formal and informal hierarchy, varied cultures, and loyalty were crucial aspects of informal groupings in GP practices. These qualities impelled the informal interactions between the practice manager and staff.

The emic account above reveals that GP Practice staff are influenced by IS implementation (Proposition 2). It results in increased reliance between individuals trying to make sense of the formal IS that they are required to work with. This increases the interdependences amongst users through increased informal group activity. The overall situation is one of emergence that requires adaptation of workflows and IS. This accounts for Proposition 4 which states that, rather than the use of the formal structured IS, users resort to their own design of deferred systems through diffusion management, or interdependencies amongst IS users that results in IS adaptation.

Underpinning this is the deferred action theoretic. The deferred action theoretic is that formally designed structures like IS and socially designed communities like GP Practices are subject to emergence and that this requires deferred action – the need to adapt locally to the emergent situation. Thereby reducing the gap between formal structures like formal IS and the local situation. This is coherent with Proposition 5 of the IDAP model.

5.2 Similarities and Variances Between the Sites.

This section highlights the similarities and differences across various sites concerning their culture, relationships, IS implementation process, organisation, and complexity. Especially, how these characteristics leading to deferred solutions. Consequently, it serves as an extension of Chapter 4, providing the reader with nuanced insights into these sites and elucidating the underlying reasons and contextual pressures that influence the behaviour of staff members.

Throughout all these sites, commonalities emerge in terms of organisational culture, people's culture, and behaviour, but distinctions also exist. In all of these sites investigated, staff members take pride in their contributions to patient care. In GP practices, this pride manifests as a commitment to serving the community, garnering positive responses and recognition. In contrast, professionals in Rehab and Inpatient wards view their responsibilities as part of their professional duty, emphasizing satisfaction and service. This divergence makes GP practice staff proud of their role and satisfied, while secondary care staff perceive it as a job. In GP practices the culture is vividly clear and celebrated by in the dress code, language, how they talk to each other. In the secondary care organisations, cultural differences are visible but not celebrated and expressed as in GP Practices. Perhaps, the secondary care organisations have different relationship with the local community compared to the GP surgeries.

The management styles across organisations are markedly different. GP practices adopt a Practice Manager-centric approach with a blend of informal and formal management styles. Policies and regulations come into play only when necessary, with a preference for resolving issues amicably. Secondary care sites, on the other hand, embrace a more bureaucratic and structured management style, where policies and regulations play a pivotal role. Departments have a dedicated

responsibilities and so the individuals in these departments. There was no overarching figure i.e. Practice Manager for moderation or coordination. Consequently, staff members strive to maintain a clear separation between their professional 'agency' or their ‘remits’ and their informal life and relationships.

In GP practices, there is a prevailing belief among managers that the practice is their own, and they shoulder the responsibility for its success. This belief motivates staff to work late into the night and start early. While such dedicated individuals exist in secondary care, they are less common compared to GP practices. This was why the researcher witnessed less number of staff members in secondary care sites working late. However, it is needed to highlight that there are ‘lone working’ policies in secondary care organisations, which limits individuals working alone.

Because individuals feel the organisation is theirs’ and less bureaucratically rigid, the informal and formal interactions are intertwined to focus on service delivery. Stronger informal relationships between staff and practice fostered by connections outside of office hours were less evident in secondary care, except on a few occasions. for an example a staff might not hesitant to call a Practice Manager on leave to obtain an urgent advice whilst in secondary care this is not existent.

In both types of organisations, informative objects are present. Nevertheless, in GP practices, there exists a more personalized connection between these objects and the users. This distinction arises because in secondary care settings, computers, patient files, and medical reading equipment are commonly shared within the ward or among other staff members. Consequently, there is a reduced level of personal connection or relationship with the information objects in secondary care. Also, there are strict policies of how to them. This distinction has led staff members in GP practices to adopt a more customized approach and easier to take ownership of the

changes they make to these objects compared to their counterparts in secondary care organisations.

In the context of IS implementation, both similarities and nuanced differences exist across the various sites. Despite these disparities, a crucial aspect remains constant: the IS designing process, implementation, user engagement, and participation are uniform across all sites. In each setting, IS implementation follows a top-down approach, where a select group of senior managers decides the requirements and oversees the implementation throughout the organisation. While GP practices enjoy the privilege of choosing an IS, the same autonomy does not extend to secondary care wards at the ward or borough levels. In secondary care, ward managers and clinicians are informed about the impending implementation and assured of support for customization to align with care pathways.

The technical committees overseeing IS implementation in GP practices are typically represented by active Practice managers. In contrast, in secondary care trusts, representation is delegated to either ward managers or clinicians who have earned the trust of ward managers. Similarities arise between Practice managers and ward managers, with both often sending their trusted confidants to meetings, individuals deemed knowledgeable in the subject. Therefore, selection of staff for the represent these implementation meetings are based on the trust, previous experiences and manager's perception on how they can benefit the department. For both organisation settings, sending someone for a training is a privilege and acknowledgement their hard work. In GP Practices, managers view the opportunity cost of sending someone based on financial implication, while in secondary care it is direct patient care and findings a staff coverage. The managers felt their participation at the implementation meetings as an obligation or a duty in the secondary care and GPs felt as an optional.

Interactions among staff members are primarily shaped by personal cultures and trust, particularly when seeking assistance in the face of disruptions caused by information systems. Notably, in secondary care, staff interactions are guided by factors such as proximity, trust, approachability, and uniformity. Unlike in GP practices, instances of staff members from different wards engaging in conversations are not as conspicuous. This discrepancy can be attributed to the smaller organisational scale in GP environments compared to the larger secondary care settings. In GP practices, individuals often find someone performing a similar job in a nearby practice, fostering inter-organisational connections. Conversely, in secondary care environments, where multiple clinicians may be present within one unit, staff can readily seek assistance from colleagues within the same ward, eliminating the necessity to reach out beyond their immediate work area.

The level of informality is influenced by the manager's characteristics and their willingness to assume responsibility for 'workarounds.' In secondary wards, which are centrally governed according to organisational policies, staff members exhibited some reluctance to deviate from these policies. In contrast, GP practices demonstrated flexibility in their policy implementation. This serves as an example highlighting how formal policies can contradict the informality inherent in an organisation. In general, within the secondary care setting formalities and centralised policies were strictly followed compared to the primary care setting.

Information systems within organisations are designed to facilitate specific tasks for staff members, encompassing functions such as storing, retrieving, editing, or deleting 'information elements' related to care pathways. This commonality extends across both GP surgeries and secondary care hospitals, where the philosophy and design of information systems remain consistent. In GP practices, tasks related to information systems are typically handled in-house by administrators, receptionists,

managers, or clinicians. An exception in secondary care hospitals is the centralized management of business intelligence by a dedicated team, unlike in GP practices where the Practice Manager often oversees this role.

When issues arise with the information systems, a notable distinction emerges between GP practices and secondary care hospitals. In GP practices, management actively involves itself in resolving IS issues, with Practice Managers considering it their duty and responsibility to oversee the system and care pathway. Conversely, in secondary care settings, managers, often nurses or doctors, perceive IS problem-solving as the responsibility of a dedicated help desk, typically within the IT department. Consequently, their primary focus remains on patient care rather than direct involvement in managing the information system. This difference in approach contributes to a lower incidence of workarounds developed in the secondary care context.

Section II: ‘We Work Together to Make Things Happen’

The previous section described the organisational setting, the people, their relationships, and the cultural habits within each research setting, highlighting their differences. This section details the collaborative efforts of the staff members to bring the NPfIT to fruition, illustrating a complex work environment filled with various informal engagements, workarounds, frustrations, and wasted efforts. Despite enormous challenges, the staff successfully implemented the centrally proposed IS into their GP practices and inpatient wards. The chapter described the staffs’ effort in integrating IS into their work settings and care pathways to without compromising patient care.

During the following analysis, the researcher aimed to narrow down the findings into four distinct areas: (1) top-down implementation, (2) self-organisation, (3) informal behaviour, and (4) adaptations. The main themes were then summarized to provide a comprehensive overview. Finally, a detailed description of the researcher's approach to dealing with issues during data collection and their position within the research context is provided.

5.2.1 Top-down Implementation: A Bad Recipe for User Engagement

According to the analysed documents, NHS IT contracts were signed for five years. Upon expiry of the contracts, NHS organisations can change the IS by changing the clinical system provider if required or moving to an advanced version of the existing IS. It is not uncommon for NHS organisations to use the same IS over an extended period by lengthening the contract. In one instance, a practice signed an IS contract in 2003 and extended it in 2007 and 2011. This is because introducing and

managing new IS is difficult and organisations tend to stick with the existing IS unless it has become necessary to change.

Every NHS Trust consists of separate teams or departments to manage the clinical system and extract the necessary activity into management information systems; one for implementing IS, another for managing clinical ISs, and a third for producing business intelligence reports. Depending on the organisation, the number of staff members working in these departments varied. In this instance, PCT, as the NHS organisation, had set up a new team by recruiting new staff members to facilitate the implementation and existing teams covering the clinical IS and BI functions. Respondents mentioned that two senior staff members were temporarily recruited for the implementation. It was interesting to note that none of the practice managers could recall the names of the project managers and the senior staff members involved in the IS project. The researcher found that this was exceptional as the practice manager was able to name all the staff members responsible for the IS implementation. She said:

> *'Nope, they are not locals [not known to the Primary Care Trust]. I don't think they understood our needs.'*
>
> *Source: GP-PM-F3*

By not being local, she is referring to external contractors. '[The] NHS is a tightly knit community,' the practice manager said. 'It is a big organisation, but people generally know each other.' The practice manager referred to the permanent staff members working closely with them. Often, staff members know their NHS managers. Unless an NHS staff member relocates to another geographical location, staff members primarily work in the same NHS organisation for an extended period and often live in the same area. This allows the staff in various NHS organisations to establish

relationships. For example, during the meeting, it was discussed that a new commissioning manager was appointed to the locality. One manager said the new commissioning manager used to work in the local secondary care Trust as a contract manager and lives on the other side of the town. However, the interim contractors hired by the NHS for the IS implementation project were not local often and did so to cover a specific task of the project implementation. According to the practice managers, bringing in outside project experts without NHS experience and local knowledge made IS implementation difficult since the contractors lacked local know-how to implement IS effectively and had a lack of personal relationships to initiate engagement.

> The GP Manager *showed the project initiating email received from the implementation manager. She wasn't happy with how it started. She complained that he [the project manager] was new and didn't know the practices' requirements well. She insisted it was a 'heavy handed' implementation. She insisted that they [the project managers] were working on 'their' plan. She was referring to the strategies and action carried out by the project managers to expedite the project implementation.*

Source: Fieldnotes - 3

The respondents' view of project managers was generally not so positive. They saw the project managers as outsiders and complained that implementation project managers in the NHS rigidly followed the national guidance without adapting to suit local needs. Their focus was to meet tight national deadlines for IS implementation. A practice manager showed the researcher an email stating that the PCT expected to complete the project in four months, which she thought was an ambitious target.

The support staff claimed that staff members were not consulted adequately due to time constraints. They neither demonstrated the benefits of IS introduction nor illustrated the local implementation strategy. They also failed to guide the staff regarding potential problems that might arise. In certain implementation projects, GPs were not even aware of the name of the IS until they attended IS training. This raises concerns about the degree of communication—or even indicates a lack of it—between project managers and employees. It can be inferred that the absence of communication or poor communication is a significant cause of the rise of practical problems, which led to the rise of informal groupings.

In supporting this argument, it was abundantly clear that not all the GP practices knew the IS project details. Some NHS staff members assumed IT changes to be an unchallengeable decision made by the NHS bureaucrats and just tended to comply with the process rather than understand the process. Given that the NHS is a highly bureaucratic organisation, many staff members have responded differently compared to how they respond to other directives. As such, this shows that the top-down implementation of the IT systems may have a harmful effect on the end users' engagement with the process of implementation and change.

> *Pressure came pressure to change the clinical system. We [the Practice] didn't have any other option. No one complained. Staff knew the basics (necessary skills required in IS Implementation). We started with ...when moved to Vision [new Information System], started with the appointment system (Step by step approach). It was difficult.*

Source: GP PM F1

In some instances, consultation was conducted, but it was limited. Staff members called it: ‘like a tick-box exercise’, as consultations were brief to achieve national deadlines. The agenda items discussed at these meetings were not adequate to understand the routines, business processes, local care pathways, skill sets, and local complexities. The agenda of the meeting consisted of:

1. Description of the New IS
2. Implementation
3. Training Available
4. Support Provided
5. Any Other Business (AOB)

At the initial meeting with the project managers, one practice manager said that local managers questioned the benefits that the NHS IS implementation brought to the practices, as there was not much information available at that time. This highlights that there were gaps in the expectations between what the project managers who tried to ‘capture’ system requirements and what GP practices’ staff members required. The practice manager mentioned that she did not attend further meetings. This indicates different cultures operating between IS developers and NHS staff. The way IS professionals gather knowledge about the application domain is quite different. It consists of a rational and logical approach to IT systems’ ‘methodology.’ It requires the decomposition of the ‘application domain’ or the work and knowledge of NHS staff into programmable computer components and creating computer ‘algorithms’ to reflect this reality. Such algorithms do not adequately reflect the work, knowledge, and context of the NHS staff. This means of gathering knowledge is a culture that is very different from the actual work and knowledge of NHS staff. Usually, staff members’ work is tied to the context in which they work, the patients, and their medical case files or information. This is highly contextual information

based on intimate relationships between the doctor and patients, in which the practice staff are a critical medium. The project management meetings did not 'capture' such nuances about medical information and the level of intimacy between the clinicians and the patients. Instead, the project participants and the technical implementors remained to guess about the subject matter and were unprepared for the 'information' about the planned IS and the medical information such IS would deliver. Knowing the GP practices, structures, and work cultures remains important to plan such meetings more effectively. This may help the project management team gather the right inputs from participants for the IS implementation.

In addition to cutting corners to save project time, the local managers believe that the NHS project managers concluded that practice managers and the staff could not understand IT and its complexities. Hence, one respondent said a top-down approach was the best implementation strategy. However, project implementation managers gave users reasonable freedom to select IS and an opportunity to configure the IS according to local needs. After further investigation, it came to be known that the project managers worked with selected practices to identify a suitable IS and plan the implementation strategy accordingly.

A senior staff member agreed that initially, none of the practices were willing to test the clinical system. She explained that she had seen few IS implementations in her time as the practice manager. However, she questioned how many practices got involved in the implementation. She said, 'You cannot expect a payment to get involved in the project.' She was sympathetic to those who agreed to pilot the IS and calmly pointed out that, if people were not willing to participate because they were 'busy,' there was no point in complaining about it after. This doesn't mean that

the ‘money-driven’ culture is superior to ‘we are here to help.’ However, managers are keen to balance doing ‘favours’ and ‘income generating activities.’

The local practice manager's meeting chair said this issue had been discussed in detail with her practice manager colleagues. Most GP practice managers did not ask questions; they followed guidance from the NHS. Therefore, NHS project managers select the IS system to be implemented in their patches. One practice manager agreed with her by readily nodding her head. This supports that practice managers viewed implementation as another bureaucratic exercise and did not pay much attention unless they felt immediate financial benefits.

A technical committee performed these communications and engagement under the IS steering committee. The committee was responsible for collecting information about local care pathways and services provided to the local patients within the area. A practice manager, a technical committee member, highlighted that she visited several practices and discussed the requirements in detail at the practice managers’ meeting. System developers attended most meetings, in which care pathway diagrams were developed and discussed with the managers. Moreover, system developers attended meetings with the pilot practices to understand the care processes and data entry process within each care pathway. This means the implementation project managers followed the project plan without much genuine involvement from the actual users. In addition, because the system was developed to meet their paths, the pilot practices and participants benefitted from their non-participant colleagues. All these led to varying degrees of the design-reality gap within the locality.

Besides considering the IS implementation as another bureaucratic exercise that they couldn’t ‘control’, most GP practices staff members paid less attention to new

IS and associated technologies. This was because they believed their purpose for joining the NHS was to offer patient care and not to become an expert in IS. As one GP said, ‘GPs are here to look after patients, not computers.’ Such statements sum up staff members' lack of enthusiasm and approach toward involvement in IS implementation. Hence, it was evident that ordinary NHS staff members give less attention and interest to non-clinical activities in their departments. This may be why IS implementation project planning meetings were poorly attended. Few respondents mentioned that they received an invitation, but they relied on their colleagues who were good at IT to be in a better position to represent them during implementation meetings. Often, IT staff assumed that individual staff members in business organisations anticipated their colleagues would attend and represent them in meetings that were not part of their core responsibilities.

If we look into how the training was carried out, the implementation training was carried out in a temporary setting in a GP practice. The room selected at the GP was not adequate. Also, organisers could not get suitable computers linked to the clinical system due to a server issue. Considering that there were 30 GP practices in the PCT, planning issues led to a lack of engagement from GP practices.

> *Mede-Analytics, [I have] been to one meeting. [They] said there will be training available. But [at the training]4-5 PMs [Practice managers] shared one PC [Computer]. [I] never had a chance to see the screen even.*

Source: GP PM F2

The clinicians in GP practices were apprehensive of their involvement in IT decisions. They tended to believe they didn’t need to know or didn’t want to get involved in IT decisions. As one clinician said, it is not their ‘area of interest.’ The

researcher interpreted his attitude as being cold towards IS implementation. However, he acknowledged that the ‘activity reports’ were helpful. He also mentioned that ‘implementation and design’ are not his responsibility.

Similarly, another clinician said, ‘We look after patients, not computers.’ This shows that physicians recognised the necessity and advantages of the IS but desired to remove themselves from its implementation and the obligations that come with it.

There should be no doubt that good communication between the project and local managers helps successful IS implementation. Such relationships could have benefited the project managers in understanding the specific needs of the GP practices. The practice managers could also have achieved these benefits by attending monthly practice manager meetings, informal events to discuss local issues related to GP practices, payments, NHS contracts, and computer problems (according to their verbally agreed standard agenda). The congregation was held at a practice in the town centre. At these meetings, minutes were not taken, but critical points were written down for further discussion or ‘follow through’. The same group of practice managers chaired the practice manager’s meeting for some time. All the officials were white British middle-aged female practice managers. The researcher would liken these ‘officials’ to being pseudo-officials as the group is a voluntary and informal organisation, and there have never been any elections or selection of officials.

They represented a handful of ‘elite’ GP practices in the area. One manager, who did not belong to this category, explained that the ‘eliteness’ came with their involvement in various NHS projects, but this was not related to the clinical quality of their service. Another observation is the differences in the traditional understanding of gender and hierarchy between IT professionals and NHS

professionals. Namely, there are proportionally more senior females in the NHS than in the IT sector.

As part of the interview process, the practice managers' meeting vice-chair was interviewed. The vice-chair started her career in the same practice as an administrator 22 years prior. She illustrated her system and described her daily routines enthusiastically. She described her role as handling payments, responding to the emails and letters received from the NHS, suppliers, and mediating minor HR matters. Her role also included dealing with patient complaints, maintaining patient booking, and ensuring the practice was operational and functioning on behalf of the GPs. At her practice, GPs dealt with data extraction, read coding, and even reported bugs to the clinical system supplier as she is not IT literate. However, everyone respected her as a 'tough and IS savvy' practice manager to represent them at the NHS IT project meetings. She attended meetings with the NHS IT implementation on behalf of her 'patch' and fed back necessary information to other practice managers.

Lack of requisite involvement in IS implementation for local teams led to negative implications, such as IS being non-compatible with medical and patient administrative processes, staff skill levels, routines, and financial management. This, in turn, led to numerous issues with day-to-day operations within the trust. This was far more significant when the trust depended on the IS for its income.

Such significant Design-Reality Gaps could be attributed to a lack of engagement, quality time to understand, and a lack of notable details. The pathway mapping was not detailed enough to 'capture' all necessary scenarios. The care pathways tend to be different at each GP practice to an extent. Not capturing these nuances is a

critical design-reality gap. Logically, planned user engagement is very crucial to avoid them.

As previously discussed, IS in the NHS are ‘structured’ abstractly and designed by reflective designers based on the knowledge of NHS staff and actual workflow and generic care pathways. No significant effort has been made to understand the unique complexities of each team. Also, not much effort is made to configure the IS to these changes. Developers designed an IS based on standard workflow diagrams, entity relationships, data flow diagrams gathered during brief consultations to ‘capture requirements,’ as previously described. However, each care pathway is unique and different from another. For example, in one GP practice, a receptionist may only offer appointments; in another practice, receptionists may offer appointments and record the patients’ smoking status. Also, some practices used the reporting module of their clinical system to extract reports, and other practices used third-party software packages. This is a challenge for the local IS project to understand each pathway well and design a universally acceptable solution.

Staff members highlighted that the management could have completed a better implementation project. Most of the problems were due to the poor engagement offered by the NHS. The staff expected that the implementation should not disrupt their patient care pathways and business processes. A staff member also said, ‘At least there is someone to talk to when there is a problem.’

In one instance, due to a simple incident, the receptionist was unable to log into the clinical system. Her colleague tried to help her several times. However, she was unable to mark those who came for their appointments. Nearly eight patients were waiting with toddlers. Only a short while later, the children began to cry, so the mothers started to complain. It was noticed that the receptionist was stressed; she

was sweating, and her face was red. Finally, the receptionist called the practice manager for support. She recommended she reset the Internet router. In less than ten minutes, everything went back to normal. The researcher observed several such small instances wherein the practice manager or another experienced staff responded to routine challenges and mitigated them with aplomb. However, if no local resource person was available to assist or resolve the problem, what could have happened to the business processes?

On another occasion, a staff member was on hold for more than 20 minutes, waiting for her call to be answered by the IT help desk. Therefore, a communication channel should be readily available throughout the IS life cycle. This could have enabled the GP practices to continue their care processes. Alternatively, they would have a pre-defined timeline to resolve their problems. So, the staff members can bring temporary need-based measures and carry on the care processes.

> *Their [other users] views are similar to mine. They all agree with the need for changes happening in the NHS. However, they disagree, whether what is happening is the correct and best model! The whole system, as it rolled out, was very messy. Less support was given to users. No one wanted to talk about it.*
>
> *Source: GP AM F4*

In a broad sense, bureaucracy has been the underlying metaphor in structured processes. No matter how small or big, every organisation tends to operate and behave according to pre-defined procedures, guidance, structures, protocols, and responsibilities. Individual staff members work in areas where they are permitted.

For example, a receptionist never registers a new patient unless they have received authorisation from the practice manager. On one occasion, the administrator did not register a patient because the practice manager's signature was not on the patient registration form. This necessitates GP practices to refer to and follow the NHS guidelines. However, the disadvantage is that bureaucracy sometimes fails to bridge knowledge gaps and expectations. For example, the implementation plan was shared with the senior managers during IS introduction, leaving out the users. The staff remained unaware of the potential of the implemented IS and the support they could expect during IS implementation. This, in turn, negatively affected the confidence and participation of staff members in the process.

The knowledge gap created due to interactions between local IS implementation managers, system developers, project managers, and front-end users was significant enough to create operational problems. In other words, they implemented an IS that was different to what was needed; users did not know about its purpose and capabilities. At one point, the practice manager was completely unaware of a system implementation until another practice manager told her about it. She was not ashamed of her lack of understanding but was explicit about her experience and told the researcher:

> *Quest Browser was introduced whilst I was working on something else. Initially- to capture data in relation to Health check LES [type of contract] it was very difficult to write my reports in the QUEST BROWSER [IS name]. the researcher came to know it (QUEST BROWSER) via another practice manager.*

Source: GP-PM-F3

The above statement supports the fact that the implementations were carried out

without considering much involvement or engagement of the user. Given that the care pathways, training requirements, skill levels, organisational behaviours, and staff behaviours are unique for each practice, implementing a standard product has led to significant gaps between its reality, affecting the success of the project.

Theoretically, IS implementation is a never-ending cycle as post-implementation support and feedback are critical and enable the users to adapt to the IS and improve future developments. However, local IT experts followed a structured top-down deployment model designed by the DH without a feedback process. It was found that the NHS employed project managers only until implementation was completed. There were no staff members left to carry out any post-implementation feedback or support. An administrator showed the last email they received from the project manager three months after the implementation; since then, there had been no communication. The last communication coincided with the payment to the clinical system provider.

> *PCT had not asked anyone whether the system was ok so far. Someone just contacted me before the final payment was made.*

Source: GP-PM-F1

5.3.2 How a Lack of Engagement Leads to Increased Design-Reality Gap: A Tick Box Exercise

The previous section discussed top-down and structured IS implementation concerning user engagement and demonstrated the challenges in bureaucratic IS implementation. The problems were caused due to the lack of user participation, involvement during the requirement-gathering stage, and implementation. Hence,

this section is not intended to analyse user engagement in further detail. Instead, the researcher attempts to analyse the project implementation concerning understanding ‘gaps’ in the process. Design-Reality Gaps are described in the literature as inconsistencies between the IS and organisational context at any given time. These gaps could be categorised into Information, Technology, Process, Objectives, Skills, and Management Systems. Alternatively, they could be related to any other resources in a given context. The concept of a design-reality gap covers a series of complex organisational and procedural aspects of the organisation’s context in which people carry out their ‘organisational life,’ where the work requires empathy and sensitivity in patients’ care. However, the aim of minimising these gaps as much as possible is not a feature of structured IS methodologies. This can only be achieved by making the clinical system native to the organisational context; thus, it is more suitable and native for the user. To make the IS relevant and sustainable, it must be adaptable and minimise the Design-Reality gap.

Communicative acts between the staff and the practice managers mainly focus on queries and acceptance of orders. The researcher heard the terms ‘Can I’ and ‘Ok, sure.’ This was because the direction of instructions came from the practice managers rather than vice versa.

Within informal groups, the discussions and questions were much different. Those focused on ‘Can we,’ ‘Is it possible,’ and ‘How can I?’ Within the informal groups, there is a sense of collaboration, which answers the ‘why and how’ questions rather than the ‘what.’ To get attention or help from another, the researcher noted that staff physically went to people who could help them rather than using email or phone contacts. However, when the practice manager needed help, they often phoned or emailed to summon the staff who could help them. When a staff member needed

help from the practice manager, they physically went to wait at the door until they got their attention. This signified the cultural importance of the practice manager. Whereas the communicative acts between less significant people could be conducted electronically, the importance of the practice manager almost demanded the person's physical presence at the door of the practice manager.

As noted above, project-based implementation is inherently bureaucratic since any project is designed and planned to achieve specific objectives or goals. Bureaucracy occurs as a form of a regulator that organises the inputs in such a way as to achieve intended targets at a given point in time. These bureaucratic regulations and management are prescribed in project plans. So, bureaucracy is an enabler. The management and bureaucracy of a project are maintained by the managing agents. IS implementation in the NHS organisations investigated highlights that an implementation steering group and a technical sub-committee oversaw project. The technical subcommittee was composed of practice managers, analysts, and administrators, as described in the previous chapter. The project manager collected information from selected users and passed it on to the developers on behalf of the system suppliers. Respondents mentioned that IS project managers collected user requirements through steering groups and technical steering groups.

> *[According to an email received by the practice managers, the steering group consists of two practice managers, the IS project manager, Director of IT, Director of Primary Care Commissioning, analysts, three officials representing the system supplier and three senior GPs. A subcommittee was established to collect technical specifications. The practice managers representing the steering group and the technical subcommittee would provide the specific requirements about care*

pathways and business processes, collected through the practice manager's meeting.]

Fieldnote: 01 GP

It was evident that practice managers or users adequately represented neither the steering group nor the sub-committees. One practice manager smiled and brushed away a question about her participation. She implied that practice managers are not technical experts, hence being unable to understand the technical jargon discussed at the first meeting. She said, 'They talked technical stuff.' Hence, she did not attend the subsequent meetings. This led to a situation where user experiences were not heard at meetings. Consequently, the practical requirements required for the IS had been overlooked. For example, none of the systems could offer a group appointment to a mother with more than one sick child at the same time. These are practical issues experienced and known mainly through receptionists at the GP surgery. If receptionists are not represented at the IS meetings, their requirements are not included in the design. This becomes more critical when the practices do not have standard care pathways.

The practice and deputy manager at the pilot site showed the researcher the reporting module of the IS and the reports they have designed, which other practices are unable to do. This means that adopting the clinical system is inconsistent within the locality as the practices occur in different stages in the implementation lifecycle. However, given that there were inconsistencies in IS implementation, we can assume that part of the problem was testing, and the pilot site selection did not reflect the organisational reality within the area. Therefore, measuring the success based on an IS implementation in IT affluent GP practices or assuming that a few

individuals in the steering group represent the whole locality does not make the IS relevant for the user's informational needs.

Undoubtedly, an IS is a type of design created by technical experts based on the information requirements collected by third-party individuals, i.e., project managers. They are called 'reflective designers' in the theory of deferred action explained earlier. The designing fundamentals and parameters are based on rational and structured processes that are devoid of actual organisational contexts. Structured indicates a logically organised and documented understanding of 'where,' 'what,' and 'how' data is captured at various business processes and translated into flow diagrams and other such techniques. Rationale indicates that there is no account for the actual living experiences of users serving their communities of patients. Such living experiences are not 'captured' during the structured phase of the IS requirement-gathering process.

Furthermore, user knowledge and experiences consist of emotions, experiences, behaviour, judgments, observations, and interactions. For example, a patient's care journey can go beyond diagnosis, assessment, and prescriptions; for example, such is the case for a mentally ill patient living with an elderly mother refusing to open the front door to let a community nurse in to give an insulin injection. How can IT assist in such situations to provide better care? Such information helps design relevant IS for real-life scenarios. However, these types of scenarios are hardly captured by any IS. Therefore, user knowledge and experience play an integral part in IS design, but structured IS design solutions do not capture such inputs. At the requirement-capturing stage, this intimate knowledge and certain behaviour patterns should have been known and analysed early.

When there is a lack of user engagement, vital information is ‘off-design’ to the reflective designer. IS designers do not think about the context where their design is to work or how the context changes. They do not ‘capture’ the living context. It is even harder to include this intimate local knowledge in designs. Given that the IS are ‘communicative designs,’ the user is unable to communicate with the ‘system’ as desired, which may lead to the loss or misinterpretation of information.

Additionally, since users are the organisational reality, they are the ultimate experts who understand the context, know intimate information, and share their experiences with the designers. However, even if such information and knowledge were provided, the staff members were not convinced that their information would be used for IS development. As a result, there is an engagement issue at the project level, as well as issues regarding whether the designers evaluated the needs supplied.

> *I was involved in Mede-Analytics implementation, and [practice managers] were asked [consulted] about it. We explained where the data is recorded and how we extract it to the implementation manager. But the researcher didn’t know whether our decision was affected [on the design] or not. It’s about the accuracy of the Mede analytics data.*
>
> *Source: GP-PM-F3*

According to the NHS, IS implementation project plan, staff, and the GP practices were promised training, support from an IT help desk, frequent floor-walker sessions, and formal classroom-based training sessions. However, the evidence showed that staff members were not provided adequate training. Hence, they faced critical problems in finding forms and entering data. Staff members work to tight schedules, and the care pathways operate similarly regulated and controlled processes. Interruption at one stage will have a domino effect, leading to longer

queues and affecting patient care. Therefore, to minimise disruptions to the flow and efficacy of these processes, having the necessary, adequate training for everyone who uses the IS is integral.

In one instance, a staff member couldn't log on to her computer. Hence, she was unable to record that a patient had arrived. She struggled for nearly 25 minutes. During that time, more than 15 patients queued in front of the desk, waiting to see the doctor. Some were carrying babies, and some were elderly. All waited impatiently while the receptionist tried to resolve the issue. It was found that the issue was related to the system provider, and the doctor started calling patients based on the time they arrived without using the IS. The practice manager said that these things happen occasionally, and in these cases, they switch to a manual system to avoid significant disruptions.

The biggest complaint was that the clinical system training was provided just months before the IS implementation. Hence, users were not able to use and master their newly acquired skills. As well as leading to memory loss, improper training and training schedules result in a lack of opportunity to develop competency and a decay in knowledge and skills. The training materials were often related to earlier IT system versions, which were available around 8 to 9 months before their 'go live' date. This is cultural, too; it refers to the culture of IT professionals who do not appreciate the people component of the IT systems they develop. Hence, it was not easy to use the materials if they wished to learn the system themselves.

Also, staff members complained that what they had been taught during the training was a demo version. Hence, project managers had to organise another training session soon after switching to the new IS. The managers highlighted that the implementation was planned and carried out on a tight schedule. Therefore, the

training was carried out before the product was completed and ‘live.’ In such instances, the purpose of providing training is lost. Users may develop indifference from day one to a new application, which is difficult to understand and adapt to. This may render IS implementation a burden to the users and create a further design-reality gap. Well-planned training may help accommodate these issues and result in greater success of the IS implementation, which would also eventually reduce the need for support.

According to the data, these implementation delays were caused by infrastructure and design issues. Combining these meant the go-live date had been postponed a few times for some practices. All the teams and GP practices investigated had experienced some sort of delay. One practice manager and her deputy mentioned that they had to wait several months until British Telecom laid new infrastructure to facilitate high-speed broadband network cables in the area. Such delays lead to a waste of resources.

Furthermore, it significantly reduced confidence in IS implementation amongst the staff members using it daily. Considering that several different agencies are independent of each other, working to such a tight deadline would usually cause delays. However, project managers should have factored such dependencies into their project plan. Moreover, if the IS went ‘live’ months after the training was provided, it is unrealistic to assume that all staff members would remember everything they were taught. These issues should have been understood and remedied to minimise the design-reality gap impact as part of the implementation project plan.

In any information system, help pages play a pivotal role in guiding the user if the user wishes to re-learn or resolve an issue. Help pages on many of the clinical

systems were up to date. The researcher compared the instructions in the IS help section to the current version of IS and found it to be significantly different. This increases frustration and increases the number of calls to the help desk. In one instance, the staff member put the phone on speaker mode and waited for 26 minutes until the other end picked up the phone. Whilst this may be acceptable in a business office, it is not often possible for clinical staff to 'wait on hold.' It was evident that the IT help desk had an up-to-date help guide that was not shared with the users or uploaded to the help pages.

IS training can either be provided on a live or demo system. Live system training is more relevant to the user, as that is the IS version the trainee would use eventually. The research found a considerable difference in outcomes, depending on whether training is delivered on a Live or Demo version of the IS. Whether the training uses test patients or not. In primary care, users did not find any differences between the demo and the live IS. However, they said that using test patients during the training did not provide adequate knowledge to deal with practical issues they face daily. The underpinning issue arose that, during the training, they were asked to create new patient records with basic information. However, in real life, they deal with existing patients with substantial information attached to each patient. Editing patient records and entering new information leads to complications, as these patient records consist of many 'linked' assessment forms and diary appointments. Therefore, editing existing patient records is more complex than the level of complexity that staff members learned during the IS training.

We [the practice managers and staff] have a week's training. Someone [the trainer] came to the premises and when she finished, she gave

her telephone number, support was there. However, the researcher did the training on a Demo system, not Live system. The system is the same, but she did use Test patients. But when the system was live, the real problems came up. We did not know the difference between some values, e.g., Not Applicable and Not know and what to select when… She [the trainer] came 2-3 times even afterward as some staff members, had problems. They had training on specific problems.

Source: GP-PM-F5

Moreover, training was performed by the system expert, but this individual was not an expert on care pathways. Therefore, the trainers could not explain this to the users when there was a gap between the care pathways and the system data entry process. The training was designed without consultation or analysis of local needs. Respondents highlighted that if the training could have bridged this gap, it would have been more relevant and practical.

The training was divided according to the staff member's work area in primary care. Receptionists were trained on the appointment booking module, and secretaries on clinical coding. Meanwhile, clinicians were trained solely on the clinical notes section. Only practice managers were provided with full system training, which may have had negative implications; whenever one staff member tried to cover someone else's role, the practice manager had to assist them. Given that practice managers are not necessarily IT literate, staff often had to seek help from the IT help desk or the system suppliers. Practice managers consider training as a reward for loyal service.

Because of the staff members have different tasks to do. They cover a limited area. When we started, we had [IS] training. That was very

specific for the job they do. Then the researcher has the training that covers all over. As a result, they approach me every time.

Source: GP-PM-F5

However, practice managers and senior managers consider that data entry issues were related to staff members not using the clinical system often enough. The research found that most GPs were over fifty years old, and their expertise was not in IT. One GP, in his seventies, asked the practice manager to search for and buy a book on the Internet during the participant observation session. When asked why the doctor had requested that they do so, the manager explained that the doctor was not capable and confident in doing it, especially when his bank card was involved.

A practice manager said that younger GPs working as contractors did not care as much about the accuracy of the data, although they were much more IT literate than the senior GPs. This meant senior staff members had varying degrees of data entry accuracy commitments. The practice manager complained that the doctors did not enter read-codes correctly, and so the practice lost money; therefore, administrators were employed to check each patient record and enter the correct read-codes, which was necessary to achieve the required data quality.

In contrast to most sites researched, the pilot site used to test the IS system showed advanced use of training with advanced functionalities. The practice manager and the deputy practice manager, mother and daughter, explained that in addition to the formal training, trainers visited the practice for a week to help the staff members. They assisted them in ironing out practical problems they faced during the initial stages of the transition process. The staff members referred to this as ‘floor-walking’, where a trainer mingles with the staff members for some time, helping them carry

out day-to-day system tasks and troubleshoot issues on the spot. Practice managers acknowledged that this helped the NHS learn the system based on practical problems and solutions and properly customise the IS as required. The respondents mentioned that they proactively investigated all the possible issues, and the 'floor walkers' helped them resolve these problems. However, this may not have been the case in other practices where practice managers did not understand the potential problems or efficiently utilise the floorwalkers' time.

I [practice manager] have received a week's training. The trainers had come to support our practice. It was a bit difficult initially; we were not aware of the system. But we received great support from the trainers. As usual, every pilot is a success as much emphasis is given to make pilots successful.

Source: GP-PM&AM-F9

However, there were incidents where IS trainers arrived for floorwalking sessions a week after the go-live date. The project manager forgot to book the training for the scheduled date. As a result, the practice had to use paper notes and re-enter everything into the system after the implementation. Such avoidable project management issues negatively affect user interest and faith in IS, further widening the design-reality gaps.

> *I know Sam [not real name] was the leader [IS implementation project]. We had floorwalkers. Once in the last 14 months. Was the training useful? No. The problem was not Jade.*

Source: CNWL-COM-CCM1

It has been argued that the frequency of floor walking support has been minimal and inadequate. Staff members mentioned that Jade is a complex IS and requires them

to fill in many forms. However, not all these are used daily, e.g., Clustering and IRAC forms. Therefore, staff members had to put extra effort into finding these forms, and they could not remember how to locate them. This could have been averted if consideration had been given in the design stage to place these forms more methodically. For a designer, placing these forms in a methodical and suitable place shouldn't have required any additional designer input. However, this required the IS designer to understand a typical NHS staff member's mindset, thought process, and skill level.

One respondent mentioned that she used the Internet and web-based forms when banking but had not experienced any problems. The reason here was that the use of banking services provided limited facilities compared to a clinical system. Moreover, going through six windows to open a form didn't help her either. Therefore, this is a technological and design challenge and results from the training issues, which had initially been due in part to a lack of user engagement.

Practice managers argue that when the training is conducted offsite, it is difficult to release all the staff members for training because, in smaller practices, only two or three staff members are doing all secretarial, reception, and administrator tasks. In such circumstances, it was not practical for both staff members to attend the training. Moreover, some practice managers sent experienced and permanent staff members for the training instead of the junior staff members. Junior staff members were more enthusiastic and interested in learning new skills than their senior colleagues. The expectation was that experienced staff members could understand the new system without difficulty and pass the knowledge on to other team members. However, the junior receptionist mentioned that she was a temporary staff member at the time of training; hence, she did not have the opportunity to attend training. When asked

whether she had the training from her colleague who had received the training, she said no. She was trying to watch and see how she was using the system.

> *[We sent] two staff members from our practice [for training]. I cannot let others go as we don't have backup staff to cover the work.*
>
> *Source: GP-PM&AM-F7*

In larger practices, training staff members on a brand-new clinical system requires a considerable investment from the practice in terms of time and money. The staff members are required to be free from the work environment for the duration of training.

> *Vision [name of the clinical system]is very good and expensive to train 35 staff members. It's not about the cost but also finding the time. Staff say they cannot remember after training, so spend a lot of money. It has to be quite a big reword to train that much of investment.*
>
> *Source: GP-PM-F8*

One critical point from the analysis is that project managers should have understood the difficulties and operational costs of training staff members. They could have planned better to facilitate the training. Project managers were selected on a contract basis for a limited time. Therefore, they did not have NHS experience or understand the administrative processes within the NHS. Most practice managers believed that having interim project managers assigned until the 'Go live' date affected the continuity of the IS. This fundamentally affected when a new version or IS module was available, as there were no staff members with historical experience

to facilitate the transition. This resulted in staff members experiencing the same issues repeatedly.

> *We find the training problems in most clinical system implementations.*
>
> *We learn things in a hard way, from our mistakes. [A sarcastic smile]*
>
> *Source: GP-PM-F4*

As previously argued, each NHS area is unique concerning the care pathways, processes, user skills, management structures, and user abilities. Hence the application of a generic implementation plan did not meet the users' actual experiences. Partly, this makes users reluctant to engage, as discussed in detail in the previous chapter. For example, in some practices, the receptionist may ask questions about the smoking and alcohol consumption of the patient, which was an important performance indicator for the GP practices. However, in other practices, these questions were asked by the GP and read-coded by the secretaries. Therefore, in some practices, receptionists have to access modules aside from just the appointment booking area, whereas others do not. It was noticed that, in one practice, receptionists knew both the clinical and appointment module, but in most practices, receptionists only had access to the appointment module. Therefore, user training requirements are varied based on practices.

The research identified that practice managers have their close staff members, someone they trust and considered intelligent, capable, and dedicated. One practice manager mentioned that she selected staff members for IS training based on trust and based on their 'future plans'. She also mentioned that she wanted her staff to understand and use the opportunity to improve their skills and work for the practice

in the long term. She also stressed that they represented the practice at the training session.

She named a staff member and mentioned that she was really good but wouldn't expect her to stay in the job due to her higher educational qualifications. Therefore, she could easily pick up the system from her colleagues. Hence, there are organisational management gaps in the implementation project. Implementing an IS has never been easy; however, it is challenging with the complexities found in the NHS compared to the factory floor.

The role of objects is a significant aspect of the peoples' world and their cultural practices. It is important for the development of both formal and informal groups as well as for preserving their own cultures. They viewed the patients and their health in terms of the brand-new digital objects that the IT systems had brought. For doctors and practice employees, these IT artifacts served as significant informational objects. Not everyone had access to a desktop computer except five staff members who did not use the system at all. In the GP practices, everyone had desktop computers. Patient notes and files were cluttered on everyone's desks, although every NHS organisation investigated being formally accredited as 'paper lite.' The presence of the IT informational objects affected power relations, as noted above. It also changed the interaction that was possible with patients. For example, making a family appointment, where a mother brought more than one of her children to be seen by the doctor, became a potential point of conflict because of the appointment booking system, which only allowed one appointment for one patient. Such interaction issues also arose around the newly recognised experts of IT, the staff who could resolve data entry or information-getting from the newly introduced IT systems.

The conversation below with a staff member summarises this sub-section. This questions whether the IS project has achieved the intended objectives.

> *The staff member was a very cheering person. He greeted me with a broad smile and offered me a seat. He said his boss [manager] told him that a researcher would approach him today. His room was full of files and documents on the table and all around. It questioned the level of use of electronic data. There were three shelves full of files. One away from his desk was looking old. It appeared no files were taken out for a long time, considering the faded colours of the file covers. Two desks were put inside a room made me assume he was sharing his room with another.*
>
> Source: Fieldnotes-6

5.3.2 Informal Relationships Led to Self-Organisation

Business organisations are created to achieve specific objectives and exist to pursue their goals. To achieve these objectives, hierarchies, written governance structures, and regulations exist to ensure staff members' actions, behaviours, and interactions between themselves are directed towards achieving these goals. As part of the employment contract, staff members spend their labour or use their intellectual capacity for a scheduled number of hours completing given tasks. Staff members' actions, behaviours, and interactions in business organisations fall within the stipulated organisational formalities. e.g., adhere to all instructions, follow set processes, wear uniform as required, report on duty on time, work according to their job descriptions, follow organisational protocols, etc. However, certain actions and

behaviour patterns fall outside of this. These behaviour patterns do not directly help to achieve the main business objectives but, rather, help the staff members to feel comfortable and ensure that the environment is enjoyable. For example, during the research, some staff members wore sarees or shalwars at work; some brought Indian, Pakistani, and Bangladeshi food and shared it with their colleagues during lunch.

These actions and behaviours reflect individual cultures, social values, interpersonal bonding, and more. For example, the research did not find any written policy for bringing lunch or sharing it with their colleagues, but such actions and behaviours exist in every organisation to varying degrees. Bringing something from home and sharing it with others made the workplace homelier, friendlier, more enjoyable, and more comfortable.

The ratio between formal rules and informal practices differs from organisation to organisation. For example, some NHS organisations require staff members to wear a uniform by policy, while some do not. Some bring novels to read at the office, and some do not. Informal relationships, emotions, feelings, beliefs, mutual trust, situational knowledge, expertise, and many more exist outside the formal prescribed policies. Some receptionists read novels when there were no patients. However, some were given other jobs when there was less work. Therefore, there is no standard, agreed combination of formal rules and informal practices within organisations.

Once entered into a GP practice, the researcher saw staff members talking in different languages, wearing multicultural clothes, and allowing certain patients to jump the queues, which you would hardly see in any other government or private organisation in the United Kingdom. Jumping the queue is generally accepted in

Asian culture because of the deference to authority. People in the queue would not question the receptionist or doctor. The research witnessed how far GP practices were trying to be flexible about organisational policies, reward local patients, and facilitate their needs. As one GP practice manager said, ‘We try to make ourselves approachable and culturally sensitive as much as possible to serve our local community.’ These informalities go way beyond their front desk customer relationships. Staff members in GP practices were handpicked by the practice managers and trained based on their loyalty and dedication. Also, some GP practices are managed by the GP’s spouse and owned by another family member, which makes the GP practices more like a family-run business.

There is no doubt that interpersonal relationships are common and play an essential part in an organisational context. Informal relationships are the results of the work environment, the organisation’s policies for staff, mutual trust, and bonding between them beyond standard organisational rules and formalities. These are labelled as informal behaviours and interactions. They occur inside the organisational perimeter but outside of the formal organisational rules. Often, these contacts also extend beyond the organisation’s boundaries. Most staff members spend at least eight hours per day in certain instances for a decade or more of service in one organisation; as such, they develop deep personal bonding between them. These mutually beneficial relationships are time-tested. Informal interactions are based on goodwill, trust, support, and help in anticipation that the recipient might do the same in the future if needed.

Having informal relationships in a formal environment makes the staff feel well looked after, protected, empowered, and helps to provide a stronger sense of belongingness. As one staff member said, such interactions make the office less

stressful. It softens perceptions about the structures of power and hierarchy and helps in the adaptive application of the organisation's policies by collectively solving problems. It creates an affable atmosphere at work that makes staff members feel more comfortable. Moreover, wearing sarees at work and finding part-read novels on staff members' desks are common examples of this. Also, these relationships helped the staff gain a greater degree of work-life balance. The researcher found a daughter of a staff member staying with her mom after school (an administrator of the practice) until her shift finished. This helps soften and blur the lines between the office and home, and other staff members remain in a supportive environment to further help them achieve a good work-life balance.

> *It was 5.15pm, and the administrator is not in a hurry to go home. There is a child wearing a school uniform sitting on a nearby chair. She is doing some schoolwork. I asked whether she (administrator) had finished her work? She said she finished at 17:00 and still has some more work to complete.*

Source: Filed Notes -14

At one point, a staff member who also happened to be a single mother was waiting for her colleague to give her a lift so that she could get home quicker than usual. She said she could pick up her daughter from the daycare quicker if she went with her colleague rather than taking the local bus. Such informal arrangements helped them manage their work-life balance and made their jobs less stressful; however, such offers may not always be free. In a social context, the person who offers 'informal help' may expect something similar in return in the future. Such help might

be work-related or personal help. These transactions do not have written agreements; they are implied, situational and ubiquitous.

These informalities are the antithesis of bureaucracy. Bureaucracy lacks emergence, and the ability to adapt and be flexible. Often, it cannot change or respond to the changing organisational context. Therefore, gaps exist between the bureaucratic system and its operating context. Informal interactions between staff members fill these gaps in the bureaucracy and achieve organisational objectives by circumventing and adapting formalities.

In an acute ward, some staff members relied on one colleague to enter case notes onto the clinical system. He was given a smaller caseload so that he could focus more on entering data. This was agreed on by everyone, including local management. While the normal caseload per staff member is between 15 to 18, this staff member had 10 patients to look after and was helping others to enter data for them. In GP practices, a similar arrangement was seen between clinical secretaries and GPs. The clinical secretaries would enter read codes into the IS, based on the clinical notes written by the GPs.

> *Two secretaries were busy reading the clinical notes of patients seen by the GP, the previous day. It was apparent that they had been working for some hours now. Both were white British and appeared to be between 50 to 60 years of age. They had dressed smartly. I asked them about their day so far. They both said very tiring while one of them continued and said, now the PCT (now the CCG) has asked to enter more and more read codes. They have more work to input read codes based on the GPs notes.*

Source: Filed Notes -24

No formal policies stated that clinical secretaries could extract read codes based on the notes. However, in the practice manager's view, such arrangements made the organisation compliant with the requirements of the Commissioners.

The sense of informality in GP practices was not limited to the social aspects but was also visible in the practice buildings. The architectural settings of most GP practices are similar to residential homes. Most practices were converted residential houses, and many were initially built in the 1970s or 80s. GP consultation rooms were often made from converted double bedrooms, and the reception was in a converted large living room. In some practices, the middle wall in a duplex house may have been removed to create a larger waiting area and reception. Staircases were narrow, and no lifts were available. Hence, they were not suitable for disabled users. In some GP practices, it was nearly impossible to identify the GP practice from the outside, as there were no name boards or identifiers.

It was also noticed that practices had devised various adaptations to comply with mandatory and statutory requirements. A GP practice near the town centre had developed an improvised ramp. The ramp was stable but narrow. However, it was steep and would need assistance from another person. However, there was a buzzer at the beginning of the ramp, and an administrator or a receptionist would help the patient when they pressed it.

> *In one instance, the researcher was about to enter the GP practice, and a middle-aged Asian lady brought her wheelchair-bound mother. It was about to rain. The ramp was too steep and difficult to push the chair. The researcher wanted to help but didn't. The researcher went in and told the receptionist that someone was struggling to get into the*

building. The receptionist quickly came outside and pushed the chair. She didn't show any hesitation. She talked with the patient and the carer. It seems they knew each other well.

Fieldnotes-23

A sense of informality extended beyond the interactions between the individual staff members within GP practices. It was noticed that the practices worked together as an informal group with the commissioners through the practice managers' meeting.

The practice managers' meeting was an informal arrangement to network. It offered an opportunity and a platform for the practices to share their views, knowledge, research consensus, and non-binding agreements. The practice managers' views towards the local practice manager's meeting was generally relaxed and informal. The meeting was usually organised and held by one of the more 'affluent' GP practices. The room was well-lit, with a few bundles of old leaflets left in the corner and a half-filled bookshelf. An old computer in the corner reflected the age of the practice. Practice managers who belonged to 'affluent practices' attended the meeting. These practices were bigger in list size and were mostly owned by British GPs or GPs with a higher amount of influence over the local community. All these practice managers were white British females aged 50 years or older. They actively participated in the discussion and appeared to be engaging with the commissioners often, given their rapport, level of understanding, and based on what they talked about. However, some managers did not attend the meeting. These are mostly the practices owned by single GPs and GP practices that belonged to non-white British GPs and practice managers.

Attending the meeting was voluntary. Regardless of previous attendance, everyone was invited, not only by email but also by phone. Those who could not attend would

have sent their apologies via their peer practice managers. Some came late, while others left early. There were no minutes documented. Piping hot tea and a few packs of biscuits were available throughout the event. It was an event where attendees shared their views and gained an understanding of the commissioning projects collectively and the commissioning intentions of the NHS for the next year. It was like a discussion venue, a place where they could discuss and reach a common ground to put forward their demand to the Commissioners. Such informal arrangements prove vital to making decisions collectively while retaining contracts with the Commissioners.

The practice staff meeting is not far removed from the practice manager's meetings. The practice manager's meeting was scheduled when the practice was closed to the patients or during their PLT (Protected Learning Time). However, staff members brought their chairs from nearby rooms when necessary. Once everyone had arrived, the practice manager phoned the Senior GP to request their attendance at the meeting. The researcher noticed that the practice manager shared new information about vaccination campaign dates, vaccine receiving dates, and how to use the last year's stock of vaccines. They also covered new flu types, and next year's targets, and they stressed that the doctors must record this information on the clinical system. Issues related to IS were also discussed. Junior staff members asked about data entry problems, especially in reading codes, and the practice manager replied that she would ask a colleague in another practice and let everyone know. This reinforces the idea that the practice managers' meeting is central to knowledge sharing and acts as a self-help group.

The practice manager said, 'The water in the kettle is boiling' during the meeting, and a junior staff member made tea for all present. The atmosphere of the meeting

remained relaxed and informal but also disciplined. Moreover, during the practice meeting, none of the discussions were noted down by anyone. However, the discussion was detailed but succinct, without technical jargon to ensure everyone understood what was discussed.

The practice manager provided pleasant and patient responses to all of the staff members' inquiries. She provided practical examples and situations in her detailed explanations of some of the junior member's queries. By altering the circumstance, staff requested assistance from the manager. All the participants were engaged in the discussion, asked questions, and shared their experiences relating to the discussed topic.

> *However, we [Practice staff] are like a small family. We share our knowledge, concerns, and interests. We don't do formal meetings Instead, we do informal meetings. We discuss things during the lunch. As a result, motivation, job satisfaction, mutual bonding, respect and recognition of each other's work is high.*
>
> *Source: GP-PM-F5*

In larger practices, it's costlier to have formal meetings as it needs additional effort and time to organise meetings. It is necessary to halt the practice operations for such meetings in bigger practices with considerably more staff members. Hence, they were moving towards a series of smaller informal events daily. These practices tried to maximise the operational time by reducing the formal administrative overheads. Some GPs disagree with the NHS guidelines published to have formal learning time for staff members. This is because the management believed formal

meetings and allocating mandatory training time for staff members was a burden. This may be especially true for a smaller GP practice and its cost structures. Hands-on training and need-based support are all that is needed for a small organisation. It can practically meet the needs of a close-knit team working closely with each other, like an extended family. More structured training interventions may end up overwhelming them.

> *We [as the Practice] don't have that many meetings, as our practice is not much bigger. So much more effective to have informal networking. Receptionists occasionally have [formal meetings] with doctors. New regulation suggested, that we have two GPs for PLT [Protected Learning Time]. We are seriously concerned about it and think it's really bad news. PLT is a burden for us, small practices.*
>
> Source: GP-PM-F8

5.3.3 Understanding Key Determinants of Informal Relationships

The previous section described the complex and critical nature of informal relationships and how they are deeply intertwined with formal operational structures within healthcare organisations. It is impossible to make a quantitative analysis as these are non-deducible. For example, developing a mathematical formula to reflect a practice manager's decision to select a staff member for IS training is nearly impossible. Informal relationships are developed over time and result in complex interactions between individuals. Therefore, it is impossible to analyse the degree to which factor affects informal relationships. So, without deducing informal

relationships, the key enablers are described that affect a staff member to contact and seek help when they find a problem with the system.

Out of all the enablers, staff tended to talk to someone physically closer and more approachable to them rather than speaking to the help desk over the phone. This also saved their time. It was noticed that individuals tried to resolve problems themselves at first. Some even tried to look for their training notes before they asked someone next to them. They called the help desk as the last resort only when their colleagues could not help them through.

Once a colleague is contacted, the attention and response are immediate. However, this may not always guarantee the resolution of the issue at hand. Contacting the help desk requires a considerable amount of effort and time. Spending much time and effort is difficult if many patients are waiting. Hence, staff members prefer to seek help from a colleague as their first choice. In the two-week investigation period, only a handful of times a staff member contacted the helpline. Usually, in smaller organisations, practical solutions are understood, accepted, and adapted much more easily.

Furthermore, those who need to contact the IT help desk must give a series of codes and user details that most users won't actually remember. It was seen that some users had written their details and user codes in their diaries, which also means they were not regular support desk users.

More interestingly, as soon as the help desk found a resolution for their problem, colleagues who tried to help the staff checked the resolution. Alternatively, the staff member informed everyone about the resolution to their knowledge. Sharing and disseminating information was vital as it stored that knowledge in the collective memory. So, individuals know how to deal with similar problems if they arise for

them in the future. This type of ‘cultural memory’ facilitates bonding, connection, and identity. Colleagues curiously checked for details of the resolution of the issue, which remained unresolved for them. Such sharing of information with others is also a way of ‘showing respect for those who tried but were unable to help.’ It is a way of showing gratitude. This mutual coordination increases the chances of preserving and updating knowledge inside the informal group.

Due to bureaucracy and difficulties in communication to request support from the help desk, staff considered contacting the help desk a ‘hassle.’ This was because they had to provide a series of user identification codes, wait until someone answered their call, and then explain the problem to an IT customer service adviser, who may not completely understand the care pathway as they cannot see the user’s screen. On one occasion, a staff member waited for 20 minutes before the IT help desk answered her call. This waiting may turn difficult when the situation is loaded on more than one front—impatiently waiting for patients already frustrated with their illness, limited waiting area, cross-functional roles for staff, and an irritating IT system.

The researcher witnessed that helping with and resolving IS problems are a collective task. For example, at one point, more than four staff members were trying to help one of their colleagues find a solution. The staff member initially asked someone working next to her. However, within 15 minutes, all three staff members in the room were trying to resolve the problem. Later, another colleague who works in the next room joined them to resolve the problem. None of them knew what the resolution was. They tried various methods and approaches that ‘worked’ for them previously. Therefore, it is an exercise of collective effort to recall their collective memory.

They were all working in the same room. The building was old, but as the researcher look around, the researcher could see many signs of renovation. Desks and the room were untidy. It was noticed that someone had a problem and she immediately asked help from one of her colleagues in the room. It was later joined by another staff member who came from another room.

Source: Fieldnotes -31

Subsequently, it was understood that the issue resulted from a version change to the clinical system. During the version updates, staff members found many difficulties. It was noticed that one staff member read the IS manual and tried to follow the guidance provided to resolve the problem. Generally, staff members tend to help each other and find a solution. They felt 'it would be beneficial for everyone.' Staff members readily helped each other, as they felt they would likely have a problem in the future or even the recipient would do a favour in return.

There is a consensus of shared fate. For example, if a problem is related to a new 'layout' or a change of a 'form,' staff understand that finding the solution will help when they themselves face it individually. This is why other staff members would volunteer to help and get involved in the process to understand the problem and how to resolve it. For them, it is a proactive measure. Therefore, people get into the process to show that they listen and understand the problem. They might find it helpful in the future and to show others that they are listening with empathy.

Another category of staff members, the so-called 'IT wizards', recognised as having good IS and data entry expertise. They are younger compared to other staff

members. Often these IT ‘wizards’ were called in by senior clinicians and managers to help resolve IT and IS problems. They listened to these junior staff members with respect. Senior managers would send them to the technical committees and other senior-level meetings to discuss the progress of the IS and the implementation regardless of their seniority in the NHS staff banding. They were sent for training, expecting to understand, learn, and teach their colleagues.

Individuals with high technical knowledge and experience were given more access, flexibility, and respect. This was known when a computer ‘wizard’ entered the GP practice manager’s room while the locum GP had to wait at the door until he got the attention from the practice manager. Especially during the IS implementation, the individuals represented the GP practices in the IS implementation technical meetings.

Being knowledgeable and having a reputation plays a significant role in attracting help from colleagues. Reputation has been a time-tested element. How staff view and gauge, their colleague’s reputations is complex. However, one of the considerations is their involvement in various projects and how successfully they have helped others with an open mind. One practice manager mentioned that a colleague is knowledgeable because of her involvement in various IT groups and in the project. She is one of the vocal members of practice managers who regularly visit the NHS Commissioners. Her status, involvement, and visibility are the reasons for her reputation.

Yes. I think she is a knowledgeable person (impression and trust). the researcher also, trust her as a friend.

Source: GP-PM-F2

Furthermore, being knowledgeable is not the only factor for someone to request help. Individuals tend to look towards someone approachable, with an ear to listen, someone willing to share something helpful to resolve their problem. Practice managers and CNWL staff members were asked why they chose to contact individual(s), not others. The response was that those who were contacted were more approachable than others.

Approachability is based on individual experience and the assumption that 'this individual will help me.' That is similar to a lost person asking for directions from an unknown person. People look at others' proximity, how they dress, how they behave, and what they say before asking for direction. Would anyone ask for directions from a drunken person struggling to walk? Therefore, approachability is situational knowledge and a rational decision based on previous experiences assuming that one is capable of helping to resolve a problem.

This often happens between colleagues in a department. Because they work in the same department, sharing the same job role makes everyone under pressure to work collectively to resolve a problem and be more approachable to each other, to a certain degree. With time and a build-up of experiences, most individuals identify and reach their judgement about knowledgeable and approachable persons from those on-site and are able to resolve problems.

> *We worked together before. We became friends. That's the basis. That relationship continued.*

Source: GP-PM-F2

However, trust is not directly complementary to knowledge and approachability. An Asian practice manager mentioned that she requested help from another practice manager. She did not want to contact someone working in a nearby practice but instead decided to contact a White British practice manager in a further away practice. When queried, she mentioned that he was knowledgeable and approachable. Given that there was another practice less than 200 metres from this practice, the manager chose to approach someone further away. The nearby practice was much larger, with six GPs, and was deeply embedded within the community. It seemed the practice manager might not have a close relationship with the nearby practice.

> *A middle-aged female patient arrived at the practice. It appeared the practice manager was well acquainted with the patient for a long time. The time was around 10.45. The practice manager asked how's her brother. The patient had a chronic illness, it appeared. She said he is feeling a bit better and has registered with another practice.*

Fieldnotes- 18

In GP practices, income is determined by the number of registered patients. It was reasonable to assume that, in this case, the practice manager probably felt the practice located just 200 metres away as a competitor, a challenge. Hence, she trusted someone a bit further away who may not be interested in her GP practice. Staff members had their long-established preferences about whom they talked to often. They shared similar views about certain things, like the practice manager's meeting. GP practices that attend the practice manager's meetings have established close relationships. Those who attend meetings share details with those

who did not attend. As no minutes were taken in such meetings, the decisions and discussions needed to be shared with those who could not attend. Such relationships have evolved among themselves over time. These staff members who are affluent in IT skills and have attended IS training and are sharing the know-how with others.

5.3.4 Adaptations

The response given below was made by an assistant manager. It encapsulates the problem that arises alongside IS implementation response in general. It illustrates how staff members with limited training and know-how can work together to adjust the IS to provide the necessary standard of care for their patients.

> *Also, the training is very basic- that's a real problem. We don't know much about the report's module. Hence, we try to design our own reports as much as we can.*

Source: GP-AM-F4

Adaptations are visible in every aspect of the NHS organisations investigated. In layman's terms, adaptations could be anything modified from the original design to make it more suitable for use. These could be hardware adaptation, e.g., a temporary ramp fixed to the front door, hiring receptionists who can speak a foreign language, or customising reports on the information system with a more suitable form. Adaptations are commonly visible at both individual and organisational levels.

The section discusses these adaptations and how informal organisations are linked to the adaptations in IS, care pathways, workflows, etc. It has been argued that IS implementations and incremental IS designs bring new challenges due to the design-reality gap (Jiang, Hong and Chen, 2019). Each new IS implementation or IS version includes changes to the interface, how individuals log on to the IS, how they record information, or how information is extracted from the clinical system. This means, with each change to the IS, the fragile harmony between various elements in the context breaks and creates a new design-reality gap. Staff members try to bring back the normality by responding to these changes and adapting changes in the IS, their behaviour, local workflow, practices, infrastructure, etc. Changes often initiate at an individual level when the staff members try to find solutions to suit needs, adapt the IS, and mitigate the problems. Over time, these behaviours slowly reflect at an organisational level.

As previously described, adaptations became visible at the entry point to most GP practices. These adaptations could be related to infrastructure, e.g., the response to the needs of wheelchair users' access. Most practices were converted from residential buildings. In some practices, the front desk is protected by a glass panel to make the environment safer. Front desks covered with glass were common around the practices in the heart of the town but were rarely seen in the practices outside the town areas.

During the participant observation, a patient argued with the receptionist, saying she had booked an appointment. She wanted herself and her son to be consulted at the same time. When queried, the receptionist said that sometimes the patients think they can make one appointment and the doctor will see all the patients coming with her. This assumption often leads to arguments, and she said she felt safer inside a

glass cubicle in such instances. In contrast, at a GP practice in a less deprived area, a receptionist said they did not want to stay inside a glass cubicle, which may hinder patient engagement. When the receptionists ask for the patient's smoking cessation information, sitting behind a cubicle seems to be a barrier to effective communication.

> *We have to ask some questions to the patient. i.e., smoking status. We ask our HCAs and receptionists to do it. Also, sexual orientation and etc is important at the point of registration. previously all these were done by the GP.*

Source: GP-PM-F8

There are more prominent adaptations also. However, care pathways and IS adaptations can be made as we look closer. As mentioned in one response, it was clear that the workflows and business practices are changing; administrators and receptionists now collect data previously collected by doctors. This is a trend in the NHS that clinicians focus on clinical work. More and more such administrative tasks have been transferred over to non-clinicians.

To facilitate this, the local managers changed the patient administration module of the IS. Secondly, infrastructure was changed (by adding the glass cubicle) to suit the local population. Perhaps, this is why the clinicians are not interested in getting involved in IS implementation projects.

In some practices, the problem arose that the patient administration module was not adapted to capture information by the receptionists. In such cases, smoking cessation information is captured on paper forms and passed on to the clinical secretaries to enter into the IS. Meanwhile, information on the clinical system is

entered straightaway without much delay in GP Practices. Mostly GPs enter the data directly into the IS, or clinical secretaries enter the data based on the notes written by the doctors or captured on the paper forms by the receptionists. Information collected by the receptionists was passed on to the clinical secretaries before lunch and just before the practice accepted the attendance of the last patient.

> *The time was 5.35 pm. It was already dark outside, and the last patient was checked in. One of the two receptionists switched off her computer and handed over the smoking cessation forms. The recipient asked, how many and the other said 16. The recipient put the forms on another set of forms and said, 'I will leave this on Sandy's (name changed) desk once the researcher finish.'*

Source: Fieldnotes- 26

However, problems arose when a doctor sought to see a patient outside the GP practice as there was no mobile version of the IS. On such occasions, notes were taken on paper, and the clinical secretary entered the data the following, day or day after.

> *Home visits reports are uploaded separately as there is no way we can enter things in real-time. there is no facility for data entry from a mobile system.*

Source: GP-PM-F1

On occasions where there was an IT failure, the GPs quickly started to call in the patients and write down clinical notes on paper forms. The IS failure went on for twenty minutes, and patients started to feel anxious as it was challenging to stay in the queue while holding children and infants. It was natural for them to feel that something needed to be done. A senior doctor came to the reception and told the receptionists to send the patients in order to arrive. Moreover, once the IS access is re-established, an administrator goes in to collect all the paper notes written by the GPs. Later on, the clinical secretaries and administrators later enter the data into the IS.

The adaptations go beyond workflow changes also, as the IS is designed without relevant and significant user involvement. Thus, the IS could not fully capture all of the necessary information required by the Commissioners. Hence, some practices developed specific internal read-codes to capture information from the patients.

These read codes are specific to the practice and not transferrable across GP practices. However, the adaptation allowed the practices to capture the necessary information required by the Commissioners. For example, a practice manager mentioned that the clinical system could not capture carer's assessment, which is Quality Outcome Framework (QOF)[6] related information. The practices have developed their read codes and fields to capture this information.

[6] A quality care rewarding mechanism and performance management systems in GP practices

> Another *example is that we have developed various read codes, just for our practice i.e., carers assessments, which is done by the HCAs and not by the GPs*
>
> *Source: GP-PM-F8*

The staff member showed how to create a local read code to capture specific information on the system. They also opened the reporting module and completed a form, allowing the staff members to input a code and map that onto particular actions. She took no more than fifteen minutes to create a read code to capture a certain action on the front end of the clinical system. This means the clinical system has some adaptability if the users know how to adapt it. Therefore, the IS generally shows some deferred solution characteristics.

Staff members bring adaptations to their workflows when they experience training issues regarding new users' IT skills. As described before, some staff members cannot effectively use the system. It had been noticed that some staff members struggled to switch on their computers and often struggled to locate a specific assessment form on the IS. This led the staff members to collaborate and develop a workflow change.

Some other staff members visited patients and passed it on to others to enter information into the IS. Sometimes staff members entered notes belonging to their colleagues to return a favour. Also, depending on the care unit, the researcher noticed that at times, a staff member might be given a lower caseload to help other staff members with data entry. Therefore, those who enter data for others do not feel

they are overloaded with extra work. Staff members consider sharing data entry tasks among themselves as a collegial responsibility with other team members.

Previously discussed adaptations were all informal or agreed upon by the local management. In a way, these were the bottom-up attempts to formalise the adaptations and the local management decisions that supported those adaptations. One such attempt was the ‘Super User’ group. Super Users were the IT-savvy staff members with above-average IT/IS skills. They were relatively younger and had recently graduated from university; they joined the NHS recently.

Super Users were considered IT ‘Wizards’ and trusted by their colleagues. They acted as local experts and as a linkage between the users and the IT project managers through the Super User group. In a way, they provided a local solution to the design-reality gap. Their importance had been recognised by the senior management and formalised their activities by directly coordinating their work with senior management, and the IT/IS technical committee. The user group meeting convenes every other week. However, according to their records, the meeting was sometimes held monthly. An administrator attending the Super User group said that the frequency of Super User group meetings depends on the workload.

After analysing the meeting minutes, it was found that the meeting was a platform where the Super Users and the technical experts liaise with each other. It provided an opportunity to share some of the different problems and arrive at solutions. Sometimes, they even formalised the informal solutions that were developed by the local teams and GP practices.

If a team developed a local solution, the technical team would share those solutions with other teams.

According to the minutes, a locally defined read code meant to capture information related to smoking status was shared with a few other practices. Therefore, the Super User group is a mechanism to provide feedback, exchange notes on adaptations, and allow knowledge to flow upwards.

> *We had a meeting. We always had brainstorming sessions and long discussions to understand & solve our problems. We collectively discussed likes and dislikes in our clinical systems. I scribbled them down mostly.*

Source: GP-PM-F5

5.4 Main Themes as a Summary

The researcher's reflexivity is integral to the account being presented. As an insider, the researcher was affected by their observations, especially since they are an IS expert insider interested in promoting IT systems within the NHS.

The introduction of IT has represented a significant challenge for NHS IT project managers, mid-level managers, practice managers, and those using it. Everyone was affected by the changes to their working methods and habits, routines, gaps with the realities, and limitations. However, users' collective power and the ability to share experiences by working together and combining skills improved the overall IS success rates.

At the beginning of the study, the researcher was unsure how users would change the direction of IS and how their involvement could improve the chances of IS success. Nevertheless, they started the research with an open mind.

The researcher uncovered significant differences in IS implementation regarding how staff members stepped in to fill the design-reality gaps and changed their working habits. Some of these challenges were identified by the management team, i.e., through Super User groups.

Four key findings were identified based on the above data alignment with a theoretical framework. This broadly represents the IDAP Process, where structured IS design and implementation influence the design-reality gap. Consequently, it clearly demonstrates how the informally organised staff members are similar to CAS and adapt to the IS to make it as sustainable as possible for their requirements.

1. It is evident that, during most stages of the IS implementation project, users had limited opportunities to engage and get involved with the project. Therefore, user participation in configuring needs, specifications, design of application user interface, and overall implementation lacked contextual information, especially when drawing on the informal groupings and behaviours of the observed participants.

2. The lack of user engagement often creates a design-reality gap in IS implementations as user requirements are not included in IS. This often creates problems for users.

3. Consequently, to the above, it is observed that users have developed intense informal relationships to overcome their problems. This is in relation to the actual context of their organisation and cultural relationships. Their challenges with IS usage are largely common, leading to the development of unique informal, internal methods and workaround tactics to overcome common, repetitive IS challenges. This has led to Complex Adaptation

System (CAS) behaviours. Such informal relationships based on bounded solidarity are evident in all of the NHS organisations observed.

4. Users and managers have become adept at making need-based changes to the IS for their local needs as they emerge and repeat. All of these adaptations have made IS sustainable for the NHS, despite the system's design-reality gaps and implementation difficulties. Thus, this was described as a deferred solution.

5.5 Researcher's Approach During Data Collection

Conducting ethnographic research presents several notable challenges, particularly when dealing with complex organisations like the NHS. Its intricate management structures are based on units such as GP practices and their unique subcultures. The researcher took these complexities into account, yet it remained a demanding task to win the trust of participants and obtain honest, realistic, and relevant responses during each interview.

The quality of these responses is critical to the overall research findings and the development of theoretical ideas. From the outset, the researcher focused on maintaining balance and avoiding involvement in any participant organisation's activities, processes, or inadvertent interference.

The researcher's impressions, memories, and feelings, referred to as 'soft data' in research literature, played an essential role in interpreting the collected data. To integrate into the groups, the researcher made tea for other staff members, a common activity at GP practice meetings. Bringing a pack of biscuits further helped break the ice and led many staff members to invite the researcher to shadow them.

Therefore, the researcher didn't hesitate to utilise cultural nuances to improve engagement and become part of the group.

Staff often see patients as individuals and consider their circumstances. Sometimes, patients share their backgrounds to garner sympathy, which can help bypass administrative and procedural hurdles. Staff members, familiar with patients' backgrounds due to living in the locality, may also bend rules to help. This empathy was evident in various justifications, such as patients being old, caring for elderly parents, or working multiple jobs. The researcher viewed and considered these as part of the utilitarian philosophy the NHS is embedded in.

Practice managers were observed to hold considerable power within practices, as seen in how other staff interacted with them and the number of staff visiting the practice manager's room. In contrast, those in informal leadership roles were approached with greater camaraderie, leading to less tense interactions. This cultural diversity and the power dynamics involving practice managers were viewed through a cultural lens. For example, standing when a doctor arrives in the morning is not coercion or guidance but a sign of respect and appreciation in most Asian GP practices.

The implementation of IS adds complexity to the organisational context. Staff members face varied challenges with IS functions during daily operations, impacting their ability to deliver optimal services. The research aimed to understand the situations necessitating such adaptations, how staff members adapt, and the relevance, frequency, and impact of these adaptations. This comprehensive understanding helped gather, collate, and analyse firsthand information, shedding light on Design-Reality Gaps in IS implementation in NHS healthcare facilities.

To support these research objectives, the researcher inquired about the current IS implementation processes, including user involvement, participation, responses, experiences, suggestions, and needs. Participant observations often included mapping Design-Reality Gaps by observing the level of engagement between IS users and patients. This unplanned but useful approach provided a contextual framework for the identified gaps and allowed cross-checking the validity and credibility of findings.

The researcher remained conscious not to breach any ethical conditions agreed upon with the NHS and the University. Interviews were preferably conducted at the usual place of work but were relocated if requested by participants. During IT problems, the researcher observed staff efforts to cope without intervening, analysing their coordination and adaptation strategies.

Respecting the balance between individuals and their contextual realities was crucial. The researcher aimed to understand respondents' experiences through their descriptions, comparing observed behaviours with described experiences to identify perception gaps. Selective involvement helped facilitate conversations between respondents and the researcher.

This approach parallels Geertz's (2000) 'Deep Play: Notes on the Balinese Cockfight,' where breaking the ice with participants helped the researcher feel and act like them, experiencing their feelings, emotions, and situational knowledge.

Building trust and confidence with participants was critical for improving the quality and quantity of information gathered. This close interaction provided deeper insights into IS users' challenges, enabling the researcher to form practical, actionable recommendations to address Design-Reality Gaps in IS implementation.

Users often used interviews and informal interactions to vent frustrations about balancing patient service issues with IS-related challenges. They detailed their struggles, knowing immediate changes would not result from the research. The research highlighted users' dissatisfaction with the IS's lack of amenities and the importance of addressing these frustrations to improve outcomes and effectiveness. Addressing users' frustrations is crucial for any organisation to avoid poor quality outcomes and ineffectiveness. This research underscores the importance of improving IS implementation for the benefit of all NHS IT system stakeholders.

Chapter 6: Discussion and Interpretations

6.1 Introduction

IS failures are pervasive, expensive, disruptive, and have a detrimental impact on patient care, rendering them an industrially significant area of concern. This study addresses the knowledge gap surrounding IS failures by exploring how improvements in information system implementation within the NHS can be achieved by acknowledging the presence of informal relationships among staff and their ability to function as Complex Adaptive Systems (CAS), adapting to the dynamic working reality.

As discussed in previous chapters, the design, implementation, and operational processes of ISs are structured and predefined. The inquiry into the impact of structured design on the success of IS implementation reveals a dyadic perspective. Firstly, ISs are crafted by reflective designers, making them inherently non-compliant with the ever-evolving organisational reality. They are tailored for specific organisational conditions, creating a misalignment over time. Secondly, the organisational context undergoes changes continuously over the time, with staff members exhibiting dynamic behaviours that evolve. This dynamic interplay results in a disparity between the IS and its organisational reality at any given point. The research data sheds light on how contextual discrepancies between a structured IS and its operating conditions instigate self-organisation of staff members and prompt organisational and IS adaptations.

This chapter aims to present and comprehend the research findings within the theoretical framework (IDAP), as illustrated in Figure 19. By delving into the intricacies of IS design and its relationship with organisational dynamics, the study

contributes to a comprehensive understanding of how informal relationships and the adaptive nature of staff contribute to the success or failure of IS implementation in healthcare settings.

The research findings support that informal relationships are common (Snowden, 2002; Fu *et al.*, 2019; Winslow *et al.*, 2019; Leschke and Weiss, 2020; King and Shaw, 2022). Additionally, they have functional a value. Informal relationships are vital for the functioning of the NHS, as staff members use informal relationships to resolve their day-to-day problems. For example, solutions based on informal relationships can help resolve many organisational IT issues, such as, IS login issues and general IT issues, and achieve social comfort and work-life balance. The IDAP model demonstrated the evolution and sustain of this functional value in the NHS.

6.2 Informal Interactions and Emergence

In all NHS organisations investigated, there are informal interactions to varying degrees. As described in section 5.3.2, these interactions are wide ranging from making and offering a cup of tea, going on shopping during lunch hour, help a colleague with transportation, assisting a colleague when needed help with the IS, sharing IS training knowledge or a IS templates are a handful of examples. These informal interactions bring comfort, solutions, collaboration, a sense of solidarity, belonging, camaraderie, work-life balance, and value to individuals. These benefit the organisation and the individuals working in these organisations. The results of the interactions include but are not limited to helping others when they have IT problems. It extends to providing transportation and sharing home-cooked foods for lunch, as evidenced in the research. These informal interactions are voluntary,

however, not one-sided transactions as described in page 310. When a colleague helps another, there is a silent agreement that in the future, the receiving party would do a similar favour when needed. Hence, there is an implicit transaction between the two parties. It is a type of hedging against future problems where staff members depend on as described in page 253.

All informal relationships are ubiquitous, spontaneous and difficult to judge as no formalities are attached. However, are common and exist everywhere in various forms and serves different purposes. In one organisational setting it might be a staff member entering data on behalf of a less IT literate colleague as on Page 311 or helping to find a data recording template. It is difficult to explain what causes and behind them, but it is easy to identify and describe them. As described on Page-328, helping a colleague struggling to find a form on a newly introduced IS is not anyone's job description. But such altruism is common in every NHS organisation, and everyone celebrates their values at meetings or coffee break meetings and encourages their effort.

However, the reasons they exist and how they evolve are not clear. Hence, the deducibility of such behaviour is problematic and difficult to explain based on cause-and-effect relationships. Because of spontaneity and ubiquitous nature, informal relationships occur inside and outside the organisational perimeter. There were ample of evidence such as going on shopping with the practice managers in page 242 and attending parties and ceremonies at each other's places. The existence of informal interactions inside and outside the formal organisation plays a pivotal role how staff members interact and make decisions. The research findings suggested that informal relationships within the organisational perimeter are strengthened by their interactions outside the organisation. For example, in page 305, GP practice

managers aware of staff members' background and their long-term plans for their career so they were sending staff for training accordingly.

Research aligns with the findings of Hayes (1981) and Fu *et al.* (2019), which highlight the voluntary nature of informal relationships. Although Hayes (1981) focused on the congressional travel and tourism caucus, and Fu *et al.* (2019) examined construction workers in China, the underlying principle remains relevant in the context of the NHS. Helping a colleague, as discussed in the previous chapter, is not explicitly outlined in anyone's job description or formal responsibilities. However, NHS staff members often assist one another voluntarily, without any formal obligation to do so.

As described in section 2.7.1 page 144, every business organisation is an 'emergent entity' to a certain degree (Tasaka, 1999; Johnson, 2002; Lissack and Letiche, 2002; Patel, 2009; Jobbágy, 2020; Nyame-Asiamah, 2020). However, healthcare organisations stand out, as they have a higher degree of emergence and complexity (Lenz and Kuhn, 2004; Sindhwani *et al.*, 2019). The research findings support that, unlike other business organisations, in NHS organisations operational decisions are made at a relatively lower level, despite the strong bureaucratic nature of the organisations. Problems were solved at the local team level or by professional individuals, similar to the findings of Tasaka (1999) and Jobbágy (2020). This is because not only the service or the value generation is happening at a lower level compared to other industrial organisations, but the actors who create the value of the service have greater freedom to create and adapt the value generation process. This is why the staff members can quickly bypass IS and started treating patients as highlighted on page 297 when there is a glitch in the system. This makes each NHS unit unique. The value creation and adaptation process often happen through

collaboration. Such as giving less caseload for those who enter data on the system on behalf of others in page 311. Such collaboration is impossible in a production line due to a high degree of structured arrangement. Collaboration creates solutions to everyday problems. These local solutions are simple and hold great value at a local level. On the other hand, local solutions or practices provide an alternative for organisational, local, and team-specific problems.

Having the freedom to be creative and use their creativity to solve problems collaboratively in the business process makes healthcare unique but also adaptive and emergent. Considering that local solutions are developed and meet the specific needs of staff, their skill level, emotions, and other local requirements. They make the IS more receptacle and acceptable to the staff. That is why the user said, ‘they [colleagues] know better’ as her colleagues understand her needs and situational needs to resolve the problem than the IT helpdesk.

Secondly, management accepts locally produced solutions as ‘workarounds’ and ‘good practices’, diffuses them upward, and then spreads them to other teams either informally or with the help of local management. Such as the Super user groups in page 329. This makes the organisations adapt well to changes, organisational activities are initiated at an individual level (Patel, 2009; Fertner, 2008). The best example to demonstrate this scenario is the emergence of Self-help groups, usually called super user groups.’ It started with the willingness of a few staff members to help others by sharing their expertise in IS use. The management has regarded it as a successful initiative, and other departments have adopted it as a best practice.

Informal interactions make the organisation more adaptable to the changing internal and external environment than any other. These interactions extend beyond supporting organisational objectives but also bring work-life balance and comfort.

Hence, informal interactions make the organisation sustainable, adaptable, and both externally and internally stable by bringing work-life balance. For example, it could have been difficult to retain these staff members if a staff member did not receive a lift from a colleague to collect her daughter or not had the opportunity to bring and share their own lunch. Thus, informal interaction not only supports emergence but also provides stability. Without such stability, organisations could not survive and continue their functions (Heylighen, 1989).

6.3 Design-Reality Gap Underpins Everything?

The concept of design-reality gap (Heeks, 2006; 2017) is a multifactorial concept based on a series of factors, i.e., information, technology, process, objectives, skills, management systems, and other resources (ITPOSMO), which looks into discrepancies between the reality and expectations at each domain area. The research investigated the gaps in detail under Chapter 5.2.1. It further analyses how the inconsistent and incongruent nature of IS implementation in the NHS promotes informal interaction between staff members. The bureaucratic and project-based implementation leads to a lack of engagement and participation by the IS users. Hence, the research did not substitute the design-reality gap only as a problem, as Heeks (2006) did in his paper. Instead, the research viewed the design-reality gap as complementary and a catalyst to human interaction, leading to innovation and adaptation.

Since the design-reality gap manifests in many ways, the chapter attempts to understand various gaps separately. The findings of this study suggest the design-reality gap is an inherent problem in structured IS implementation as each NHS organisation has unique management and operational characteristics, i.e., each GP

practice has had its own care pathways and workflow patterns. Hence, designing IS solutions without investigating the unique organisational reality will widen the gaps between the IS designs and the organisational reality. The developers did not consider the informal nature of the NHS organisation, nor did they consider how specific individuals influence others and how collective power among staff is exerted.

On the one hand, the design-reality gap begins at the designing stage when the reflexive designer affiliated with a vendor organisation delivers an IS without having the ‘user experience’ in an NHS organisation. Instead, the designer envisages designing problems based on personal experiences and visions, which Patel (2006b) called the ‘domain of problems.’ Therefore, the ‘problems’ envisaged by the designer significantly differ from the problems experienced by the NHS staff members. For example, the previous chapter highlighted that some patients bring more than one child to an appointment and demand that all of them be seen by the doctor. These exceptional requirements are only known to the users, and the developers would be oblivious to such scenarios. Importantly, these are not considered problems to the NHS staff but how the NHS works. (Heeks, 2006; 2017) recommended using hybrid power with NHS user experience and technical expertise. However, it is not easy to implement as developers do not work as IS users in the NHS. It is possible to train users as low level developers. Given the situational knowledge is current and highly localised, as soon as someone deviates from a standard ‘role’ as an IS user, that individual is incapable of involving informal formations during IS implementation. Therefore, staff members can become configuration specialists by using their expert knowledge in local context to make the technology more suitable. This is staff members were doing by creating shortcuts and creating new templates that suits local needs in page 244.

Also, the design-reality gap is an inherent problem in the project management approach as due to its structured nature. This is the case in each step of Prince 2, i.e. Pre-project, project initiation, delivery, and project closure. For each stage, relevant tasks have been meticulously planned to achieve the intended objectives. However, the problem is that the goal setting and timing are done at a higher level. In this case, project implementation designing and actual implementation deadlines have been set based on the Department of Health guidelines or by the senior managers at trust head offices without knowing the unique contexts in GP surgeries or different departments. At one instance, the time between the training and the rollout of the IS was almost a year due to BT's delays in infrastructure upgrade problems.

This approach to implementation widens the design-reality gap, as described in Chapter 6.2.1. According to Chapter 3.5, Figure 17, the planned output of the planned action was skewed by the emergent nature of reality. For example, in another instance, the acute trust IS data did not migrate into the new IS. Such unexpected hindrances in every project affect project outcomes and deliveries. This leads to a significant application problem.

In addition to the inherent ontological design-reality gap in structured design processes, there is a knowledge and perception gap between the project managers' 'domain of problems' and the reality as they have deviated from the organisational reality in the NHS. This means that the design specification was based on various assumptions. One of the assumptions was selecting *affluent* and easily approachable practice managers would be easy for technical committee members to gather requirements. This is fundamentally flawed, as practice managers in technical committees are not qualified for requirement gathering because they are

not the day-to-day users of the IS. Secondly, they have assumed that each GP practice operates similarly and pilots the new IS with IT-savvy practices who volunteer for piloting. Furthermore, issues related to the provision of training, such as the scheduling of training, have seriously impacted IS implementation. Such problems have been highlighted by Cadle and Yeates (2004) as a disparity between the IS life cycle and project implementation. The project life cycle and implementation life cycle should be compatible and complementary. This result design-reality gap exists from inception throughout the IS life cycle.

Secondly, the local project managers haven't considered training requirements. As one user suggested, training issues have risen due to varying training needs and skill levels of the staff and, more importantly, project management issues.

There have been many attempts to reduce the design-reality gap. (Heeks, 2006; 2017)suggested modularisation as a solution to the design-reality gap. The incremental design and modularisation can be expected to compensate for the emergent gaps. He argued that it is natural that there will be a widening gap between the IS and its reality over time due to changing organisational realities. Having incremental updates or periodical patches will fill these gaps. However, the user has to be informed and trained of incremental changes prerequisite. However, often it was highlighted that that was not the case. It was found that incremental designs make it more difficult for the user to navigate and use the IS often, particularly when training or guidance notes are unavailable. The research found that the help manuals refer to the old version of IS. In such situations, staff members collaboratively share their knowledge to reduce the knowledge gap.

6.3.1 Too Much Bureaucracy During IS Implementation?

This chapter analyses the level of bureaucracy in IS implementation within the NHS at both national and local levels and discusses the local shortcuts project managers followed to meet national deadlines, turning the whole project into a bureaucratic exercise.

The documentation analysed reveals that the local IS implementation model adhered to strict national guidance. The NHS centrally determined the scope of IS implementation, specifying which systems were to be implemented, in which departments, and the timelines for implementation. The national project was designed to be deployed in three stages: (1) identification of sites, (2) provision of information, and (3) IS roll-out. This top-down, bureaucratic approach did not consider the specific characteristics of local care pathways and the unique aspects of NHS organisations. Instead, it relied on suppliers and their core versions of the IS, provided by software development organisations contracted through the NPfIT project, including Lorenso, BT, Fujitsu, and TPP. These organisations designed IS based on standardised care pathways and information gathered by project technical experts.

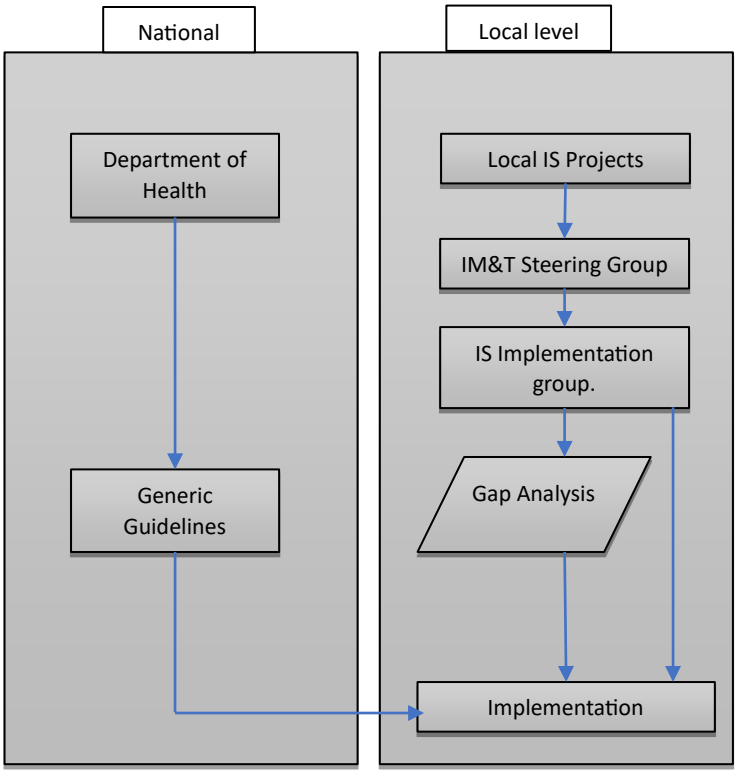

Figure 28:Approaches of IS Implementation

The diagram below summarises how national-level policy dictates IS implementation and how these implementations are carried out at the local level. The Department of Health issued various directives and policy decisions related to the NPfIT. Senior-level regional IT implementation managers then translated these directives into local policies and targets, which the local implementation managers followed. A few practice managers represented the technical committee, providing feedback on gap analysis to the project steering committee and IS designers in their respective domains.

However, such top-down implementations are not uncommon globally. Similar approaches are documented in the literature, such as the Canadian EMR implementation, which also used a top-down approach where medical centres were given a choice between two systems (Price, Singer and Kim, 2013).

Beyond the strategic-level bureaucracy, project managers employed a series of shortcuts to achieve deadlines. The findings revealed that a selected cohort of practice managers was chosen to collect information according to the local technical committee's requirements. However, as discussed in Chapter 5, not all practices were consulted or requested for their involvement. Ultimately, only a handful of affluent GP practices were represented at various meetings and during the piloting phase. For IS selection, project leads provided a choice between two systems, leading to bureaucratic decisions that favoured practices actively involved in the project.

Based on the information collected by a small group of local experts, the core version of the IS was adapted with minor customisations to suit local needs. Adaptation and implementation were performed through local project boards, indicating that the IS origin was not local but followed a top-down approach rather than a bottom-up one. It is highly questionable whether such a basic requirement collection could sufficiently capture local needs. For example, an ethnographic or grounded theory-based bottom-up approach would have reflected users' requirements more accurately than what managers assumed was needed (Mattarelli, Bertolotti and Macrì, 2013).

The deployment and implementation methodology were developed and actioned by the local technical committee, with detailed information rarely passed on to IS users. As a result, many IS users and managers were unaware of the suitability and features of the IS implemented in their GP practices.

Bureaucracy was not limited to project design but was also reflected in its implementation, including the selection of practice managers or representatives for technical and management implementation committees. Various shortcuts were

taken in selecting practice managers or representatives for these committees, limiting the opportunity for user engagement and participation. A possible explanation is that project managers were attempting to meet the nationally defined deadlines and milestones.

Further, bureaucracy is not limited to project design but is also reflected in its implementation, from selecting practice managers or representatives at technical and management implementation committees. Various shortcuts were taken, including in selecting practice managers or representatives for technical and management implementation committees. This limited the opportunity for user engagement and participation. A possible explanation is that project managers attempted to achieve the nationally defined deadlines and milestones.

6.4 Design- Reality Gap Influences Routines

The workplace is where staff perform specific tasks repeatedly to achieve certain objectives. For example, doctors treat patients, and engineers build things. Repetition of actions allows staff to focus on these actions and complete these tasks effortlessly (Winter Jr, 1964) and develop a specialisation. The research identified that any changes to the IS (new IS or IS upgrades) make these repetitive actions either impossible to perform or not yield the intended results, e.g., an administrator might perform the same action of entering data into a new IS, but it may not result in the intended outcomes. A clinician who used to find HONOS forms in a particular area may get confused if they cannot find the form after an upgrade.

Such repetitive actions have been defined as routines (Winter Jr, 1964, p. 263). Routines consist of behaviour, interaction, action, and activity (Becker, 2004, p.

644). On the one hand, the ability to make repetitive actions supports IS usage and make the care pathway functioning, as it is not possible to use an IS or even a process itself without repetitive actions. In another point, the foundation of object-oriented design depends on repeated actions. As described in the previous chapter, routines change over time. Once such occurrence is that routines changes as a result of learning. However, if there is a significant learning gap, users cannot perform certain operations to achieve expected results, which will affect the IS acceptance by staff members. Zibrowski *et al.* (2018) found that when structured IS disrupts doctors' routines, there is a lesser likelihood of accepting the new IS. Bichel-Findlay, Callen and Sara (2008) found the same fact during the IS implementation at the University of Virginia Medical Centre.

This research has found that specific actions and behaviours can be problematic when they fail to produce the same outcomes (Figure 26). The research highlighted that actions do not yield the same outcome after an IS implementation for two reasons: (1) the user is unable to act due to the restrictions in the post-implementation context, and (2) the action performed leads to an expectedly different outcome.

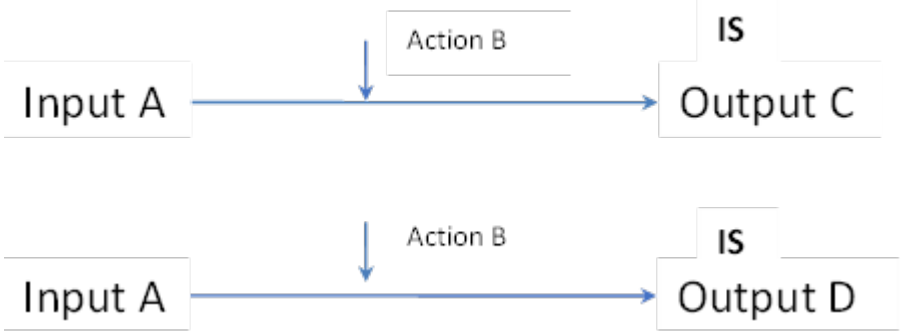

Figure 29: Pre and Post-IS Implementation and the Outcomes

6.4.1 Increased Interdependencies

Staff response has been a critical factor in IS implementation. Staff members show a varied response to the changes in ISs and disruptions to the routines in the NHS. Their behaviour is systematic and organised. A similar concept by Sensenbrenner and Portes (2018) discussed the emergence of bounded solidarity when there is a homogeneous population in the same externality, based on the behaviour of the Polish, Korean and Cuban immigrant populations in the United States. The research identified a similar pattern of behaviour among staff members in NHS organisations, especially among staff members doing the same job, i.e., administrators or community care coordinators working in the same department. Section 6.9 how approachability, proximity and uniformity affects interdependencies between staff members and their actions.

Moreover, section 5.3.4 discusses in detail the factors that affect interdependence. According to Anderson and Skinner (1999) , individuals seek informal support for corporate training, knowledge, and skills. In alignment with the literature, staff members in NHS organisations look towards their colleagues as a resource for help and support. The research identified two common objectives of someone using their informal relationships for (1) psychological comfort and (2) solutions to common problems.

Psychological comfort is defined as the sense of belonging or control over the work environment (Rebillon *et al.*, 2023). Staff members lose their control over their work routines when they cannot achieve intended outcome from the communicative objects they were dealing with. For an example, when the IS stopped working and the receptionist was unable to book in patients she started sweating and her face got red (page 289). It was a clear the staff members is not in a comfortable situation.

These kinds of situations are not psychologically comfortable, common and part of everyday life in the NHS.

However, IS implementation managers considered ‘common problems’ would be resolved through training, improving staff skills, and increasing awareness. The practice managers were aware that the problems they face at each practice are the same and attempted to use structured and bureaucratic means to resolve them. One of the critical points is that formalities are the antithesis of informal organisations and, therefore, unresponsive to formal methods. For an example, according to the NHS policy on being ‘paper lite’, it was not recommended to have clinical work to be noted on paper or entered into IS by a clinical secretary. Yet, in an event where IS is not functional as expected or the clinicians having issues, it is deemed to be practical at least these notes to be entered by someone else. The argument put forward by the research is that, when structured IS implementation leads to the design-reality gap, which inevitably disrupts both organisational and individual routines, individuals tend to find alternative ways to make their formal processes workable. Below section 6.4 demonstrates, how the process in which the design reality gap leads to increased interdependencies.

6.4.2 Basis of Informal Relationships

Informal relationships are fluid and co-exist in formal organisations. They intertwine with each other and are difficult to separate. For example, a practice manager’s decision to send someone for training is determined by her informal interactions with her staff members than by a policy. A staff member’s decision to ask help from a colleague to resolve an issue with an IS is situational and based on her previous experiences, approachability and more. Informal relationships can be distinguished

or implied and are relatively stable. Consequently, the characteristics of these relationships cannot be described based on a blanket theory as those arise and continue due to local circumstances.

The research analysed the formation of informal relationships in order to identify what factors affect their existence, evolution and continuation. The research strengthens the existing findings as critical factors that help to form and develop informal relationships are (1) approachability (2) uniformity (3) Proximity (Hays, 1993; Martin, 1956), which are described in detail in section in page 377. Informal relationships enable and are collaborative efforts of individuals in organisations to connect. Sometimes between NHS organisations, not just between individuals in one NHS organisation. These connections bring comfort, solutions, work-life balance, etc. On many occasions, the researchers noticed that staff members tend to call on someone next to them. This is more common among staff members in the same team.

In GP practices and secondary care settings, where teams are often housed in the same room, a unique dynamic emerges that fosters the formation of informal relationships among staff members performing similar roles. This proximity and shared context not only facilitate easier communication but also enhance the sharing of knowledge when challenges arise. The research identified people doing same job in a context and doing same role as a key feature in the emergence of informal relationships as it facilitates sharing knowledge when there is a problem. The definition of ‘uniformity’ is dyadic, as it depends on both the characters of individuals and the external context. Contextual uniformity is described as staff members working in the same department, doing similar job roles, or having closer relationships will seek support from colleagues in the same context. Moreover, the

research found that staff tend to ask for support from their colleagues in the same position or doing the same job, assuming that responding staff members had experienced the problem before or could respond. Staff members often use informal relationships to find such help. In certain occasions, being in the same externality compelled them to break the organisational and individual boundaries and assume that they belong to a 'niche' within the organisation. However, the self-consciousness of the staff about the existence of organisational formalities and responsibilities reduces their informal behaviour to a certain level. Problems, such as IS problems, lead to 'bounded solidarity' as previously discussed. This happens when specific individuals are deprived or in a deprived situation. Staff members are deprived as they have a problem but are also under pressure to deliver their duties. In the literature, this behaviour is typical among immigrant and expatriate communities (Lee and Katz, 2015), which is the basis for cultural and economic reasons.

Secondly, being in the same organisational context influences the cohesiveness between staff members, as the individuals have the same problems, resource scarcities, and responsibility to deliver their service. This cohesiveness was described as 'bonded solidarity' in page 337. For example, a GP cannot refuse to see patients due to an IT problem. Care coordinators must see their patients and do assessments regardless of whether they can find the HONOS form on the system. It was highlighted that members in the same context and experiencing the same externality (e.g. due to an IT issue) feel homogeneous and more compelled to collaborate as a single unit. The inherent advantage of collaboration is the division of labour based on consensus. This means, regardless of age, gender, or job position, staff members were selected and given leadership tasks and listened to

their views. Usually, senior staff will listen to junior staff members on issues related to IS or IT.

However, formalities, such as organisational management, objectives, workload, tasks, and responsibilities, are the antithesis of informal interactions. For example, organisational formalities focus on the individual roles and their collective effort to achieve the organisational objectives. In a business environment, formalities direct everyone's actions towards increasing productivity. This aims to reduce informal interactions. The research found that on one occasion, three administrators were talking with each other about 'sharing documents on the system', and they stopped when they saw the practice manager coming towards them. Hence, self-corrections by staff members and the authority tends to keep their behaviour in alignment with the formal organisational objectives. Hence, formalities and authorities are the antitheses of informality. However, staff and the management balance organisational formalities and informal interactions to make the organisational environment creative, homely, comfortable, and supportive rather than chaotic and disruptive.

Literature highlights that trust between staff members is the basis for informal relationships (Realo, Allik and Greenfield, 2008). The research found evidence that trust is a crucial factor that enables informal relationships between individuals. According to Realo, Allik and Greenfield (2008), the trust serves two functional purposes: (1) bonding, which is inclusive and (2) bridging, which is exclusive. The research findings highlight that interactions and informal troubleshooting are related to bonding between staff members. They are in the same organisational reality, and their problems are the same. From a practical point of view, it was difficult to answer the problems of an outsider in their team. This is why most staff members preferred

asking for help from their colleagues in the same unit rather than the IT help desk. Hence, bridging rarely happens unless someone wants expertise from a different team.

Trust reassures the recipients that the respondents have sufficient knowledge and experience in resolving common problems. Also, respondents offer information and support because (1) the collective behaviour will improve the condition and (2) the receivers will return the favour.

In GP practices, practice managers showed that they contacted their informal friends outside their organisation for help, as previously explained by Realo, Allik and Greenfield (2008) and King and Shaw (2022). Such actions were similar to ‘bridging’, in order to introduce new knowledge and skills from outside the organisation.

It is important to ask why the staff members are helping others. There are various reasons for helping, collaborating with, and guiding others. Informal help is an entirely voluntary action. As discussed in chapter 5, NHS staff members help their colleagues as part of their shared responsibility towards patient care. This voluntary help builds social capital, an intangible value that staff members ‘bank’ when they assist others. They help one another with the expectation that the recipient will reciprocate the favour in the future. The research findings extend the concept of ‘community of practice’ (CoP), introduced by Lave and Wenger (1991), a conceptualisation of practitioners' learning. So, the informal interactions are not just transactions but it also a mean of how given social environments create new knowledge. According to (Wenger, 1998), people who engage in the collective learning process form communities of practice which individuals having a pool of knowledge in a shared domain for common use. Like the NHS practitioners in the

NHS, they share a passion for what they do and learn how to do it better when interacting regularly and preserve that knowledge informally. The diagram (Figure 29) describes the reasons within organisational context that influence an informal organisation. These are all part of the organisational reality at a given time.

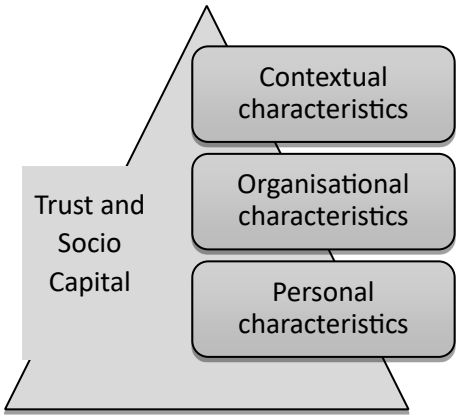

Figure 30:Factors Influencing Informal Relationships

6.4.3 Emergence of 'Common Problem'

The research identified that having a 'common problem' in a relatively small space makes the individuals work cohesively. Informal cohesion emerges from staff members working collectively in response to a 'common problem.' For example, when they answered how they responded to common problems, almost all the respondents used 'we' instead of 'I.' Even those who pessimist about IS implementation, believes the emergence that come with the IS implementation it is a common problem. Therefore, it is not about providing a service, but also the survival of the service we provide, our jobs. It is tough. We have to be proactive and well ahead of the game' a GP Practice Manager said (Page 251). The subtle

meaning was that through collectivism they can achieve better delivery of outcome and job security.

What underpins the collective behaviour through informal interactions are the sense of ‘bounded solidarity’ Sensenbrenner and Portes (2018). This is antithesis to the formal organisation as the organisational formalities restricts bounded solidarity. According to. Aguilera and Massey (2003), contextual pressure makes individuals work in solidarity bounded by external common issue acts as a complex adaptive system. The research found that NHS staff members strive to achieve organisational and personal objectives; they view changes to their routines as a ‘common problem’. These individuals recognise other colleagues’ capacity to resolve problems and, through the division of labour, based on trust, to solve common problems. Unable to find a form on the IS is a common problem as peers widely use the forms in the team or throughout the organisation. Hence, it is in everyone’s interest to find a solution. NHS staff members developed informal platforms, events and opportunities such as ‘Practice managers group’ in page 315 for share common problems that affects their ‘patch’. It is a response for a common problem.

Individuals in a CAS effectively utilise individuals’ skills, experiences, and tacit knowledge in responding to the common problem. However, the decision-making process is not entirely democratic and is instead consensual. It was identified that the individuals respect and allow those who have had proven knowledge in dealing with similar problems to support them through the division of labour. It was found that staff with less skill and experience perform tasks that do not require technical expertise. Moreover, junior staff with IT skills have played a leading role in the IS implementation by the GP practices. In which they called as ‘IT wizards’ in page 319.

When a problem affects everyone, staff members tend not to follow the organisational hierarchy, at least they used to. Instead, an informal hierarchy has evolved with everyone's consensus based on expertise. In such events, staff members with proven experiences, knowledge and track records with a high level of trust become the key to finding the solutions. This is where the informal organisation takes the lead over the formal structure.

The research found that a whole ward runs on a paper-based patient record system and IS, i.e., Jade in page 254. These staff members agreed on running a dual system as a failsafe method according to their skills and contextual problems, even though the CNWL NHS advises the opposite. This means staff members do not hesitate to violate organisational policies when there is a common problem, and there is no other way out to achieve sustainment in care pathways.

Hence, informally driven CAS behaviour is beyond the scope of the formal organisation and seeks a localised solution. Moreover, the behaviour of individuals in a CAS is dynamic and endless. They try to solve problems or respond to changing organisational environments by continuously evaluating and adjusting their interactions in complex adaptive systems (Holland, 2000; Kariippanon *et al.*, 2020).

In summary, changes to the routines will cause a common problem. Common problems arise when individuals try to achieve similar goals in the same context when their routines are disrupted. In such circumstances, individuals will increase contact and interaction between them to share skills, experience, and knowledge to make the organisational reality and outcomes acceptable to them.

6.4.4 ITPOSMO-E

The concept of emergence played a critical role in understanding and addressing the design-reality gap in Information Systems implementation within the NHS. Using the ITPOSMO framework: Information, Technology, Processes, Objectives and values, Staffing and skills, Management systems and structures, and Other among staff influence the success of IS deployment and adaptation. By analysing these emergent phenomena, can gain insights into the dynamic and complex nature of IS implementation and identify strategies to bridge the design-reality gap, especially by understanding the role of emergence in design reality gap described in page 109. Each element in ITPOSMO concept has been analysed in regards to the impact of emergence.

Information

Emergence in information flow is evident when staff members adapt and share information beyond formal communication channels. During IS implementation, the formal design often fails to account for the informal networks through which crucial information is disseminated. These informal networks are essential for handling unforeseen issues such as training for an example and ensuring that relevant information reaches the right people. As observed in the thesis, staff members frequently rely on these emergent information flows to navigate the constraints imposed by the formal IS design, implementation and training needs. Recognising and incorporating these informal networks into the IS design can help bridge the design-reality gap.

Technology

The technological aspects of IS implementation also exhibit emergent properties. Users often develop workarounds and improvised solutions to cope with the limitations of the prescribed systems. These emergent adaptations highlight the gap between the standardised technological solutions provided by vendors and the actual needs of users in diverse healthcare settings. The thesis provides examples of how staff members creatively modify their interactions with the technology to better fit their workflows. By understanding these emergent technological behaviours, designers can create more flexible and adaptable systems that align with users' real-world practices.

Processes

Emergent processes within the NHS illustrate how staff adapt standardised procedures to better fit their operational realities. The formal IS implementation processes often overlook the nuanced and evolving nature of clinical and administrative workflows. Staff members routinely adjust these processes to meet immediate needs and improve efficiency, thereby demonstrating emergent behaviour. The thesis discusses several instances where informal processes were developed to bridge the gaps left by the formal IS design. These could be doctors directly calling patients for clinical assessments bypassing the need for entering patients attendance into IS booking module, or clinical secretaries are entering notes into IS. Acknowledging these emergent processes and integrating them into the formal system design can significantly reduce the design-reality gap.

Objectives and Values

The objectives and values of healthcare providers often diverge from those assumed in the formal IS design. Emergent values, such as the prioritisation of patient care and the need for empathy in interactions, frequently conflict with the

efficiency-driven objectives of standardised IS implementations. The thesis highlights how healthcare professionals' intrinsic motivations and ethical considerations drive their emergent behaviours, often leading to resistance against rigid IS protocols. Aligning IS objectives with the emergent values of healthcare providers can create systems that are more supportive and better received by users.

Staffing and Skills

Emergent interactions among staff reveal the importance of informal learning and knowledge sharing in IS implementation. The formal training programmes provided during IS rollout often fail to cover the practical and contextual nuances that staff encounter. As a result, staff members develop emergent strategies for acquiring and sharing knowledge, such as peer mentoring and on-the-job problem-solving. The thesis provides evidence of these emergent learning behaviours, emphasising the need for IS training programmes that support and enhance these informal practices.

Management Systems and Structures

Management systems and structures within the NHS can either facilitate or hinder emergent behaviours. Bureaucratic and hierarchical structures often stifle the flexibility required for emergent solutions to thrive. The thesis illustrates how emergent leadership and informal management practices can enhance IS implementation by fostering a more responsive and adaptive organisational culture. Encouraging management structures that support emergent behaviours can help bridge the design-reality gap and improve overall system effectiveness.

Other Resources

The allocation and utilisation of resources also exhibit emergent characteristics. Staff often find creative ways to maximise the limited resources available to them,

demonstrating resourcefulness and adaptability. These emergent resource management strategies can provide valuable insights into more effective and efficient resource allocation models. The thesis discusses how understanding and supporting these emergent practices can lead to better resource utilisation and a more resilient IS implementation process.

Emergence (E) plays a pivotal role in bridging the design-reality gap in IS implementation within the NHS. By recognising and incorporating emergent behaviours and interactions as an element in design reality gap (ITPOSMO), we can create systems that are more aligned with the dynamic and complex realities of healthcare environments. The ITPOSMO-E framework provides a comprehensive lens through which to analyse these emergent phenomena and develop strategies to support and enhance them. This approach not only improves the fit between the designed systems and organisational realities but also fosters a more adaptive and resilient healthcare system. The insights gained from this analysis offer valuable guidance for future IS implementations, ensuring they are better equipped to meet the evolving needs of healthcare providers and patients alike.

6.5 Interdependencies Influence IS Adaptations

Informal relationships in the NHS are voluntary, unplanned, and mutually beneficial among staff, leading to solid interdependence in organisational contexts. Their degree of formality/informality varies. The informality to formality spectrum of activities varies from having a cup of tea with a colleague, going out for a meal, shopping together to designing and sharing IS templates. Staff members benefit from these relationships, as the consequent changes and adaptations help to resolve common problems. The improvement in psychological comfort underpins their collaborative effort. As discussed in previous section, contextual pressure

compels staff members to increase interdependence between individuals in the organisation and cooperate by sharing information, knowledge, experiences, and skills. It is expected that sharing and cooperation with each other are beneficial; by improving the environment and expecting recipients to return the favour when needed.

Also, during IS implementation, individuals maintain a degree of independence from each other. This is more obvious in GP practices, where formal management is structured under the practice manager. Each practice manager has a vested interest in their practice. They do not follow guidelines strictly. One practice manager mentioned that she contacted a faraway practice manager as she was felt threatened by the nearby practices other practices offer GP appointments quicker. Similarly, Miller and Page (2007) highlight that agents' ability to keep a degree of independence in a CAS is vital to its behaviour and evolution. Informal behaviour is structurally decentralised as individual involvement in a CAS is voluntary. The sense of 'common problem' and psychological comfort make them to work in a harmony to resolve their problem by collaboration and collectivism. Therefore, willingness to stay in the CAS and seek help from more trusted colleagues is anyone's best choice when they needed help.

CAS behaviour in the NHS as any other in the nature, surviews through learning and adaptations. Adaptations and learning are the main characteristics of CAS (Mitchell, 2009; Cooke-Davies *et al.*, 2007). Adaptations during the IS implementation are dyadic. This includes IS adaptations which are the changes to the IS or workflows and how they work. The changes to the IS or the workflows are the external adaptations, while the latter underpins internal adaptations through learning. External adaptation can be a new step in the care pathway or a new

template designed by the staff members and internal adaptation be discovering a new expertise in the group.

As discussed in chapter 3.3, the ‘adaptation’ process is an order-to-disorder-to-order process initiated as a result of changes to the routines due to new IS implementation. The process is similar to the ‘Complex Responsive Process of Relating’ (Stacey and Griffin, 2005), in that behaviour of informal groups changes from one response to another. The staff works collaboratively to change and adjust the IS and workflows. The initial ‘status quo’ has been disrupted as a result of the IS introduction and led to the disruption of routines. This leads to increased inter-dependencies between staff members who work collaboratively to change the context. Adaptation is a dynamic and continuous process.

The research identified three different types of external adaptations: (1) IS adaptations, (2) infrastructure adaptations, and (3) workflow adaptations. It was highlighted that the adaptation of IS enhanced four functions: (1) data entry, (2) retrieval, (3) navigation, and (4) learning and further adaptation through self-organisation, i.e., ’super user’ groups.

The interdependencies between staff affect the sharing of knowledge, skills, and experience to improve the efficiency of ISs. In that sense, interdependences between the members act as ‘enabler.’ It has been identified that a successful change to the IS has been deployed successfully throughout the entire CAS within short periods, and often, individuals added value and adjusted ‘it’ further to suit their needs. Hence, behaviour of informal groups during IS implementation is a complex social system where tasks, technology, people, and structure adjust and respond to internal and external factors, as specified by Levitt and March (1988).

In addition, the research found that any adjustments to the cooperation process brought about by the division of labour diffuse through consensus. For example, a new ‘report’ developed by an experienced practice manager accept by the community. Similarly, a few individuals have developed templates and shortcuts, which have spread through formal and informal channels, e, g, ’super user’ groups.

Moreover, collaboration among staff will bring added value to organisational formalities, leading to efficient use of resources and division of labour. Unlike the division of labour in formal organisations, informal ways of the division of labour are more pragmatic, efficient, and effective as the organisation selects the right set of skills and the right staff member at the right time. Selection and recruitment of an individual to carry out a certain task has been done through consensus and based on trust and the individual’s previous performance.

Analogous to adaptation in any other CAS, adaptations of and in informal groups are based on individual learning and sharing. Similarly, due to the dynamic nature of organisations, adaptation is a continuous process from order to disorder to order.

As discussed in Chapters 5.5, 5.7, and 6, personal experiences and knowledge play a significant role in informal organisations. Also, practice managers in the PCT area highlighted that. Adaptations are in response to the changes to the context. The findings emphasise that interdependence is the primary enabler of cooperation that leads to change.

6.6 Identification of Deferred Action

Sections 6.2, 6.3, and 6.4 examine how Information Systems (IS) implementation affects the informal behaviour of staff members in the NHS. Consequently, such

behaviour leads to IS adaptations. This section highlights how adaptations and localized actions by informal organisations are incorporated into IS design and implementation projects.

It was evident that neither IS implementation nor IS design considered the informal behaviour of staff either structurally or functionally. This is because structured ISs are not deferred designs, meaning they are created to perform predefined tasks based on prescribed workflows and lack the flexibility for adaptation. The lack of interaction between IS users and IS designers further exacerbates this issue, resulting in ISs that are misaligned with the actual needs and behaviours of users.

Therefore, ISs are not compliant with emergent behaviours and are not designed to adapt to their context. The emergence of informal groups and their behaviours during IS implementation operates independently of formal implementations and structured ISs. This results in a gap where staff members adapt IS and workflows without formal support, as detailed in Table 14 on page 371. The research identified that integrating local actions and behaviours into IS designs and implementations can transform structured ISs into deferred solutions, making them more sustainable with formal management support.

Supporting Chapter 3 and Figure 21, the researcher identified that planned actions based on organisational rules, objectives, policies, and formalities guide staff efforts to achieve their goals, as defined by Patel (2006b). While IS designs comply with business processes such as care pathways and protocols, real organisational life often deviates from these plans. This incompatibility is further complicated by structured, bureaucratic, and top-down IS implementations, leading to a disconnect between the rational formalization of design and its practical application termed the design-reality gap.

The NHS has attempted to bridge the design-reality gap through formalized methods like modularization and incremental design. However, these top-down, institutionalized approaches place additional pressure on staff, prompting them to develop local workarounds to ease their workflow. Examples include maintaining both electronic and paper-based records or junior administrators advising senior doctors on IS usage.

My study identified that the informal behaviour of NHS staff in response to IS reduces the design-reality gap, adapting the IS to its unique context. Without these adaptive mechanisms, the primary functions of some organisations could be adversely affected. For instance, the coexistence of electronic and paper records or junior administrators viewed as IT experts guiding senior doctors exemplify these adaptations.

Furthermore, informal actions are sometimes encouraged or supported by local management, though often reactively. ISs like Mede-Analytics seldom promote deferred action by facilitating the adaptation and dissemination of reports among informal colleagues, which could enhance user acceptance.

In conclusion, incorporating informal behaviours and local adaptations into IS design and implementation can bridge the design-reality gap, leading to more sustainable and user accepted IS solutions.

6.7.1 Deferred Design as An Enhancement

Enhancements are the kind of improvements of action, or task which increase the quality, outcome or value of an output. In this subchapter let’s understand how deferred designs enhance the IS design.

Structured IS implementations in the NHS do not recognise the emergence and are designed for a 'simplified reality,' using specification formalisms (Patel, 2006b). Here simplified reality means the reality that has been interpreted based on various flow diagrams, axiom, etc. Emergence is not included in simplification process. Therefore, a structured IS design will not respond to emergence within organisations. However, the research found that users and individuals change the context and the IS to enhance its implementation to maximise the workability of the context. These local enhancements create a sense of satisfaction and achievement among staff members. The feeling of satisfaction arises because the solution enhances their sense of accomplishment, and the new solution makes their work easier. This feeling of 'satisfaction' is a crucial factor in IS adoption, as highlighted by earlier studies such as DeLone and McLean (2003), which is depicted in Figure 5 page 66. Given that organisational reality is changing and evolving, so too is the design-reality gap and the user response to it. Hence, the enhancement process is an order-disorder-to-order process that never ends. As described in page 53, Walraven *et al.* (2019); (Walraven, Wetering and Helms, 2020; Walraven *et al.*, 2022a; Greenhalgh *et al.*, 2018) supports this evolutionary response and considers as a never-ending process.

This research emphasises that IS implementation within the NHS shows that although IS is a structured design, local actions still affect IS design. Initially, the actions were tested and executed through informal relationships, and successful actions were formalised and incorporated into the organisational formality. The research found that local action has enhanced system implementation, and sometimes these actions have been integrated into organisational formalities. Patel (2006b) describes this as diffusion management. This includes changing the workflows and adapting the IS to suit the organisations.

As described in Chapter 5, informal relationships acted as a catalyst, and the level of freedom within the NHS organisations enabled creativity and the ability to develop new solutions. One such solution is self-help groups, and local agreements to use a dual entry system for clinical records on both manual records and IS. Therefore, it solves the uncertainties and risks inherent in local designs. Such deferred actions cannot be pre-planned. It is a spontaneous and ubiquitous response at a given point in time.

6.7.2 Diffusion Management

Diffusion management is the formal response to the local action (Patel, 2006c; Nyame-Asiamah and Patel, 2010). While formal organisations focus on structured design issues or 'deal with things formally', they are also pragmatic in acknowledging the value of informal solutions. These informal solutions are usually perceived as simple, practical workarounds by everyone involved, as described in Section 6.6, 'Identification of Deferred Action.' Successful informal actions are often identified as best practices by formal management, which then disseminates these practices to other teams.

Formal management carefully selects and encourages the adoption of effective local practices across different units or departments. This selective process, known as diffusion management, is characterized by the deliberate encouragement or, in some cases, passive tolerance of practices that align with organisational goals, even if they sometimes conflict with official policies. For instance, certain local practices that may contradict formal policies are neither explicitly endorsed nor actively discouraged, allowing them to exist without formal interference.

Diffusion management practices vary significantly among NHS organisations. In some instances, local management introduces new policies or directives to formalize informal adaptations to business practices. Table 14 on page 371 provides examples of these locally developed informal adaptations and how they have been integrated by formal management.

In bureaucratic and vertically structured organisations, diffusion management is often less prevalent due to the stronger influence of formal organisational structures, which can impede adaptive mechanisms. In such contexts, local management may become part of the Complex Adaptive System (CAS) by accepting deferred actions. These managers may support diffusion management practices discreetly, without informing senior management, or by maintaining dual information systems (both electronic and paper records) as substitutes.

Adoption of new practices and self-organisation with the support from the management within NHS organisations contribute positively by improving data entry, navigation, and extraction, thereby enhancing information system implementation. These improvements reduce stress and enable NHS organisations to function more effectively. The psychological comfort and efficiency gains from these adaptations encourage staff members to adopt new routines over outdated ones.

In summary, diffusion management involves the selective adoption and dissemination of informal practices within formal organisational structures, particularly within the NHS. This process varies across organisations and is influenced by the degree of bureaucratic rigidity. Adaptation and self-organisation resulting from diffusion management contribute to improved operational efficiency and staff well-being, demonstrating the practical value of informal practices in formal settings.

Localised solution	Identification of Diffusion Management	Diffusion management	Outcome
Use of Paper notes as a backup system to the IS/ Running a dual system		No written policies identified. However, local management support running a paper recording system alongside Jade (IS)	Reduce clinical errors, reduce stress due to relaxation of data putting and etc
Designing of data input templates.	☑	Combination of informal and formal approach.	Facilitate data input and increases Data Quality
Customising IS and Creating shortcuts on the Interface	☑	Diffusion management identified, i.e., How to create short cuts were included in training notes and disseminated by the management	Facilitate individual's routines and increases efficiency
Changing workflows i.e., Smoking cessation data collected by receptionists not by doctors.	☑	Written policies identified and Workflow changes as a result of the IS implementation	Increases efficiency
Designing new data extraction reports		No policies were identified. No up-to-date manuals are available	Enhance management decision making
Formation of Super User Groups	☑	Formal Terms of Reference has been identified. Supported by the management. However, the level of focus varies with the NHS organisation.	Enhance development and implementation of IS in the NHS.
GP practice Managers meeting and informal sharing of Knowledge, skills, experiences and information	☑	No formal policies. However, management does not hinder the informal sharing of knowledge, skills, experiences and information through informal means.	Increase corporate and understanding of policies, standards, frameworks, Key performance indicators and etc.
Peer training	☑	No written policies. Based on the trainer or management. Informally encourage learning from peers	Increases knowledge retention

Table 14:Relationship Between Deferred Action, Diffusion Management and Outcomes

6.8 Reflexivity of the Researcher

This chapter builds upon the discussions presented in Chapter 5, specifically Sections 1 of the Chapter and sub chapter 5.5, to delve deeper into the reflexivity of the research. Within the social context, researchers need to introspect on various factors including gender, race, ethnicity, class, and cultural background, as these elements can significantly shape their worldview and potentially impact the research process. As outlined in Section 1 of the previous chapter, the researcher engaged in reflection and interpretation of the IS implementation and staff behaviour within the NHS, situated within specific sociocultural contexts. The interpretation of GP Practices was intricately linked to their location, socio-cultural milieu, and their involvement in PCT-driven projects.

The analysis sought to contextualize the socio-cultural settings, exemplifying this through distinctions between working-class environments in urban areas and more affluent white British neighbourhoods in rural or semi-rural practices. While the researcher acknowledged that the level of poverty and economic conditions within the communities although that did not directly influence IS implementation, a detailed exploration of research context, such as the ethnicities of staff members, their attire, behaviour, food culture, and relationships was presented to give the context to the reader. This approach aimed to provide readers with a comprehensive understanding of actions within their respective contexts, thereby emphasizing the importance of the context itself, and rational behind certain behaviours rather than the researcher's perspective as described in section in

4.2.1 Interpretive Approach

Observations of informalities, such as dress codes, shared meals, lunchtime shopping, late work hours, and colleagues providing transportation services, were highlighted to elucidate the degree of informal relationships among staff. These behaviours not only provided insights into the work culture but also hinted at levels of approachability and tolerance within the GP Practices. These descriptions do not only bring meanings to the characters but also create multiple subjective accounts of research context. This rich description is a vital characteristic in interpretivist research.

A significant aspect explored in this chapter was the integral role of food in the daily lives of staff members, impacting their routines and communicative acts. For instance, in both GP Practices and secondary care settings, information sharing during daily handover meetings and discussions often took place in the kitchen, accompanied by a cup of tea. This behaviour was noted to have a cultural dimension, with distinctions observed between more affluent rural white British Practices where such practices were less common. This chapter, therefore, unravels the intricate interplay between sociocultural contexts, informalities in professional settings, and the cultural dimensions influencing behaviour within healthcare organisations.

The research process was meticulously conducted with a keen awareness of biases, particularly those inherent to the researcher. These biases could be rooted in personal beliefs, experiences, or theoretical orientations. Recognizing these biases was essential to minimize their impact on both research design and interpretation. It is acknowledged that the researcher had previous experience working in the same PCT area, inevitably influencing certain beliefs and perceptions.

To mitigate this influence, the researcher adopted the perspective of a third person and provided ample supportive background information to offer transparency.

Thick description was employed as a method to guide the reader through the researcher's journey, aiming to present a vivid and detailed account. The intention was to refrain from overly interpreting findings, allowing the reader to engage in their own interpretation as part of their journey. The researcher maintained a delicate balance, avoiding full participation and assuming the role of an observer.

There were instances where the researcher offered assistance to participants, such as helping them find the HONOS form on the system. However, this intervention was recognized as potentially turning the researcher into a resource person for the participant. This realization prompted the recording and reflection of the researcher's behaviour, leading to a conscious effort to refrain from repeating such actions.

Even during the selection of GP practices, the researcher took steps to minimize bias by sending invitations to all practices in the locality. This approach aimed to ensure a more representative and diverse sample, avoiding the pitfalls of a biased selection process. In this way, the researcher sought to uphold the principles of transparency, reflexivity, and methodological rigor throughout the research journey.

Crucial to understanding the researcher-participant dynamics is the consideration of the researcher's role in the research process. It is imperative to grasp the potential power dynamics between the researcher and participants, as these dynamics can significantly impact data collection and participant responses (Berger, 2015; Elwood and Martin, 2000). For instance, overlooking unexpected power dynamics between the participant and interviewer can create situations where some participants feel

pressured to reveal personal details they are uncomfortable sharing or feel silenced, limiting their ability to fully express their experiences (Olmos-Vega *et al.*, 2023).

The researcher recognized and critically examined these complex power dynamics, integrating their reflections into the overall research process. As part of personal reflexivity, the researcher explored, acknowledged, and clarified their expectations, assumptions, and both conscious and unconscious reactions to contexts, participants, and data with an open and unbiased approach (Walsh, 2003). Additionally, interpersonal reflexivity involved analysing how relationships within the research process influence the context, the individuals involved, and the resulting findings (Walsh, 2003).

For an example, several years prior to the research, the researcher had worked in the NHS area, which led to some senior managers being familiar with him. However, for receptionists, clinicians, and administrators, there was limited or no prior contact with the researcher. Consequently, the researcher was perceived as entirely new to the research setting. This perception was evident in the way participants addressed the researcher, referring to him as Amila rather than Mr. Amila. As detailed in Chapter 5 Section I, participants often introduced the researcher as a university student. Small gestures, such as bringing biscuits and making tea, subtly reinforced the view that the researcher was not merely an official but one of them. These actions also played a role in breaking the ice between the researcher and the participants. In fact, one staff member explicitly stated that the researcher was considered one of them'.

While there was one instance where a GP directly addressed the researcher as Mr. Amila, this interaction had little impact, as the staff members were preoccupied with their work at that moment. This highlights the nuanced nature of researcher-participant dynamics, where the researcher's previous experience in the NHS area

shaped perceptions and interactions, and subtle actions were employed to establish rapport and integration within the research setting.

Careful consideration was given to the methodological choice of using thick description, as described 4.8 Data Analysis Technique- Thick Description. Reflecting on the reasons behind methodological choices is crucial for the researcher. This encompasses decisions related to data collection methods, sampling strategies, and analytical approaches. Documenting each step and providing justifications, along with exploring possible alternatives, enhances the credibility of the research.

Another facet of reflexivity is engagement with literature. Researchers must reflect on their position within the broader academic community, understanding the relationship of their work to existing literature, acknowledging intellectual influences, and being transparent about the theoretical frameworks guiding their research (Olmos-Vega *et al.*, 2023). The interpretation of not just findings but also their link with the literature was emphasized.

Vital to the research process is acknowledging subjectivity in interpretation (Olmos-Vega *et al.*, 2023; Elwood and Martin, 2000). Researchers should recognize their subjectivity in interpreting findings, considering alternative explanations, being open to diverse perspectives, and avoiding overly deterministic or biased interpretations. The use of thick description played a pivotal role in allowing readers to draw their conclusions related to the findings. At the interpretation level, the researcher aimed to avoid overly prescribing or interpreting the findings and provided alternative interpretations where possible. This approach fosters a more nuanced and open-ended understanding of the research outcomes.

6.9 Approachability, Proximity and Uniformity

Approachability emerged as a key aspect in the research, proving its significance in informal interactions, knowledge sharing, and deferred solution development within the NHS context. This qualitative attribute of interpersonal communication plays a crucial role in social and professional settings, fostering effective communication and collaboration. An approachable person, characterized by warmth, openness, and a willingness to engage, creates an environment conducive to such interactions.

The reception of information is influenced by the perceived approachability of the person conveying it. Individuals are more confident in information received from someone they have engaged with previously or someone known for their knowledge. This dynamic explains why practice managers were in contact with colleagues from somewhat distant practices.

Approachability in the professional NHS context extends beyond ethnic affiliations, with certain individuals perceived as more approachable within their own ethnic community. This finding underscores the multifaceted nature of approachability, which transcends cultural boundaries.

Even in the secondary care setting, approachability proves to be a valuable trait for leaders, managers, and educators. Leaders who exhibit approachability are more likely to foster positive relationships, encourage open communication, and create a supportive work environment (Asianab and Amouzou, 2024). An example is the secondary care ward manager who, by arriving early, greeting all staff, and attentively addressing their concerns, contributes to a trouble-free care pathway operation. Colleagues feel comfortable seeking guidance and sharing ideas, fostering a positive work atmosphere observed across various NHS settings. The managers noted for their approachability displayed significant patience and empathy, especially when repeatedly teaching certain skills.

Moreover, approachability extends beyond the professional realm and is fundamental for establishing personal connections, making friends, and navigating social situations (Porter, Wrench and Hoskinson, 2007; Asianab and Amouzou, 2024). This quality allows individuals to form meaningful relationships, share experiences, and build a network of social support—essential elements for the development of workarounds and deferred action within the NHS. As the research unfolded, it became evident that approachability is a pervasive and influential factor that significantly shapes interactions and relationships in both professional and personal spheres within healthcare organisations (Swani and Isherwood, 2020).

Proximity and Uniformity are significant factors influencing informal interactions among staff members, playing a pivotal role in fostering collaborative relationships. Proximity, referring to the physical distance between staff members, emerged as a notable determinant of informal interactions. Staff members consistently emphasized the preference for engaging with someone in close proximity or someone performing a similar role. This tendency was driven by the practical advantage of obtaining quick answers and insights from a colleague engaged in a similar job. Chapter 5.3.2 delves into this transactional aspect, where colleagues assist one another with the assumption of reciprocal assistance in the future.

The positive contributions of proximity and uniformity to informal interactions are detailed in Chapter 5.3.3, titled ‘Understanding Key Determinants of Informal Relationships.’ The findings reveal that individuals often attempt to resolve issues independently and then turn to someone nearby when assistance is needed. This behaviour is particularly effective in open office environments or when staff members sharing similar job roles are in close proximity.

Chapter 6.4.2, titled ‘Basis of Informal Relationships,’ further explores the role of uniformity in interactions among staff members. It is observed that individuals tend

to seek advice and share experiences with those of similar levels or positions. For instance, clinicians at the same level may exchange insights, and Practice Managers within the same practice area often seek advice from their counterparts. Notably, the likelihood of interactions is not solely confined to those in close proximity; the researcher observed instances where Senior GPs attentively listened to junior staff members discussing IT-related topics. Practice Managers also see advice from peers outside their locality, often seek help from those who belongs to different ethnic background.

Trust and previous experiences emerge as pivotal factors influencing the seeking of advice or help related to IS issues. The chapter emphasizes that there is no general principle dictating that staff members in the same room or building will necessarily seek advice among themselves. Rather, complex circumstances and the dynamics between individuals determine where they choose to seek help.

In summary, Approachability, Proximity and Uniformity are dynamic elements that shape the informal interactions within the healthcare environment, influencing how staff members collaborate, share knowledge, and seek assistance in navigating the complexities of information systems. However, it is extremely difficult to determine their individual degrees of influence on one's decision to seek advice due to the complex nature of human behaviour. Thus, approachability, proximity, and uniformity, along with other contextual characteristics, play a role in shaping staff behaviour.

6.10 Deviations from IDAP

While the research is critical of the conventional information systems (IS) design and structured design implementation through PRINCE2 methodology, the research

data recognizes the significance of employing structured measures. The systematic nature of IS design was instrumental in making the IS design a reality. Without relying on structured processes, IS developers and the National Health Service would not have had the opportunity to integrate various experts, resources, and technologies into the development and implementation of IS in the NHS. Staff members did not express criticism toward the implementation of new information technology or information systems or the introduction of new versions. Instead, their frustration stemmed from the disruptions to their daily routines during these implementations. It is important to note that the Integrated Design and Adoption Process is not positioned as an antithesis to the structured IS development or implementation but is considered a means to achieve sustainability after structured implementation.

Structured and top-down implementation enables the coordination of various resources and experts who may not have pre-existing relationships. However, their operational ontologies often differ. The ontology of an IT developer and an IS user in the NHS, for instance, is completely distinct. The top-down or structured implementation method has brought these disconnected ontologies into one place where they had to collaborate to make an IS to design and implement. The formalism used in structured design processes, such as object-oriented programming, bridges these ontological gaps through an abstraction process. This allows an isolated IS designer to comprehend care pathways and design an IS using flow diagrams developed by local technical committee members.

It's important to note that informal communication is not a universal solution for IS development, as informal relationships do not always exist between various departments and experts. Instead, informal relationships tend to exist between staff

members who already have formal relationships. Respondents in the research consistently referred to someone with whom they had official contact when seeking help, rather than reaching out to someone outside the official setting. Therefore, informal connections that find solutions to IS problems are often rooted in formal foundations.

> However, it is crucial to recognize that informal connections do not always lead to the resolution of IS problems. Some staff members perceive that the introduction of IS reduces informal interactions and staff satisfaction. They believe that IS implementation hinders their connections with others. As expressed by one staff member:
>
> *Personal relationships are much less now. Previously we used a manual system and talked a lot about gossiping. Not anymore. More formal.*

Source: GP-PM-F2

This perspective indicates that some staff members believe IS implementation impedes their informal connections. Moreover, it highlights that not all informal communications are supportive of the organisation; some may have the opposite effect. This is why some staff members believe IS implementation has improved organisational efficiency~~, as described on page 252~~.

6.11 Summary

This chapter discussed and interpreted the findings of the data analysed in Chapter 5 along with existing literature and aimed to test the IDAP model presented in Chapter 3. This chapter interpreted how the implementation of structured IS designs leads to a design-reality gap, and how that initiates localised actions by the IS users, eventually leading to IS adaptations. The design reality gap emerges as a result of many reasons. Some reasons are structured formalisms used in IS designing, bureaucracy and lack of end-user involvement in the designing and implementation stages, changing organisational contexts and many other things. The findings extended certain theories in the literature, while others were falsified, at least within the given research context.

The findings established that the design-reality gap affects the routines of individuals. This is because either the same routine may not result in an intended outcome or may not be possible to carry out the action as a result of the new IS implementation. The effect on routines in a given context creates a sense of a ‘common problem’ Localised actions by IS users respond to the design-reality gap, aiming to enhance their experience with IS implementation in a given context. Localised actions are the result of informal interactions. Informal interactions are organic to organisational contexts. Especially in organisations similar to the NHS where decisions are made at lower level individuals in the hierarchy. These relationships bring solutions not only to formal problems but also bring work-life balance. Whenever there is an IS issue, the users tended to seek help from someone close to them or trust them or perceived as knowledgeable or someone who had approached them before. These actions can be described but hard to explain why they exist. Furthermore, collective behaviours by the users cushion the design reality gap and preserves the knowledge locally. Encountering a common problem compels individuals to share knowledge, experience, and skills through

informal interactions, thereby enhancing their experience by adapting the IS. These local actions result from informal interactions; they bring tacit knowledge, informal interactions, trust, routines, and intuition to the IS design and implementation.

It has been witnessed that actions leading to successful adaptations are supported by local management. These consist of 'super user' groups or self-help groups, and maintenance of a dual system (e.g., paper and electronic record system, flow-walker training, etc.). Whenever these actions result in positive outcomes, the actions were supported by the management. This supports the proposition that certain actions (deferred action) that bring positive outcomes to organisational reality have been supported by managerial decisions (diffusion management).

The next chapter (Chapter 7) presents a general summary of this study, discusses the contributions, acknowledges its limitation, and provides suggestions for further research.

Chapter 7: Conclusions

7.1 Introduction

Information Systems in the NHS are often designed using structured approaches. While these designs offer benefits in organisation and control, they lack consideration for the complexities of healthcare context. This can lead to a ‘design-reality gap’ where the implemented system doesn't account for informal interactions, intuition, and situational knowledge of healthcare professionals. Chapter 2 explored this issue through a systematic literature review, applying complexity theory, deferred action theory, and the design-reality gap concept. This review identified recurring themes of IS failure in healthcare organisations and established the research problem.

Building upon this foundation, Chapter 3 developed and empirically tested the IDAP model. This framework investigates how structured IS can lead to ‘deferred action’ through user adaptations and informal interactions.

This conclusion chapter revisits the research questions and demonstrates how the research findings address them. then discuss the study's contributions to both theory and empirical knowledge of IS failures in complex systems. The broader applicability of our findings across various industries will be explored. Additionally, we discuss the implications for users, project managers, and information systems designers, offering recommendations for improving IS design in the NHS and beyond.

7.2 Summary of The Research

Modern health organisations heavily rely on Information Systems to maintain health records, manage patient appointments, process images, handle prescriptions, process orders, connect service points, and monitor organisational performance. These systems are crucial for gaining a competitive edge and enhancing efficiency. As described in Chapter 2, health information management holds immense theoretical and practical value, maximizing patient safety and providing effective care. Consequently, global efforts to digitize health records have increased, making health data management, retrieval, and business use in planning and commissioning central to IS strategies worldwide.

The NHS launched the National Programme for IT to enhance efficiency, quality, and patient choice by providing clinicians with real-time access to Summary Care Records, regardless of their location. Despite its ambitious goals, the project encountered numerous setbacks and failures, as detailed in Chapter 2. These issues resulted in significant financial costs to UK taxpayers. Such challenges are not unique to NPfIT, as similar failures and setbacks have been documented in other IS implementations within the literature.

The primary critique of this research thesis is that the ISs implemented under the NHS's NPfIT were designed based on structured formalisms by reflective designers affiliated with vendor organisations. These designers, part of NPfIT clusters or clinical system suppliers, employed methods, formalisms, and tools grounded in structured abstraction techniques, such as flow diagrams and axioms. Third-party developers, lacking familiarity with the NHS's cultural and organisational contexts, executed these designs. For instance, Lorenzo, a contributor to NPfIT, offered a generic version of SystemOne for the GP environment, which was subsequently customized according to GP specifications. This detachment from the actual

working conditions of the NHS meant the IS designs lacked situational knowledge, cultural values, and user characteristics such as intuition and emotions. Especially, these designs did not adequately account for users' reliance on their colleagues to resolve IS-related issues, failing to meet local requirements effectively.

Project implementation methods and practices within the NHS have faced similar criticisms. NHS methodologies are often bureaucratic and top-down, varying by IS implementation type, organisation, and context. This bureaucracy should not hinder user engagement, which is crucial for capturing user needs during IS design. Unfortunately, current implementation approaches discourage end-user involvement, failing to capture individuals' voluntary contributions of experiences, thoughts, and knowledge. Despite formal participatory activities organized by management, opportunities for genuine involvement remain suboptimal due to strict deadlines, managerial shortcuts, and top-down methods. Only a few practices and managers effectively captured local requirements through meetings and discussions, with some participants voluntarily engaging despite financial implications, bias, or internal politics.

The combined effect of inadequate user engagement, limitations in design methods, and the designers’ lack of insight and understanding resulted in a final design that deviated from local requirements, creating what is known as the design-reality gap. This gap disrupts individual routines and established procedures within the NHS. For instance, it hampers service delivery in GP practices when nurses cannot locate forms during patient consultations or manage patient appointments efficiently. Practice managers may face financial losses if they cannot track appointments accurately.

In such scenarios, staff often resolve issues through common-sense approaches rather than formal processes. They seek help from colleagues instead of the IT help desk, relying on social trust and interdependence. This informal problem-solving foster cohesion and knowledge sharing within teams, unlike the isolated knowledge transfer from an IT helpdesk. Local solutions often lead to workarounds to fix initial issues and are sometimes adopted by formal management as best practices, recognizing these users as super users. These solutions aim to minimize the design-reality gap by making IS and processes more suitable for the organisational context.

The research argues that such informal behaviours at the local level should be integrated with formal IS implementation, recognizing locally developed designs, solutions, and workarounds as deferred actions acknowledged by organisational management and be part of overall IS implementation. The NHS, as a complex organisation with diverse contexts, should design and implement IS by leveraging the local behaviours of staff members, rather than solely relying on structured approaches like predefined business processes, workflows, and training. Implementation should be as bottom-up as possible, allowing local users' interactions and problem-solving practices to inform IS design.

By incorporating deferred actions localized responses to specific situations not anticipated by IS designers into the IS design and implementation process, the NHS can enhance the relevance and effectiveness of its' IS solutions. This approach represents a methodological change aimed at minimizing the design-reality gap, leading to better-aligned IS implementations that meet the real needs of NHS organisations.

7.3 Key Findings

The research found that ISs in the NHS are structured because they were designed based on formal methodologies by designers affiliated with vendor organisations e.g. Fujitsu. These IS designs were created using standard software development techniques and technologies within the Software Development Life Cycle, relying on structured abstraction methods like flow diagrams and formalisms. There was a clear separation between IS designers and the NHS organisational reality, leading to a lack of understanding of the actual context of NHS organisations. Then these ISs were customized based on design requirements provided by local technical committees, which consisted of GP Practice Managers, NHS officials, and project managers, without adequate user involvement.

During implementation, staff were not given sufficient opportunities for involvement in the implementation or information. In some cases, only personnel close to management participated in IS training and requirement gathering. The working style of practice managers, informal relationships, perceptions of junior staff members, and their ethics played key roles during design and implementation, resulting in IS solutions that did not fit the organisational reality. This highlights the shortcomings of structured IS design and implementation processes.

Another key finding is the role of emergence in the design-reality gap. The research defined the design-reality gap in IS implementation contexts and demonstrated its role. The thesis discusses the gap resulting from a structured design process, underlying formalisms, lack of user engagement, local organisational culture, and bureaucratic top-down IS implementation. Heeks (2017); Heeks (2006) and McCarthy *et al.* (2022) define the design-reality gap as a gap between design and reality at a given point in time, not considering IS implementation as a continuous

process. The original concept lacks the role of emergence in the gap. While the concept is valid at a given point, it does not account for the interactions of various elements in organisational realities and their outcomes over time as an evolutionary process. Hence, the research suggested incorporating emergence into the design-reality gap as its 8th element (ITPOSMO-E).

The research shows that the design-reality gap disrupts organisational routines, such as locating forms or booking appointments, stalling business and care pathways. This leads to increased interactions as individuals attempt to resolve common problems, not a planned outcome in any implementation project. Increased cooperation and reliance on others to resolve IS problems increase solidarity among staff members, underpinned by their clinical responsibilities and duty of care in the NHS.

Involvement in collective problem-solving results in (1) increased cohesion, (2) improved trust and reputation, and (3) efficient knowledge management and preservation. Factors motivating staff to help others include (1) proximity, (2) approachability, (3) trust, (4) perceptions, (5) working in the same capacity, and (6) historical experiences. Helping colleagues is voluntary, assuming future reciprocity. ‘Help’ has social value, converting to ‘trust’ and enhancing one’s reputation and recognition. This local problem-solving maximizes collaboration, interdependence, and knowledge retention compared to contacting the IT help desk.

Increased staff collaboration has led to local solutions, adaptations, and processes that are widely regarded as useful, even if they do not conform to formal policies. Examples include maintaining dual recording systems (paper-based and IS-based), assigning staff to cover others, and using locally perceived ‘IS gurus.’

However, not all collective behaviours among staff are sustainable, and some may disrupt IS implementation.

Occasionally, IS implementation project managers and operational managers integrated these adaptations into the formal implementation framework. Staff with extensive IS knowledge became recognized as IT experts, named ‘IS champions’ or ‘super users.’ They attended IS implementation and development meetings with system developers without extra payment but were rewarded with recognition and respect. Sometimes, local solutions like ‘read-codes’ and report logic were shared across the patch as ‘golden rules’ or ‘best practices.’ However, there were no incentives for sharing these reports with other practices. Such deferred solutions cushion the design-reality gap, making the IS more relevant to the organisational reality.

7.4 Research Contributions and Implications

First, the research extends the concept of the design-reality gap by Heeks (2006); (2017) and McCarthy *et al.* (2021). The concept highlights the gaps in information, technology, processes, objectives and values, staffing and skills, management systems and structures, and other resources (ITPOSMO). However, it ignores the role of emergence in the design-reality gap. The research highlights the importance of Emergence occurring as a result of complex interactions over time and adding to ITPOSMO concept.

The research reassures that IS implementation failure is process failure that happens over time. It highlights the human desire to work toward natural systems (Patel, 2006b) and the system breaks when there are gaps within its context. IS

failures are neither just design nor project failures (Herbst *et al.*, 1999; Littlejohns, Wyatt and Garvican, 2003; Trigo and Varajão, 2020). Thus, it is a combination of both. The failures started at the design and kept growing over time. If links with the literature, the research extends the studies of (McDaniel Jr, Driebe and Lanham, 2013; McDaniel Jr, Lanham and Anderson, 2009; Nyame-Asiamah, 2020; King and Shaw, 2022) and their argument of health organisations as complex adaptive systems full of individuals working collaboration by empirically proving, informal interaction in the NHS similar to a CAS. In these small entities, there are local actions, also called deferred action, which are localised reactions to the emergence in organisational context to reduce the deviations from planned actions. The planned actions lack intuition, informal behaviour, and tacit knowledge. Thus, deferred action is the local solution enacted by the local actors. The management supported localised actions that lead to success management by creating management decisions1This will further blur the line between formal and informal aspects of the business organisation and their impact on business processes.

Also, the findings strengthen the existing literature on the reasons that affect the emergence of informal relationships (Martin, 1956; Fu *et al.*, 2019; Winslow *et al.*, 2019) and how trust between individuals affects IS implementation, which has not been researched before (Ghorbani and Azadi, 2021). Sociological and cultural understanding during the IS design and implementation as Berg (1998); Atkinson and Peel (1998); Fu *et al.* (2019) said, would allow developing IS systems that intertwine with social aspects in the organisations. This research views that social action as a reflection of cultural characteristics. Culture influences loyalty to practice managers, their interaction, trust, respect, and more. Racial/ethnic concordance affects how individuals choose their allegiance, trust, hired,

promoted, etc. This is closer to the positions of (Berg, 1998); Atkinson and Peel (1998); Fu *et al.* (2019); Viberg, Andersson and Wiklund (2021); King and Shaw (2022).

The research quoted Feldman (2000) research on ‘routines as an emergent phenomenon’. In which he argued that routines as the building block of the organisation. Thus, he never viewed the evolution of routines as a process. The research found that the design-reality gap leads to interruptions in business processes and create ‘common problems’ when routines are disturbed. This is complimentary to the research carried out by Wenzel, Danner-Schröder and Spee (2021), which they viewed routines as a key component leading to organisational change.

Then, individuals attempt to solve common problems by sharing knowledge, experiences, and skills through informal interactions. The role of routines were discussed in Chapter 2 in view of structured designs would not be compliant with changes in routines. Thus, it would have never been assumed that disruption to routines directly leads to increased interactions and CAS behaviour. The findings clearly pointed out that, routines are the building block for organisations ability to operate, as Feldman (2000) pointed and any disruptions lead to CAS behaviour.

The study strengthens the research of Mattarelli, Bertolotti and Macrì (2013) related to ‘how ethnography and the grounded theory approach can be integrated within a participatory information system development process.’ The main aim is to develop a bottom-up technique to capture users' requirement and active participation in the ISD process, similar to (Orlikowski and Baroudi, 1991). By doing this, Mattarelli, Bertolotti and Macrì (2013)attempted an alternative to traditional ISD formalism. This research attempted the same by incorporating

ubiquitous and local action as an enabler into the traditional IS. Mattarelli, Bertolotti and Macrì (2013) tried to achieve this by getting ‘rich’ and ‘thick’ user requirements into structured IS designs. Similarly, the IDAP process attempts sustainability by enabling local action in structured designs. Although these two are similar when looked closer, these two are distinctively different. Mattarelli, Bertolotti and Macrì (2013) attempted to capture the user requirement in IS better, and this research attempted to make the IS more sustainable by making it adaptable.

At a philosophical level, research also questions the broader positivist view of seeing IS success based on user satisfaction or deductions attempted (e.g. DeLone and McLean (2003) complex-dependent variable model) to segregate IS success into its’ pieces. IDAP model views organisation, and its behaviour based on Complexity theory, and it has analysed the informal staff behaviour as CAS in detail. There was no one factor or factor that determined the IS success. Instead, it was a process in which many reasons interacting in complex ways within organisations result in IS success over time. This is somewhat similar to (Berg, 2001) position but going one step further by demonstrating how it happens.

7.5 Contribution to the Practice and Recommendations

This research examines the challenges of implementing information systems in dynamic organisational environments, where frequent changes and structured IS designs create a significant ‘design-reality gap.’ While users demonstrate remarkable adaptability, the research reveals that traditional implementation approaches often fail to adequately address the interplay between formal structures, informal networks, and user agency. This section outlines practical recommendations for improving IS implementation processes.

Embrace User-Centric Design: Organisations should prioritize involving end-users at all stages of the IS design and implementation process. This includes incorporating their specific needs, knowledge, culture, beliefs, informal interactions, and perspectives to ensure the system aligns with their work contexts and supports their daily activities. This collaborative approach will foster user buy-in and increase the likelihood of successful implementation.

Enhance Flexibility in System Design: Develop IS that are adaptable and flexible, allowing for modifications and updates that can dynamically respond to the changing needs of the healthcare environment and user feedback. This is not merely a passive feedback mechanism, but rather, it actively involves users in customizing and designing IS according to local needs, thus transforming users from passive recipients to hybrid designers. This can be achieved through no-code IS design methods, where users can design or modify applications without needing knowledge of application development code. There are emerging technologies, such as KNIME are used for data migration, or similar for workflow or application design should be incorporated into IS implementation methodologies.

Promote User Agency and Local Activism: IS implementation strategies should extend beyond merely providing a system and focusing on user training. Instead, they should encourage user agency and local activism, recognizing that users are not passive recipients of technology but active participants in shaping its use and impact. This can be achieved by empowering users to contribute to the design process, experiment with system features, and develop local workarounds to address specific needs. This requires organisational changes in terms of policies and the organisation's formal culture to recognize and promote such behaviour.

Recognize and Leverage Informal Networks: Formal organisational structures should acknowledge the power of informal networks and strategically incorporate them into IS implementation efforts. This can be achieved by facilitating communication and collaboration between users through platforms like online forums, knowledge-sharing sessions, or dedicated social spaces, and by recognizing super users. This will leverage the collective intelligence and informal expertise within the organisation, enhancing the effectiveness of IS implementation.

Prioritize Ongoing User Feedback and Adaptation: Organisations should be flexible enough to identify, grasp, and promote local adaptations in terms of system usability, functionality, and impact on work practices. This feedback should be used to iteratively adapt and refine the system over time, ensuring its ongoing relevance and responsiveness to evolving user needs and organisational changes. This includes incorporating adaptations into workflows and policies to recognize and sustain these changes.

This research underscores the importance of user-centricity, informal networks, and continuous adaptation in achieving successful IS implementation. By shifting from traditional, top-down approaches to a more collaborative and inclusive model, organisations can overcome the challenges of the dynamic design-reality gap and ensure that their IS investments deliver tangible benefits.

7.6 Limitations of the study

This research has uncovered that behaviours and informal relationships among staff members lead to deferred actions and adaptive mechanisms. The next logical step is to develop a more adaptable IS design. However, several limitations need to be addressed:

Cultural Specificity:

The study was conducted in a multicultural area in North London, where the researcher identified various cultural characteristics. For instance, patients exhibited loyalty to specific GPs, receptionists often bent rules to assist individuals they knew, and some staff members were employed due to personal connections. These unique cultural dynamics may not be present in other parts of the UK, limiting the generalizability of the findings.

Role of Clinical Secretaries:

The research did not extensively focus on clinical secretaries, who play a crucial role in translating clinicians' free text into the IS. Although an in-depth interview with one staff member provided insights into this role, a more comprehensive investigation could have offered a fuller understanding of their impact on IS implementation.

Retrospective Nature:

The study focused on an IS implementation that had already occurred. This retrospective approach might have led to the loss of some memories, feelings, or emotions that were not properly documented. The temporal gap could have affected the accuracy and completeness of the data collected, as participants may not recall all relevant details.

Methodological Limitations: Participant Observation

Despite efforts to remain impartial, the presence of an outsider during participant observation inevitably influences the behaviour and outcomes of the staff being

observed. This observer effect, although minimized as much as possible, cannot be entirely eliminated and may have introduced some bias into the findings.

Time and Resource Constraints:

Participant observation requires extended periods to immerse in the environment and gather comprehensive data. While a longer study duration would have provided a deeper understanding of the research context, it also demands significant resources, including time, effort, and financial costs, making it impractical for this study. Consequently, the research period may not have been sufficient to capture all relevant dynamics and interactions.

Researcher Bias:

Despite all efforts to minimize subjectivity, the researcher's personal beliefs, values, and experiences can influence observations and interpretations, potentially leading to biased results. Preconceptions and prior knowledge about the study context may have shaped what the researcher noticed and recorded. This inherent subjectivity is a common challenge in qualitative research, which relies heavily on the researcher's perspective.

Dual Role of Researcher:

The researcher had to perform both as a participant to some extent and as an observer. This dual role was stressful and required enormous effort to maintain independence when interpreting events and behaviours. Interactions with other participants could create feelings of bias towards them, challenging the researcher's objectivity.

Lack of Prospective Data:

An ethnographic study conducted from the beginning of the IS implementation would have enabled the research to capture the entire process of IS implementation. However, the current research was a retrospective investigation carried out sometime after the initial implementation, potentially missing critical stages of the IS adaptation process.

While this research provides valuable insights into the informal interactions and adaptive mechanisms during IS implementation in a multicultural NHS setting, the limitations discussed above highlight areas for caution when generalizing the findings. Future research should consider a more diverse range of settings, extended observation periods, and strategies to mitigate researcher bias to enhance the robustness and applicability of the findings. Conducting prospective studies from the outset of IS implementations could also provide a more comprehensive understanding of the adaptation processes.

7.7 Future Research and Development

The theoretical framework, the IDAP model, demonstrated how top-down IS implementation creates design-reality gaps and how the individual users develop workarounds to adapt the IS. The study did not discuss the possibilities of the future direction of IS designing and implementation formalisms. These structured designs do not represent tacit knowledge, informal interactions, trust, routines, and intuition in organisational reality. Thus, IS design and implementation formalisms (e.g., project management concepts, theories, and principles) should be further developed to incorporate CAS behaviour and their ability to make adaptations. How this could be achieved is beyond the scope of this thesis. However, there is a growing requirement for such.

Individuals in organisations are subject to organisational formalities. However, due to personal self-awareness, staff members can maintain a certain degree of freedom of operation and behaviour outside the organisational formalities. This leads to an alternative environment of informalities governed by completely different values, norms, standards, idols, etc. Each organisation has its own informal to formal ratio. This would influence the interactions and CAS behaviour. Knowing this will help designers to design more adaptable and sustainable solutions.

Organisational culture and the ethnic background of users play a critical role in staff behaviour (Cherian *et al.*, 2021; Randle and Dolnicar, 2009; Willie, 2007). This research, conducted in a multicultural area, may have been somewhat skewed due to this diversity. To enhance the generalizability of the findings to other NHS contexts, further research is necessary.

Future research should be part of a longitudinal study to capture the design and implementation phases from the very beginning of the IS implementation. While this study provides a retrospective analysis of the implementation, synchronizing research with the actual implementation process would validate the model more robustly.

The data collection for this study was conducted solely by the researcher, which introduces potential biases inherent to any individual's perspective. The researcher's prior exposure to the setting may have inadvertently introduced biases. To minimize this, future studies should involve collaboration with other researchers in the field. This approach would also mitigate the dual role of the researcher as both participant and observer.

The researcher interpreted observations and experiences through the lens of the NHS as an altruistic organisation, which aligns with its core mission. However, there is growing societal debate about whether the NHS is becoming more business oriented. This shift could lead to different interpretations of similar experiences, and it is uncertain whether the model remains valid in a more business-focused context.

By addressing these aspects, future research can provide a more comprehensive understanding of IS implementation in various NHS settings, ensuring the findings are robust and widely applicable.

The research considered the need to engage with the users and capture their views, requirements, and local behaviours. The research attempts to fill in the knowledge gaps about how top-down implementation and specified design increase informal interactions between users and ultimately lead to deferred solutions. However, this research did not study how to incorporate it into the IS design cycle.

In this research, ‘IS success’ was not considered. Instead, it discussed and analysed how local adaptation leads to sustainable solutions. One of the core issues in the IS implementation world is how to measure the success of IS implementation. The IDAP model is based on human efforts to bring structured systems closer to natural systems, and by introducing voluntary deferred actions, it demonstrates how informal interactions can lead to adaptation. Not much focus on IS success, which has some industrial importance if it could.

It has not been discussed whether the continuous emergence process described in IDAP could be extended to understand different organisational events other than IS implementation.

The research also showed that informal groups behaviour might tend to act as a complex adaptive system to resolve local problems and knowledge retention units. Individuals' tendency towards relying on colleagues and especially with those in close proximity to solve their day-to-day IS issues jointly as groups, demonstrates how the informal groups evolve, store and share key organisational knowledge which is not formally captured or written anywhere else. How these informal mechanisms manage tacit knowledge should be investigated further to utilise them in organisational context more efficiently.

The research extended the Heeks (2017); Heeks (2006) ITPOSMO concept by adding emergence as another dimension to the design-reality gap concept. This was based on the research's assumptions related to the level of complexity in NHS organisations. However, industrial organisations need to be analysed further, especially in manufacturing sector organisations as those are less complex structured and human – IS interactions are not as complex as in the NHS. In such conditions, how does the behaviour of IDAP process and informally driven knowledge management and design-reality gap should be analysed further?

The research identified the use of 'super users', their role in IS implementation, and their ability to provide feedback and suggestions for continuous development of the IS. This is a 'deferred solution' in response to the changes happening in the NHS organisational reality. Similarly, users could bring their experiences and tacit knowledge to the IS design stage. But could this be achieved? Perhaps how this could be achieved need further investigations. One way suggested was using hybrid users who are experts in clinical systems and giving them the opportunity to learn IS designing skills and let them be part of the processes. Another way a new generation of IS designing methodology which allows the users to build their

own IS, just like building a LEGO[7] toy or more recently prop up self-designing website market like WIX[8].

7.8 Summary

This chapter outlined this thesis's empirical and theoretical contributions to understand how IS system implementations can be improved by including informal groups behaviour as a CAS in the planned implementation. In particular, how this study has managed to answer the research questions posed within Chapter 3 by validating the IDAP process and each proposition that is built upon.

The IDAP framework, in practice, enables designers to re-think their design strategies and methodologies. It highlights the fact that standard bottom-up designing methodologies and implementation processes should enable local behaviour patterns during the IS design and implementation. So, the implementation would be less intrusive to the organisational reality. Practitioners should go beyond not just capturing mechanical human–computer interactions that lead to 'form designing' as a data input method but to capture and reflect upon implicit, tacit and local collective actions and behaviours. This will bring down the separation wall between the IS designers and the users. This can be achieved by allowing users to actively be part of the designing team and let the design and implementation be flexible and configurable enough to suit organisational complexities and dynamics. Then the local users will not be just users, but also active IS designers and

[7] Lego A/S is a Danish toy production company based in Billund, Denmark. It manufactures Lego-brand toys, consisting mostly of interlocking plastic bricks. The Lego Group has also built several amusement parks around the world, each known as Legoland, and operates numerous retail stores. Wikipedia, 2022

8 Wix.com Ltd is an Israeli software company publicly listed in the US that provides cloud-based web development services. It allows users to create HTML5 websites and mobile sites through the use of online drag and drop tools. Source: Wikipedia,2022

configuration experts. This makes the IS designing a thorough, interactive, conscious and locally born process rather than implementing something foreign and disrupting contextual equilibrium at a given time.

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APPENDIX- I Reflections of Participants' Characters

Participants in Luton PCT

Practice Manager 1: A middle-aged South Asian Practice Manager in Town centre. On one side of the room, there were piles of patient notes. Was computer literate.

Their character based on their own words: "This is our family practice."

Practice Manager 2: Middle-aged White British Practice manager. Spoke very straightforwardly and considered his/her practice as one of the elite GP practices. Was not a partner in the practice but had worked there for more than 20 years. Developed policy documents for the Practice and shared them with others through practice managers' meetings. Was moderately computer literate. Practice was in a suburban area.

Their character based on their own words: "We need more funding."

Practice Manager 3: A GP in one of the practices in the town centre. Worked as the Practice Manager and was nearing retirement age, over 65 years old. Often took a leadership role in local health events and closely worked with the PCT.

Their character based on their own words: "I would join the military."

Practice Manager 4: A GP in a practice away from the town centre. Did not have a dedicated room for the practice manager and promoted hot-desking within the practice. Promoted fewer formal meetings and modern office settings and facilities. Developed policies and processes for the practice and was a Practice Partner. Was a middle-aged White British. Was computer literate.

Their character based on their own words: "No formal meetings here."

Practice Manager 5: Worked in a practice near the town centre and had immigrated to the UK from India. Worked as a single practicing GP and was soft-spoken. Treated everyone with a smile and dressed nicely and formally. Always offered a cup of tea and some cookies. Not adequately computer literate.

Their character based on their own words: "Yes, I want more support."

Practice Manager 6: Of Asian descent, worked late into the night. Was around early 40s. Had been a receptionist before and was promoted to a practice manager's role. Lived locally to the area and worked late. Held the key to the practice and opened and closed the practice. Used to make and drink tea often and worked in an old and dusty room because of old patient notes stored there. Was not computer literate.

Their character based on their own words: "Yes, it is difficult, but we improve."

Practice Manager 7: Practice located in a rural area. Was known as a straight-talking person. Organized and showed practice care pathways based on process flow charts. Had close connections with nearby Asian practice managers. Highly computer literate.

Their character based on their own words: "Commissioners are making preposterous demands."

Practice Manager 8: Was a middle-aged White British practice manager. Had been a close confidante of the sole GP. Had been respected by everyone as a knowledgeable person and had been kind of a lone wolf character. Had hardly attended the Practice Managers' meetings. Searched for the latest NHS policies and understood alone. Had been respected by others as a very knowledgeable practice

manager but hadn't taken any chair post at the practice managers' meetings. Highly computer literate.

Their character based on their own words: "We know what we are doing."

Practice Manager 9: An Asian Practice Manager. South Asian background and had a master's degree in business administration. Developed policies and did all the documentation work. Highly computer literate.

Their character based on their own words: "I am helping [cannot be disclosed]."

Participant in Central and Northwest London NHS Trust

Activity Coordinator: She joined the organization four years ago and was of Asian descent with mixed ethnicity. She was in her late thirties and dressed casually. She drove to work, not every day, but only on the days she worked in the hospital. She worked three days a week and worked in a different organization within the Borough on other days.

Their character is based on their own words: "Everything is good."

Care Coordinator: A Black African gentleman. He always carried a pen in the front shirt pocket and had untidy shoes. He carried a set of paper files, documents, and notes. He was responsible for visiting and looking after patients in the community 24 hours a day, 7 days a week, with short notice. He often came to the hospital to update patient records and report on patient progress. He had worked as a care coordinator for 24 years.

Their character based on their own words: "We are not water meter readers; we can't carry a mobile IS device."

Care Coordinator and Caseload Manager: He joined the NHS in 1990 and had worked in the community to ensure patients took necessary medication and found placements for patients within the community. An ethnically Caribbean Indian, he had additionally helped the Rehab manager. He attended daily handover meetings, was anti-computer, said he liked paper records, dressed very casually, and loved discussing his Caribbean heritage.

Their character is based on their own words: "We look after each other."

Centre Manager: He managed nine care coordinators, social workers, and CPNs (Community Psychiatric Nurses). He managed patients with Complex MH needs and was responsible for managing the team, currently supervising staff, and monitoring their work. He was ethnically Caribbean Indian, dressed very smartly, and was a pleasant and friendly character. Everyone considered him the man who could solve problems.

Their character based on their own words: "We are a team."

Rehab Nurse: A White British gentleman in his 50s who had previously worked in Social care in the borough council. He had joined the NHS in 1995 and dressed ordinarily. His main responsibility had been to help patients get back to the community and achieve their highest potential, providing support within the rehab unit.

Their character based on their own words: "It is hard work."

Inpatient Administrator: She discharged patients from Jade and then entered clinical records into the system. A White British woman near her retirement age, she had been very passionate about her work and had often brought lunch from home. She

talked about how good the services provided by the NHS were in the 1980s and 1990s and had been very nostalgic.

Their character is based on their own words: "We provided a better service years ago."

Inpatient HCA: An ethnically Black African gentleman worked as a support worker. He maintained good relationships with senior staff, supported patient assessments, ensured patients took medication, observed patients' behaviour, and encouraged them for recovery. He was a very soft-spoken and helpful individual. He listened to the senior managers and the doctors attentively and wore a shirtsleeve shirt. He was seen talking to patients and giving medication to patients in the mental health inpatient ward.

Their character is based on their own words: "I like everything I do."

Inpatient HCA: A white British gentleman in his mid-30s, a part-time psychology student. He was involved in organizing and coordinating activities about the patients and liaising with other departments, e.g., prescribing and placements. He spoke to duty doctors to prioritize workload, and his main responsibility had been as a liaison and coordinating officer. He did slightly more administration work than the work related to care.

Their character is based on their own words: "I do my part."

APPENDIX- III R&D Approval

Central and North West London NHS
NHS Foundation Trust

London West Mental Health R&D Consortium
R&D Office, Trust Headquarters
St Bernard's Wing
Uxbridge Road
Middlesex, UB1 3EU

Tel: 020 8354 8738
Fax: 020 8354 8733
Email: rd.office@wlmht.nhs.uk

8 May 2012

Mr Amila Wilegoda-Wickramage
Luton NHS
Nightingale House
94 Inkerman Street
LU1 1JD

Dear Mr Wilegoda-Wickramage

Re: Informal groups and information system implementation in the NHS
LREC Ref:
R&D Reference Number: WILAC1101

I am pleased to confirm that the above study has now received a full R&D approval, and you may continue your research in **Central and North West London NHS Foundation Trust**. May I take this opportunity to remind you that during the course of your research you will be expected to ensure the following:

- **Patient contact:** only trained or supervised researchers who hold the appropriate Trust/NHS contract (honorary or full) with each Trust are allowed contact with that Trust's patients. If any researcher on the study does not hold a contract please contact the R&D office as soon as possible.
- **Informed consent:** original signed consent forms must be kept on file. A copy of the consent form must also be placed in the patient's notes. Research projects are subject to random audit by a member of the R&D office who will ask to see all original signed consent forms.
- **Data protection:** measures must be taken to ensure that patient data is kept confidential in accordance with the Data Protection Act 1998.
- **Health and safety:** all local health & safety regulations where the research is being conducted must be adhered to.
- **Adverse events:** adverse events or suspected misconduct should be reported to the R&D office and the Ethics Committee.
- **Project update:** you will be sent a project update form at regular intervals. Please complete the form and return it to the R&D office.
- **Publications:** it is essential that you inform the R&D office about any publications which result from your research.
- **Ethics:** R&D approval is based on the conditions set out in the favourable opinion letter from the Ethics Committee. If during the lifetime of your research project, you wish to make a revision or amendment to your original submission, please contact both the Ethics Committee and R&D Office as soon as possible.
- Please ensure that all members of the research team are aware of their responsibilities as researchers.

We would like to wish you every success with your project.

APPENDIX- IV University Ethics Approval

Manchester Metropolitan
University

M E M O R A N D U M

FACULTY ACADEMIC ETHICS COMMITTEE

Faculty of Health,
Psychology & Social Care

Brooks Building
Birley Fields Campus
53 Bonsall Street
Manchester
M15 6GX

+44 (0)161 247 2569

HPSCresearchdegrees@mmu.ac.uk

To: Amila Wickramage

From: Prof Carol Haigh

Date: 05/05/2017

Subject: Ethics Application 1479

Title: Informal groups and information system implementation in the NHS

This is to confirm that we have received notification of ethical approval for the above application, as granted by Central and North West London NHS Foundation Trust on 8 May 2012.

For part-time students, we give ethical approval for 6 years. Therefore, please be aware that your ethical approval will need to be reviewed in 2018.

We wish you every success with your project.

Prof Carol Haigh
Chair
Faculty Academic Ethics Committee

APPENDIX-V Participant Information Sheet

Central and North West London NHS
NHS Foundation Trust

London West

Mental Health R&D Consortium
R&D Office, Trust Headquarters
St Bernard's Wing
Uxbridge Road

Middlesex, UB1 3EU

Tel: 020 8354 8738

Fax: 020 8354 8733

Email: rd.office@wlmht.nhs.uk

PARTICIPANT INFORMATION SHEET

1. Invitation

'You are being invited to take part in a research project. Before you decide, it is important for you to understand why the research is carried out done and what it will involve. Please take time to read the following information carefully and discuss it with others if you wish. Ask us if there is anything that is not clear or if you would like more information. Please take time to decide whether or not you wish to take part. Thank you for reading this.'

Title of Research

UK National Health Service Information Systems Implementation: Emergence of and in Informal Group

2. Researcher

Student Amila Wilegoda-Wickramage on PhD (Part Time), Brunel Business School, Brunel University

3. Contact Email: cbpgasw@brunel.ac.uk

4 . Purpose of the research

Information System (IS) failure is costly, complex and multi-dimensional phenomenon. Many researchers tried to understand IS failure based on different perspectives i.e. Design-reality gap, Project perspective. We argue that, IS fails due to the emergence of and in informal groups in organisations. This research has been conducted to understand, how informal behaviour affects IS implementation in the NHS, and how can IS implementation be improved by understanding emergent informal relationships.

5. What is involved

It is expected you to share true and honest experiences and information about the Information System implementation in your department. Particularly, your response and behaviour to the Information system implementation as an individual and collectively with other staff members.

6. Voluntary nature of participation and confidentiality

Participation is completely voluntary; you may stop and leave at any time.

Information and the data gathered during the interview/ participant observation will be transferred to a NHS accredited secure laptop, to prevent any unauthorized access and maintain confidentiality. Data collected will be kept securely and only accessible to the researcher. The data will be used in aggregated form in the project report with no reference to you as an individual.

If you have any query or complaint, Please do not hesitate to contact Dr. Nandish Patel, Brunel University, Tel: ***01895 265295, Fax: 01895 203141, Email: nandish.patel@brunel.ac.uk***

APPENDIX-VI NHS Performa Confirmation

NHS to NHS letter of access: proforma confirmation of pre-engagement checks
Version 1

For NHS researchers who have a substantive NHS contract of employment or clinical academics with an honorary clinical contract with an NHS organisation, and who need an NHS to NHS letter of access from an NHS organisation hosting their research

CONFIRMATION OF PRE-ENGAGEMENT CHECKS

To: R&D Office

Address of NHS site hosting the research

Re: **Researcher's name: Amila Wilegoda-Wickramage**

Job title: **Performance and Improvement Manager (GP)**

Contract end-date: **Open-ended**

Workplace and postal address: **NHS Luton & Bedfordshire Cluster, Nightingale House, 94 Inkerman Street, LUTON LU1 1JD**

Electronic Staff Record number: **21402847**

As the representative of the NHS employer[1] of the above-named person, I can confirm that s/he is employed by this organisation. I understand that the responsibility for ensuring that the appropriate pre-engagement checks have been undertaken rests with us as the individual's substantive employer. I can confirm that the appropriate pre-engagement checks have been completed, commensurate with her/his job description and proposed research role in your NHS organisation, and in line with NHS employment checks standards

Name of employer's representative: **Janet Hargreaves**

APPENDIX-VII IRAS Application

[NOTE: This is not a direct export form NHS IIRAS Version 3.4. Therefore, may include some inconsistencies and data loss.]

Welcome to the Integrated Research Application System

IRAS Project Filter

The integrated dataset required for your project will be created from the answers you give to the following questions. The system will generate only those questions and sections which (a) apply to your study type and (b) are required by the bodies reviewing your study. Please ensure you answer all the questions before proceeding with your applications.

Please enter a short title for this project (maximum 70 characters)

Informal Groups and Information System implementation in the NHS

1. Is your project research?

(●) Yes ( ) No

2. Select one category from the list below:

( ) Clinical trial of an investigational medicinal product

( ) Clinical investigation or other study of a medical device

( ) Combined trial of an investigational medicinal product and an investigational medical device

( ) Other clinical trial to study a novel intervention or randomised clinical trial to compare interventions in clinical practice

( ) Basic science study involving procedures with human participants

(●) Study administering questionnaires/interviews for quantitative analysis, or using mixed quantitative/qualitative methodology

( ) Study involving qualitative methods only

( ) Study limited to working with human tissue samples (or other human biological samples) and data (specific project only)

( ) Study limited to working with data (specific project only)

( ) Research tissue bank

( ) Research database

If your work does not fit any of these categories, select the option below:

( ) Other study

2a. Please answer the following question(s):

a) Does the study involve the use of any ionising radiation?	Yes	No
b) Will you be taking new human tissue samples (or other human biological samples)?	Yes	No

c) Will you be using existing human tissue samples (or other human biological samples)? Yes No

3. In which countries of the UK will the research sites be located? *(Tick all that apply)*

◉ England

Scotland

Wales

Northern Ireland

3a. In which country of the UK will the lead NHS R&D office be located:

◉ England

Scotland

Wales

Northern Ireland

This study does not involve the NHS

4. Which review bodies are you applying to?

NHS/HSC Research and Development offices

Social Care Research Ethics Committee

◉ Research Ethics Committee

National Information Governance Board for Health and Social Care (NIGB)

Ministry of Justice (MoJ)

National Offender Management Service (NOMS) (Prisons & Probation)

For NHS/HSC R&D offices, the CI must create Site-Specific Information Forms for each site, in addition to the study-wide forms, and transfer them to the PIs or local collaborators.

It looks like your project is research requiring NHS R&D approval but does not require review by a REC within the UK Health Departments Research Ethics Service – is that right?

Yes ~~No~~

4b. Please confirm the reason(s) why the project does not require review by a REC within the UK Health Departments Research Ethics Service:

☐ Projects limited to the use of samples/data samples provided by a Research Tissue Bank (RTB) with generic ethical

☐ approval from a REC, in accordance with the conditions of approval.

☐ Projects limited to the use of data provided by a Research Database with generic ethical approval from a REC, in

☐ accordance with the conditions of approval.

Research limited to use of previously collected, non-identifiable information

Research limited to use of previously collected, non-identifiable tissue samples within terms of donor consent

Research limited to use of acellular material

☐ Research limited to use of the premises or facilities of care organisations (no involvement of patients/service users as participants)

◉ Research limited to involvement of staff as participants (no involvement of patients/service users as participants)

5. Will any research sites in this study be NHS organisations?

Yes ~~No~~

5a. Are all the research costs and infrastructure costs for this study provided by an NIHR Biomedical Research Centre, NIHR Biomedical Research Unit, NIHR Collaboration for Leadership in Health Research and Care (CLAHRC) or NIHR Research Centre for Patient Safety & Service Quality in all study sites?

Yes No

If yes, NHS permission for your study will be processed through the NIHR Coordinated System for gaining NHS Permission (NIHR CSP).

5b. Do you wish to make an application for the study to be considered for NIHR Clinical Research Network (CRN) support and inclusion in the NIHR Clinical Research Network (CRN) Portfolio? Please see information button for further details.

Yes No

If yes, NHS permission for your study will be processed through the NIHR Coordinated System for gaining NHS Permission (NIHR CSP) and you must complete a NIHR Clinical Research Network (CRN) Portfolio Application Form immediately after completing this project filter and before completing and submitting other applications.

6. Do you plan to include any participants who are children?

~~Yes~~ No

7. Do you plan at any stage of the project to undertake intrusive research involving adults lacking capacity to consent for themselves?

~~Yes~~ No

Answer Yes if you plan to recruit living participants aged 16 or over who lack capacity, or to retain them in the study following loss of capacity. Intrusive research means any research with the living requiring consent in law. This includes use of identifiable tissue samples or personal information, except where application is being made to the NIGB Ethics and Confidentiality Committee to set aside the common law duty of confidentiality in England and Wales. Please consult the guidance notes for further information on the legal frameworks for research involving adults lacking capacity in the UK.

8. Do you plan to include any participants who are prisoners or young offenders in the custody of HM Prison Service or who are offenders supervised by the probation service in England or Wales?

Yes No

9. Is the study or any part of it being undertaken as an educational project?

Yes No

Please describe briefly the involvement of the student(s):
This research has been conducted in part fulfilment of PhD study

9a. Is the project being undertaken in part fulfilment of a PhD or other doctorate?

Yes No

10. Will this research be financially supported by the United States Department of Health and Human Services or any of its divisions, agencies or programs?

Yes No

11. Will identifiable patient data be accessed outside the care team without prior consent at any stage of the project
(including identification of potential participants)?

Yes No

Site-Specific Information Form (NHS sites)

Is the site hosting this research a NHS site or a non-NHS site? *NHS sites include Health and Social Care organisations*
in Northern Ireland. The sites hosting the research are the sites in which or through which research procedures are conducted
. For NHS sites, this includes sites where NHS staff are participants.

NHS site

Non-NHS site

This question must be completed before proceeding. The filter will customise the form, disabling questions which are not
relevant to this application.

One Site-Specific Information Form should be completed for each research site and submitted to the relevant R&D office
with the documents in the checklist. See guidance notes.

The data in this box is populated from Part A:

Title of research:
UK National Health Service Information Systems Implementation: Emergence of and in Informal Groups

Short title: Informal Groups and Information System implementation in the NHS

Chief Investigator:	Title	Forename/Initials	Surname
	Mr	Amila	Wilegoda-Wickramage

Name of NHS Research Ethics Committee to which application for ethical review is being made:

Project reference number from above REC:

1-1. Give the name of the NHS organisation responsible for this research site
Central and NorthWest London Mental Health Trust

1-2. In which country is the research site located?

England

Wales

Scotland

Northern Ireland

1-3. Is the research site a GP practice or other Primary Care Organisation?

Yes ◉ No

2. Who is the Principal Investigator or Local Collaborator for this research at this site?NHS SSI

Select the appropriate title:

Principal Investigator

Local Collaborator

	Title	Forename/Initials	Surname
	Mr	Amila	Wilegoda-Wickramage
Post	Performance and Improvement Manager /PhD Student		
Qualifications	BSc (Sp),Reading for PhD		
Organisation	Luton NHS		
Work Address	94, Nightingale House		

	Inkerman Street
	Luton
PostCode	LU1 1JD
Work E-mail	amila.wilegoda-wickramage@nhs.net
Work Telephone	01582532005
Mobile	
Fax	01582521036

a) Approximately how much time will this person allocate to conducting this research? *Please provide your response*

b) *in terms of Whole Time Equivalents (WTE).*

1 WTE

b) Does this person hold a current substantive employment contract, Honorary Clinical Contract or Honorary Research Contract with the NHS organisation or accepted by the NHS organisation? Yes No

A copy of a current CV for the Principal Investigator (maximum 2 pages of A4) must be submitted with this form.

3. Please give details of all locations, departments, groups or units at which or through which research procedures

will be conducted at this site and describe the activity that will take place.

Please list all locations/departments etc where research procedures will be conducted within the NHS organisation,

describing the involvement in a few words. Where access to specific facilities will be required these should also be listed

for each location.

Name the main location/department first. Give details of any research procedures to be carried out off site, for example

in participants' homes.

	Location	Activity/facilities
1	Central and North Weat London Mental health Trust- Inpatient ward	Conduct In depth interview and participant observation
2	Central and North Weat London Mental health Trust- 3 Community Mental Health Team -Mill House, Mead House and Pembroke Centre	Conduct detailed interviews and participant observation
3	Central and North Weat London Mental health Trust- Collhamgreen Rehabilitation ward	Conduct detailed interviews and participant observation

5. Please give details of all other members of the research team at this site.

1

Title Forename/Initials Surname

	Mr Amila Wilegoda-Wickramage
Work E-mail	amila.wilegoda-wickramage@nhs.net

Employing organisation	NHS Luton
Post	Performance and Improvement Manager
Qualifications	BSC (sp), reading for PhD
Role in research team:	researcher

a) Approximately how much time (approximately) will this person allocate to conducting this research? *Please provide*

b) *your response in terms of Whole Time Equivalents (WTE).*

1 WTE

b) Does this person hold a current substantive employment contract, Honorary Clinical Contract or Honorary Research Contract with the NHS organisation or accepted by the NHS organisation? Yes No

A copy of a current CV for the research team member (maximum 2 pages of A4) must be submitted to the R&D office.

6. Does the Principal Investigator or any other member of the site research team have any direct personal involvement

(e.g. financial, share-holding, personal relationship etc) in the organisation sponsoring or funding the research that

may give rise to a possible conflict of interest?

Yes No

7. What is the proposed local start and end date for the research at this site?

Start date:	01/04/2012
End date:	15/04/2012
Duration (Months):	1

8-1. Give details of all non-clinical intervention(s) or procedure(s) that will be received by participants as part of the

research protocol. *(These include seeking consent, interviews, non-clinical observations and use of questionnaires.)*

Columns 1-4 have been completed with information from A18 as below:

1. *Total number of interventions/procedures to be received by each participant as part of the research protocol.*
2. *If this intervention would have been routinely given to participants as part of their care, how many of the total*
3. *would have been routine?*

4. Average time taken per intervention (minutes, hours or days)

5. Details of who will conduct the procedure, and where it will take place

Please complete Column 5 with details of the names of individuals or names of staff groups who will conduct the
procedure at this site.

Intervention or procedure	1	2	3	4	5
In-depth Interviews	1	1	1 hour	Principal investigator will interview the respondents and interviews will be conducted at the site or at a convenient place	Amila Wilegoda-Wickramage
Participant Observations	1	1	3 hour	Conducted by Pricipal investigator at the site	Amila Wilegoda-Wickramage

8-2. Will any aspects of the research at this site be conducted in a different way to that described in Part A or the protocol?

Yes NoNHS SSI IRAS Version 3.4

If Yes, please note any relevant changes to the information in the above table.

Are there any changes other than those noted in the table?

10. How many research participants/samples is it expected will be recruited/obtained from this site?

25 individual staff members

11. Give details of how potential participants will be identified locally and who will be making the first approach
to them to take part in the study.

Sample will be randomply selected based on the individual staff members use of IS in day to day operations.

Chief investigator will speak individually or during a team meeting (with the approval from the Manager)

12. Who will be responsible for obtaining informed consent at this site? What expertise and training do these
persons have in obtaining consent for research purposes?

Name	Expertise/training
Amila Wilegoda-Wickramage	Principal Investigator/PhD Student

15-1. Is there an independent contact point where potential participants can seek general advice about taking part
in research?

No

15-2. Is there a contact point where potential participants can seek further details about this specific research project?

Yes, Dr. Nadish V. Patel, PhD Research Supervisor. Contact information will be included in the leaflet which will be given

to every respondent.

16. Are there any changes that should be made to the generic content of the information sheet to reflect site-specific

issues in the conduct of the study? *A substantial amendment may need to be discussed with the Chief Investigator and*

submitted to the main REC.

N/A

Please provide a copy on headed paper of the participant information sheet and consent form that will be used locally.

Unless indicated above, this must be the same generic version submitted to/approved by the main REC for the study while

including relevant local information about the site, investigator and contact points for participants (see guidance notes).

17. What local arrangements have been made for participants who might not adequately understand verbal

explanations or written information given in English, or who have special communication needs? *(e.g. translation,*

use of interpreters etc.)

N/A

18. What local arrangements will be made to inform the GP or other health care professionals responsible for the care

of the participants?

N/A

19. What arrangements (e.g. facilities, staffing, psychosocial support, emergency procedures) will be in place at the site,

where appropriate, to minimise the risks to participants and staff and deal with the consequences of any harm?

N/A

20. What are the arrangements for the supervision of the conduct of the research at this site? *Please give the name*

and contact details of any supervisor not already listed in the application.

Research will be supervised according to the Brunel University Research standards

21. What external funding will be provided for the research at this site?

Funded by commercial sponsor

Other funding

◉ No external funding

How will the costs of the research be covered?

This research has been undertaken as a part fulfilment of PhD

23. Authorisations required prior to R&D approval

This section deals with authorisations by managers within the NHS organisation. It should be signed in accordance with the guidance provided by the NHS organisation. This may include authorisation by clinical supervisors, line managers, service managers, support department managers, pharmacy, data protection officers or finance managers, depending on the nature of the research. Managers completing this section should confirm in the text what the authorisation means, in accordance with the guidance provided by the NHS organisation.

This section may also be used by university employers or research support staff to provide authorisation to NHS organisations,

in accordance with guidance from the university.

1. Type of authorisation: CNWL NHS Foundation Trust

	Title	Forename/Initials	Surname
	Dr	Alex	Lewis
Post	Medical Director		
Qualifications			
Organisation	CNWL NHS Foundation trust		
Work Address	Trust HQ		
	Greater London house		
	London		
PostCode	NW1 7QY		
Work E-mail	alex.lewis@nhs.net		
Work Telephone	02032145700		
Mobile			
Fax			

Signature: .....

.....

Date:

.....

.....

2. Type of authorisation:
020 7612 1632

	Title	Forename/Initials	Surname
	Ms	Sandra	Brooks
Post	Director		
Qualifications			
Organisation	CNWL NHS Foundation Trust		
Work Address	Riverside Centre, Hillingdon Hospital site		
	Pieldheath Road		
	Hillingdon		
PostCode	UB8 3NN		
Work E-mail	sandra.brookes@nhs.net		
Work Telephone	020 7612 1632		
Mobile			
Fax			

Signature: .....

Date: .....

Declaration by Principal Investigator or Local Collaborator

1. The information in this form is accurate to the best of my knowledge and I take full responsibility for it.

2. I undertake to abide by the ethical principles underpinning the World Medical Association's Declaration of Helsinki and

   relevant good practice guidelines in the conduct of research.

3. If the research is approved by the main REC and NHS organisation, I undertake to adhere to the study protocol,

   the terms of the application of which the main REC has given a favourable opinion and the conditions requested by

   the NHS organisation, and to inform the NHS organisation within local timelines of any subsequent amendments to

   the protocol.

4. If the research is approved, I undertake to abide by the principles of the Research Governance Framework for Health

and Social Care.

5. I am aware of my responsibility to be up to date and comply with the requirements of the law and relevant guidelines
relating to the conduct of research.

6. I undertake to disclose any conflicts of interest that may arise during the course of this research, and take responsibility
for ensuring that all staff involved in the research are aware of their responsibilities to disclose conflicts of interest.

7. I understand and agree that study files, documents, research records and data may be subject to inspection by the
NHS organisation, the sponsor or an independent body for monitoring, audit and inspection purposes.

8. I take responsibility for ensuring that staff involved in the research at this site hold appropriate contracts for the duration
of the research, are familiar with the Research Governance Framework, the NHS organisation's Data Protection
Policy and all other relevant policies and guidelines, and are appropriately trained and experienced.

9. I undertake to complete any progress and/or final reports as requested by the NHS organisation and understand that
continuation of permission to conduct research within the NHS organisation is dependent on satisfactory completion
of such reports.

10. I undertake to maintain a project file for this research in accordance with the NHS organisation's policy.

11. I take responsibility for ensuring that all serious adverse events are handled within the NHS organisation's policy for
reporting and handling of adverse events.

12. I understand that information relating to this research, including the contact details on this application, will be held by
the R&D office and may be held on national research information systems, and that this will be managed according to
the principles established in the Data Protection Act 1998.

13. I understand that the information contained in this application, any supporting documentation and all correspondence
with the R&D office and/or the REC system relating to the application will be subject to the provisions of the Freedom
of Information Acts and may be disclosed in response to requests made under the Acts except where statutory
exemptions apply.

This section was signed electronically by Mr Amila Wilegoda-Wickramage on 28/02/2012 11:43.

Job Title/Post:	Performance and Improvement Manager
Organisation:	NHS Luton
Email:	amila.wilegoda-wickramage@nhs.net

Appendix VII – IRAS R&D Form

[NOTE: This is not a direct export form NHS IIRAS Version 3.4. Therefore, may include some inconsistencies and data loss.]

Welcome to the Integrated Research Application System

IRAS Project Filter

The integrated dataset required for your project will be created from the answers you give to the following questions. The system will generate only those questions and sections which (a) apply to your study type and (b) are required by the bodies reviewing your study. Please ensure you answer all the questions before proceeding with your applications.

Please enter a short title for this project (maximum 70 characters)
Informal Groups and Information System implementation in the NHS

1. Is your project research?

● Yes ○ No

2. Select one category from the list below:

○ Clinical trial of an investigational medicinal product

○ Clinical investigation or other study of a medical device

○ Combined trial of an investigational medicinal product and an investigational medical device

○ Other clinical trial to study a novel intervention or randomised clinical trial to compare interventions in clinical practice

○ Basic science study involving procedures with human participants

● Study administering questionnaires/interviews for quantitative analysis, or using mixed

quantitative/qualitative methodology

- ○ Study involving qualitative methods only
- ○ Study limited to working with human tissue samples (or other human biological samples) and data (specific project only)
- ○ Study limited to working with data (specific project only)
- ○ Research tissue bank
- ○ Research database

If your work does not fit any of these categories, select the option below:

- ○ Other study

2a. Please answer the following question(s):

a) Does the study involve the use of any ionising radiation?	~~Yes~~	No
b) Will you be taking new human tissue samples (or other human biological samples)?	~~Yes~~	No
c) Will you be using existing human tissue samples (or other human biological samples)?	~~Yes~~	No

3. In which countries of the UK will the research sites be located? *(Tick all that apply)*

- ● England
- ○ Scotland
- ○ Wales
- Northern Ireland

3a. In which country of the UK will the lead NHS R&D office be located:

- ● England
- Scotland
- Wales
- Northern Ireland
- This study does not involve the NHS

4. Which review bodies are you applying to?

- ● NHS/HSC Research and Development offices
- ○ Social Care Research Ethics Committee
- ○ Research Ethics Committee
- ○ National Information Governance Board for Health and Social Care (NIGB)
- ○ Ministry of Justice (MoJ)
- ○ National Offender Management Service (NOMS) (Prisons & Probation)

For NHS/HSC R&D offices, the CI must create Site-Specific Information Forms for each site, in addition to the study-wide forms, and transfer them to the PIs or local collaborators.

It looks like your project is research requiring NHS R&D approval but does not require review by a REC within the UK Health Departments Research Ethics Service – is that right?

Yes ~~No~~

4b. Please confirm the reason(s) why the project does not require review by a REC within the UK Health Departments Research Ethics Service:

- ○ Projects limited to the use of samples/data samples provided by a Research Tissue Bank (RTB) with generic ethical approval from a REC, in accordance with the conditions of approval.
- ○ Projects limited to the use of data provided by a Research Database with generic ethical approval from a REC,in accordance with the conditions of approval.
- ○ Research limited to use of previously collected, non-identifiable information
- ○ Research limited to use of previously collected, non-identifiable tissue samples within terms of donor consent
- ○ Research limited to use of acellular material
- ○ Research limited to use of the premises or facilities of care organisations (no involvement of patients/service users as participants)
- ● Research limited to involvement of staff as participants (no involvement of patients/service users as participants)

5. Will any research sites in this study be NHS organisations?

Yes ~~No~~

5a. Are all the research costs and infrastructure costs for this study provided by an NIHR Biomedical Research Centre, NIHR Biomedical Research Unit, NIHR Collaboration for Leadership in Health Research and Care (CLAHRC) or NIHR Research Centre for Patient Safety & Service Quality in all study sites?

~~Yes~~ No

If yes, NHS permission for your study will be processed through the NIHR Coordinated System for gaining NHS Permission (NIHR CSP).

5b. Do you wish to make an application for the study to be considered for NIHR Clinical Research Network (CRN) support and inclusion in the NIHR Clinical Research Network (CRN) Portfolio? Please see information button for further details.

~~Yes~~ No

If yes, NHS permission for your study will be processed through the NIHR Coordinated System for gaining NHS Permission (NIHR CSP) and you must complete a NIHR Clinical Research Network (CRN) Portfolio Application Form immediately after completing this project filter and before completing and submitting other applications.

6. Do you plan to include any participants who are children?

~~Yes~~ No

7. Do you plan at any stage of the project to undertake intrusive research involving adults lacking capacity to consent for themselves?

~~Yes~~ No

Answer Yes if you plan to recruit living participants aged 16 or over who lack capacity, or to retain them in the study following loss of capacity. Intrusive research means any research with the living requiring

consent in law.
This includes use of identifiable tissue samples or personal information, except where application is being made to the NIGB
Ethics and Confidentiality Committee to set aside the common law duty of confidentiality in England and Wales. Please
consult the guidance notes for further information on the legal frameworks for research involving adults lacking capacity in the UK.

8. **Do you plan to include any participants who are prisoners or young offenders in the custody of HM Prison Service or who are offenders supervised by the probation service in England or Wales?**

~~Yes~~ No

9. Is the study or any part of it being undertaken as an educational project?

Yes ~~No~~

Please describe briefly the involvement of the student(s):
This research has been conducted in part fulfilment of PhD study

9a. Is the project being undertaken in part fulfilment of a PhD or other doctorate?

Yes No

6. **Will this research be financially supported by the United States Department of Health and Human Services or any of its divisions, agencies or programs?**

~~Yes~~ No

7. **Will identifiable patient data be accessed outside the care team without prior consent at any stage of the project (including identification of potential participants)?**

~~Yes~~ No

Integrated Research Application System
Application Form for Research involving qualitative methods only

NHS/HSC R&D Form (project information)

Please refer to the Submission and Checklist tabs for instructions on submitting R&D applications.

The student should complete this form on behalf of the Chief Investigator. Guidance on the questions is available wherever you see this symbol displayed. We recommend reading the guidance first. The complete guidance and a glossary are available by selecting Help.

Please define any terms or acronyms that might not be familar to lay reviewers of the application.

Short title and version number: (maximum 70 characters - this will be inserted as header on all forms) Informal Groups and Information System implementation in the NHS

PART A: Core study information

1. ADMINISTRATIVE DETAILS

A1. Full title of the research:

UK National Health Service Information Systems Implementation: Emergence of and in Informal Groups

A2-1. Educational projects

Name and contact details of student(s):

Student 1

	Title	Forename/Initials	Surname
	Mr	Amila	Wilegoda-Wickramage
Address	Luton PCt		
	94 Nightingale House		
	Luton		
Post Code	LU1 1JD		
E-mail	amila.wilegoda-wickramage@nhs.net		
Telephone	01582532005		
Fax	01582521036		

Give details of the educational course or degree for which this research is being undertaken:

Name and level of course/ degree:
PhD

Name of educational establishment:
Brunel University, London

Name and contact details of academic supervisor(s):

Academic supervisor 1

	Title	Forename/Initials	Surname
	Dr.	Nandish	Patel
Address	Brunel Business School		
	Brunel University Kingston lane, Uxbridge		
Post Code	UB8 3PH		
E-mail	Nandish.Patel@brunel.ac.uk		
	01895 265295		
Fax	07990 082 822		

Please state which academic supervisor(s) has responsibility for which student(s):
Please click "Save now" before completing this table. This will ensure that all of the student and

academic supervisor details are shown correctly.

Student(s)	Academic supervisor(s)
Student 1 Mr Amila Wilegoda-Wickramage	Dr. Nandish Patel

A copy of a current CV for the student and the academic supervisor (maximum 2 pages of A4) must be submitted with the application.

A2-2. Who will act as Chief Investigator for this study?

- (●) Student
- ( ) Academic supervisor
- ( ) Other

A3-1. Chief Investigator:

	Title	Forename/Initials	Surname
	Mr	Amila	Wilegoda-Wickramage
Post	Performance and Improvement Manager		
Qualifications	BSc (sp), Reading for a PhD		
Employer	Luton NHS		
Work Address	Nightingale House 94, Inkerman Street Luton		
Post Code	LU1 1JD		
Work E-mail	amila.wilegoda-wickramage@nhs.net		
* Personal E-mail	biz_cecb@hotmail.com		
Work Telephone	01582532005		
* Personal Telephone/Mobile	07427526124		
Fax	01582521036		

** This information is optional. It will not be placed in the public domain or disclosed to any other third party without prior consent.*
A copy of a current CV (maximum 2 pages of A4) for the Chief Investigator must be submitted with the application.

A4. Who is the contact on behalf of the sponsor for all correspondence relating to applications for this project?
This contact will receive copies of all correspondence from REC and R&D reviewers that is sent to the CI.

	Title	Forename/Initials	Surname
	Mr	Amila	Wilegoda-Wickramage
Address	Primary Care Commissioning		

	Luton NHS
	94, Nightingale House, Luton
Post Code	LU1 1JD
E-mail	amila.wilegoda-wickramage@nhs.net
Telephone	01582532005
Fax	01582521036

A5-1. Research reference numbers. *Please give any relevant references for your study:*

Applicant's/organisation's own reference number, e.g. R & D (if available):	N/A
Sponsor's/protocol number:	N/A
Protocol Version:	1.1
Protocol Date:	27/02/2012
Funder's reference number:	N/A

Project website: N/A

Additional reference number(s):

Ref.Number Description	Reference Number
Re-cubmission	WILAC1101

Registration of research studies is encouraged wherever possible. You may be able to register your study through your
NHS organisation or a register run by a medical research charity, or publish your protocol through an open access publisher.
If you have registered your study please give details in the "Additional reference number(s)" section.

A5-2. Is this application linked to a previous study or another current application?

Yes No

Please give brief details and reference numbers.
This is re-submission in response to the response received on 12/01/2012. ref. WILAC1101

2. OVERVIEW OF THE RESEARCH

To provide all the information required by review bodies and research information systems, we ask a number of
specific questions. This section invites you to give an overview using language comprehensible to lay reviewers
and members of the public. Please read the guidance notes for advice on this section.

A6-1. Summary of the study. *Please provide a brief summary of the research (maximum 300 words) using language easily*
understood by lay reviewers and members of the public. Where the research is reviewed by a REC within the UK Health
Departments Research Ethics Service, this summary will be published on the website of the National Research Ethics Service
following the ethical review.

Information Systems (IS) that have been introduced into the United Kingdom National Health Service (NHS) are designed to operate in specified conditions than the actual conditions in NHS. This gap between the reality and designs have been conceptually demonstrated as Design-Reality gap, which

we argue as a structured interpretation of IS failure. It ignores emergence and adaptations, which are fundamental to IS success. Many researches have been conducted to understand IS failure; however, given less attention to investigate the emergence that occurs in and of informal groups and their effect on IS implementation. We propose to integrate emergence and adaptations by considering IS failure as a process failure and we demonstrate ISs failure as an 'emergence' between the IS, project

perceived objectives and its context. Therefore, this research argues that, IS implementation can be a success, if Informal Groups and their interaction can be characterised as a Complex Adaptive System (CAS) and IS designs could facilitate the emergence and adapt according to the behaviour of CASs. We argue that, in practice, that can be achieved through Theory of Deferred Action to enhance the IS implementation process.

A6-2. Summary of main issues. *Please summarise the main ethical, legal, or management issues arising from your study*
and say how you have addressed them.

Not all studies raise significant issues. Some studies may have straightforward ethical or other issues that can be identified and managed routinely. Others may present significant issues requiring further consideration by a REC, R&D office or other review body (as appropriate to the issue). Studies that present a minimal risk to participants may raise complex organisational or legal issues. You should try to consider all the types of issues that the different reviewers may need to consider.

Data Protection and Confidentiality:

Consideration would be given to protect the confidentiality, protection and security of the data. Therefore, conversations, discussions and notes will be saved into a NHS accredited secure laptop. Prior to the interview, respondents will be given an Information sheet, which details the title of the research, researcher's name and contact details, purpose of the research, confidentiality and objectives of this study. Also, PhD supervisor's contact number will be given, if anyone needs further information or to make a complaint. Patient identifiable or patient related information will not be collected during the interview under any circumstances. Researcher recognised the availability of confidential information around the research environment, hence expecting to sign up to the CNWL data protection and confidentiality policy.

During the transcription stage, respondents names and their references will be removed to keep the annonimity, and no person identifiable information will be published. It is expected to store dat for one year period in a NHS secure laptop and destroyed after that.

Note: For further information on ethics and data protection, please refer to the NHS information governance procedures and
research ethics.

3. PURPOSE AND DESIGN OF THE RESEARCH

A7. Select the appropriate methodology description for this research. *Please tick all that apply*:

- Case series/ case note review
- Case control
- Cohort observation
- Controlled trial without randomisation
- Cross-sectional study
- Database analysis
- Epidemiology
- Feasibility/ pilot study
- Laboratory study
- Metanalysis
- Qualitative research

Questionnaire, interview or observation study

Randomised controlled trial

Other (please specify)

A10. What is the principal research question/objective? *Please put this in language comprehensible to a lay person.*

How does informal group behaviour affect information system implementation in the NHS?

A11. What are the secondary research questions/objectives if applicable? *Please put this in language comprehensible to a lay person.*

How can information systems implementation be improved by understanding emergent informal group behaviour and
incorporating it into NHS IS design and implementation?

A12. What is the scientific justification for the research? *Please put this in language comprehensible to a lay person.*

Integration of Information Technology (IT) and Information Systems (IS) into the NHS has been witnessed since early 1960s; however, its contribution to daily operations were relatively limited until 1980s. The advancements in global ICT sector steadily diffused into NHS since late 80s, to increase efficiency, cost reduction, managing demand and improving patient safety (Anderson, Aydin 2005; Brenan, 2005).
The government's National Project for Information Technology (NPfIT) has been designed to integrate IT and IS into the NHS operations in anticipation of increasing efficiency and effectiveness, by enabling the clinicians to track case notes, order and view test results online and prescribe drugs. This has been intended to supply a foundation for faster, efficient, safer and cost effective patient care (NHS Executive, 1998; 1989; 1992; Greenhalgh T., Stramer K., and et al, 2008). Also, it digitizes the NHS by linking every service point in the NHS, i.e. GP surgeries, Hospitals and Primary Care Trusts cross the UK, to provide real time Electronic Health Records (EHR) (Lenz, R.; Kuhn, K.A., 2004) of patients, irrespective of when and where they are in the United Kingdom (NHS Executive, 1998). Number of clinical and supporting ISs have been introduced to realise the above. However, these ISs have been introduced assuming the staff members would and should accept new ISs (Wilegoda-Wickramage and Patel, 2010).

Manifestations of staff response to ISs are diverse. The literature supports that, IS implementation leads to unpredictable organizational behaviour (Lenz, R.; Kuhn, K.A., 2004; Berg M., Toussaint P., 2003); promotes anxiety and aggravation (Ludwick, John Doucette, 2009); increased dependence on computer systems (Physician Office System Program (2005 and 2006); erodes decision making capacity and disrupt the provider–patient relationship (Ash, Berg, and Coiera , 2004; Doebbeling, Chou, and Tierney , 2006).

Traditional ISs are designed by the 'reflective designers', professional IT specialists who are separated from the actual work of the NHS, and the they represent organisational, procedural knowledge in two known design dimensions space and structure, termed 'specified design' (Patel NV, 2006). Ontologically, specified design is built to operate rationally,
which differs to the reality in organisations. These are designed based on various assumptions, ignoring ubiquitous outcomes due to affiliated uncertainties or emergence.
The gap between the IS and the reality has been defined as 'design-reality gap' (Heeks, 2005) and catalyse IS failure. According to the literature, many researches have argued that, design-reality gap determines the IS success or failure (Littlejohns P, et al., 2003). Heeks (2005) had defined the IS failure based the ITPOSMO (Information, Technology, Process, Objectives, Skills, Management systems and other resources)

We argue that, current interpretations of ISs are epistemologically not logical as design-reality gap is inherent to specified IS which are structured interpretation of IS which causes failure. We contend that, IS failure is a reflection of the complex interaction between the context composed of people and work, supporting IS and its perceived objectives which have been triggered by the design reality gap

due to the inability of IS to adapt and respond to the emergence generated by these various factors. Emergence is the ubiquitous reflection of complexity and complex interaction between the elements in a system (Holland J, 1998). Therefore, from the complexity theory perspective, IS failure can be defined as an emergence of complex interactions.

In the literature, emergent behaviour of IS users and their ability to form complex adaptive systems (CAS) have been neglected. Informal groups and their behaviour reflect CAS, which has yet to be evidenced in research. Hence, we seek to evidence it and inform the design and implementation of IS by considering CAS. This could be achieved by facilitating 'emergence' into IS design, and to reduce the design-reality gap.

The Research gap

Heeks's (2005) demonstration of the design reality gap provides a foundation to understand the dimensions of IS failure on the basis of the difference between the actuality and reality. Adaptation plays a major role in making an IS a success, and ensuring continuity through maintaining the design-reality gap at a minimum. It has been evident in the Literature review that, researches conduct on organizational IS implementation and IS adaptations ignores informal groups and their complex interactions (Khoumbati, Themistocleous et al., 2006; Irani, Love et al., 2005). We believe that, adaptations should be socially natural and cannot be formally designed in i.e. Incremental designs or modularisation. If so, there is a question of what makes such adaptation natural? If adaptations are planned through training and development, then it becomes another formal design restricted in Space and Structure (Patel, 2006) without continuity and adaptation. We propose rational planning and specified designs are not sufficient to survive in light of 'emergence' in organisational context due to separation from reality (Patel NV, 2006). This fundamental incompatibility, become a prominent factor which limits the continuity of IS in NHS. Hence the purpose of this research is to understand the behaviour of informal groups during IS implementation in terms of Structure- Emergence-Space-Time (SEST) properties of systems. We argue, the incorporation of emergence makes the IS more dynamic and adaptable, hence ameliorate design reality gap.

Deferred Action is defined as the place within planned action in response to emergent locale (Patel NV, 2008). Patel NV (2009) argues, agents local response to the environment creates emergent situations and Deferred Action negotiates it to make the IS continuous. Therefore, 'emergence' could be harnessed into formal design through Deferred Action. It enables Emergence to integrate into-Space and Time in planned action. Deferred action counters the emergence that occurs in reality and it can be embedded into an artefact and integrate in the organisational process through Deferment formalism. Once embedded into a design, it becomes an adaptive system which is capable of countering the effect of emergence. Deferred Action attributes of an artefact and negotiate emergence which leads the IS success to an enhanced level. Therefore IS should be designed by incorporating emergence of informal groups into IS to reflect reality. The theory of Deferred Action encapsulates 'natural changes into IS designs and makes them sustainable. This overcomes the deficiencies in specified design and helps the IS to adapt according to emergence. Deferred Action helps to develop dynamic, and adaptable IS systems on Planned IS skeletons to negotiate emergence (Patel NV et al, 2010).

A13. Please summarise your design and methodology. *It should be clear exactly what will happen to the research participant, how many times and in what order. Please complete this section in language comprehensible to the lay person. Do not simply reproduce or refer to the protocol. Further guidance is available in the guidance notes.*

Multi-site Ethnography

We argue that, complexity in a system can be empirically understood in the natural context, based on qualitative inductionist study, for example through ethnography. Particularly, by reflecting meanings that people attach to their experience, descriptions of social structures, routines, events and processes (Avis, 2006). Therefore, we argue that,
ethnography captures holistic nature of a phenomenon rather than considering the impact of individual element(s) on the end result. Traditional single sited ethnography is suitable for homogeneously conceived conceptual units' (Marcus, 1995 in Nadai and Maeder, 2005). Also, it is highlighted that multi-site ethnographic research effectively captures heterogenic and structured organisational contexts; hence, it would increase the generalizability of research findings due to the broader definition of "locality" (Marcus, 1995). Therefore, due to the geographical dispersion and complexity in the organisational context of NHS, single sited ethnographic research doesn't meet the post-modernist description of 'representativeness' in NHS. Hence, a multi-site ethnography is proposed for this research, and the sites will be selected based on accessibility, simplicity, unobtrusiveness, permissibility and participation of staff members (Brewer, 2000).

Research Sites:

Individuals will be selected from 01 Inpatient Ward, 03 Community based treatment centres and a rehabilitation ward in Central and North West London Mental Health Trust.

Interviewing Context and Duration:
Wood (1997) argues, items and places in the setting provide valuable reference to the individual's experiences and that affect the quality of the ethnographic data (O'Reilly, 2009; Wallace, 2005). Therefore, every step will be taken to conduct interviews in the natural setting (Schensul, Schensul and LeCompte, 1999) i.e. office or any convenient place request by the subject (Crang and Cooke, 2007) and an interview will last for (nearly) one hour to collect adequate information.

In-depth questionnaire has been designed as guide the researcher during the process, and it has been developed according to the theoretical framework (Wilegoda-Wickramage and Patel, 2011) and Deferred Action Theory (Patel 2006; 2008). The questionnaire will collect details in relation to individual's experiences (context), involvement and understanding of IS implementation (planned action), working habits (before and after the IS implementation), routines of Informal group and their involvement in IS implementation. As a result, it is expected to empirically identify and validate 'formation of CAS', 'emergence' and 'deferred action'. It is expected to interview 25 staff members across the sites.

Participant Observation:
In addition to in-depth interviews, Kluckhohn (1940) demonstrates the observer/researcher can participates in the daily life with the people under study (shadowing), either openly in the role of a researcher or covertly in some disguised role, observing things that happen, listening to what is said and questioning people, over some length of time (Becker and Geer, 1957). Hence, we argue that,Participant Observation helps the researcher to experience the 'user perspective' of IS implementation (Sharkey and Larsen, 2005). It provides an opportunity to understand work flows, reciprocity amongst staff members, competency in relation to the IS system, IS compatibility and its appropriateness with the care pathway, managerial process and informal organisation.

The information collected through Participant observation will be used to either strengthen or to verify the findings of the in-depth-interviews. It is expected that the researcher will immerse with the staff members in a given locality for at least 5 hours per week over two weeks to understand user behaviour. Investigator will not only observe the research phenomenon, but try to understand the routines and the workflows by shadowing key personals. During the observation, questions will be asked to clarify certain behaviour patterns, the context, changes to their routines informal relationships, expectations in IS and 'commons fate' in pre and post IS introduction. This enables the researcher to obtain detail account of routines, work flows and working behaviours and patters. According to Kaplan, B., & Duchon, D., (1988) such methods will help to understand technological impact and identify the potential gaps in the existing system (Kaplan and Duchon, 1988). Further, researcher's prior knowledge and acquaintance with the context would help him to accurately reflect the experience (Atkinson and Hammersley, 1994).

A14-1. In which aspects of the research process have you actively involved, or will you involve, patients, service users, and/or their carers, or members of the public?

- ○ Design of the research
- ○ Management of the research
- ○ Undertaking the research
- ○ Analysis of results
- ○ Dissemination of findings
- ● None of the above

Give details of involvement, or if none please justify the absence of involvement.
None of the categories will be involved in data collection. Data will be collected directly from NHS staff members only.

4. RISKS AND ETHICAL ISSUES

RESEARCH PARTICIPANTS

A15. What is the sample group or cohort to be studied in this research?

Select all that apply:

Neurological

Oral and Gastrointestinal

Paediatrics

Renal and Urogenital

Reproductive Health and Childbirth

Respiratory

Skin

Stroke

Gender: Male and female participants

Lower age limit: Years

Upper age limit: Years

Blood

Cancer

Cardiovascular

Congenital Disorders

Dementias and Neurodegenerative Diseases

Diabetes

Ear

Eye

Generic Health Relevance

Infection

Inflammatory and Immune System

Injuries and Accidents

Mental Health

Metabolic and Endocrine

Musculoskeletal

A17-1. Please list the principal inclusion criteria (list the most important, max 5000 characters).

To fulfil the inclusion criteria, both Condition 1 and Condition 2 satisfied.
Condition 1-
Staff members in the selected sites of CNWL NHS Trust

Condition 2-
Staff members who should utilise Information Systems according to their Job Descriptions.

A17-2. Please list the principal exclusion criteria (list the most important, max 5000 characters).

Any staff member who should not use/operate Information System as part of their daily work.

RESEARCH PROCEDURES, RISKS AND BENEFITS

A18. Give details of all non-clinical intervention(s) or procedure(s) that will be received by participants as part of the research protocol. *These include seeking consent, interviews, non-clinical observations and use of questionnaires.*

Please complete the columns for each intervention/procedure as follows:

1. Total number of interventions/procedures to be received by each participant as part of the research protocol.
2. If this intervention/procedure would be routinely given to participants as part of their care outside the research, how many of the total would be routine?
3. Average time taken per intervention/procedure (minutes, hours or days)
4. Details of who will conduct the intervention/procedure, and where it will take place.

Intervention or procedure	1	2	3	4
In-depth Interviews	1	1	1 hour	Principal investigator will interview the respondents and interviews will be conducted at the site or at a convenient place
Participant Observations	1	1	3 hour	Conducted by Pricipal investigator at the site

A21. How long do you expect each participant to be in the study in total?

In-depth interview is a snap shot study.

A22. What are the potential risks and burdens for research participants and how will you minimise them?

For all studies, describe any potential adverse effects, pain, discomfort, distress, intrusion, inconvenience or changes to lifestyle. Only describe risks or burdens that could occur as a result of participation in the research. Say what steps would be taken to minimise risks and burdens as far as possible.

Information collected during the survey may be categorsed as "personally identifiable". However, every step will be taken to maintain the confidentiality and privacy of the data. Audio files (that creates during the interviews) will be transferred into a NHS accredited laptop to minimize breach of

confidentiality during an event of theft or accidental loss.

During the transcribing stage, personal data will be removed to maintain the anonymity.

Prior to the interview, researcher will inform prospective participants,

The researcher endeavours to minimize breach of confidentiality and maintain anonymity of the information.

Information will be used only for academic purpose and any personal identifiable information will not be published.

Data will be stored, accessed and processed and disposed according to the Brunel Data protection policy

(full document : http://www.brunel.ac.uk/__data/assets/pdf_file/0014/7430/DPpolicy 08.pdf)

Researcher will provide a "Participant Information sheet" to each participant, which assures any personal information collected, will remain strictly confidential and, information will be restricted only to the cheif investigator at all times. And information will be destroyed after the completion of the research. Also, if a respondent wants to make a complaint or query about the survey, Dr. Nandish Patel's (PhD Supervisors) contact details will be given.

2. Information and the data will transferred into NHS secure laptop to prevent unauthorized access and to maintain
confidentiality. NHS computers have been specially designed to prevent loosing confidential data.

A23. Will interviews/ questionnaires or group discussions include topics that might be sensitive, embarrassing or upsetting, or is it possible that criminal or other disclosures requiring action could occur during the study?

~~Yes~~ No

A24. What is the potential for benefit to research participants?

There won't be any direct or short term benefits to the participants.

A26. What are the potential risks for the researchers themselves? *(if any)*

N/A

RECRUITMENT AND INFORMED CONSENT

In this section we ask you to describe the recruitment procedures for the study. Please give separate details for different study groups where appro*A27-1. How will potential participants, records or samples be identified? Who will carry this out and what resources will be used?

For example, identification may involve a disease register, computerised search of GP records, or review of medical records. Indicate whether this will be done by the direct healthcare team or by researchers acting under arrangements with the responsible care organisation(s).

A list of staff members involved with ISs will be developed for each research site in CNWL NHS Trust according to theinformation collected from the centre managers. Individuals will be selected randomly from that list for in-depth interviews. The principle researcher will conduct the interviews with the help of a questionnaire (attached) and tries to understand the information in relation to:

1. Informal relationships (Pre and Post IS implementation)
2. Planned action in relati on to IS
3. Affects of planned action
4. Planned outcome
5. Experienced outcome and impact of informal groups in outcome

6. Deferment formalism

7. Use of informal relationships in deferment formalism

8. Deferred action

Principal investigator will conduct the interviews and voice- data will be stored into a NHS laptop.

A27-2. Will the identification of potential participants involve reviewing or screening the identifiable personal information of patients, service users or any other person?

~~Yes~~ No

Please give details below:
No

A28. Will any participants be recruited by publicity through posters, leaflets, adverts or websites?

~~Yes~~ No

A29. How and by whom will potential participants first be approached?

Principal investigator will select participants for the interviews with the help of Service Director/Site Manager. Participants
will be invited (verbally) and a copy of "participant information sheet" will be given.

A30-1. Will you obtain informed consent from or on behalf of research participants?

Yes ~~No~~

If you will be obtaining consent from adult participants, please give details of who will take consent and how it will be done, with details of any steps to provide information (a written information sheet, videos, or interactive material). Arrangements for adults unable to consent for themselves should be described separately in Part B Section 6, and for children in Part B Section 7.

If you plan to seek informed consent from vulnerable groups, say how you will ensure that consent is voluntary and fully informed.

Principal investigation officer will present "research information sheet" and an inform consent form will be given to each participant.

If you are not obtaining consent, please explain why not.

Please enclose a copy of the information sheet(s) and consent form(s).

A30-2. Will you record informed consent (or advice from consultees) in writing?

Yes No

A31. How long will you allow potential participants to decide whether or not to take part?

Minimum of 24 hours.

A33-1. What arrangements have been made for persons who might not adequately understand verbal explanations or written

information given in English, or who have special communication needs?*(e.g. translation, use of interpreters)*

N/A

A35. What steps would you take if a participant, who has given informed consent, loses capacity to consent during the study? *Tick one option only.*

- ○ The participant and all identifiable data or tissue collected would be withdrawn from the study. Data or tissue which is not identifiable to the research team may be retained.
- ○ The participant would be withdrawn from the study. Identifiable data or tissue already collected with consent would beretained and used in the study. No further data or tissue would be collected or any other research procedures carried out on or in relation to the participant.
- The participant would continue to be included in the study.
- Not applicable – informed consent will not be sought from any participants in this research.
- ◉ Not applicable – it is not practicable for the research team to monitor capacity and continued capacity will be assumed.

Further details:

CONFIDENTIALITY

In this section, personal data means any data relating to a participant who could potentially be identified. It includes pseudonymised data capable of being linked to a participant through a unique code number. orage and use of personal data during the study

A36. Will you be undertaking any of the following activities at any stage (including in the identification of potential participants)?*(Tick as appropriate)*

- Access to medical records by those outside the direct healthcare team
- Electronic transfer by magnetic or optical media, email or computer networks
- Sharing of personal data with other organisations
- Export of personal data outside the EEA
- Use of personal addresses, postcodes, faxes, emails or telephone numbers
- Publication of direct quotations from respondents
- Publication of data that might allow identification of individuals
- Use of audio/visual recording devices
- Storage of personal data on any of the following:
- Manual files including X−rays
- NHS computers
- Home or other personal computers
- University computers
- Private company computers
- Laptop computers

Further details:
Information and the data (collected during the interviews and participant observation) will be

transferred into NHS secure laptop to prevent unauthorized access and to maintain confidentiality. NHS computers have been specially designed to prevent loss of confidential data during an even of theft. Only principal investigator can access to the computer folder which data will be saved.

A37. Please describe the physical security arrangements for storage of personal data during the study?

Information will be stored in secure NHS computer and the computer will be stored in a secure location i.e. locked cabinet

A38. How will you ensure the confidentiality of personal data?*Please provide a general statement of the policy and procedures for ensuring confidentiality, e.g. anonymisation or pseudonymisation of data.*

Information and the data will be transferred to a NHS accredited secure laptop, to prevent unauthorized access, to maintain confidentiality and only accessible to the researcher. The data will only be used in an aggregated form in the project report with no reference to the participants as individuals.

Due to the availability of confidential information around the research environment, the chief investigator is expecting to sign up to the CNWL data protection and confidentiality policy.

A40. Who will have access to participants' personal data during the study? *Where access is by individuals outside the direct care team, please justify and say whether consent will be sought.*

Principal Invitigator/Chief investigator

Storage and use of data after the end of the study

A41. Where will the data generated by the study be analysed and by whom?

The Principal Investigator/Chief Investigator

A42. Who will have control of and act as the custodian for the data generated by the study?

	Title	Forename/Initials	Surname
	Mr.	Amila	Wilegoda-wickramage
Post	Principal Investigator of the research		
Qualifications	BSc (sp), Reading for PhD		
Work Address	Luton NHS		
	Nightingale House		
	94 Inkerman street		
Post Code	LU1 1JD		
Work Email	amila.wilegoda-wickramage@nhs.net		
Work Telephone	01582532005		
Fax	01582521036		

A43. How long will personal data be stored or accessed after the study has ended?

◯ Less than 3 months

◯ 3 – 6 months

◉ 6 – 12 months
○ 12 months – 3 years
○ Over 3 years

A44. For how long will you store research data generated by the study?

Years: 1
Months: 0

A45. Please give details of the long term arrangements for storage of research data after the study has ended.*Say where data will be stored, who will have access and the arrangements to ensure security.*

Only pricipal/Chief investigator have access to the data and the data will be deleted/destroyed after one year.

INCENTIVES AND PAYMENTS

A46. Will research participants receive any payments, reimbursement of expenses or any other benefits or incentives for taking part in this research?

~~Yes~~ No

A47. Will individual researchers receive any personal payment over and above normal salary, or any other benefits or incentives, for taking part in this research?

Yes No

A48. Does the Chief Investigator or any other investigator/collaborator have any direct personal involvement (e.g. financial, share holding, personal relationship etc.) in the organisations sponsoring or funding the research that may give rise to a possible conflict of interest?

Yes No

NOTIFICATION OF OTHER PROFESSIONALS

A49-1. Will you inform the participants ' General Practitioners (and/or any other health or care professional responsible for their care) that they are taking part in the study?

~~Yes~~ No

If Yes, please enclose a copy of the information sheet/letter for the GP/health professional with a version number and date.

PUBLICATION AND DISSEMINATION

A50. Will the research be registered on a public database?

Yes ~~No~~

Please give details, or justify if not registering the research. This is not a clinical research. This research will be conducted for partial fulfilment of PhD and shall be accessed through BURA (Brunel University Research Archive)

Registration of research studies is encouraged wherever possible.
You may be able to register your study through your NHS organisation or a register run by a medical research charity, or publish your protocol through an open access publisher. If you are aware of a suitable register or other method of publication, please give details. If not, you may indicate that no suitable register exists. Please ensure that you have entered registry reference number(s) in question A5-1.

A51. How do you intend to report and disseminate the results of the study? *Tick as appropriate:*

- (•) Peer reviewed scientific journals
- Internal report
- Conference presentation
- Publication on website
- Other publication
- Submission to regulatory authorities
- Access to raw data and right to publish freely by all investigators in study or by Independent Steering Committee on behalf of all investigators
- No plans to report or disseminate the results
- Other (please specify)

A52. If you will be using identifiable personal data, how will you ensure that anonymity will be maintained when publishing the results?

No participant identifiable information will be published under any circumstances.

A53. Will you inform participants of the results?

~~Yes~~ No

Please give details of how you will inform participants or justify if not doing so.
Findings will be more theoretical; however, results will be informed to anyone who is interested. Also, a copy of the final
research report will be presented to the Clinical Director of Central & North West London Mental Health Trust.

5. Scientific and Statistical Review

A54. How has the scientific quality of the research been assessed?*Tick as appropriate:*

- Independent external review
- Review within a company
- Review within a multi−centre research group
- Review within the Chief Investigator's institution or host organisation
- Review within the research team
- Review by educational supervisor
- ☐ Other

Justify and describe the review process and outcome. If the review has been undertaken but not seen by the researcher, give details of the body which has undertaken the review:
This research will be reviewed and supervised according to the Brunel University Doctoral research program.

For all studies except non-doctoral student research, please enclose a copy of any available scientific critique reports, together with any related correspondence.

For non-doctoral student research, please enclose a copy of the assessment from your educational supervisor/ institution.

A59. What is the sample size for the research? *How many participants/samples/data records do you plan to study in total?*
If there is more than one group, please give further details below.

Total UK sample size:	25
Total international sample size (including UK):	0
Total in European Economic Area:	0

Further details:

A60. How was the sample size decided upon? *If a formal sample size calculation was used, indicate how this was done, giving sufficient information to justify and reproduce the calculation.*

this is a qualitative Ethnographic research, above stated sample size is valid and adequate. Sample size has been17 selected based on accessibility and manageability.

A62. Please describe the methods of analysis (statistical or other appropriate methods, e.g. for qualitative research)
by which the data will be evaluated to meet the study objectives.

Primary data collected through in-depth interviews, participant observation will be transcribed into NVivo (Gouldner, 1973; Orlikowski and Baroudi, 1991). Due to the level of investment involved, non-verbatim transcription methods will be followed. It is expected to follow Silverman (1993) and Portland (2002) transcription techniques to maintain transcription quality.Data will be analysed using thematic analysis (King and Horrocks, 2010). Six stage framework proposed by Crabtree & Miller (1999) will be followed to derive a code- manual and themes. The steps include, 1. developing the code manual, 2. testing the reliability of the code, 3. summarizing data and identifying initial themes, 4. applying template of codes and additional coding, 5. connecting the codes and identifying themes, 6. corroborating and legitimating coded themes.

Once coding manual has developed Crabtree & Miller (1999), similar semantic meanings across the data corpus will be searched, labelled, and categorised (Schutz, 1967). Interpretive codes will be developed based on the Descriptive codes. Interpretive codes will be sort to over arch a set of descriptive codes that covers a broader meaning Tobin and Begley (2004). Overarching themes will be developed and compared against the theoretical framework. A thematic flowchart will be developed to demonstrate the evolution of CAS, how it leads to emergence and deferred action.

6. MANAGEMENT OF THE RESEARCH

A63. Other key investigators/collaborators. *Please include all grant co−applicants, protocol co−authors and other key*
members of the Chief Investigator's team, including non-doctoral student researchers.

	Dr. Nandish V. Patel
Post	Lecturer in IT-enabled Management Systems
Qualifications	Ph.D., M.Sc., B.A.(Hons.), Cert. Ed., FHEA, ILTM , TMIET
Employer	Brunel University
Work Address	Kingston Lane Uxbridge, Middlesex
Post Code	UB8 3PH
Telephone	01895 265295
Fax	01895 203141
Mobile	
Work Email	nandish.patel@brunel.ac.uk

A64. Details of research sponsor(s)

A64-1. Sponsor

Lead Sponsor

Status: NHS or HSC care organisation

Academic

Pharmaceutical industry

Medical device industry

Commercial status: Non-Commercial

○ Local Authority

○ Other social care provider (including voluntary sector or private organisation)

○ Other

If Other, please specify:

Contact person

Name of organisation	Brunel University
Given name	Nandish V.
Family name	Patel
Address	Kingston lane
Town/city	Uxbridge, Middlesex
Post code	UB8 3PH
Country	UNITED KINGDOM
Telephone	01895 265295
Fax	01895 203141
E-mail	nandish.patel@brunel.ac.uk

Is the sponsor based outside the UK?

~~Yes~~ No

Under the Research Governance Framework for Health and Social Care, a sponsor outside the UK must appoint a legal representative established in the UK. Please consult the guidance notes.

A65. Has external funding for the research been secured?

Funding secured from one or more funders

External funding application to one or more funders in progress

(•) No application for external funding will be made

What type of research project is this?

Standalone project

Project that is part of a programme grant

Project that is part of a Centre grant

(•) Project that is part of a fellowship/ personal award/ research training award

( ) Other

Other – please state:

A66. Has responsibility for any specific research activities or procedures been delegated to a subcontractor (other than a co-sponsor listed in A64-1) ? *Please give details of subcontractors if applicable.*

~~Yes~~ No

A67. Has this or a similar application been previously rejected by a Research Ethics Committee in the UK or another country?

~~Yes~~ No

Please provide a copy of the unfavourable opinion letter(s). You should explain in your answer to question A6-2 how the reasons for the unfavourable opinion have been addressed in this application.

A68. Give details of the lead NHS R&D contact for this research:

	Title	Forename/Initials	Surname
	Ms	Agela	Williams
Organisation	Central and North West London Mental Health Trust		
Address	London West Mental Health R&D Consortium		
	R&D Office HQ		
	St Bernard, Uxbridge		
Post Code	UB1 3EU		
Work Email	rd.office@wlmht.nhs.uk		
Telephone	020 8354 8738		

Fax 020 8354 8733
Mobile

Details can be obtained from the NHS R&D Forum website: http://www.rdforum.nhs.uk

A69 1. How long do you expect the study to last in the UK?

Planned start date: 01/04/2012
Planned end date: 15/04/2012
Total duration:
Years: 0 Months: 0 Days: 14

A71-1. Is this study?

Single centre
(•) Multicentre

A71-2. Where will the research take place? *(Tick as appropriate)*

England
Scotland
Wales
Northern Ireland
Other countries in European Economic Area

Total UK sites in study

Does this trial involve countries outside the EU?
Yes No

A72. What host organisations (NHS or other) in the UK will be responsible for the research sites? *Please indicate the type of organisation by ticking the box and give approximate numbers of planned research sites:*

NHS organisations in England 1
NHS organisations in Wales
NHS organisations in Scotland
HSC organisations in Northern Ireland
(•) GP practices in England
GP practices in Wales
GP practices in Scotland
GP practices in Northern Ireland
Social care organisations
Phase 1 trial units
Prison establishments
Probation areas
Independent hospitals
Educational establishments

Independent research units

Other (give details)

Total UK sites in study: 1

A73-1. Will potential participants be identified through any organisations other than the research sites listed above?

Yes No

A74. What arrangements are in place for monitoring and auditing the conduct of the research?

Research will be carried out in accordance with the Brunel University research standards and in accordance with NHS
research standards.

A76. Insurance/ indemnity to meet potential legal liabilities

***Note: in this question to NHS indemnity schemes include equivalent schemes provided by Health and Social Care
(HSC) in Northern Ireland***

**A76-1. What arrangements will be made for insurance and/or indemnity to meet the potential legal liability of the
sponsor(s) for harm to participants arising from the management of the research?** *Please tick box(es) as applicable.*

Note: Where a NHS organisation has agreed to act as sponsor or co-sponsor, indemnity is provided through NHS schemes. Indicate if this applies (there is no need to provide documentary evidence). For all other sponsors, please describe the arrangements and provide evidence.

NHS indemnity scheme will apply (NHS sponsors only)

Other insurance or indemnity arrangements will apply (give details below)

Brunel University imdemnity policy

Please enclose a copy of relevant documents.

A76-2. What arrangements will be made for insurance and/ or indemnity to meet the potential legal liability of the sponsor(s) or employer(s) for harm to participants arising from the design of the research? *Please tick box(es) as applicable.*

Note: Where researchers with substantive NHS employment contracts have designed the research, indemnity is provided through NHS schemes. Indicate if this applies (there is no need to provide documentary evidence). For other protocol authors (e.g. company employees, university members), please describe the arrangements and provide evidence.

◉ NHS indemnity scheme will apply (protocol authors with NHS contracts only)

Other insurance or indemnity arrangements will apply (give details below)

Please enclose a copy of relevant documents.

A76-3. What arrangements will be made for insurance and/ or indemnity to meet the potential legal liability of investigators/collaborators arising from harm to participants in the conduct of the research?

Note: Where the participants are NHS patients, indemnity is provided through the NHS schemes or through professional indemnity. Indicate if this applies to the whole study (there is no need to provide documentary evidence). Where non-NHS sites are to be included in the research, including private practices, please describe the arrangements which will be made at these sites and provide evidence.

NHS indemnity scheme or professional indemnity will apply (participants recruited at NHS sites only)

Research includes non-NHS sites (give details of insurance/ indemnity arrangements for these sites below)

Please enclose a copy of relevant documents.

A78. Could the research lead to the development of a new product/process or the generation of intellectual property?

Yes ◉ No ○ Not sure

PART C: Overview of research sites

Please enter details of the host organisations (Local Authority, NHS or other) in the UK that will be responsible for the research sites. *For NHS sites, the host organisation is the Trust or Health Board. Where the research site is a primary care site, e.g. GP practice, please insert the host organisation (PCT or Health Board) in the Institution row and insert the research site (e.g. GP practice) in the Department row.*

Research site		Investigator/ Collaborator/ Contact	
Institution name	Central and North West London NHS Trust	Title	Mr.
Department name	Director of Clinical Governance and Medical Director	First name/ Initials	Amila
Street address	Stephenson House 75 Hampstead Road	Surname	Wilegoda-Wickramage
Town/city	London		
Post Code	NW1 2PL		

PART D: Declarations

D1. Declaration by Chief Investigator

1. The information in this form is accurate to the best of my knowledge and belief and I take full

responsibility for it.

2. I undertake to abide by the ethical principles underlying the Declaration of Helsinki and good practice guidelines on the proper conduct of research.

3. If the research is approved I undertake to adhere to the study protocol, the terms of the full application as approved
4. and any conditions set out by review bodies in giving approval.

5. I undertake to notify review bodies of substantial amendments to the protocol or the terms of the approved application, and to seek a favourable opinion from the main REC before implementing the amendment.

6. I undertake to submit annual progress reports setting out the progress of the research, as required by review bodies.

7. I am aware of my responsibility to be up to date and comply with the requirements of the law and relevant guidelines

   relating to security and confidentiality of patient or other personal data, including the need to register when necessary with the appropriate Data Protection Officer. I understand that I am not permitted to disclose identifiable data to third parties unless the disclosure has the consent of the data subject or, in the case of patient data in England and Wales, the disclosure is covered by the terms of an approval under Section 251 of the NHS Act 2006.

8. I understand that research records/data may be subject to inspection by review bodies for audit purposes if required.

9. I understand that any personal data in this application will be held by review bodies and their operational managers

   and that this will be managed according to the principles established in the Data Protection Act 1998.

10. I understand that the information contained in this application, any supporting documentation and all correspondence with review bodies or their operational managers relating to the application:

    - Will be held by the REC (where applicable) until at least 3 years after the end of the study; and by NHS R&D offices (where the research requires NHS management permission) in accordance with the NHS Code of Practice on Records Management.
    - May be disclosed to the operational managers of review bodies, or the appointing authority for the REC
    - (where applicable), in order to check that the application has been processed correctly or to investigate any complaint.
    - May be seen by auditors appointed to undertake accreditation of RECs (where applicable).
    - Will be subject to the provisions of the Freedom of Information Acts and may be disclosed in response

      to requests made under the Acts except where statutory exemptions apply.

10. I understand that information relating to this research, including the contact details on this application, may be held on national research information systems, and that this will be managed according to the principles established in the Data Protection Act 1998.

11. Where the research is reviewed by a REC within the UK Health Departments Research Ethics

Service,
I understand that the summary of this study will be published on the website of the National Research Ethics Service
(NRES), together with the contact point for enquiries named below. Publication will take place no earlier than 3
months after issue of the ethics committee's final opinion or the withdrawal of the application.

Contact point for publication*(Not applicable for R&D Forms)*

NRES would like to include a contact point with the published summary of the study for those wishing to seek further information. We would be grateful if you would indicate one of the contact points below.

Chief Investigator

Sponsor ○ Study co-ordinator

Student

○ Other – please give details

None

Access to application for training purposes *(Not applicable for R&D Forms)*

Optional – please tick as appropriate:

☑ I would be content for members of other RECs to have access to the information in the application in confidence

☑ for training purposes. All personal identifiers and references to sponsors, funders and research units would be removed.

This section was signed electronically by Mr Amila Wilegoda-Wickramage on 28/02/2012 11:26.

Job Title/Post:	Performance and Improvement Manager
Organisation:	Luton NHS
Email:	amila.wilegoda-wickramage@nhs.net
Signature:	.....
Print Name:	Amila S. Wilegoda-Wickramage
Date:	20/11/2011 *(dd/mm/yyyy)*

D2. Declaration by the sponsor's representative

If there is more than one sponsor, this declaration should be signed on behalf of the co−sponsors by a representative of the
lead sponsor named at A64-1.

I confirm that:

1. This research proposal has been discussed with the Chief Investigator and agreement in principle to sponsor the
research is in place.

2. Any necessary indemnity or insurance arrangements, as described in question A76, will be

in place before this

research starts. Insurance or indemnity policies will be renewed for the duration of the study where necessary.

3. Arrangements will be in place before the study starts for the research team to access resources and support to deliver

the research as proposed.

4. Arrangements to allocate responsibilities for the management, monitoring and reporting of the research will be in place

before the research starts.

5. The duties of sponsors set out in the Research Governance Framework for Health and Social Care will be undertaken

in relation to this research.

6. Where the research is reviewed by a REC within the UK Health Departments Research Ethics Service, I understand

that the summary of this study will be published on the website of the National Research Ethics Service (NRES),
together with the contact point for enquiries named in this application. Publication will take place no earlier than 3
months after issue of the ethics

committee's final opinion or the withdrawal of the application.

This section was signed electronically by Dr Nandish Patel on 28/02/2012 11:35.

Job Title/Post:	Lecturer
Organisation:	Brunel University
Email:	nandish.patel@brunel.ac.uk

D3. Declaration for student projects by academic supervisor(s)

1. I have read and approved both the research proposal and this application. I am satisfied that the scientific content of the
research is satisfactory for an educational qualification at this level.

2. I undertake to fulfil the responsibilities of the supervisor for this study as set out in the Research Governance Framework
for Health and Social Care.

3. I take responsibility for ensuring that this study is conducted in accordance with the ethical principles underlying the
Declaration of Helsinki and good practice guidelines on the proper conduct of research, in conjunction with clinical supervisors
as appropriate.

4. I take responsibility for ensuring that the applicant is up to date and complies with the requirements of the law and relevant
guidelines relating to security and confidentiality of patient and other personal data, in conjunction with clinical supervisors as
appropriate.

Academic supervisor 1

This section was signed electronically by Dr Nandish Patel on 28/02/2012 11:36.

Job Title/Post:	Lecturer
Organisation:	Brunel University
Email:	nandish.patel@brunel.ac.uk