

Impacts of Policy and Design Events
on the Success of National Health
Information System:
A Boundary Object Perspective

by

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Author declaration

I hereby declare that I am the sole author of this thesis and all materials used from other sources or in collaboration with other researchers have been properly and fully acknowledged.

Abstract

Information Systems adoption is an area of focus for business change and transformation where innovative technologies and procedures provide perceived benefits to the organisation. However, the impact of Information Systems adoption, use and factors contributing to Information System success, alongside failures in a healthcare context is an area in need of further critical, empirical research. This study investigates the role and evolution of a health Information System in various organisational contexts to reveal the issues in adoption, the factors contributing to unintended use, and the impact of policy and design intention on Information System success. A longitudinal study was conducted into the human-information aspects in four cases within the National Health Service, to understand the changing sentiment towards a national health Information System in the context of emerging policy and design events. Analysis showed the importance of Information Systems adoptability, purposefulness and acceptance, and key barriers to adoption in the gap between clinical and administrative use versus intended use. Boundary work and effective feedback were identified as important components in addressing social aspects conveying policy and design intentions, and expectation setting in awareness practice across the interface between organisations, people, and Information System. User satisfaction emerged as a significant factor contributing to Information System success. Finally, an evaluation framework and conceptual model is proposed for the identification of factors contributing to Information System success. The findings from this study can be applied to socio-technical issues in the context of policy and design change in a national healthcare Information System, with the view of making continuous improvement leading to Information System adoption and success while simultaneously identifying and reducing factors that lead to failure.

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Table of contents

Author declaration	i
Abstract	ii
Acknowledgements	iii
Table of contents	iv
List of figures	viii
List of tables	ix
1. Introduction	1
1.1. Background and motivation	1
1.1.1. Practical problem	4
1.1.2. Research problem	9
1.1.3. Research questions	10
1.2. Aims and objectives	10
1.3. Expected contribution	11
1.3.1. Theoretical contribution	11
1.3.2. Practical contribution	12
1.4. Outline of thesis	12
2. Acceptance and success of Information Systems, and adoption in the NHS	14
2.1. Introduction	14
2.2. Technology acceptance and Information Systems success	14
2.3. Adoption of Information Systems in NHS	23
2.4. Summary	25
3. Theoretical foundations - Boundary objects and organisational semiotics	26
3.1. Introduction	26
3.2. Boundary Objects	26
3.2.1. Objects	26

3.2.2.	Boundary objects	29
3.2.3.	Boundary interfaces	32
3.2.4.	Boundary alignment.....	34
3.3.	Organisational semiotics.....	35
3.4.	Summary	38
4.	Research methodology for the actor centric evaluation of Information System adoption, use and success.....	39
4.1.	Introduction	39
4.2.	Research paradigm.....	39
4.3.	Research approach.....	41
4.3.1.	Data collection methods	46
4.3.2.	Analysis strategy and framework.....	50
4.4.	Validation	54
4.5.	Ethical considerations	55
4.6.	Summary	56
5.	Impact of policy and design intention on Information Systems use, and factors in adoption attributed to success.....	57
5.1.	Introduction	57
5.2.	Findings on policy and Information System design context	57
5.3.	Observations on expected use of Information System.....	58
5.4.	Factors in Information System adoption and success	62
5.5.	Summary	66
6.	Study at the human-information function and of change in participant sentiment in four case studies on adoptability, use, acceptance and success of healthcare Information System. 67	
6.1.	Introduction	67
6.2.	Context.....	67
6.2.1.	Case 1	67
6.2.2.	Case 2	68

6.2.3.	Case 3	69
6.2.4.	Case 4	69
6.3.	Points of interest.....	70
6.3.1.	Case 1	70
6.3.2.	Case 2	71
6.3.3.	Case 3	72
6.3.4.	Case 4	73
6.4.	Adoptability of Information System.....	74
6.4.1.	Case 1	74
6.4.2.	Case 2	75
6.4.3.	Case 3	78
6.4.4.	Case 4	79
6.5.	Use of Information System	80
6.5.1.	Case 1	80
6.5.2.	Case 2	82
6.5.3.	Case 3	83
6.5.4.	Case 4	85
6.6.	Acceptance of Information System.....	86
6.6.1.	Case 1	86
6.6.2.	Case 2	87
6.6.3.	Case 3	88
6.6.4.	Case 4	89
6.7.	Summary of Information System success	90
6.7.1.	Case 1	90
6.7.2.	Case 2	94
6.7.3.	Case 3	96
6.7.4.	Case 4	99
6.8.	Key findings	101

6.9. Summary	106
7. Discussion on the role of boundary work in addressing barriers to adoption and factors contributing to Information Systems success.....	107
7.1. Introduction	107
7.2. Role of conveyance in boundary work.....	107
7.3. Barriers to Information System adoption	109
7.4. Unintended use of Information System.....	112
7.5. Factors contributing to Information System success.....	113
7.6. Evaluation of research	116
7.7. Limitation of research	117
7.7.1. Research design	117
7.7.2. Participants	117
7.7.3. Analysis.....	117
7.8. Summary of recommendations	118
8. Conclusion.....	120
8.1. Summary of research	120
8.2. Conclusions	120
8.3. Contribution of research.....	122
8.4. Future work.....	122
References.....	124
Appendix	131
Key actors identified	131
Summary results of case sentiment.....	135
Variable centric analysis of framework matrices.....	136
Theme centric analysis of framework matrices	153
Description of policy and design events	187
Dominant attribute sentiment in radar charts of research stages	190
Participant information sheet and consent form	194

List of figures

Figure 1 - Organisational actors in the NHS Information System	2
Figure 2 - Signification of Information System as a boundary object	3
Figure 3 - Timeline of policy and design change events	6
Figure 4 - Information System responsibility-relationship diagram	7
Figure 5 – Process flow in expected Referrer Use	8
Figure 6 - Process flow in expected Service Provider Use	9
Figure 7 - IS Success model (Delone and Mclean 1992)	18
Figure 8 – Updated IS Success model (Delone and Mclean 2003)	20
Figure 9 - Organisational onion (Stamper 1992)	36
Figure 10 - Semiotic Ladder (Stamper 1973)	36
Figure 11 - Influencing model of policy and design intention on attributes of Information System success	45
Figure 12 - Qualitative research methods for expected Use, IS adoption and success	46
Figure 13 - Actor-participant identification method	47
Figure 14 – Data collection stages, and policy and design change events	48
Figure 15 – Semiotic framework for human-information convergence toward policy and design intention	51
Figure 16 - Analytical framework	52
Figure 17 - Changing participant sentiment relative to policy and design events	58
Figure 18 - Variable case sentiment across success attributes – Case 1	70
Figure 20 - Variable case sentiment across success attributes – Case 2	71
Figure 22 - Variable case sentiment across success attributes – Case 3	72
Figure 24 - Variable case sentiment across success attributes – Case 4	73
Figure 19 - Case 1 influencing model	93
Figure 21 - Case 2 influencing model	95
Figure 23 - Case 3 influencing model	98
Figure 25 - Case 4 influencing model	101
Figure 26 - Influencing model of awareness practice on dimensions of Information System success	105

List of tables

Table 1 - Variable attributes in dimensions of Information Systems success.....	44
Table 2 - Summary of research participants	49
Table 3 - Variable attributes embedded in research questions.....	50
Table 4 - Sentiment scale applied to changing variables	54
Table 5 - Peer review assessment of sentiment	55
Table 6 - Analysis of human-information functions.....	58
Table 7 - Failures in expected Use	61
Table 8 - Case variable sentiment in dimensions of success	63
Table 9 - Emergence of acceptance	65

1. Introduction

1.1. Background and motivation

Information System (IS) incorporation into UK healthcare and wider industries has been problematic in relation to adoption of IS into practice, and understanding the impact of use on people in their business organisations. It has long been accepted in the IS discipline that effective development combines understanding of the people who use Information Technology (IT) and the processes through which organisations apply IT, as well as the IT infrastructure itself (LeRouge, Mantzana et al. 2007). IS are designed with intentions in mind and along with strategic and policy initiatives can shape outcomes from the perspective of the system user or actor. Little is known about how technological innovations are assimilated into routine practice in the contemporary National Health Service (NHS) in England, and the impacts such innovations have on people in their business organisations once they have been implemented and adopted. There is also a gap in the understanding of the people perspective of (often mandated) implementation of innovations and how their responses accentuate or limit the benefits of the innovations in question. There is subsequently a need to further examine how IS will be adopted and diffused among specific clinical and non-clinical user groups within healthcare organisations (Currie and Finnegan 2011). UK Healthcare is a system that is complex and highly institutionalised which exists and operates both as a material resource environment and a set of beliefs, ideas and rules (Constantinides and Barrett 2006).

Several core national healthcare IS are currently in use by the NHS in England, of which one facilitates the electronic booking of appointments across NHS organisations nationally. Its fundamental use is to refer a patient from a primary care organisation to another care organisation, and to support the electronic transfer of clinical information, service selection and appointments booking across healthcare organisations. This Information System is based on a 'Directory of Services', from which referrers and patients can choose and book an appointment date and time of their preference, in a clinical service of their choice. The Information System is populated by clinical service definitions from Providers of NHS services and integrates with their patient administration systems, so that appointment slots can be polled and made available to the IS. Additionally, referrers can initiate the creation of a referral and attach content from within their own clinical system. Access is based on user roles and governed by Role Based Access Controls on physical smartcards used to access the system. Users of the system have referring, service provider, commissioning and further supporting access roles with the appropriate functionality. The information within this system can be utilised to understand 'future outpatient' activity and the demands and trends of populations on Provider clinical services.

The electronic referrals and appointments booking system is utilised in the NHS as part of a core provision of national information services. The core principle is to enable direct access and booking from primary care to secondary care through a safe and secure digital mechanism. Early design intention was to support patient choice of clinical service and appointment date/time; to support clinical Service Providers to triage and accept referrals that are clinically appropriate only once the patient has been provided an appointment; to facilitate advice and guidance in supporting a referral decision thereby reducing first outpatient appointments through activity diversion and reducing waiting times. The IS provides a ‘shop window’ for referrers to navigate and identify healthcare provider services nationally in the NHS in England.

To enable this design intention involves the co-ordinated participation of key actors identified (in the appendix) in organisations across the IS interface. Fig. 1 illustrates the IS as a mediating artefact in a network of actors and organisations (indicated the first level), and systems/functions within that organisation:

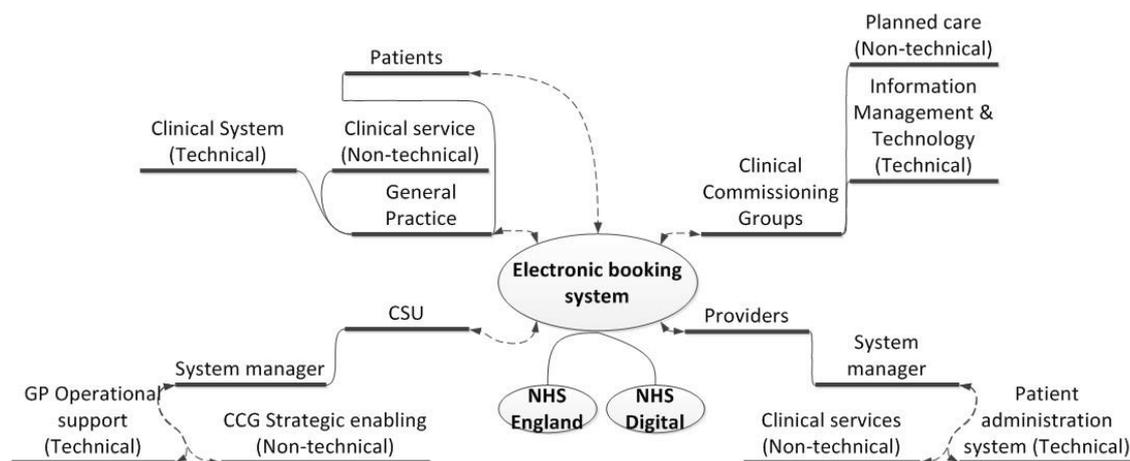


Figure 1 - Organisational actors in the NHS Information System

NHS England set the official strategy and policy and are the ‘Information Authority’ (IA) in relation to the commissioning of the IS. NHS Digital own the product and service, and develop official design intention, and are referred to in this study as the Information Service Organisation (ISO). Clinical Commissioning Groups (CCGs) play a beneficiary role in the use of management information to support Planned Care, but also have responsibility for uptake in commissioned organisations. The Commissioning Support Unit (CSU) plays a facilitating role in operational support to General Practice, strategic enablement to the CCGs and an interfacing role for the electronic booking system. Providers of healthcare services ensure the definitions are described on the IS and that appointments are made available to the IS. General Practice has a role in adopting the IS for use in referring patients through their clinical system as part of

transfer of clinical service. There are technical and non-technical roles, with the end users acting within the technical IS, and management stakeholders in the non-technical aspects of IS.

The IS can be classified as one that acts as a point for the interfaces between a number organisations, systems, and the co-operative work (Schmidt and Bannon 1992) of a variety of actors in the formal and informal system (Stamper 1992). The IS provides a locus for beliefs and perceptions relating to policy, IS adoption, use and success. This is based on the signification and interpretation of the IS to various actor domains. In Fig. 2 adapted from Charles Sanders Peirce (Peirce, Hartshorne et al. 1958) the IS and its meaning are represented relative to locus between the IS and actors. The IS therefore can be treated as an ‘artefact’ that sits between and forms many ‘boundaries’ with organisations and their actors, that forms various views and perceptions:

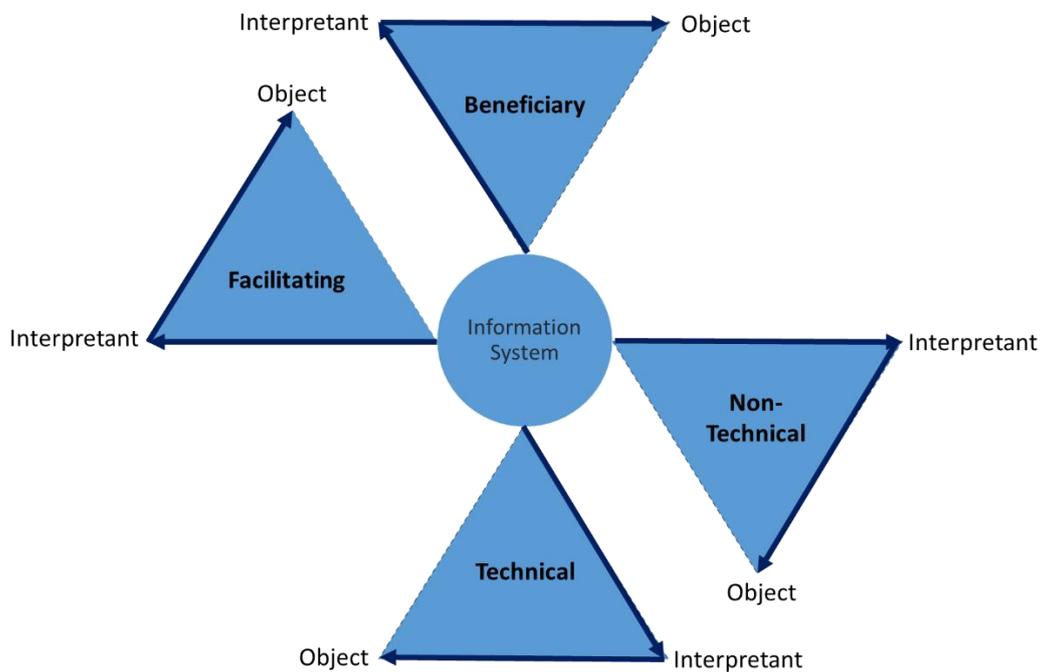


Figure 2 - Signification of Information System as a boundary object

With the view of the system as a boundary object in use, differences in local and regional norms cause variation in these multiple domains of technical, non-technical, beneficiary and facilitating actors. This can lead to a great degree of permutation in use, from design intention. The actors in these organisations take on a number of roles in which they play a part in the function of the IS as a boundary object (Star and Griesemer 1989). Each account of use (Venkatesh, Morris et al. 2003) at a given time can lead to various determinants of Information Systems success (DeLone and McLean 1992).

The motivation behind this research is to understand the socio-material factors, as the intersection of technology, work and organisation, which impact on IS use, and divergence from official expectations on system design intentions. Additionally, barriers to adoption and factors contributing to IS success, and to understand the role of the IS as an object, that draws together human relationships. The role of periphery systems also needs consideration to assess the impact of interoperation at boundary interfaces. In the use of such IS, this study aims to analyse the actor journey to uncover the specific issues in complex social events, and to assess perceived effectiveness in IS use.

The philosophical approach of critical realism (Bhaskar 1975) in realist review of a health intervention context (Pawson, Greenhalgh et al. 2005) is applied to identify the causal relationships in various settings or context, and reviewing actual practice against official expectations. This approach assists in identification of deep structures of causal relationships, in the explanation of why certain events are occurring, in the separation of 'artefacts', 'events' and 'mechanisms' that govern the role of artefacts. This approach in viewing the artefact as a boundary object in use requires a method of analysis that elicits the meanings derived, intentions conveyed and beliefs that are held in relation to the artefact.

By taking an organisational semiotics (Stamper 1973) approach, new methods of analysis are applied in this research context to develop an understanding of the changing views and perceptions of the artefact as a boundary object in-use, and in further concept development on the effects of the human-information effect on IS failures as well as success.

1.1.1. Practical problem

The IS as the focus of this study has been in operation for over 10 years, and while national utilisation varies to a great extent uptake has reached a plateau. There are also various accounts of success determined by a range of stakeholder views. The IS depends on multiple interfaces between organisations and the actors within. Issues from IS conception still manifest themselves as ongoing issues to date, thus engagement from end users and managers in some places has remained poor. Fragmented organisational boundaries, as well as internal factors such as authority and delegation of tasks, impact upon system efficacy (Greenhalgh, Stones et al. 2014). Perceptions are formed and embedded through bad experience, relationships or interactions (Peltu, Eason et al. 2008). Utilisation is hampered by inflexibility of the system features, functionality and processes, with local workarounds being put in place (Pothier, Awad et al. 2006). The provision of 'choice' that the IS had been designed to support is still not realised (Green, McDowall et al. 2008) and the misunderstanding and misuse of the system in referral management schemes has not reduced referral activity and increased cost (Davies and Elwyn 2006, Ball, Greenhalgh et al. 2016). The lack of co-ordination and collaboration across the local health community also hampers sustainable improvements and organisational willingness to engage with national and local

initiatives (Kaffash 2016, McBeth 2016). The IS facilitates the flow of clinical service, referral and appointments information across Referrer and Service Provider organisations in England. Where this information flow is impeded, the Information System is not perceived to function to full effect.

The IS in June 2015 underwent transition to a new platform and developer. Issues in performance and usability during this time impacted on user confidence in the IS (Nash 2015) and ongoing issues in relation to the provision of management information (McBeth 2015) had impacted ongoing service improvements. From its inception, the new system had a revised user interface and is based on an open source, agile development platform, providing scope for rapid development of new features, functionality and system improvements. This contrasts with the legacy system which was bound to an external change management process.

IS performance is assessed at the highest level through quantitative utilisation statistics which indicate proportion of referrals (instance of use) that are made through the IS. Although there are a number of national policies related to the use of the system in the form of contracts, frameworks, and guidance, utilisation does not take into account any deviation from design intention that results in unintended use that contributes to the various levels of utilisation nationally.

Whilst it is common knowledge that one size does not fit all with respect to national IS in the NHS (Greenhalgh and Keen 2013), this enabling IS has a unique role in its community and mechanism towards compliance. In alignment with IS design philosophy and design intention, there is a practical question as to how its role and stakeholder behaviour is affected by policy and design change?

In the absence of a standard in bridging the gap between the business needs of the end user and technical aspects of this enabling solution, the wider issue around the organisational influence in creating success factors is the main focus of this research. In addressing the issues caused in adoption to local context, an effective evaluation framework is required that will have implication on future policy, programme and system design in identifying factors leading to IS failure and those contributing to IS success.

The policy and design context can be described as a result of the documented intentions laid out by the Information Authority (IA) and Information Service Organisation (ISO) in published documents, which include policy, guidance, service specifications and design roadmaps. The documents provide detail on key milestones and planned events in relation to policy and design change. The diagram in Fig.3 illustrates the timeline of policy and design change events, which from the time period between February 2017 and November 2018, identifies in **bold** is design changes, and in *italics* policy changes:

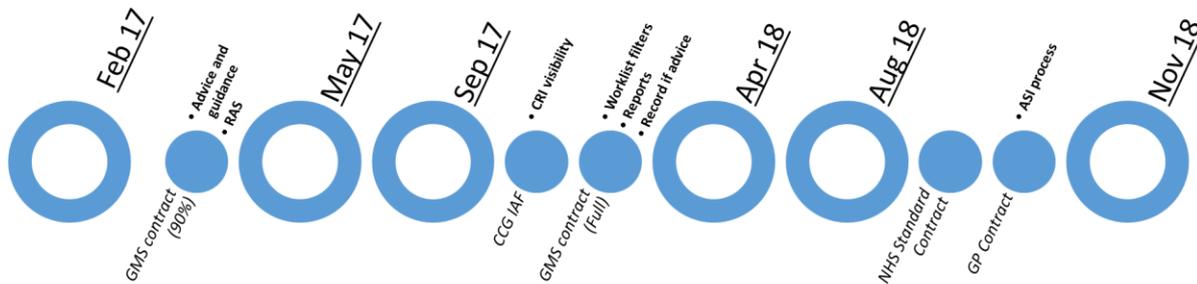


Figure 3 - Timeline of policy and design change events

The IS design changes consisted of introduction of new functionality such as Referral Assessment services, improvements on existing functionality such as Advice and Guidance, and improvements to user interface, reporting functionality and processes. The policy events determined particular compliance objectives in terms of contractual uptake, improvement in adoption rates, and levers to drive full IS adoption. These policy events target particular user groups such as Clinical Commissioning Groups (CCG) and their membership practices, through the General Medical Service contract, and CCG Improvement and Assessment Framework. Also, NHS Providers through the NHS Standard Contract.

Following the document review, observations during preliminary cohort study produced an initial insight into the people and processes within the organisational context, and the variance from expected to actual use of the IS. The diagram in Fig. 4 was produced as a result of the document review and observations, indicating the intended roles and relationships between responsibilities of actors relative to the IS:

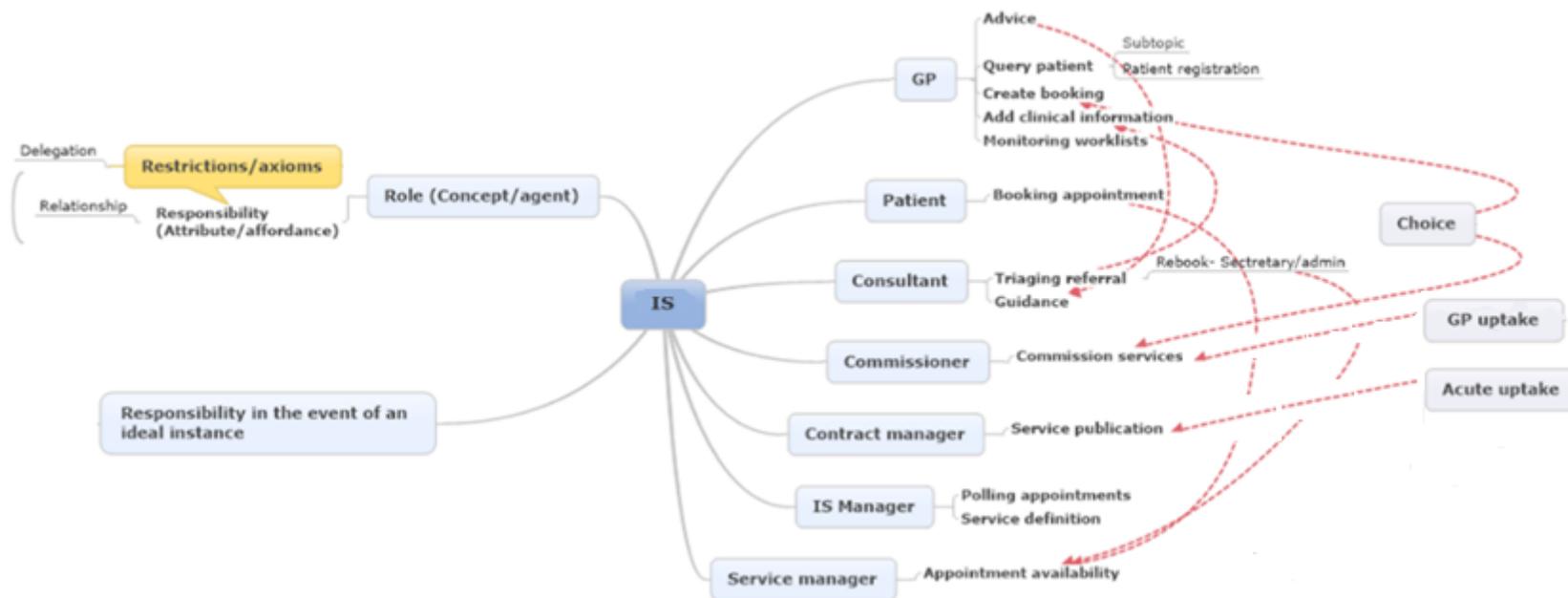


Figure 4 - Information System responsibility-relationship diagram

Fig. 4 provides a single view of responsibility-relationship to the IS as intended in IS policy and design. It was found that in accordance with expected use, quality is achieved from the perspective of the IA and ISO. Divergence from design intention impacts on perceived net benefits. The diagram was further refined through analysis of systems use against business process models and IS training and guidance, to analyse deviation from expected use.

The information system process model is a linear series of tasks that take place for end users interacting with the system in part from a Referring organisation and in completion at a Service Provider organisation. This is described from the referring GP perspective as illustrated in Fig. 5. In practice, these tasks can be delegated and carried out by different users, such as a Medical Secretary which may not be completed as a set of tasks in an instance of IS use:

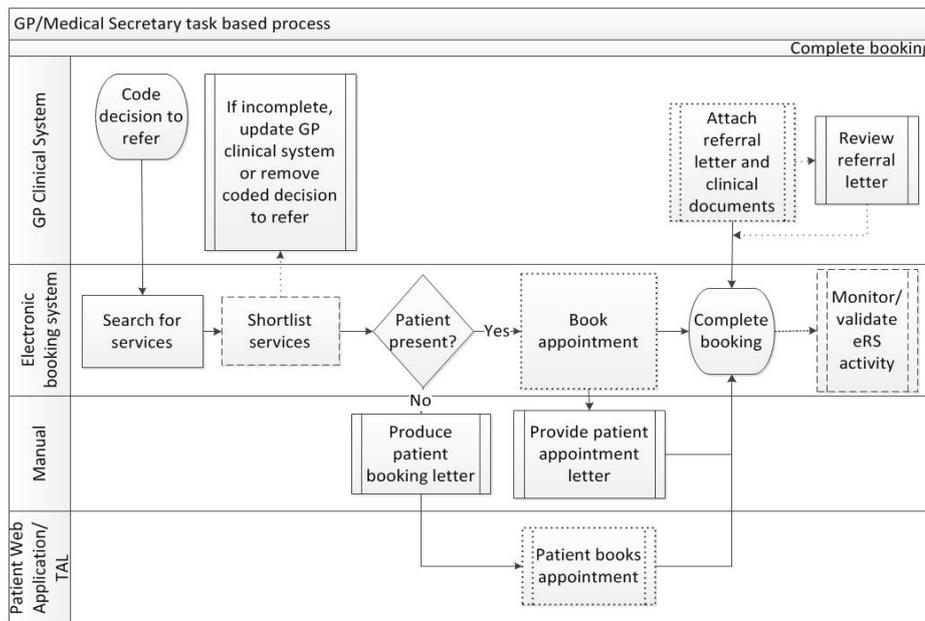


Figure 5 – Process flow in expected Referrer Use

The referrer makes a clinical decision to refer, which is coded in their GP clinical system. The IS subsequently is launched to identify and shortlist clinically appropriate services for the patient. Following this, the next stage of the appointment booking processes is triggered, which is based on whether the patient is physically present, or not. The ‘book appointment’ process releases any attached clinical information to the Service Provider and acts as a handover part in the process from the referring organisation to the receiving organisation; the referral attachments also need to have been previously attached into the IS. Due to the variety of clinical systems used in General Practice there are multiple methods by which the letter and clinical documents can be attached. Process variations and the timeliness of working through the process in Fig. 5 directly impact the efficacy of the process in the Service Provider illustrated in Fig. 6:

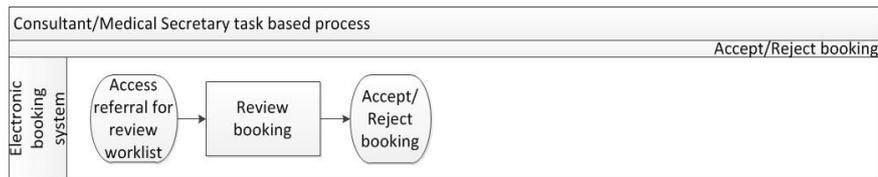


Figure 6 - Process flow in expected Service Provider Use

In order for the ‘review booking’ process to take place the ‘patient books appointment’ and ‘attach referral letter and clinical documents’ sub processes in Fig. 5 need to have taken place in the time prior to the triaging of the booking. Timeliness of sub processes is key to the success of the system, but is also a constraining dependency, without which the system fails. In Fig. 5, where the processes in dashed lines are not carried out completely or routinely, adverse effects, such as the GP clinical system recording that a booking has been created when in fact no booking has been created, occur. Also, bookings that are rejected may not be detected and therefore the patient has not progressed in receiving any care.

1.1.2. Research problem

Integration of healthcare systems at the macro, meso and micro levels is high on the research agenda and in practice within the NHS in England. Much of the effort and activity has been focused on the technical integration of systems through core services, linking of datasets, definitions and technical interfaces (Clegg and Shepherd 2007). However, the NHS struggles to achieve effective integration and alignment locally, within or across organisations in the local health community, or nationally across regions and geographies. Lack of social collaboration in the technical design, development and implementation of systems could be a barrier to healthcare systems interoperability. Complexity is found in translating national strategy to local policy, procedures, and governance structures, within a national backdrop of variable funding, and disconnect is evident from national directives to local implementation.

An understanding of the interfaces, behaviours and perceptions of the actors who take a role within and around co-operative systems is required, to understand the socio-material (Orlikowski 2007) aspects of co-ordinated system adoption and the interdependent and complex relationship between organisation, IS and use which in some cases can result in negative effects. There is a need to investigate the role of distributed IS that co-ordinate collaborative activity in their society, and the factors in the adoption and use of the IS that impact their effectiveness and success. Nature of the IS as the focus of this study is described as nationally provided, but locally used in the participation of multiple actors across organisations

in achieving a common societal goal. The society would be formed of local communities of practice (Wenger 1998) in common use. Further research is required into the analysis of the environmental and social context to develop a greater understanding of actor perspectives which can be developed towards gaining intellectual buy in and societal value. Subsequently, factors relating to IS acceptance and use (Venkatesh, Morris et al. 2003) and dimensions of IS success (DeLone and McLean 1992) are identified and require exploration in assessing and evaluating changing sentiment over time, in the context of boundary conditions such as type of IS, timing of adoption, success and voluntariness (Petter, DeLone et al. 2008).

1.1.3. Research questions

Based on the problem areas outlined above, the following research questions emerge:

What are the barriers to incorporation into local practice of health Information Systems adoption in convergence to signified goals?

What are the factors that contribute to divergence from expected use of health Information System from official expectations?

What is the impact of policy and design events in boundary work on health Information Systems success?

What is an effective way to capture boundary types in human-information aspects of health information systems adoption and use?

How can a framework be incorporated into the Information System blueprint to evaluate transformational factors that influence Information Systems success?

1.2. Aims and objectives

The aim of this study was to investigate the role and evolution of the health Information System in various organisational contexts to reveal the issues towards adoption, factors contributing to unintended use, and the impact of policy and design intention on IS Success.

The key objectives of this study were:

- To review legislative, regulatory, strategy, policy, design and guidance documents pertaining to the Information System, in order to develop understanding of policy and design intention

- To characterise the role of healthcare Information System within the wider organisational context, and establish factors contributing to adoption and IS success, to establish the relationship between human-information system
- To develop a methodology for the assessment and evaluation of policy impacts and design on the attributes contributing to IS success
- To develop an analytical framework to guide the implementation, adoption and expected use of national healthcare information system
- To develop a conceptual model on the influencing factors of awareness practices on dimensions of IS success

The purpose of the first objective in document review was to provide an ‘official’ contextual basis from the perspective of the IA and ISO, as background knowledge on IS related policy and design intention. A review into the literature provided the conceptual basis for the analytical approach of the study. Through the achievement of the above research objectives, the research aim was satisfied to address each of the research questions.

1.3. Expected contribution

This study explored the existing theory on Boundary Objects (Star and Griesemer 1989) in order to characterise the IS, and the perspective of the relationship between people and IS within their organisations. The study drew on existing literature on IS success (DeLone and McLean 2016) and explored the interdependencies associated with variable attributes relating to IS adoption and success factors in use. Practical utility was developed through the application of techniques drawn from Organisational Semiotics (Stamper 1973) to develop approaches to analyse and evaluate the IS within organisations.

1.3.1. Theoretical contribution

In characterisation of the technical IS as a boundary object, analytical techniques supported by organisational semiotics have been utilised to support assessment of multiple case studies of collaborative and co-ordinated work around the artefact. In the application of this approach a deep understanding of causal factors were uncovered in determining the intricacies of stakeholder groups. This can be advantageous as the meaning, intention and beliefs within the formal and informal system can be reviewed with the boundary object functioning as a constant artefact in different contexts over time.

This view established over multiple instances provided insight into contrasts between actual practice and official expectations. Further exploration was made to identify design issues which in themselves contribute to impacts on intended use and IS success. This theoretical approach would be useful for similar IS that require the action of multiple stakeholders across several organisations within the formal and IS on a local, regional or national scale. The IS Success Model (DeLone and McLean 2016) was used to support attribution of factors in changing perceptions contributing to IS success. Therefore, this research aims to contribute to boundary object theory and deepen the understanding of factors contributing to IS success.

1.3.2. Practical contribution

This study provides descriptions of the generative mechanisms for and why IS adoption and use maybe divergent from design intentions. This was measured by comparing the use of IS against various policy and strategic drivers, differences in local implementation and use, and the environmental and social context on the state of the system. The study took place during a period of system transition which provided the opportunity to focus the assessment on the implications of changes in design intention to accommodate specific user needs, and how this is negotiated within view of the strategic and policy initiatives.

This research has implications on future system design in terms of the technical aspects of the IS, overarching governance structures established by the IA and feedback, evaluation, and development processes. Understanding these aspects will facilitate standard assessment of desired outcomes to provide systematic feedback to inform policy, governance and quality metrics, with broader application to evaluation frameworks in the context of IS adoption through various IS evolution states of implementation, operationalisation, utilisation, optimisation.

1.4. Outline of thesis

Structure of this thesis is composed of an introduction to the literature in Chapter 2 encompassing Technology Acceptance and IS success. This is followed by a background into the realist approaches taken to study in healthcare contexts of IS, and their adoption in the NHS. Theoretical foundations are provided in Chapter 3 in discussion of the previous literature on boundary object (Star and Griesemer 1989) theory and its application in the study of the focal IS. An introduction to the applied concepts in organisational semiotics is presented as part of incorporation into the analysis strategy in the research methodology. In Chapter 4, the philosophical background comprised of the research paradigm leads into the outline and

description of the research approach. The data collection methods and analytical framework are described, followed by research validation and ethical considerations. In Chapter 5, the results and key findings are presented on the policy and IS design context, observations of expected IS use, and factors in IS adoption and contribution to success. The main results from data collection and analysis are presented in Chapter 6 in the form of 4 cases, structured by an exploration of adoptability, use and acceptance of the IS and factors contributing to IS success in each case. In Chapter 7, the results and key finding are discussed, and the research questions addressed. Emerging themes are discussed, and practical recommendations are provided in utility and future work from this study. The thesis is concluded in Chapter 8. References used during this study are provided, and followed by the appendices containing the data used in the analysis.

2. Acceptance and success of Information Systems, and adoption in the NHS

2.1. Introduction

This literature review was conducted relating to key terms in the literature on Information Systems acceptance & success, and adoption in the NHS. Technology acceptance is a widely studied area that aims to understand the factors that affect the ways in which, at an organisational to individual level, intended behaviour and expectancy towards technology may affect individual perception. A background on technology acceptance is explored reviewing the literature on behavioural intentions to perceptions towards use of technologies, and individual perceptions of expectancy towards the technology. This supports the understanding of how organisations and their actors relate to technologies and IS, and how IS may succeed or fail in meeting the expectations of these actors. This background leads into the literature on success factors for IS and identifies specific attributes and dimensions of IS success. The literature develops on the main factors in IS success and research gaps identified in the relationship between technology acceptance and IS success. Secondly, the literature on adoption of innovation in NHS is reviewed to establish the methods and approaches taken to identifying barriers to adoption and key areas of focus in improving adoption of IS in NHS. There are a large number of adoption studies in the NHS, and this review particularly focuses on the adoption of national systems and services and the specific literature on IS within the scope of the NHS in England.

2.2 Technology acceptance and Information Systems success

(Robey 1979, p.537) theorises that: "A system that does not help people perform their jobs is not likely to be received favourably in spite of careful implementation efforts". Users are driven to IS adoption owing to the functions it performs for them, and secondarily for how easy or difficult it is to get the IS to perform those functions. Although difficulty of use can discourage adoption of an otherwise useful system, no amount of ease of use can compensate for a system that does not perform a useful function. A focus has been made on 'acceptance' of IS as a constituent of IS adoption, where 'Use' has remained a primary component of interest relating to intentions, effort and expectancy of Use. Conceived from the Theory of Reasoned Action (Fishbein and Ajzen 1975), Behavioural Intention (BI) was defined as the individual's subjective probability that he or she will perform a specified behavior. Attitude refers to an individual's

degree of evaluative affect toward the target behavior. A study of medical computing (Kaplan 1982) posited that applications which do not significantly change the practice of medicine or significantly challenge what the physician considers the essence of medical practice, are more likely to be accepted by physicians. In application to IS, the essence being that the proposed IS solution should not impinge on the practice of medicine and in the least support existing clinical practice. Through digitisation, the IS should have the ability to acknowledge and provide the basic essential aspects of the clinical context. But this could be deemed as interfering with the clinicians' role in patient management and should allow the autonomy for guiding clinical practice.

In the Technology Acceptance Model (Davis 1989), attitude toward using, is a function of two major beliefs: Perceived Usefulness and Perceived Ease of Use. Perceived Ease of Use has a causal effect on Perceived Usefulness. Perceived Usefulness was defined as "the degree to which an individual believes that using a particular system would enhance his or her job performance." Perceived Ease of Use is defined as "the degree to which an individual believes that using a particular system would be free of physical and mental effort" (Davis 1989, p. 320). Design features directly influence Perceived Usefulness and Perceived Ease of Use. Design features, instead affected these variables only indirectly through Perceived Usefulness and Perceived Ease of Use (Davis, Bagozzi et al. 1989). People formed general perceptions of a system's usefulness that were strongly linked to usage intentions and their intentions were significantly correlated with their future acceptance of the system. Usefulness of the system was identified with importance. Users may withstand a difficult interface in order to access important functionality, while no amount of ease of use will be able to compensate for a system that does not do a useful task (Davis, Bagozzi et al. 1989).

A marketing study by Hauser and Simmie (1981) concerning user perceptions of alternative communication technologies similarly derived two underlying dimensions: Ease of Use and Effectiveness. Both Ease of Use and Effectiveness were influential in the formation of user preferences regarding a set of alternative communication technologies. Decisions regarding technology acceptance and actual usage are often done collaboratively or with an aim to how they fit in with, or affect, other people or group requisites. By human agency, we mean that a decision maker is capable at times of choosing to act in a way that is not impulsive, compulsive, habitual, coerced, nor bribed, but rather results as an intentional response (Searle 1992).

Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh, Morris et al. 2003), expands on this and posits three direct determinants of intention to use (performance

expectancy, effort expectancy, and social influence) and two direct determinants of usage behaviour (intention and facilitating conditions). Performance expectancy is defined as the degree to which using a technology will provide benefits to consumers in performing certain activities; effort expectancy is the degree of ease associated with consumers' use of technology; social influence is the extent to which consumers perceive that important others (e.g., family and friends) believe they should use a particular technology; and facilitating conditions refer to consumers' perceptions of the resources and support available to perform a behaviour (Venkatesh, Morris et al. 2003, Brown and Venkatesh 2005). According to UTAUT, performance expectancy, effort expectancy, and social influence affect behavioural intention to use a technology, while behavioural intention and facilitating conditions determine technology use. Facilitating conditions are under significant moderating influences of age, gender and experience. Experience is an important moderating variable in IT adoption contexts because, as suggested in much prior research, individuals' reactions toward an IT may change over time (Karahanna, Straub et al. 1999, Bhattacharjee and Premkumar 2004). UTAUT underscores this point and highlights the importance of contextual analysis in developing strategies for technology implementation within organisations. Despite the ability of the existing models to predict intention and usage, current theoretical perspectives on individual acceptance are notably weak in providing prescriptive guidance to designers (Venkatesh, Morris et al. 2003). Experience can be characterised differently to habit in the relationship between human-IS studies, where lived experience of IS can contribute to expertise from the previous use of an IS. Habits can form in relation to experiential learning through ongoing use over a period of time. Also, the feeling of sensation to a level of (dis)satisfaction can also be constitutive of experience to a user, relating to the perception of the human aspects of IS. It is the latter that is applied as the reference in the context of this study.

Behavioural Expectation (BE) captures the influence of external factors (e.g., situations and/or environmental factors) that may augment or inhibit the ability to perform a desired behaviour, for example IS use. BE takes into consideration external influencers such as social influence that can facilitate or impede such use. It is possible that social influence affects BE through compliance and affects BI through internalisation and identification (Maruping, Bala et al. 2017). Managerial support and training programmes were suggested to support BE and may also be the case in addition to expectation setting in mandatory adoption contexts. Managers and system designers can potentially include these design characteristics to influence individuals' BE to use a system. Moderators can be used to identify users who are most likely to need support, thus giving managers an opportunity to ensure that adequate support is in place for those users

(Maruping, Bala et al. 2017). An IS designed to gather data as a by-product of human-IS interactions would be more likely to be adopted by health clinicians, rather than repositories of decontextualised data collected and input by a range of actors that have no interaction. The top down nature of projects provides limited scope for productive engagement with users, in particular clinicians, over and above sporadic consultation exercises (McLoughlin, Garett et al. 2016).

The literature insofar highlights the importance of user perspective relative to an IS under consideration. Also, that there is an intention with regards to IS adoption and use, which implies a designer or information authority responsible for the adoption of the IS. Where IS use is mandatory there are intended benefits to be realised from adoption and use, and these benefits, as of adoption and use can be profiled to a range of stakeholders. Therefore, in order for the IS benefits to be realised there is requirement for the measurement of success in terms of IS implementation, operationalisation, optimisation and utilisation as a dynamic progression of adoption, use and acceptance. For this, an understanding of effectiveness is needed from the perspective of the actor and respective to the Information Authority.

When investigating the perceived effectiveness of organisations, (Cameron and Whetten 1983) describe seven lines of enquiry when measuring organisational performance:

1. From whose perspective is effectiveness being judged?
2. What is the domain of activity?
3. What is the level of analysis?
4. What is the purpose of evaluation?
5. What is time frame is employed?
6. What types of data are to be used?
7. Against which referent is effectiveness to be judged?

These questions can be answered at the level of the IA responsible for IS policy and design with some ideal level of desired characteristics, stated goals and performance. Different individuals are likely to evaluate the consequences of IT use in different ways: "IS Success is thus conceptualised as a value judgement made by an individual, from the point of some stakeholder" (Seddon 1997, p.248). The evaluation of IS practice, policies, and procedures require an IS success measure against which various strategies can be tested. In the IS effectiveness process, the dependency of user satisfaction on the use of the product is an

example of such a dependency relationship. So, while there is a temporal dimension to IS success measurement, there is also an interdependency dimension.

Delone and Mclean, in the Six Dimensions of IS Success model (DeLone and McLean 1992), conceptualise the relationship and interdependency between various dimensions of IS success, and the subsequent impact at an individual and organisational level. Developing on previous literature on technology acceptance, the IS success model was found significant in the context of this study as it addressed the relationship between human use of IS and the impact of user satisfaction in the individual and subsequently the organisation. This model was therefore useful in conceptualising views and perceptions of success relative to IS and organisation, from the individual perspective. Delone and Mclean found that system quality and information quality singularly and jointly affect both use and user satisfaction. Additionally, the amount of use can affect the degree of user satisfaction, either positively or negatively. In the IS success model, both use and user satisfaction contribute to individual and organisational impacts. This relationship is represented in Fig. 7:

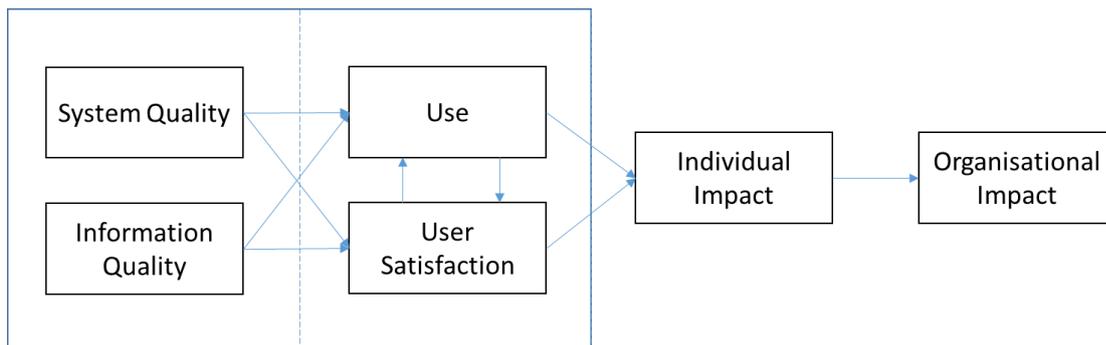


Figure 7 - IS Success model (Delone and Mclean 1992)

Researchers attempting to measure effects of user participation on the subsequent success of different IS may rely on user satisfaction as their primary measure, without recognising that system and information quality may be highly variable among the systems being studied (DeLone and McLean 1992).

Measurement of IS success or effectiveness is critical to our understanding of the value and efficacy of IS management actions and IS investments. Declining usage may be an important indication that the anticipated benefits are not being realised. Variability in the quality and intensity of this use is likely to have a significant impact on the realisation of the system benefits.

Delone and Mclean, in referring to use in mandatory versus voluntary, informed versus uninformed, effective versus ineffective contexts, suggest intention to use as a more appropriate measure as it is an attitude, while use is a behaviour. They found that use must precede user satisfaction in a process sense, but positive experience with use will lead to greater user satisfaction in a causal sense. Similarly, increased user satisfaction will lead to increased intention to use and thus greater use. As a result of this use and user satisfaction, certain net benefits will occur (DeLone and McLean 1992).

The critical success factor for IS measurement is not system use, but that net benefits or impacts should flow from use. A successful system will provide benefits such as helping the user do more or work better in the same time, or take less time to achieve as much work with the same quality as was done in the past (Seddon 1997). Workers and managers may have different goals. Even if they agree on what the outcomes of system use are (the consequences), they may have different conclusions about success of the system. When senior management are asked to evaluate their systems, they will tend to talk in terms of the systems perceived contribution to organisational profitability or to the efficiency of the organisation. By contrast, clerks in an organisation are more likely to be concerned with whether the system makes it easy or difficult for them to record new data, correct errors, or extract the detailed information they require (Seddon 1997).

Different stakeholder groups were identified in the evaluation of IS (Seddon, Staples et al. 1999) such as observers, individuals, groups, managers, and societies, along with different types of measures that could be used to evaluate these systems. Using a matrix, the authors demonstrated that there should be different measures of success, depending on the stakeholder involved and the context of the system.

In the Delone and Mclean IS Success Model, 'systems quality' measures technical success; 'information quality' measures semantic success; and 'use, user satisfaction, individual impacts', and 'organisational impacts' measure effectiveness success. As represented in Fig. 8, in the 2003 updated model, quality has three major dimensions: 'information quality', 'systems quality', and 'service quality'. Each should be measured or controlled for separately, because singularly or jointly, they will affect subsequent 'use' and 'user satisfaction'. As a result of this 'use' and 'user satisfaction', certain 'net benefits' will occur. If the IS or service is to be continued, it is assumed that the 'net benefits' from the perspective of the owner or sponsor of the system are positive, thus influencing and reinforcing subsequent 'use' and 'user satisfaction'. These feedback loops are still valid, however, even if the 'net benefits' are negative. The lack of positive benefits is

likely to lead to decreased use and possible discontinuance of the system or of the IS department itself.

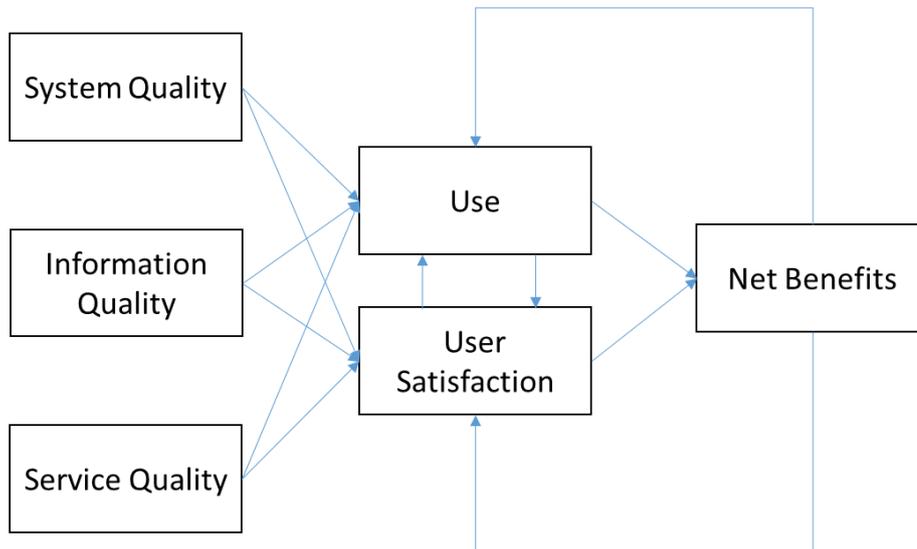


Figure 8 – Updated IS Success model (Delone and Mclean 2003)

The dimensions of success relative to the IS and IS service organisation and derivation of variables can be described as:

System quality – the desirable characteristics of an IS. For example: ease of use, system flexibility, system reliability, and ease of learning, as well as system features of adoptability, intuitiveness, sophistication, flexibility, and response times are examples of qualities that are valued by users of IS. In this study, the specific aspect of reliability is encompassed under service quality and is applied in that manner in the rest of the study.

Information quality – the desirable characteristics of the system outputs; that is information, knowledge and management reports and capability to retrieve. For example: relevance, understandability, accuracy, conciseness, completeness, usability, and usefulness

Service quality – the overall quality of the support that system users receive from the IS department and IT support personnel. For example: responsiveness, accuracy, reliability, technical competence, and empathy of the personnel staff. Reliability relates both to the technical reliability of IS, and that of the IS service organisation.

System use – the degree and manner in which staff and customers utilise the capabilities of an IS. For example: amount of use, frequency of use, nature of use, appropriateness of use, extent of use, and purpose of use.

User satisfaction – users' level of satisfaction with IS and experience of support services. For example, acceptance. The most widely used multi-attribute instrument for measuring user information satisfaction can be found in Ives, Olson et al. (1983).

Net benefits – the extent to which IS are contributing to the success of individuals, groups, organisations, industries, and nations. For example, perceived usefulness or job impact is the most common measure at the individual level. At the organisational level, effectiveness may be a good indicator overall.

Focusing further on use, confirmation is required on the meaning of 'Use of the System', in a technical sense, or 'Use of the Information', in a cognitive one. IS use for systems success (DeLone and McLean 2016, p.40) was re-conceptualised as: "The extent to which IS incorporated into the user's business processes" and that "the only type of use that produces these effects is that in which the IS has become a part of the user's standard operating procedures, and has been internalised and become part of the user's process knowledge". To achieve this goal, it is not solely the technical quality of the system that will drive benefits to the organisation or society, but the value of the information and experience that is produced by the system. The object of these dimensions is to measure the level to which the system has been made part of the user's process knowledge, where 'the system is the process'. Amount of use, which is a widely used measure of 'use', becomes a less useful measure where use is mandatory rather than under the discretion of the user. However, with system use which is inappropriate or ill-informed, there may also be no benefits. Furthermore, no system use is totally mandatory. At some level of the organisation, an executive or management committee has chosen to implement a system and require employees to use it. Thus, whereas usage of a system may be mandatory at one level, the continued adoption and use of the system itself may be wholly voluntary, based upon management judgment, at a higher level or even lower level. Management always has the option of discontinuing a system that is not providing the desired results and benefits (DeLone and McLean 2003).

In a review of the IS success literature (Petter, DeLone et al. 2008) it had been theorised that system quality leads to net benefits and net benefits leads to use. Therefore, high quality systems lead to greater net benefits, and that systems that yield higher net benefits are used to a greater degree. A number of other boundary conditions were identified such as the

voluntariness of the system, the timing of success measurement (the difference between the time in the lifecycle of the system and the time of measurement), and the type of IS examined. With increased experience in using a system, problems come to light and possible improvements are recognised, contributing to requests for changes and updates to the system, what is commonly called 'maintenance'. This requires the need for an additional set of feedback loops. Evaluating IS success has evolved from originally focusing on speed and accuracy, which is a more quantitative and objective evaluation, to now considering the strategic and social impacts of the system, which is a more qualitative and subjective evaluation. Therefore, meaningful IS success measures must capture the information requirements of all stakeholders, and yet be reasonably parsimonious to be useful and practical to researchers and practitioners. To accomplish this goal, it is not just the technical quality of the system that will drive benefits to the organisation or society, but the value of the information and experience that is produced by the IS (DeLone and McLean 2016).

Organisational role is a demographic user characteristic that has a moderate influence on IS success, and the position of a person within an organisation has an impact on multiple dimensions of IS success (Petter, DeLone et al. 2013). User involvement, relationship with developers, and domain expert knowledge were found to be moderate predictors of IS success and most often associated with user satisfaction. For example, by having users involved in the development process, it is likely that user expectations can be better managed. Management support was identified as best supported organisational characteristic that predicts IS success. Studies have found consistent relationships between management support and success measures such as use, individual impact, and organisational impact. However, results were mixed when user satisfaction was the dependent variable. While managers cannot always change the level of technology experience of their users, it is possible to influence the users' attitudes, self-efficacy, and experience through training or other activities to assist the users to feel more comfortable with the IS. The strongest determinants for use include organisational competence, extrinsic motivation, and IT infrastructure. The knowledge possessed by the management of a firm about IS, known as organisational competence, is a strong predictor of use (Petter, DeLone et al. 2013). In a study of e-Learning Systems (Freeze, Alshare et al. 2010), system quality and information quality were suggested to indirectly impact success, predominantly through user satisfaction. System quality was identified as the best determinant for user satisfaction, which is inter dependant with use. Purposefulness in use was a dependant variable between system quality and user satisfaction.

2.3 Adoption of Information Systems in NHS

Healthcare in the UK is instilled with institutional logics arising from various sectors across the field, and is contentious where societal level logics are embodied in policies and procedures that cascade down to organisations from national authorities (Currie and Guah 2007, p.237). Various stakeholders including clinicians, managers, administrators and patients interpret and re-interpret these logics according to the degree to which they affect changes to the perceived or real material resource environment of the institutional actors. The implementation of Choose & Book (legacy IS), however, was particularly problematic, as clinicians were highly critical about being 'left out of the loop' in the critical design stages of the system, highlighting a flaw in the process of design and development of the IS. As General Practitioners (GPs) operate as autonomous businesses and there was a cost implication of using Choose & Book it was found that unless GPs buy into the system, the take-up would be poor. The success of Choose & Book, for example, was posited to depend not only on the clinicians' and administrators' assessment of its effectiveness, but also from the patients' viewpoint. This may be counterproductive as public criticism of Choose & Book (and other facets of the National Programme for IT (NPFIT) destabilised its further implementation and enhancement (Medix 2006). Rapid change is an unusually attributed to healthcare, as hospitals, for example, display highly institutionalised structures and practices, which, by definition, are more amenable to incremental rather than discontinuous change (Scott, Ruef et al. 2000). Prior studies on IT innovation have largely applied the organisation or even individual as unit of analysis. To understand full implications, the wider societal context are all relevant constituents in development, implementation and evaluation. Sedimentation is achieved by the almost complete diffusion of structures across a group of actors who may be likely adopters, and by the reinforcement of structures over a significant time period (Currie and Finnegan 2011). A weak, yet positive relation between a structure and desired outcomes may be sufficient to affect the spread and maintenance of structures, especially if advocates continue to be actively involved in the rhetoric and promotion. However, in many cases, the link between the structure and the intended outcomes is quite distant, and demonstration of impact difficult to discern (Clegg, Hardy et al. 1999).

Adoption of innovations can be clustered into three categories with differing preoccupations: (1) explaining patterns of adoption in terms of where and when, (2) establishing determinants or correlates of adoption by individuals, and (3) explaining the processes by which innovations come to be adopted (Robert, Greenhalgh et al. 2009). Adoption in basic terms can be defined at an individual basis as acceptance and making one's own by assent. Organisational adoption has been defined as 'the discrete organisational decision to accept or reject an innovation'.

Where 'discrete organisational decision' is viewed as a relatively distinct organisational event, where processes of adoption and implementation are fundamentally different' (Robert, Greenhalgh et al. 2009). The adoption of innovative healthcare technologies with a proven ability to deliver increased patient benefits and significant efficiencies is perceived as slower in the NHS than other healthcare economies. These projects will involve managing implementation and systems integration issues of the technology, as well as identifying where additional changes to a clinical pathway or service may need to be made in order to unlock the full benefit of each technology. In a study of technology supported programmes (Greenhalgh, Wherton et al. 2017) suggest that acceptance by professional staff may be the single most important determinant of whether a new technology succeeds or fails at a local level. Interpersonal connections are also critical for creating the necessary trust in innovation (Liebe, Hüßers et al. 2016).

A lack of digitisation clearly limits the ability of healthcare organisations to, for example, effectively share information between patients, professionals, care settings and organisations, as does the fact that the NHS contains a plethora of incompatible patient record systems that were developed to meet the needs of local services or specialties. In a study of factors affecting digital health innovation (Asthana, Jones et al. 2019) digital maturity would appear to be geographically concentrating rather than trickling down, and fragmentation of the NHS is the most important barrier to innovation, a problem that is exacerbated by current approaches to appraisal that are not sufficiently agile for rapidly evolving technologies. Comparatively in a study of mobile banking in the financial sector (Zhou, Lu et al. 2010) the authors postulated that users may be utilitarian, and their adoption is not only determined by their perception and attitudes toward the technology, but also by a good task technology fit. They found that task technology fit not only affects user adoption but also affects performance expectancy. Subsequently, three key areas for consideration were identified: effort expectancy reflecting the ease of learning to use; social influence of stakeholders on user adoption behaviour; and facilitating conditions of the resources and user knowledge and skills.

Adoption of IS in the NHS therefore needs to be able to appraise and evaluate IS adoption in various localities over time. Additionally, for that evaluation to be agile and in alignment with standards that support integration and interoperability in the resolution to fragmentation. Social influence and facilitating conditions on end use, acceptance of the IS and interrelationships in use of the IS may contribute to successful adoption.

2.4 Summary

Adoption of IS at the individual level is associated with progressively taking new approaches and 'acceptance' as making one's own by assent, and at the organisational level forthcoming innovation, in best course characterised as progressive and incremental, when evaluation is carried out in various localities over time. Adoption is enabled in assessment and evaluation of clinical pathways cross settings and in any IS adoption context where IS can perform a useful job function to enhance job performance and specifically fit to a task (Greenhalgh, Wherton et al. 2017). The effort expectancy (Venkatesh, Morris et al. 2003) is the ease or difficulty in learning to use the IS. There is stakeholder influence on adoption behaviour, and knowledge, skills and experience in use are moderating factors. Use in a technical or cognitive sense relates to process knowledge and the enactment of Standard Operating Procedures (DeLone and McLean 2016). Intention to use (Venkatesh, Morris et al. 2003) is based on perception of usefulness and quality of the information and system. The relationship between experience and use can be described as a feeling of sensation to a level of (dis)satisfaction.

Management will have responsibility for the benefits of IS success, where the role of management in competence may be expectation setting, training and support on intended IS use, and set 'target behaviour' to realise the value and efficiency of IS adoption. Measurement of effectiveness from various value judgements would be useful in evaluating successful adoption, and the net impacts in 'use' and subsequently 'user satisfaction'. The Six Dimensions of IS success (DeLone and McLean 2003) can be utilised to assess and evaluate the IS and service organisation in terms of effectiveness, and the complex interplay and dynamics relative to maintenance and feedback, and information value and experience effect on Use and User satisfaction.

3. Theoretical foundations - Boundary objects and organisational semiotics

3.1. Introduction

In this review of the literature the concept of 'objects and artefacts is explored and developed into a presentation of objects that manifest boundaries, as boundary objects in use. Association is made between the role of an IS within and across organisational boundaries and the role of crossing these interfaces. A summary of concepts from organisational semiotics is provided to establish an analytical perspective to IS and develop the techniques to investigate the IS relative to the human-information aspects of technical systems. The scope of this review is around the application of boundary object theory to characterise healthcare IS and the utilisation of human information functions in organisational semiotics to analyse the object from a participant perspective. Boundary objects was chosen as an underlying theory for the basis of this study as it provides a theoretical lens for the view of an IS in multiple instances over time, and the role of practices at the interface between organisations, people and IS. Organisational semiotics was chosen due to the utility in analytical approach towards Information Systems in organisations, and in particular the human-information functions in semiosis. This theoretical perspective assists in the deeper understanding of factors impacting on IS adoption and success, by providing a view of the information system from a variety of perspectives, ability to ascertain the meaning associated with the information systems, and utility in application of analytical techniques from organisational semiotics, particularly at the interface between human and information system.

3.2. Boundary Objects

3.2.1. Objects

Objects have ranged in their description and categorisation from the more abstract epistemic objects (Rheinberger 1997) to the further tangible boundary objects (Star and Griesemer 1989) as characterised in museum taxonomies, project management tools (Sapsed and Salter 2004), timelines or Gantt charts (Yakura 2002), and as technical objects in the form of machines and parts (Carlile 2002). Epistemic things and objects embody complexity and ambiguity. They are open ended and work as a source of interest and motivation by virtue of their opacity (Rheinberger 2005). The appearance of the epistemic object generated collective problem

solving sustained by practices such as questioning, framing, probing, and telling 'war stories' (Nicolini, Mengis et al. 2012). Epistemic objects are plural and evolving; they are multiple and unfold over time. The lack, uncertainty or indeterminacy of epistemic objects generates questions which turn into avenues for further exploration. Pursuing these avenues causes the epistemic object to evolve, satisfying some questions while leading to new ones (Knorr-Cetina 1997, Knorr-Cetina 1999). The epistemic object is a broad abstract phenomenon, partially captured within a visual representation, which is an instantiation of it. In multifunctional teams, elements of visual representations convey different relevance to various actors. Meanings shift, supporting different interpretations carrying different implications for different actors, depending on their context and agenda (Ewenstein and Whyte 2009). Epistemic objects exemplify the unknown, open ended, nature that can be related to a blueprint, programme or governance framework. The activity of occupational health and safety inspection in Finland (Miettinen and Virkkunen 2005) were made into an epistemic object, where this led to both a new kind of inspection practice and the creation and implementation of a new set of tools necessary for carrying it out. Technical objects are determined, repeatable and transferable in nature. They can be seen to convey the routines, and activities of the procedure in practice through local adaption of the interdependent object technicalities.

Cooperative work is essentially characterised by distributed control where work plans, conventions and the coordinative artefacts play a critical role in reducing the effort of handling the complex interdependencies. Despite agreement over the centrality of artefacts to both thought and action, the nature of objects of work is seen as complex and ambiguous (Engeström and Blackler 2005). For actors to be able to define, specify, and control the execution of the mechanism, the protocol should be 'visible' to actors at 'the semantic level of articulation work', i.e., it should be expressed in terms that are meaningful to competent members of the cooperative work arrangement (Schmidt and Bannon 1992). It is important to understand how IS development is performed as a socio-material practice in contexts such as open-source software, co-development with users, and the implementation and customisation of enterprise and inter-organisational systems. In such development environments, the diverse groups involved are separated not only in terms of knowledge domains, but culturally, linguistically and geographically; the design of systems and artefacts is not solely the responsibility of IS professionals; and the boundary between development and use is blurring (Doolin and McLeod 2012).

IS are the ensemble or 'web' of equipment, techniques, applications, and people that define a social context, including the history of commitments in making up that web, the infrastructure

that supports its development and use, and the social relations and processes that make up the terrain in which people use it (Orlikowski and Iacono 2001, p.122). The tool view, the proxy view, the ensemble view, the computational view, and the nominal view were identified at theoretical vantage points in previous conceptualisation of IT. In the tool view, the dependant variable is what is affected, altered and transformed by the tool. In the proxy view, one or a few key elements represent the essential aspect, property, or value of the IT. The tool view of an information system assumes a rational designer and a rational user. It assumes that if users have well designed tools and receive training, then they should use these tools to their benefit, as designed, and with minimal problems (George and Kohnke 2018). In the ensemble view, the technical artifact is an element in a package that is applied to socio-economic activity to enable the effective management and use of new technologies. The computational view is interested in the capabilities of the technology to represent, manipulate, store, retrieve, and transmit information, thereby supporting, processing, modelling, or simulating aspects of the world. In the nominal view, the conceptual and analytical emphasis is elsewhere, typically focused on a range of topics of broad interest to the IS field. In many articles over the past decade, IT artifacts are either absent, black-boxed, abstracted from social life, or reduced to surrogate measures. IT artifacts are designed, constructed, and used by people; they are shaped by the interests, values, and assumptions of a wide variety of communities of developers, investors and users. They are always embedded in some time, place, discourse and community. The components and interconnections that make up IT artefacts require bridging, interrogation and articulation in order for them to work together (Orlikowski and Iacono 2001).

A study in exploration of technology at work (Orlikowski and Iacono 2001) identifies difficulty concerning the explicit focus on technology adoption, diffusion and use as separate and distinct phenomena occurring within organisations. The difficulty associated with organisational studies of technology adoption, diffusion and use has a tendency to focus either on technology effects (a techno-centric perspective) or on interactions with technology (a human-centred perspective). IS are systems for using signs in the sense that they act as a communication medium between different people, sometimes spatially and temporally distant. IS are best described as semi-formal languages: some of their features are designed; some of their features emerge in continuous human interaction (Beynon-Davies 2009).

The roles of physical and conceptual artifacts can be described as informative socio-material forms in the practices of sharing, disseminating, reusing, and exchanging information, with a specific focus on how specific artifacts can support and serve multiple, multifaceted communities and allow users to engage in situated, distributed, and social information work.

3.2.2. Boundary objects

Boundary objects reside amid different social worlds, groups cooperate without consensus, tacking “back-and-forth between both forms of the object” (Star 2010, p.605). The relationships between these concepts point to the multidimensional nature of objects. An object can be at one and the same time a boundary object and a technical object, or a boundary object and an epistemic object. However, objects can also be used in epistemic work without spanning across boundaries of practice (Ewenstein and Whyte 2009). In the collation of works on Activity Theory (Engeström, Miettinen et al. 1999), objects provide the direction, motivation and meaning for the activity. Objects are depicted, then, not only instruments of translation (as per boundary objects) and sources of attraction (as per epistemic objects), but also as triggers of contradictions and negotiation (Nicolini, Mengis et al. 2012). In a study comparing the work of physicists and biologists in disaster management (Bharosa, Lee et al. 2012), objects are categorised as primary, secondary and tertiary. Primary objects were prominent in the early stages of the collaboration, being used to mobilise commitment. Secondary entered as the ‘idea’ became an epistemic object around which collaboration took shape. Tertiary objects continued to remain in the background, unless they were suddenly promoted, or called into play.

Boundary objects perform a brokering role (Fischer and Reeves 1995) involving translation, coordination and alignment between the interfaces and perspectives of specific Communities of Practice (Wenger 1998). A boundary object may be performed differently across multiple sites, times, practices and participants, with varying effects (Suchman 2007). They facilitate cooperation between intersecting communities by maintaining a common identity while satisfying the informational needs of each (Star and Griesemer 1989, Star 2010) and provide a locus for communication, conflict, and coordination (Yakura 2002) and for actors with diverse goals to work together (Briers and Chua 2001). Boundary objects require a joint field and incorporation into local practice to become boundary objects-in-use (Levina and Vaast 2005) and have material aspects that afford or constrain boundary-spanning practices (Howard-Grenville and Carlile 2006). They enable knowledge transfer and the translation of meaning and interests, but their boundary-spanning effectiveness or role may vary across settings or time (Star and Griesemer 1989, Carlile 2002, Carlile 2004). Boundary objects are inscriptions used across communities of practice and as such are a critical feature of their theoretical approach to embodied representations. They are both plastic enough to adapt to local needs and the constraints of the several parties employing them, yet robust enough to maintain a common identity across sites (Star and Griesemer 1989). Boundary objects cannot be reduced to either their relational or material elements. Instead they should be regarded as particular socio-

material configurations or assemblages that are performed in specific temporal, spatial and organisational contexts (McLoughlin, Garetty et al. 2016). For example, an information system implicated in the work practices of multiple organizational units can become a boundary object (Pawlowski and Robey 2004). Several of the studies reviewed report that artefacts can fail as boundary objects when they do not fully or rightfully capture multiple meanings and perspectives (Akkerman and Bakker 2011). Boundary objects are thereby the links in the communication processes where different perspectives are to be negotiated and discussed into a co-created meaning and consensus (Islind, Lindroth et al. 2019).

The production of boundary objects therefore depends on distributed participation whereby meaning is developed through all participants actively taking part in the negotiations around meaning and in connection to the mutual recognition of other participants (Handley, Sturdy et al. 2006). Knowledge brokering by IT professionals was facilitated by shared information systems, which served as boundary objects. Shared systems and related artifacts) served as boundary objects because they were shared by multiple user organisations. Thus, the shared system was situated in multiple work practices, where it played different roles and embodies meaning (Pawlowski and Robey 2004). Co-construction of meaning, termed as 'processual plasticity' depends upon the enactment of strategies by both superiors and subordinates that both 'soften' downward power relations and, simultaneously 'toughen' upward power relations (Thomas, Sargent et al. 2008). Failure of boundary objects is often explained by horizontal, functional and occupational power relations i.e., as a result of competition among functions or departments (Carlile 2004). Widely distributed participation can, however, be difficult to achieve. For example, work on Communities of Practice has noted that some actors may limit the participation of others (Handley, Sturdy et al. 2006) and that individuals may even voluntarily constrain their own participation (Roberts 2006). The development and implementation of new knowledge often has negative consequences for other organisational members, and boundary objects may be used, not purely for technical purposes, but also as a means of representing and instigating difference and conflict (Bechky 2003). The material apparatus of an IS thus enacts particular scripts that direct and/or constrain human activity in a specific way, depending on the assumptional frameworks for action embedded in its design. Thereby allowing, competing or collaborating stakeholder groups to frame the role and purpose of the IS according to their perspectives (Gasson 2006).

Boundary objects help interacting organisations facilitate cross-organisational communication and form an organisational identity, while they can also act as gatekeepers that selectively filter information between the organisations (Gal, Lyytinen et al. 2008). Clinical simulation as a

boundary object offers an opportunity to create a space where healthcare professional working in different locations or healthcare sectors can meet and exchange knowledge about work practices and requirement needs (Jensen and Kushniruk 2016). A large array of objects have been discussed as boundary objects, including repositories, standardised forms, sketches and drawings, workflow matrices (Star and Griesemer 1989, Carlile 2002) physical and IT objects, prototypes (Bechky 2003, Carlile 2004, Pawlowski and Robey 2004), and more abstract objects such as processes and methods in a biomedical innovation project (Swan, Bresnen et al. 2007). Within this variety of definition and categorisation there is opportunity for future work in the specificity around particular types of objects, in particular, the nature of boundary objects as in recent work deemed as a catch all term for any instantiation that seemed fit (Star 2010). Standardised packages (Fujimura 1992) combine multiple boundary objects with standardised methods which further restrict and define each object, reducing the degree of flexibility without removing it altogether. The concepts of Boundary objects have been refined to that of standards, methods, and residual categories (Star 2010). Further review of boundary objects can enable sensitivity to how individuals, communities, and things interact, and how these interactions have implications for their respective positions in mutual context (Huvila, Anderson et al. 2017). IS researchers have recognised the potential of IS as a boundary object that can facilitate boundary spanning (Carlile 2002) and that boundary objects provide a bridging function, but additionally need supporting awareness practices (Schmidt 2011).

In provision of IS support, raising issues and working towards consensus-based resolution, the notion of collective intelligence proves particularly effective on the web because people from diverse backgrounds contribute in real-time within the same forums (Brabham 2008). Characterising an IS as boundary objects would assist designers better identify each of the relevant user groups. Subsequently, developers could involve representatives of each group simultaneously in the requirements-determination process (George and Kohnke 2018). Investigating web-based systems recognises that the input of this collective takes place across multiple physical or non-physical interfaces. An interface is a means by which interaction or communication is affected at the places where peoples meet, or different social worlds intersect. These different worlds are working with different units of analysis, different representations of data, different scales of time and space, and different audiences (Fujimura 1992). Reaching common understanding between these communities is a major challenge for information technologies due to the communication divide produced by their respective cultures (Snow 1993). The 'meaning' determined and established through interpretation within the organisation, affords the actor the ability to align IS use within organisational cultures.

3.2.3. Boundary interfaces

Although boundary crossing usually refers to an agents transitions and interactions across different sites (Suchman 1994), terms such as ‘brokers’, ‘boundary crossers’, and ‘boundary workers’ are often employed to denote them (Akkerman and Bakker 2011). Although it is consistently reported how boundary-crossing individuals run the risk of not being accepted (Edwards, Lunt et al. 2010), it was found in a historical analysis of boundary-crossing architects that people can receive appreciation for their innovative role in changing established professional practices in the longer term (Jones 2010). The accounts of single groups and individuals crossing boundaries show how they not only act as a bridge between worlds, but also simultaneously represent the very division of related worlds. On one hand they have a very rich and valuable position since they are the ones who can introduce elements of one practice into the other (Wenger 1998). On the other hand, they face a difficult position because they are easily seen as being at the periphery, with the risk of never fully belonging to or being acknowledged as a participant in any one practice. It requires people to have dialogues with the actors of different practices, but also to have inner dialogues between the different perspectives they are able to take on (Akkerman, Admiraal et al. 2006).

Reflection involves what Boland and Tenkasi (1995) in their study called perspective making, which is making explicit the brokers understanding and knowledge of a particular issue. Their role can be needed to render boundary objects intelligible to other parties or for future use (Lee 2007, Lutters and Ackerman 2007). Identification processes occur by defining one practice in light of another, delineating how it differs from the other practice. This dialogical process of identification can be called ‘othering’ (Akkerman and Bakker 2011). Ackerman identifies four dialogical learning mechanisms of boundaries: (a) identification, which is about coming to know what the diverse practices are about in relation to one another; (b) coordination, which is about creating cooperative and routinised exchanges between practices; (c) reflection, which is about expanding one’s perspectives on the practices; and (d) transformation, which is about collaboration and co-development of (new) practices. The broker’s role is a delicate balancing act. Effective brokers need to have authority within all groups to which they belong. They need to be able to evaluate the knowledge produced by the different groups and to earn the trust and respect of the various parties involved. Over time, the broker’s activities may lead to the development of a repertoire of shared resources such as rules, procedures and the boundary objects used by the group (Kimble, Grenier et al. 2010). A study of innovation in collaborative engineering (Carlile 2004) also recognises the political nature of these processes, as the positions held by actors can be divergent and contradictory. In a healthcare context, making,

introducing and using clinical care pathways is crucial for making them work as boundary objects, and continuous work is needed to sustain them. Further, to make the care pathway act as a boundary object, involvement and commitment from all cooperating parties, both leaders and health personnel, is important to make the care pathway work as intended (Håland, Røstad et al. 2015).

Convergence is defined as uniformity or towards union and coming together of two or more things, whereas divergence is the increasing difference of two or more things. Boundary workers or spanners (Gasson 2006) facilitate conveyance in actions or transporting from one place to another as a conveyor that transports across a boundary. These social architects were the leaders who shaped the environment and set the tone that encouraged behaviour towards certain goals. The different perspectives of individuals and groups brought to the issue perpetuated professional and epistemic boundaries and those resulted in semantic boundaries. The degree of alignment between these positions and other features determined outcomes, including the potential to create shared spaces for collective action (Rycroft-Malone, Burton et al. 2016).

Boundary objects are artefacts that link different sets of diverse interests; they are the physical or virtual entities that allow groups to coalesce and form stable, if transitory, working relationships. They allow coordination without consensus or shared goals, as boundary objects permit an actor's local understanding to be reframed in the context of a wider collective activity (Bechky 2003). In contrast, structures that shape how knowledge is shared are always and inevitably influenced by immediate circumstances and local agendas (Boden 1994). It is important to understand how use in one constituency is intertwined with use by other constituencies, else designers may not be able to adequately anticipate the consequences that a minor change in use by one group might have on all involved (George and Kohnke 2018). In a design process where heterogeneous user groups are involved, it becomes central to deal with how different agendas and goals are negotiated, as well as how resources supporting such negotiation are constructed and brought into the design process (Islind, Lindroth et al. 2019).

Further strategies are developed on the relationship between broker and boundary objects (Kimble, Grenier et al. 2010). The first is directed towards achieving some form of political balance between the actors in a community and focuses on making information more available. The second is directed towards the definition or control of the overall direction of the community. This leads to the consideration of other political dimensions such as who should be in charge of the system of brokerage, what that system should be, and other issues related to

what might be termed the governance of innovation. In providing these reminders, brokers claimed not to explain to users how their businesses should be run. Rather, they purported to offer insights into how the businesses did run and "pushed back" when they sensed that users were abdicating their responsibilities (Pawlowski and Robey 2004). In the absence of clear authority, the less ambiguity and the less scope for negotiation, the greater likelihood that the boundary object is discarded by one or more local groups (Sapsed and Salter 2004). Cross-domain knowledge outside planned structures determines whether other actors can legitimise themselves to be a boundary spanner by actual behaviour (Zolper, Beimborn et al. 2013). Brokering required getting members of one user organisation to understand and to accept changes in their practice necessitated by system changes. This in essence meant boundary-crossing activities such as networking and transforming local domain knowledge into collective knowledge among the various participants involved. Their credibility as translators and interpreters required knowledge of the perspectives of each user group, the ability to situate the meaning and significance of information in its context, and the ability to communicate those meanings and their significance to other groups (Pawlowski and Robey 2004). Further, actors from different local contexts are involved in a process of sharing work experience, interpreting and comparing different understandings of aspects of care and constructing shared meanings on the performance of their work tasks (Huzzard, Ahlberg et al. 2010).

3.2.4. Boundary alignment

Boundaries evolve within the political and organisational context as do the interfaces which are made over time. Actor perspectives differ between individuals relative to artefacts, and these views can be convergent, divergent, or transformational. Information artefacts and communities of practice converge when use and practice fit design and access, and that individual users' perception of the object is much more important than the object's format in its identification as a boundary object (Star, Bowker et al. 2003). Convergence extends coherence across those organisations, systems and actors that are aligned. Conceptualised as information artefacts, the IS are fitted to the communities of users that create and work with them. Some boundary objects negotiate between perspectives and not constructed from standardised processes, while others specify across perspectives and assist in the establishment of standard processes (Pennington 2010).

Within this study the boundary object is taken to specify across perspectives, but also form different perspectives not based on negotiation, but interpretation.

In a context of knowledge transfer in engineering (Carlile 2004), boundaries have been classified as: 1) a syntactic or information processing boundary; 2) a semantic or interpretive boundary; and 3) a pragmatic or political boundary. The syntactic boundary is where knowledge transfer occurs between two actors in a syntactic form. The semantic or interpretive boundary can be found between two actors whose backgrounds are different or sharing common ground. The pragmatic or political boundary refers to when actors involved in knowledge sharing have a conflict of interest. It is of importance that the people from the group of actors have a high level of shared understanding, as are responsibilities and the identity of the person or people or groups/communities behind each of the views (Cordeiro and Filipe 2004). Communities of practice may face difficulties in communicating with each other, where shared understandings, identities and meanings do not exist upfront. They evolve incrementally through collaborative conversations, which require a common point of reference. In the language of semiotics, boundary-crossing conversations need shared signifiers although their significations may well be contested (Huzzard, Ahlberg et al. 2010). The semantics of the information carried by the artefact is based on individual cognition, and acquisition of information conveyed by the artefacts requires an interpretive activity on the part of the recipient (Saario, Hall et al. 2012).

3.3. Organisational semiotics

A sign is something which stands to somebody for something else in some respect or capacity, and guides behaviour of people in organisations to collaborate effectively. Signs are categorised into icons by similarity or metaphor, indexes by inherent connections and symbols by conventions or norms. Semiotics is the study of signs and the utility of semiosis as a concept to inform and communicate using signs in a logical way. Organisational semiotics (Stamper 1973) is an approach to analysing, organising and modelling IS in organisations based on the use of signs and sign based artefacts and social norms, which treats organisations as IS. Form of the representation itself significantly affects the meaning that the information may generate, which can be referred to as the semiotics of information.

The organisation as an entity with people that serves some transactional purpose is described in relation to a 'technical' system in the form of the 'organisational onion' (Stamper 1992) represented in Fig. 9.

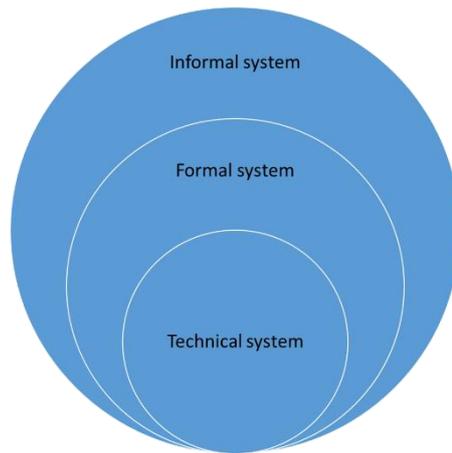


Figure 9 - Organisational onion (Stamper 1992)

The ‘technical system’ is the IT system that users interact with and where actions can be performed, and is the tangible artefact that comprises of information processing activities in sensemaking toward the technological solution. The ‘formal system’ is the set of responsibilities and guidance in the form of standard operating procedures and operational processes. The ‘informal system’ is the level at which policy are set, values and norms are established, and the influence of relationships surround the activity in the formal technical system.

The Semiotic Ladder (Stamper 1973) illustrated in Fig. 10 represents the human-information functions at a level above the technical IT platform.

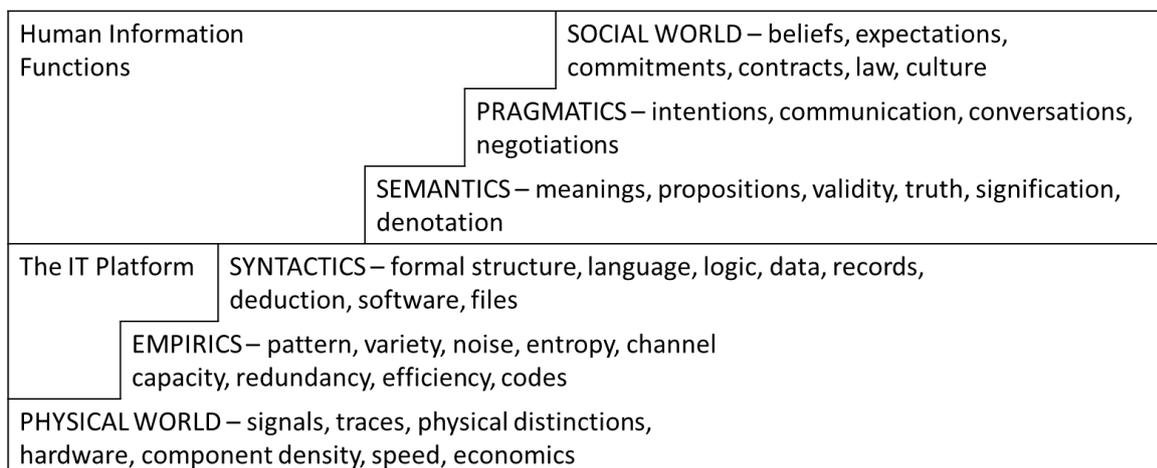


Figure 10 - Semiotic Ladder (Stamper 1973)

The ‘human-information’ functions represent the ‘Semantics’: meaning the relationship of signs to what they stand for, ‘Pragmatics’: the intended relation of signs to interpreters (e.g. the

effect), and 'Social': the relation of signs to values and norms. The 'IT Platform' represents the IT in the form of 'Syntactics', 'Empirics' and 'Physical world' which represent the formal structure, pattern and efficiency, and hardware providing the IT. The human-information functions of the formal and informal system address the way in which actors communicate within an organisation, within an IS, and individual responsibility generating those communications. These communication responsibilities are with respect to social norms and collaborative behaviour in organisations based on people sharing social norms. These various levels and aspects of incorporating human-information functions into analysis of IS in organisations can provide insight into the beliefs and perceptions of actors and their role and performance in the IS.

Semiotics studies the processes that lead signs to have particular meaning and the ways in which such meanings are communicated and have effects. By its nature, semiotics has to consider both individuals, as senders and receivers, and technology as the medium in which signs are embodied and transmitted (Mingers and Willcocks 2014). Semiosis and thus semiotics, is at the heart of the representation and transmission of information and meaning, and thus central to processes of communication and IS. Subsequently, there is significant importance of developing common meaning as a way to address interpretive differences and achieve aligned and accurate representation across boundaries.

When encountering a semantic boundary in translating knowledge (Carlile 2004) what is required is a process in which actors negotiate and are willing to change the knowledge and interests from their own domain. Carlile suggests also at a pragmatic boundary, actors negotiate and are willing to change the knowledge and interests from their own domain, and that when interests are in conflict, the knowledge developed in one domain generates negative consequences in another. In a contrasting view, there is a differential abstraction between the semantic, pragmatic and social worlds, further so in the syntactic level which resides in the technical IT platform. When interests are in conflict, there may be a negative consequence in a domain, but more so a tension to be resolved in negotiation of the conflict to share knowledge across the boundary. For instance, at a semantic boundary, Carlile suggests that a process of learning about and translating domain-specific knowledge establishes common meanings that become adequate for the actors involved to share and assess their knowledge. Carlile also suggests that if a semantic response does not resolve the problem, then a pragmatic boundary is faced. What is now required is negotiating and transforming both the common knowledge and domain-specific knowledge used in the past. It is contested that if a semantic boundary issue is not resolved then there is a pragmatic problem, on the contrary that transforming or

transformation takes place in the practical change in intention of a system or process, independent of establishing meaning of that system or process. In that there is a unification of common knowledge to develop a language that was familiar across the dependencies of all the groups involved. The social level addresses the commitments and expectations where they may be a difference in beliefs at the social boundary.

3.4. Summary

The IS under consideration of this study is a web based technical system that is acted upon by activity from the formal and informal system (Stamper 1992), transcending a number of organisations across geographies in its use. The IS interface forms boundaries between multiple organisations and being hosted nationally, is implemented, operationalised, utilised, supported and managed locally in instances that have varying effects. The IS can be characterised to depend on the co-ordination and collaboration of multiple actors to satisfy an instance of use, aligned with design intention. This system can be treated as an artefact, classified as a boundary object (Star and Griesemer 1989) in-use, which is comprised of systems acting as repositories and ideal-type concepts and definitions. These definitions could be formalised or interpreted to convey different meaning based on the context in which it is being used. An analytical perspective is provided from organisational semiotics in utilising the human-information functions at the boundary, further the role of *conveyance* in addressing concerns to alignment at these boundaries. The understanding of the variety of meanings and perspectives associated to the information system can provide insight to the barriers to adoption, and convergent and divergent factors to official expectations and stated goals. The analytical approach of organisational semiotics identifies the impact of events on individual perception of success, and a level of analysis by which to evaluate the factors that lead to success.

4. Research methodology for the actor centric evaluation of Information System adoption, use and success

4.1. Introduction

In this chapter, the research paradigm of critical realism is introduced to provide the ontological and epistemological basis for this research. Following this, the research approach is outlined with an aim to describe the data collection and analytical methodologies to characterise the role and impact of policy and design events on Information System (IS) within its social context, by utilising techniques from organisational semiotics, and boundary objects as the theoretical lens by which to analyse the focal IS. This approach was taken to highlight the different actor perspectives relative to the IS functioning as a boundary object, the aspect in common being the focal IS under consideration. The analytical framework is described relating to concepts and techniques in organisational semiotics, and in extension of existing boundary object and IS Success theory to provide the conceptual model of basis of research design. Validation approaches to the research are provided and a summary of the ethical considerations. This chapter provides the conceptual and empirical approach to actor centric evaluation of IS adoption, use and success.

4.2. Research paradigm

Critical realism (Bhaskar 1975) provides the philosophical approach in this study for identifying the deep structures of epistemological and ontological causal relationships between organisation, IS, and its actors. The resort to qualitative methods in combination with this approach, provided a non-generalist view in discovery from the subjective viewpoint that elicited 'empirical' that is observable. But further uncovers the 'actual' events that are generated by mechanisms, and the 'real' that are mechanisms that shape these events and govern their role (Lundgren and Halvarsson 2009). Realism maintains that reality exists independently of our knowledge of it, and even if this knowledge is always fallible, yet all knowledge is not equally fallible. Scientific work is instead to investigate and identify relationships and non-relationships, respectively, between what we experience, what actually happens, and the underlying mechanisms that produce the events in the world. When analysing specific social phenomena, among the substantial relations it is essential to separate between those which are internal and necessary, and those which are external and contingent, and for

the phenomenon under study the relation may also be asymmetrically necessary. This means that one object can exist without the other, but not vice-versa. Necessary relations do not have to be harmonious; on the contrary they often include one-sided dominance (Danermark and Ekström 2019).

Due to the openness of systems and broad depths of causal factors to the outcomes of an intervention, recent studies in adopting the realist approach have led to a relevant application within the healthcare context. The methodological approach of critical realist review is expressly designed to keep options open, so that researchers can be encouraged to think laterally and be open to possibilities (Grant and Booth 2009). The application of realist evaluation in Greenhalgh, Humphrey et al. (2009) describes pragmatically that success of a particular intervention can be seen to depend on the cumulative success of the entire sequence of mechanisms. Pawson's realist review noted and examined the flows, blockages and points of contention that impede the immediate and final outputs across an implementation chain. Pawson et al. explain that the actual interventions were shaped by the power of the respective parties, and that the relative influence of these parties is what affects and directs the empirically observable. Four strategies were proposed in carrying out a critical realist review where in all the reviewer should expect the same intervention to meet with both success and failure (and all points in between), when applied in different contexts. Of these strategies the review of the same theory in comparative settings would give rise to the expectation that same intervention would be delivered in a mutating fashion by refinement, reinvention and adaption to local circumstances. I agree that although this should be expected, this is in fact a contributory factor to the negative impact of human agency on the successful outcome of the intervention, so in itself highlights the issues in acceptance of local mutations leading to the more interesting finding being in the form of events and mechanisms that shape them. In a special application of this, the strategy around reviewing official expectation against actual practice is crucial in highlighting key differences in underlying use, if compared with political and system design intention. Critical realist review as a research method was further developed as practice (Edgley, Stickley et al. 2014), where for a realist, there are 'transitive' and 'intransitive' dimensions to knowledge. The intransitive dimension refers to the physical and social world we inhabit. The transitive dimension refers to the theories and discourses we hold to understand our world. Realists take the view that meanings can be causal because they see that it is possible that meanings, even though non-material and unmeasurable, may influence us to do things differently. The 'empirical' addresses a concern with that which is observable. Empiricists look for patterns and regularities but do not ask whether the objects under observation may have structures, powers or qualities that are unobservable. To explore

the 'real' is to ask about the structure of some objects as well as their causal powers, whether or not these causal powers are exercised. The 'actual' is concerned with what happens if and when those powers are activated. This is related to the recognition that the success of even the most technically straightforward clinical intervention depends on the quality and forms or organisation, leadership and/or service (or intervention) delivery (Edgley, Stickley et al. 2014). The critical realist review provides a methodological approach to test assumption and challenge conventions and reach reasoned conclusions about how organisations and practices should be. Instead of simply establishing regularities in the relationship between variables, realistic evaluation demands a closer look at the way in which the variables are connected. For that reason, realist synthesis utilises a 'generative' approach to causation. Critical realism can fill many gaps in its semiotic theory by adopting a Peircean understanding of signs and semiosis, which grasps both the intransitive dimension of reality, and the semiotic nature of our mental access to it in the transitive dimension. Critical realism can find a clearer place in its ontology for experiences and concepts by understanding them as signs (Nellhaus 1998). In a study of the experience of agricultural women workers in policy context (Fletcher 2017) the process of critical realist analysis involved several key steps: identification of demi-regularities (tendencies), abduction (also known as theoretical re-description), and retrodution in a critique of social conditions. This enables production of concrete policy recommendations and definitive claims for action on social problems. Although these recommendations will be fallible (or could have unexpected results under various social conditions), critical realists base their recommendations on the identified tendencies and causal mechanisms.

4.3. Research approach

To address the research questions of the study, the six dimensions of success (DeLone and McLean 2016) were applied in the critical realist evaluation (Pawson, Greenhalgh et al. 2005) of the IS characterised as boundary object (Star and Griesemer 1989). The analytical techniques relating to the human-information functions of the Semiotic Ladder (Stamper 1973) were utilised to assess the IS over time. In each case, barriers to adoption and unintended use were identified, supported by the prior review of documents sourced from the Information Authority and Information Service Organisation, highlighting the official policy and design expectations.

The research methods were developed from social research methods (Bryman 2015), to support the research strategy in terms of epistemological and ontological considerations, overall research design, and approach to mixed methods in data collection and analytical techniques.

Developing on the approach of realist review, a longitudinal formative evaluation was carried out to capture data on participant views and perceptions at various timepoint stages in the research chronology. The research design was supported following the approach laid out in qualitative research methods for evaluating computer information systems (Kaplan and Maxwell 2005), to understand how users perceive and evaluate a systems, and what meaning the system has for them. Further, to understand the influence of social and organisational context on systems use. The semi-structured interviews constitutive of a set of structured questions formed the basis a multiple case study approach informed by case study research (Yin 2018) to compare and contrast cases over time, in application of the analytical techniques of pattern matching, explanation building, time series analysis and cross case synthesis. Further development of the analysis strategy borrowed from techniques in Silverman (2020), relating to thematic analysis and content analysis in document review to identify design themes and policy intentions from published documents. Specific techniques in exploring, describing, ordering and explaining the data, types of coding, pattern identification, as well as methods of data presentation, prediction and explanation were drawn from Miles, Huberman et al. (2020), in order to understand human-information co-dependencies between variables, and factors contributing to unintended use, barriers to adoption and IS success.

The research model was developed to characterise the IS as a boundary object, that exists and is perceived in multiple contexts, to a varying degree such that it is signified and interpreted in a multitude of instances. The IS as a boundary object in use, or artefact was signified to a number of participants who form various beliefs and perceptions based on interpretation of the artefact. Facilitating, beneficiary, technical and non-technical participant groups of actors were identified as the key stakeholder groups in this study, and participants in the study were recruited from these key stakeholder groups relative to the IS which were also identified from various geographical contexts. With the IS characterised as a boundary object, and the IS as a technical system operating within the various layers of the socio-technical system, the impact of policy and design change enacted through the informal and formal system, subsequently impacts on the behaviours, views and perceptions of participants relative to the technical system. Analysing through these various levels of abstraction provided a deeper and more precise insight to the human aspects of IS.

Through the application of boundary objects as theoretical lens to take account of participant behaviours and perspectives toward the IS, and qualitatively described aspects of the human-information functions of the Semiotic Ladder (Stamper 1973), the study formed a unique viewpoint of the interfaces between the technology and society, and how policy and design

change impacts through these interfaces. Interfaces are intersections where multiple viewpoints meet across a shared boundary where these interfaces can be formed, between actors operating at various levels within the IS organisations. A previous study of collaborative cross-border disaster management (Bharosa, Lee et al. 2012) identifies three types of boundary object 1) governance structure, 2) IS and 3) recurring evaluation/feedback opportunities. The selective institutionalisation of these key boundary objects helped the participants to overcome various contradictions existent within the socio-technical system. As a result, the governance structure could successfully coordinate the roles, responsibilities and resources of the alliance partners without explicit rules and policies.

Referring to boundary objects and the objectives of evaluating participant viewpoints within a policy and design change context within their organisation, the impact of these interfaces is what leads to (mis)alignment with policy through the informal system to the formal system in resulting design intention. Opposingly, in use of the technical system actors may feedback on design change. The common quest in all such usability studies is to ensure that product design choices at the human interface adequately reflect the hands-on needs and skills of its intended users.

The research variables utilised in the semi-structured interview which formed the primary data source for the study were derived from the six dimensions of IS success (Petter, DeLone et al. 2008), and used to assess and evaluate participant feedback and sentiment relative to the IS in relation to policy and design change events. A range of literature was reviewed to determine the variables utilised to represent the six dimensions, ranging from IS adoption, acceptance and success. Subsequently, the DeLone and Mclean six dimensions of IS success model was adapted to support the theoretical basis and attributes in the evaluation of IS success. Finally, the variable attributes of success dimensions in Table 1 were applied with description in the study:

Table 1 - Variable attributes in dimensions of Information Systems success

<u>Success dimension</u>	<u>Description</u>	<u>Success variable</u>	<u>Description</u>
<i>System quality</i>	Desirable characteristics of IS	Adoptability	Suitable to follow or take up
		Intuitiveness	Easy to understand or operate
<i>Information quality</i>	Desirable characteristics of system output	Usability	Fit to be used
		Usefulness	Having practical worth or ability
<i>Use</i>	Degree and manner in which the capabilities of an IS are utilised	Purposefulness	Reason for which system is used
<i>User satisfaction</i>	Stakeholders level of satisfaction with the IS	Effectiveness	Producing a desired result
		Acceptance	Being received as suitable
<i>Service quality</i>	Quality of the service	Reliability	Performs consistently well
<i>Experience</i>	IS feels to the Stakeholders	Credibility	Convincing or believed in

The variables were chosen to be representative of the overarching success dimension, and to be an attribute in their own right of the respective dimensions. Within the existing literature the ‘Service quality’ dimension relates to the ability of the support service provided to enable the IS. In this study the ‘reliability’ variable was attributed to service quality, relating to the reliability of the IS technical infrastructure. Through the analysis of the data there is reference to the service quality of the support organisation, and this has subsequently been attributed as *reliability*.

The attributes were applied in structured questions constituting semi-structured interviews and utilised to develop understanding and insight into the participant beliefs and perceptions relative to the IS policy and design change context, with regards to adoption and success. Previous studies focused on the following criteria: (1) user-centricity; (2) context-centricity; (3) functionality-centricity; (4) recognition of the system development process; and (5) presence or absence of a theoretical foundation (Currie 2005). This study aimed to encompass user, context and functionality centricity by assessing the features and functionality of the IS from the individual participant perspective. Also, this study aimed to acknowledge the system development process by capturing data around particular design change and policy events. Fundamentally, a theoretical foundation is provided in the use of attributes from the Six dimensions of IS Success, to assess the IS as a boundary object, through analysis of the human-information functions of IS. This conceptual model is illustrated in Fig. 11:

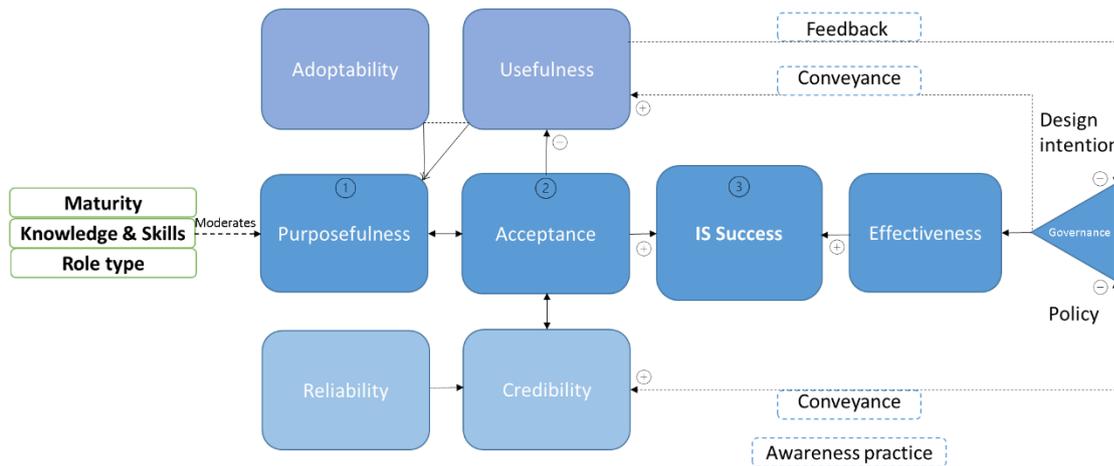


Figure 11 - Influencing model of policy and design intention on attributes of Information System success

The model was utilised to guide the assessment of change in each of the variables in consideration of the moderating factors associated with the participant role type and knowledge and skills, and the organisational maturity in relation to the IS. The impact of policy and design intention was assessed based on participant perception of the awareness practices described as conveyance undertaken by the Information Service Organisation (ISO) and Information Authority (IA). The technical design intention influences the perceived Usefulness of the IS as an attribute of Information and System Quality. Conveyance of policy influences credibility of the IS and is determinant of the participant experience. Reliability and credibility of the ISO and IA in conjunction with the adoptability and usefulness of the technical IS influence acceptance and perceived purposefulness of the IS respectively. The combination of the socio-technical factors influences the level of IS acceptance and perceived effectiveness in overall IS success.

Adopting both a systems and variable perspective provided possibilities for greater understanding of the state of a component property that may be affected by a higher-level property of the system, and for greater understanding of relationships among properties which may also be affected by a higher-level property of the system. The variance perspective provided possibilities for greater understanding of concepts, and whether an emergent property of a system is affected by a lower-level property of the system (Burton-Jones, McLean et al. 2014). This approach provided varying levels of measures, dimensions, variables in a perspective of interaction and change relating to each other in the form of actionable attributes and formative relations (Sedera, Rebekah et al. 2013).

4.3.1. Data collection methods

Several qualitative research methods were applied to investigate in the desktop document review relationships between policy and design change, and in the semi-structured interviews beliefs and perceptions and change in sentiment. This combination enabled the identification of persistent issues and over time, the impact of events relating to design change or policy, and the effect of policy and design change in particular cases. Quantitative analysis was used to support the identification of trends and significance in the data.

Official documentation published by the IA and ISO such as policy guidance, contract and service specifications, as well as technical guidance were reviewed to provide description of policy and design events (found in appendix) and were analysed from a semantic, pragmatic and social perspective to understand intended design and policy direction towards outcomes from IS use. Much of the review was conducted on documentation already in the public domain, supported by further guidance from national sources. To develop an understanding of events in the policy and design change context, a review of documents published by the IA and ISO pertaining to guidance on the IS was undertaken relating to the period of time between March 2016 to March 2018. Analysis of each policy document was undertaken to understand the purpose, particular measures being implemented and a description of who was required to meet what level of expectation. Each description of policy and design (in the appendix) was analysed for terminology used and consistency in meaning and intention and social effect, to identify which organisational actors would be impacted. Further details of actor role types and description of the policy events can be found in the Appendix.

The primary data collection was made through semi-structured interviews which were supported by the document analysis, in an overall approach illustrated in Fig. 12:



Figure 12 - Qualitative research methods for expected Use, IS adoption and success

The study was conducted as a longitudinal study over a period of 33 months that included data collection around the introduction of a new system, and a number of design change and policy events, in order to assess the changes over a period of time affecting the nature of the boundary object. In the cohort study the data was collected directly from the participants in relation to their experience during this time period. This approach enabled identification of variable attributes to policy and design change events through changes in sentiment, and the extent to which there was convergence to policy, design change/intention from acting role types in Fig. 13, and which variables has the most temporal impact:

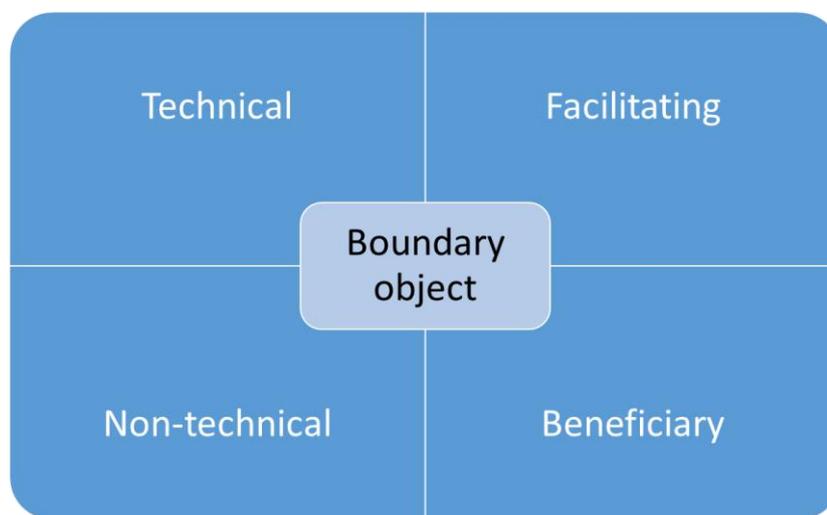


Figure 13 - Actor-participant identification method

The cohort study was based around 4 consecutive studies of research participants within their organisational environment to form the basis for simultaneous comparison across different contexts. The research subjects were actors that play a part in the formal and informal system surrounding the technical IS. Actors at the policy level were also included in preliminary interview conducted prior to the main study. Data was captured through audio recordings, transcripts, journals, logs, and memos. The purpose of conducting each of the qualitative techniques is as follows:

- Document analysis – Policy-IS design alignment
- Semi-structured interviews – Participant beliefs and perceptions

The semi-structured interviews took place within the environment of the organisational context of the participant such as GP practices, NHS hospitals and management offices. This enabled an

understanding of how actual work procedures differ from the ones intended, and behaviour in the organisation in addition to the belief and perception of those participants within their place of natural work environment. The interviews provided a temporal view of the changing sentiment towards varying attributes of success. The research programme involved empirical data collection as illustrated in Fig. 14 following the lifecycle of the focal IS over a period phased over 3 years involving the following key policy and design change events:

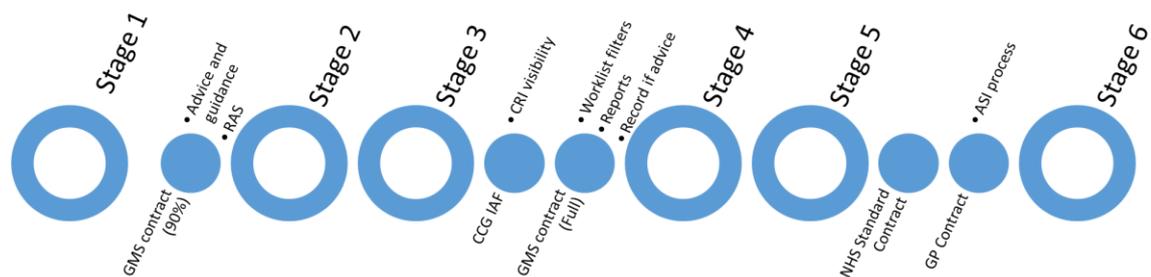


Figure 14 – Data collection stages, and policy and design change events

A total of 27 interviews were conducted in 6 stages, involving participants at the national and local level within the NHS, who were identified as actors in relation to the IS. The participants were identified and recruited by analysing the roles, responsibilities, and professional relationships in relation to the focal IS. The results of this analysis are provided in the appendix. The participants were recruited by direct contact via email, and initial interviews were conducted by telephone and primarily face to face interview with prior consent providing clarity on the purpose, scope and clear distinction between professional role versus conductive research capacity. Subsequently, a total of 22 interviews were conducted face to face with the same participants every 2-3 months, over 6 interview stages, spanning 24 months (15th February 2017 to 7th December 2018). Of the 5 interviews omitted, 2 participants dropped out of the study at stage 2 and stage 5. This was attributed to organisational change and political pressure respectively. The participants were formed of middle managers and a practicing GP in the NHS. Subsequently, the 22 interviews from 4 participants were used as the primary data to inform the findings of this study.

Case 1 took place in a Provider organisation that at the start of the study had poor IS uptake and prior to the study had been part of an organisational merger involving multiple geographical sites. The participant was an IS and Project Manager who was working on the technical and implementation aspect of the IS and worked across both sites and with clinical and admin teams within the organisation.

Case 2 took place in a Provider organisation which in previous years to the study had engaged with various initiatives to improve IS uptake that had been driven by commissioning organisations. The participant was an administrative manager, who adopted the role of IS Manager, working in the Outpatient environment supporting a number of departments and members of staff in referral and appointment booking administration, as well as providing IS support for the Provider organisation.

Case 3 took place in a GP practice with a previously good uptake across the whole practice and wider referring footprint. The participant was a GP and an acting member of the Clinical Commissioning Group (CCG), they used the IS directly as an end user and also influenced local policy decisions and IS commissioning developments. Their Use was day to day and partially in direct clinical time, where a part booking would be made with the patient present.

Case 4 took place in a Provider organisation that previously had a good level of uptake and utilisation. The participant was a technical manager who had become a specialist in the IS and maintained an up to date and innovative approach to the IS.

The collection of data utilised in this study is summarised in the Table 2:

Table 2 - Summary of research participants

Participant case	Occupational role	Research site	Number of interviews
1	Operational IS Manager	NHS Hospital	6
2	Operational IS/Project Manager	NHS Hospital	6
3	General Practitioner	GP Practice	6
4	Technical IS Manager	NHS Hospital	4

The interviews were typically 20-60 minutes in duration and transcribed during the interview, with audio recordings taken to support further accuracy. The interview recordings were utilised to refine preliminary transcripts to ensure each interview was transcribed accurately in the context from the data collection setting. Where the audio quality was insufficient or where there was occurrence of non-verbal cues, these were denoted in the transcripts within brackets. Unfortunately, 2 recordings had become corrupted and therefore the original transcripts were

utilised. The purpose of this research approach was to provide in-depth descriptions of the variance among the participants and the novelty of the situational, temporal context.

Each interview consisted of a standard set of 9 questions relative to the Information System (eRS: e-Referral Service), described in Table 3, each incorporating a research variable:

Table 3 - Variable attributes embedded in research questions

	Research question	Variable
Q.1	How intuitive to you is the role and function of eRS?	Intuitiveness
Q.2	What are the factors that impact system adoption?	Adoptability
Q.3	How widely accepted is eRS (as the digital referrals and appointments system of choice)?	Acceptance
Q.4	What would you describe as the purpose of eRS?	Purposefulness
Q.5	How useful is eRS in achieving your aims and needs?	Usefulness
Q.6	As a system, how effective is eRS (in supporting patient referrals and appointments)?	Effectiveness
Q.7	To what extent can eRS be considered a reliable system?	Reliability
Q.8	In what way would you describe eRS as a usable system?	Usability
Q.9	As a system, how credible is eRS?	Credibility

The 9 questions formed the basis of the semi-structured approach, acting as a guide for both researcher and participant to explore various themes that were explored by the participant. Supplementary prompts were utilised to elicit further detail on responses and for the participant to consider further dimensions to their response. During the study, Q. 8 required frequent clarification on the question where the line of enquiry was intended to be in relation to end user ability to use the system. The wording of this question could be improved for use in future work but was retained for consistency throughout the study.

4.3.2. Analysis strategy and framework

The approach to analysis was guided by a framework incorporating the human-information functions of the Semiotic Ladder (Stamper 1973), types of awareness practice (Carlile 2004) and change in perceptions towards the IS in an emerging policy and design change context. In analysis at the human-information functions of the Semiotic Ladder, activity at the ‘social’ level was applied to describe behaviours and commitments expected from the design authority in the use of the IS, and the behavioural actions that implement policy expectations. At the ‘pragmatic’ level, effect of design intention was analysed relative to roles and responsibilities in relation to the IS, and the change in form of business processes. At the ‘semantic’ level, meaning associated with the signification of IS as a boundary object, and that of design intention, from the participant perspectives was analysed in order to understand the level of convergence or

divergence in understanding to policy and design intention and the impact of divergence in Use, as illustrated in Fig. 15 adapted from (Carlile 2004):

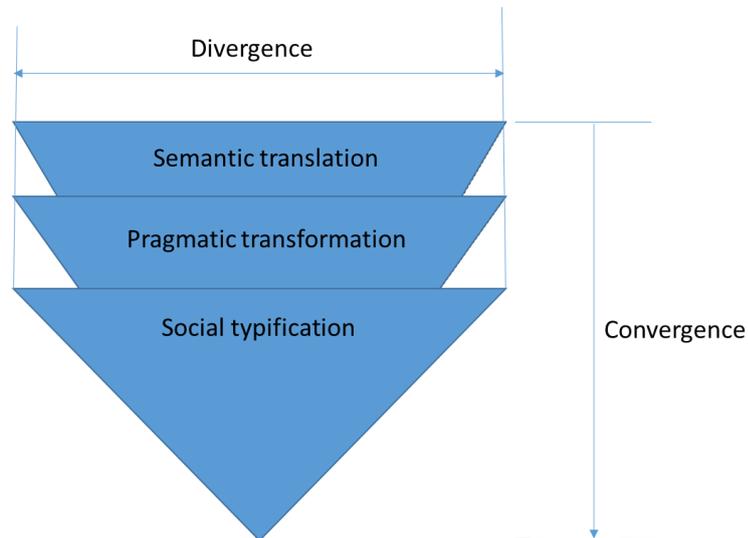


Figure 15 – Semiotic framework for human-information convergence toward policy and design intention

The activity of conveyance is represented in Fig. 15, illustrating the three levels of awareness practice (Carlile 2004) *Translation* is the creation of semantic alignment in meaning across the business between primarily the design intention of the IS and the existing business operations and processes. This activity ensures that there is meaningful use of IS from the intentions of the design perspective. *Transformation* is the pragmatic change in the form of business operations and processes to incorporate the IS into localised work. This activity drives change in practice. *Typification* is the social construction of behavioural actions that implement policy directives and achieve adoption by specifying typical expectations in the design of the IS. These activities may be carried out by a *conveyor* which is a concept in line with the existing literature relating to boundary worker, or boundary spanner who operates across organisational boundaries (Gasson 2006).

Analysis on the change in perceptions towards the IS was undertaken primarily on the interview data and this data source provided the primary mechanism for evaluating change from the participant perspective of the IS in relation to the attributes applied in the study to measure IS success. The change in sentiment over the study was analysed to identify attributes to significant variance and dominant themes and underlying participant perspectives. The semi-structured interviews were analysed as 4 independent cases in the context of the policy and design change

events over 6 time points. The analytical framework applied in each of the 6 research stages is illustrated in Fig. 16:

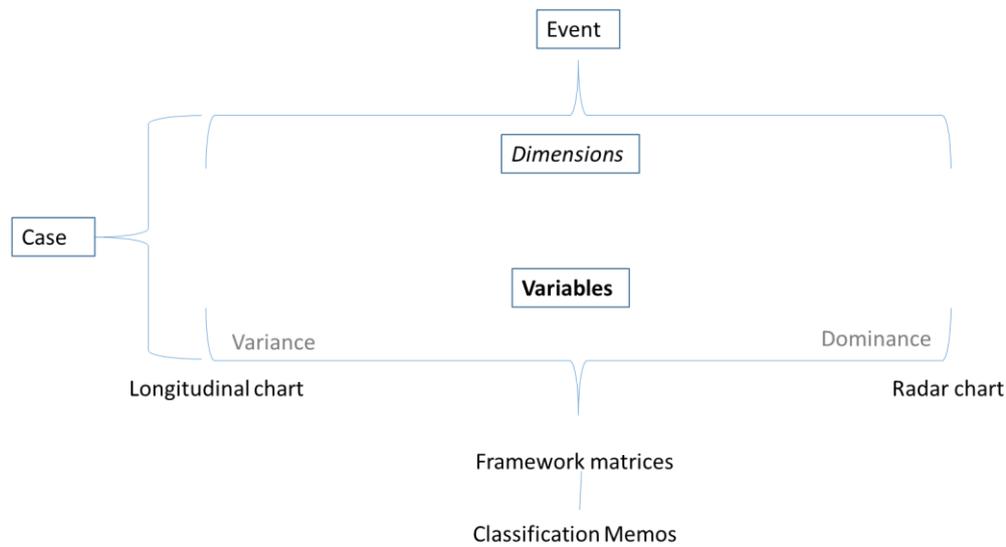


Figure 16 - Analytical framework

The analytical framework supported the identification of variable and dominant sentiment in each case based on 5-point Likert scale for each variable attributed to a success dimension. The coded transcripts were placed in framework matrices to enable text analysis and to provide a view of each case. Use of the matrices supported analysis of variables undertaken on a case-by-case basis to track the change in sentiment across the research timeframe within the identified policy and design change context. A sentiment score was assigned to each coded field in the framework matrices to indicate the level against a variable, in each case at that point in time. The sentiment scores were then plotted on a longitudinal chart displaying the change for each variable, over a series of 6 research event stages. The longitudinal charts facilitated a view of change in variables over time, in providing an indication of increase, decrease or stability of a variable. Also, in cross comparison across each case, a consistent level of high, low or neutral sentiment. The sentiment scores were also plotted on radar charts (found in appendix) to display the dominance of each attributes, in each case. The radar charts enabled a single view in each case of dominance of attributes, and at a particular research stage, which attributes had most or least dominance in terms of positive or negative sentiment. The results of the semi-structured interviews were presented on a case-by-case basis through analysis of framework matrices, longitudinal and radar charts. This provided a representation of variable sentiment in relation to chronological events, where moderating, dependant and interdependent variables were identified within a case context. This approach was utilised to target areas of interest from

coded elements of the interview transcripts which were presented in 4 framework matrices. Memos were added to the framework matrices to highlight particular quotes of interest in relation to IS design and/or policy context in reference to specific events or design changes. The memos also functioned as a way to link reference to particular events across cases and identify causal relationships across multiple case contexts. These classification memos contained descriptive information about sources, people, places, or cases. Combining differing levels of analysis focussed on events, cases, and variables facilitated the exploration of the dynamic interplay between the participants, IS and social structures.

In summary, the various stages of semi-structured interview analysis incorporated the following techniques:

1. Identify sentiment for each participant, variable at each stage
2. Identify variables with dominant or significant variable sentiment
3. Identify overall sentiment across 6 stages
4. Develop memos against identified transcript sections
5. Review memos and identify cross variable themes
6. Categorise memos/transcripts into the identified themes

In practice, the analysis was developed as iterations were made through each of the stages, as the framework was applied consistently, improvements were made to ensure the coding was consistent with the research approach and explanations were consistent with existing concepts. Application of the framework was particularly resource intensive, although a consistent approach in automation of the techniques would provide an efficient mechanism for future framework application. Interrelationships were identified within the case context between mechanisms and the emerging outcomes. Explanations were further developed referring to prior understanding of context based on the document review, to identify demi-regularities and mid-range theory. Finally, the literature was referred to, to increase specification and explanatory capacity of the results in respect of the theoretical approach. The results were also validated by participants to ensure the outputs of the analytical framework were reflective of their views. This was carried out by retrospectively presenting the participant findings to seek validation and to sense check for factual errors.

The raw data from semi-structured interviews was imported into the qualitative analysis software, NVIVO, which was used to codify each of the interview transcripts. Coding was applied based on a preconceived structure of attributes detailed in Table 3 in sections of interview responses. The finalised transcripts were analysed, and phases coded against each of the 9

research variables. This identified phrases and descriptions within the interviews that were attributed to the 9 variables, and for each participant provided a matrix of the variables over the 6 stages. There was an element of cross coding as some questions drew out beliefs and perceptions that related to variables associated in different questions. Structuring the data in this way provided a single view of each of the participants coded data over the research timeframe.

The analysis of the participant sentiment in underlying coded interview transcript was evaluated to have positive, negative, or neutral value achieved by applying a scale rating from Table 4:

Table 4 - Sentiment scale applied to changing variables

Very negative	Moderately negative	Neutral	Moderately positive	Very positive
-2	-1	0	+1	+2

The rating associated with the transcript-variable were quantitatively analysed to identify dominance in attributes, variation in sentiment, similarities and anomalies in trends and patterns (found in appendix). A systematic process of identification was applied to the sentiment ratings in cross comparison across variables in a success dimension, step change (difference overall, difference > 2), positivity/negativity, and opposing relationships. The results of this analysis were then applied in reference back to the framework matrices, constructed as a result of matrix thematic coding to provide a representation of each case based on transcript excerpts from the attribute coding. The framework matrices were used to review transcripts in each case verbatim within the framework of attributes, sentiment, transcript, and themes. Transcript memos consolidated the analytical view to describe within the context, comments on semantic, pragmatic and social factors and causal factors at that time point. The memos also captured narrative themes in relation to particular features or IS functionality, or policy events. Dependencies between and references to organisations and participants were recorded and commonality explored in themes such as professional experience/competency and habit.

4.4. Validation

The triangulation of data sources in conjunction with focus group, participant validation and assurance sessions sought to improve construct validity. A peer review midway through the study was conducted following stage 3 of the data collection to improve inter-rater reliability, where a selection of 3 variables was taken and the coded excerpts provided for assessment of

the sentiment within each of the stages 1-3, and the overall trend of the sentiment established from change in narrative was consistent. The purpose of the focus group assessment was to assess analysis tendency and across a change in narrative.

The results are provided in Table 5 which indicates a common rating tendency across the assessors which was different to the researcher:

Table 5 - Peer review assessment of sentiment

Variable	Research participant	Assessor 1	Assessor 2	Assessor 3	Researcher	Assessor variant to researcher
1 - Intuitiveness	1	Neutral	Positive	Positive	Negative	3
	2	Negative	Positive	Positive	Negative	2
	3	Neutral	Positive	Positive	Neutral	2
2 – Purposefulness	1	Neutral	Positive	Positive	Neutral	2
	2	Positive	Positive	Negative	Positive	1
	3	Positive	Positive	Positive	Neutral	3
3 - Effectiveness	1	Negative	Negative	Negative	Negative	0
	2	Neutral	Positive	Positive	Positive	1
	3	Negative	Neutral	Neutral	Neutral	1

The results of this assessment based on a set of transcript excerpts highlighted that although each of the assessors tended to agree with each other, this was variant to the researcher. This variance was attributed to the lack of contextual knowledge present in the process of assessment and evaluation, which were available within the data as part of the wider study in the document review. This related to background knowledge on the business case, design intention, policy context and design change roadmap. The approach did not elicit participant scoring as this would not provide a 3rd party view of the context within an impartial assessment framework. The peer review was useful to establish relevance of the document review aspect of the research approach in establishing background context to support the analysis of convergence or divergence to policy and design intention.

4.5. Ethical considerations

This research obtained approval as a ‘service evaluation’ from the NHS Health Research Authority. It obtained approval from the School of Business Informatics, Systems and

Accounting, Henley Business School in consultation with the University Research Ethics Committee.

An information sheet and consent form (found in appendix) were produced to each of the participants, whereby audio recording and transcription of interviews and use of data for research purposes was approved.

4.6. Summary

This chapter introduced the research methodology through the paradigm of critical realism and the approach of realist review, drawing on the conceptual foundations of Boundary Objects and IS Success. Organisational semiotics was utilised to analyse data from document review and semi-structured interviews. Application of the analytical framework in a periodic and extrospective view of dominance and variance in each case, through an event-based approach, appeared most effective.

5. Impact of policy and design intention on Information Systems use, and factors in adoption attributed to success

5.1. Introduction

In this chapter, the results of the document review are presented to provide a background into the policy and design context of the Information System, within the scope of the research study. The findings are presented in the form of intentions from policy makers and IS designers as articulated in published documentation, and further observations in practices on actual use of the IS, compared with 'official' expectations. The resulting factors presented in this chapter on factors in IS adoption and use were produced from the case centric and variable centric approach to analysis of change in participant sentiment (found in the appendix). These preliminary results were utilised to inform further specific analysis of each case and to support the identification of emergent themes arising from the gaps between expected and actual use, and sentiment change towards policy and design change events, and significance of particular variables attributed to IS success.

5.2. Findings on policy and Information System design context

Document analysis highlighted inconsistency in phraseology and terminology respective to the same subject matter, across various organisational initiatives. For example, the national policy and contractual guidance makes specific mention to a named IS. Whereas elsewhere the reference is made to 'electronic', which is generic. This can be left open to interpretation including fax and email being categorised as electronic. This highlights a mismatch between assurances on local delivery in accordance with the guidance that is published from within different corporate functions of the IA. For example, in 22b in the Clinical Commissioning Group Improvement and Assurance Framework (in the appendix), clear definition on the metrics applied has been omitted, stating that they are 'in development'. Reference is made to 2 Week Wait (cancer) referrals only on the quality premium, whereas elsewhere this is omitted. These documents originate from the same source, although there are differing levels of completeness and consistency in terminology and working use, in relation to the same measures and descriptions utilised. This illustrates the complexity of aligning a policy context across multiple organisational departments, and the subsequent creation of meaningful use in IS adoption. This can be confusing to multiple actors positioned in various parts of the organisation locally, thus carrying different significations in various contexts. The measures set out in the Quality Premium are not measures of system quality, but in relation to use and performance of the system. By proxy, use of the system is being signified as a measure of

quality, which can be confusing when utilising quantitative metrics to establish measurable IS quality and performance.

As time progressed with the level of awareness practice, the sentiment towards policy and design events changed as illustrated in Fig. 17 with yellow (neutral), red (negative) and green (positive) sentiments:

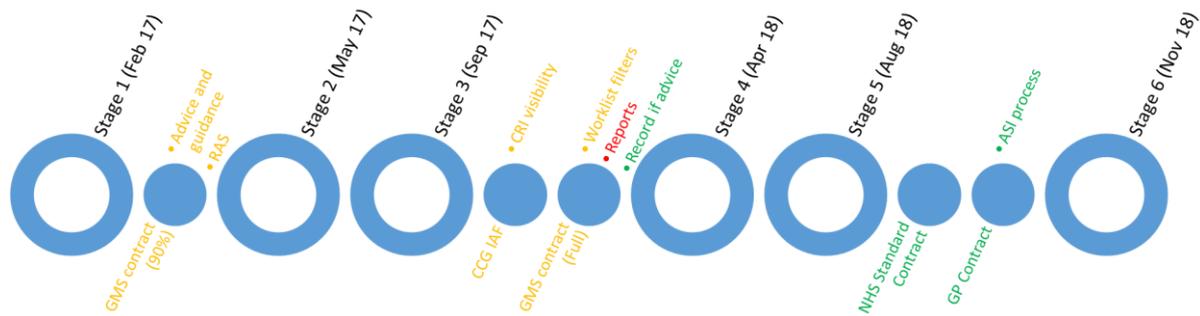


Figure 17 - Changing participant sentiment relative to policy and design events

The series of policy and design events following research stage 3 had a positive effect on participant sentiment achieved through a varying level of awareness practices in each case. The awareness practices supported convergence to policy and design intention, and took place in conveyance to the participant, subsequently impacting on the attributes associated with success.

5.3. Observations on expected use of Information System

The key finding from the study of use is that the efficient and effective process of the design intention required the co-ordinated and timely action of cross organisational actors to ensure the IS performed its core and key functions. An instance in IS use can be described as an end-to-end completion of a series of actions in the IS, the consequence of which is dependent on the sequential and timely Use by the relevant responsible actors. The semantic and pragmatic perspectives of each system role, as adopted by stakeholders in the IS are summarised in table 6:

Table 6 - Analysis of human-information functions

	Semantic	Pragmatic
GP	A comprehensive listing of locally and nationally available services, appointment dates/times. With ability	Facilitates the clinically appropriate identification of services for patient referral

	to seek advice from secondary care colleagues	and appointment booking. Facilitates advice and guidance from secondary care
Medical secretary	Comprehensive listing of locally and nationally available services, appointment dates/times	Facilitates the clinically appropriate identification of services for patient referral, automated digital referral attachments and appointment booking
Practice manager	An electronic referral and appointments system	Monitor and manage referral activity
Consultant	An electronic referral triaging and advice and guidance provision system	Electronically review incoming referrals and advice requests
Outpatients Manager	An electronic appointment booking system	Directly book appointments and manage slot availability
Service Manager	Digitally define services within speciality	Shop window of services

Referrers

GPs view the system as one which can support or impede the day-to-day clinical duty. Referring a patient is in some cases perceived as a task carried out by administrative staff. This transfer of information is sometimes supported by additional technologies, such as Dictaphones. Referral attachment content is produced by a variety of methods associated with the range of up to 5 different GP clinical systems in use by practices, and within a GP clinical system, the particular way in which the patient details and referral prose is added. This leads to inconsistencies in the structure and quality of content, impacting on the way that it is accessed and usefully perceived on the receiving side.

Where the shortlisting of services takes place there is inconsistency in the number of choices that are provided to the patient on clinically appropriate services, and in some cases in merit of the choice discussion having already taken place externally to the system, only one choice would be shortlisted within the IS. Although this is in accordance with design intention it is far from optimal use, as the opportunity for access to further clinically appropriate services and locations is subsequently limited. Additionally, if the referral is not made prior to the patient leaving the GP practice following consultation, then the patient booking letter has to be posted to the patient so that their appointment can be booked. The cost incurred in generating and posting, negates perceived benefit of IS use. In some instances, the appointment is booked without consultation with the patient and subsequently removing any requirement to generate the booking letter. This approach heavily relies on the Service Provider contacting the patient with appointment details, and negates the intended system use around choice and ability for patients to manage their booking.

Service Providers

In Service Provider organisations the triaging consultant can directly access their referral through the IS interface and accept or reject that particular booking. They are also enabled to access their 'advice and guidance' requests. Some instances were described where consultants never accessed the IS and have the referrals passed to them in paper format, where they have been retrieved by administration staff. Service Providers do not always (have the capacity) to poll available clinic appointment slots, so this can lead to subsequent manual processes where the patient has to be contacted and appointment made manually.

In Service Provider organisations, there is also similar variation in each stage of the IS use whereby some processes are carried out by clinical or administrative staff, in either centralised or distributed functions throughout the organisation. Worklists determine the management and administration tasks that occur in the use of the IS or in the management of events that have arisen from unintended circumstances. For example, if a referral is rejected as clinically inappropriate by the Service Provider, this then populates on a worklist in the GP practice. This should result in the patient being contacted by the GP practice about this cancellation. The adverse impacts of not monitoring this worklist are unforeseen by practices, and only experienced by the Service Provider and patient when a rejected appointment is subsequently attended.

Observations show that there are geographical localities that in historical or recent adoptions that have been successful in realising the original IS design intention. This is represented by a full and comprehensive 'Directory of Services' published by all Service Providers locally and a good ratio of directly bookable appointment slot availability. Furthermore, where pressures in secondary care services are realised through effective use of management information, certain diagnostic and primary care service are being commissioned out into the community or in GP practices, effectively providing services closer to the patients' home and in a shorter waiting time. Appointment booking letters are provided to patients so that they can administer their bookings, reducing the administrative burden in appointment cancellations or service bookings. Some areas utilise 'interface services', and this is still successful in design as they add clinical value to the referral pathway and utilise the system in onward referral. At the point of referral, GPs in best cases ensure that a good choice of services is shortlisted, and the patient leaves their consultation with the appointment booking letter. In most cases, they leave the practice with this information.

The key areas identified for misuse appear to be in the 'configurable' aspects, in relation to the services that are published by NHS Providers, and the appointment slots that they poll to the IS. Timeliness of process and procedure are the secondary factors to system failure. These failures in expected use are categorised in Table 7:

Table 7 - Failures in expected Use

Appointment slots	Failure
Dummy slots	To facilitate electronic document transfer
Indirectly bookable slots	No systems integration, or fixed appointment times
'Entry' slots	Appear to have a shorter waiting time
Appointment Slot Issues	Lack of slot availability

Directory of Services	Failure
DO NOT USE services	Services left published by system admin resulting in untidy directory
ZZ Services	Inappropriate use of service re-directs to administer slot issues
Restricted services	Used to inappropriately constrain choice or access to services
Primary care services	Publication as primary care so as to constrain access to services
Generic services	Use to catch all referrals for interventions not specified
Referral Support Services	Use of referral support services to take on admin
Description quality	Out of date, poor quality services descriptions

The key areas for failure appear to be where configuration has not taken place as expected in accordance with the official guidance from the ISO. Prime factors contributing to unintended system use are associated with:

- Misinterpretation of key features and functionality
- Breakdown in system flow due to neglect or non-compliance of system process by users
- Promotion during implementation of evident quick fixes rather than addressing deeper root cause
- Transfer of responsibilities from end users to a proxy function to relieve perception of administrative burden
- Use of 'dummy appointment slots' in interface services

Low adoption and unintended use appeared to occur due to poor governance around implementation activities and subsequent sustenance as it is too difficult to 'undo', or there have been no external drivers to do so. These issues identified in the data are primarily issues in compliant use, rather than functionality of the system. Therefore, actors had put up barriers, and blame on failure is transferred from the

adopting actor to the IS. Additionally, the issues are not in relation to information needs, but in the use of the system to achieve individual goals.

5.4. Factors in Information System adoption and success

The descriptor for each of the participant actors is summarised as having an organisational role that has some responsibility in relation to the IS. Each role has a type and level of use that is either strategic, tactical or operational in nature. Each of those roles primarily operates at a national, regional, or local level and there is an acknowledgement that there is individual flex and change in the capacity of their roles through each of these levels towards the IS. Each of the roles in relation to function and responsibility were identified within the various types of organisation previously identified and described in chapter 4, in order to understand the complex and interrelated human-information aspects and establish the importance of these roles, a full description of which can be found in the appendix.

Having conducted the first set of interviews it was concluded that the most fruitful responses to the study were received from GP and Provider Organisation, with a 'tactical' type of use that is at a 'local' level. These individuals would have a technical role that is facilitating in nature, which enabled them to give an insight to the study that is at a level which describes barriers to adoption, deviation from expected use, and the implication of policy and design change. Other participants initially interviewed with strategic and or national/regional roles responded at a higher level of abstraction for this study, which were useful to support further clarification on the strategic and policy context, but not directly in relation to the research questions, and were therefore not continued through to completion of the study through the 6 research stages.

In analysis of participant responses, the framework matrices were comprised of coded transcript elements made up of a total of 1503 references from the interview transcripts. This provided a rich dataset representing the beliefs and perceptions of each participants over the research timeframe. Sections of interview transcript were made into quotes which were then coded to demonstrate high impact areas, critical issues and concerns in relation to the research question, policy and programme context. Habit and efficiency were included at the coding stage, but then subsequently removed from the analysis due to lack of coding fit to research question. The interview transcripts that were primarily coded against the 11 variables were subsequently reduced to 9. Habit was redacted as a variable as it did not make useful references to policy or IS design implications, and the experience variable was subsequently assessed separately in terms of credibility and the technical experience of the participant. Efficiency, which was covered under adoptability, was monitored using memos in reference to paper

based versus IS process. This contrasts with previous studies identifying habit as a key attribute (Bhattacharjee and Premkumar 2004).

Each case was analysed in the context of the policy and design change events, assessing the variable change, over the period of 6 research stages. Table 8 below summarises overall sentiment in each case, where green is positive, yellow is neutral and red is negative, from analysis of participant sentiment in each case which can be found in the appendix, for variables in each case which facilitated the identification of persistent impacts over time and significant tendencies towards a positive, neutral or negative sentiment. The analysis identified significance in patterns and trends, and dominant sentiment in the variables attributed to IS adoptability, purposefulness and acceptance within IS success dimensions.

Table 8 - Case variable sentiment in dimensions of success

<u>Dimension</u>	<u>Variable</u>	<u>Case 1</u>	<u>Case 2</u>	<u>Case 3</u>	<u>Case 4</u>
System quality	<i>Adoptability</i>	-	-	-	-
	Intuitiveness	n	n	n	+
Information quality	Usability	-	-	n	n
	Usefulness	n	+	+	n
Use	<i>Purposefulness</i>	+	+	+	+
User satisfaction	Effectiveness	n	-	n	+
	<i>Acceptance</i>	+	-	+	+
<i>Service quality</i>	Reliability	n	-	+	+
<i>Experience</i>	Credibility	n	-	+	+

It appeared that sentiment was most consistent in each case where adoptability and purposefulness were dominant variables in terms of overall negativity and positivity respectively. In case 1, Purposefulness and Acceptance had a dominant positive sentiment, and there was dominant negative sentiment for Adoptability and Usability. In Case 2, Purposefulness and Usefulness had dominant positive sentiment, and dominant negative sentiment most notably in Usability and Adoptability, but also across User Satisfaction, Service Quality and Experience dimensions. In Case 3, there was positive dominant sentiment most notably in Usefulness and Purposefulness, and in Use, Service Quality and Experience dimensions, and dominant negative sentiment in Adoptability. In Case 4, there was dominant positive sentiment in Intuitiveness and across a number of dimensions in Use, User satisfaction, and Experience of Service Quality, and supported all cases with a consistent dominant negative sentiment towards Adoptability.

Based on these indicators, in reference back to the framework matrices it was discovered that IS adoption was resisted by clinical users due to poor IS accessibility in cases 1 and 2 associated with suitability of physical access and authentication mechanisms to the IS at point of care in Provider organisations. In case 3, it appeared that there was a good provision of access to users in GP practice organisations. In case 4, there was no reference to the use by clinical users and further investigation uncovered that interoperability workarounds utilising manual processes were in place so that clinical users were not required to directly access the IS. In cases 1 and 2, lack of ability to take corrective action in the IS against human error had a negative impact on adoption, although there were no references to this in cases 3 and 4.

The IS was considered fit to be used relating to existing core function in cases 3 and 4, but in both cases, there was negativity associated with the inability to innovate beyond core IS scope. In cases 1 and 2, there was negativity associated with workflow and task allocation between clinical and admin staff, and the absence of flexibility in assigning task roles between these staff groups. A lack of capability in the IS for notifications, alerts and messaging also had a negative effect which was linked to issues in IS interoperability. In case 3, the level of adoption by the Provider organisation in case 4 which was relational, had a positive effect on the perception in case 3 of the IS being fit to be used, but there was a negative effect associated with adoption of specific IS 'priority' functionality.

Coherence in understanding the reason for which the IS used had a positive effect in all cases and was affected by the communication of policy context and design intentions focused on a stakeholder group. There was a high level of coherence in cases 1, 3, and 4 which was attributed to systematic knowledge of policy context and IS net benefits to all stakeholder groups. In case 2, there was a low level of coherence with IS design which had a negative effect on adoption. In cases 1 and 2, there were negative effects associated with tension with IS design and the effect on tasks at a process level. There was a positive effect in case 1 and 3 associated with communication between administrative, clinical, middle and senior management staff across the local organisations, of expectations in relation to forthcoming policy and design change. In case 2, there was a positive effect associated with policy but not design change where there was a lack of coherence between organisational departments. In case 4, there was no effect caused by policy events or design changes, even though there was a high level of coherence with these changes, which was associated with the political position adopted by the organisation with regard to policy events. Senior management buy in had a positive effect on the IS being received as suitable in cases 1 and 3. In cases 2 and 4, lack of senior management buy in had a negative effect on organisational adoption, as did a lack of coherence with design intention. In case 1, there was tension associated with specific aspects of IS design which had a negative effect in the absence of Provider clinician involvement in IS design.

Acceptance appeared to be a variable of significance even though it was not apparent through the case variable sentiment indicators as a variable of dominance. It did become apparent from the narrative in Case 1, as shown in Table 9, for instance where a positive sentiment emerged across the research timeframe:

Table 9 - Emergence of acceptance

Stage 1	“Not particularly very well adopted here as in consultant wise there is still a lot of resistance.”
Stage 2	“But we've got come back from everywhere from booking staff up to clinician, AD level.”
Stage 3	“I would say we're looking at 50% are on board, I would say we're about 50/50 at the moment.”
Stage 4	“We've been live a month. Yeh I think it's getting there.”
Stage 5	“Oh, I'd say its accepted that it has to be in place, and it has to be used. Well, say has to be used, in the loosest possible terms.” “The admin teams of course have to use it, because that is how they work. However, I think it is fully accepted.”
Stage 6	“It is very widely accepted now.”

In stage 1, the participant referenced clinical resistance to adoption and a relatively low level of acceptance of the IS within the organisation, from clinician to senior management levels of staff. Midway through the study in stage 3, following new policy events there was an improvement in IS acceptance which further developed from an organisational narrative of acceptance into a description of actual use of the IS by administrative staff. By the final research stage, a claim emerged that the IS was widely accepted within the organisation. Owing to this emergence of the IS being incorporated into the organisation and subsequently into practice use, acceptance was identified as a variable of importance and focus in the remainder of the study.

A number of themes and specific IS features or functionalities were identified as barriers to IS adoption, typically where there was negative sentiment towards functionality, which resulted in divergent IS use. A distinction should be made in accordance with design intention between IS adoption and IS use, more specifically for clinical adoption and use of IS. Clinical actors felt that use of the IS was an administrative process, rather than that which was part of their core function. Not having access to the IS at the ‘Point of Care’ was a barrier where the information had not been made part of access in the natural work environment of the clinical user. Where the gap between IS use and existing process was minimised the IS appeared to be easier for adoption. The Information Quality was a key area to support clinical activity in the provision of meaningful management information and the ability to track and audit a patient episode end to end, to maintain clinical continuity. The inability and level of flexibility in allocation of tasks between clinical and admin staff appeared a key barrier to IS adoption, where there was a notion

of 'time preciousness' in terms of whose role type's time was more valuable and could be spent elsewhere focused on core purpose. The way in which the IS was authenticated and accessed was a key barrier in terms of time, resource and constraints in how amenable intended end users were to be accessing those roles. Subsequently, several 3rd party solutions emerged in some cases to automate IS use, to facilitate the relatively simple function of integrating and providing the interoperability to streamline processes and information transfer. Intentionally or unintentionally these solutions would by logic have to circumvent or diverge from design intention and governance arrangements in order to achieve their aims. The presence of a linear and set workflow supported processes across many organisations in an instance of IS use. The workflow in its design intention had a spectrum of 'use cases' in its adoption, and lack of flexibility in adoption or configuration of workflows, along with the previously mentioned transfer of responsibility between clinical and admin staff were key barriers in the technical capability of the IS.

5.5. Summary

In this chapter the key findings from the document review and observations were presented to provide the contextual background to the series of policy and IS design events which took place during the study. Inconsistencies were found in terms and definitions relative to the IS used in documents produced across multiple functions by the IA. This meant that various recipients or target organisations of the documentation work to differing descriptions which may lead to a variety of interpretations across a range of organisations. Observations on use of the IS identified deviation from expected use described in official documentation and a range of alternative use cases involving re-allocation of responsibilities, absence of activity in relation to responsibilities and significant variation in the quality and performance of local use. There appeared to be a diverse range in how geographical localities incorporated the IS into practice, an extent of which is allowed by configurable aspects in the IS, primarily associated with the attainment of individual actor goals. The criticality of timing became an IS constraint which led to failure where various actors had not completed tasks in the planned or expected manner, which subsequently was blamed on the IS. Preliminary analysis into the factors in IS adoption and success identified Adoptability, Purposefulness, and Acceptance as key attributes of significance in IS success, along with the level of organisational coherence with policy and design intention. These preliminary results were utilised to inform the following application of the analytical framework to 4 cases presented in Chapter 6, to structure the assessment of the barriers to IS adoption, factors in use, acceptance and the factors contributing to IS success.

6. Study of change in participant sentiment, and the human-information functions in four case studies on adoptability, use, acceptance and success of healthcare Information System

6.1. Introduction

This chapter presents the 4 cases each introduced with a summary of the participant and organisation relative to the policy and design context. The points of interest in each case were identified using analysis of participant sentiment, and further assessment made in relation to the significant attributes common across all 4 cases, which are presented in terms of adoptability of Information System (IS), use of IS and acceptance of IS. The study at the human-information functions is supported utilising the approach described in 4.3.2. The key findings were utilised to support the main findings of the study in unintended use, barriers to adoption and factors impacting on IS success.

The research cases comprised of 4 participants operating in relation to the focal IS within the Thames Valley, UK regional geography. A total of 22 interviews were conducted with the same participants, where unfortunately 1 participant dropped out of the study for the final 2 interview stages. This was associated with political pressures. The participants had one or more of the following IS responsibilities to utilise the system, to electronically send referrals to Provider services, to utilise the system to publish their services and appointments, to receive and triage referral information or to deliver against contracts and quality initiatives.

6.2. Context

6.2.1. Case 1

Case 1 took place in a Provider organisation that at the start of the study had poor IS uptake and prior to the study had been part of an organisational merger involving multiple geographical sites. Of the 2 main sites, the one that became part of the primary organisation had historically good uptake and a consistent level of IS utilisation. This had been supported in the locality by the use of a 'referral management centre' which supported an element of the administrative work primarily for General Practices. This setup sustained a high level of recorded utilisation and functioned as an additional support layer between the referring and provider organisations. This setup had been also divergent from design intention but conforms to IS use and supports the recorded utilisation nationally. Prior to the start of the study the 'referral management centre' had been de-commissioned, with the implication that the GP practices

would need to start using the IS in accordance with design intention, and the additional administration support would be withdrawn. The bringing together of two Provider sites also had implications in terms of different infrastructure, people, processes and cultures with regards to the IS. There was a strong governance structure to oversee the implementation of the IS following research stage 2, which had good engagement across the local organisations. Many of the referring organisations in the locality had less than 10% utilisation, but there had been a perceived commitment from organisations to improve uptake and adoption of the IS. The participant was an IS and Project Manager who was working on the technical and implementation aspect of the IS and worked across both sites and with clinical and admin teams within the organisation.

6.2.2. Case 2

Case 2 took place in a Provider organisation which in previous years to the study had engaged with various initiatives to improve IS uptake that had been driven by commissioning organisations. Those initiatives aligned with the national policy direction, and although pilots of IS features and functionality were introduced, they had not achieved intended outcomes across the local health economy. This had been primarily in relation to communications to and engagement of key stakeholders, and subsequent implementation through rudimentary procedures and a consequent lack of adoption. The Provider organisation had multiple sites spread across a local footprint, and some centralised and non-centralised clinical departments. This meant in some cases the administration of some departments was centralised and others managed internally. The senior management and administration were based at one site with some clinical specialties with the remaining services offered from other district sites.

There had been an average level of utilisation across the local health economy with pockets of resistance in particular GP practices, and in clinical specialties at the Provider. Several Clinical Assessment Services acted as interface services between GP practices and the Provider, and some also provided direct access to Diagnostic Services. Following assessment, patients would have been referred on from the GP to the Provider as appropriate. In some cases, the referral would not have followed the complete path through the IS, reverting to a manual process.

In the Provider organisation there had been a sense of reluctant willingness with respect to the IS where alternative solutions were previously being sought, and a there was a lack of support from Senior Management. The Commissioning organisation was ahead in terms of driving IS adoption and had the support and a level of engagement in place with GP practices. The participant was an administrative manager, who adopted the role of IS Manager working in the Outpatient environment supporting a number of departments and members of staff in referral and appointment booking administration, as well as providing IS support for the Provider organisation.

6.2.3. Case 3

Case 3 took place in a GP practice with a previously good uptake across the whole practice and wider referring footprint. Due to strong local support and previous initiatives to improve adoption, the local health community benefitted from good service availability from the local Provider. The Commissioning group ensured support was available locally and prior to any policy initiatives ensured a level of contract compliance. There was a good level of utilisation with a very small number of resistant GP practices. During the study some contracting decisions impacted on the appointment availability aspect of IS operations. A number of community and primary care services were made available on the IS, and this contributed to availability and choice of services.

The participant was a GP and an acting member of the Clinical Commissioning Group (CCG), they used the IS directly as an end user and also influenced local policy decisions and IS commissioning developments. Their Use was day to day and partially in direct clinical time, where a part booking would be made with the patient present.

6.2.4. Case 4

Case 4 took place in a Provider organisation that previously had a good level of uptake and utilisation. There was a good reputation for service availability, with only a small number of services not made available to GP practices by exception, and there was only one interface service present in the local health community. There was a strong resistance from the Provider related to any national policy initiatives, and previous local influence on contract negotiations related to the IS. There was a sense from the management at the Provider that they had achieved sufficiently enough, and that they did not have to engage with any related policy initiatives on IS adoption.

The Provider operated with multiple sites, but the primary activity was carried out from one main site. This is also where the management and administrative functions existed with most of the clinical departments. There was a centralised outpatients and administration function with a strong focus on performance. The high level of local uptake was impacted by the continued use of alternative methods as opposed to the IS, and an unintended process implementation which reported adversely against the nationally reported utilisation calculation, and it also impacted patient experience. Locally, accounts suggest there had been good uptake across the local health economy, with most issues related to Independent Health Sector Providers.

The participant was a technical manager who had become a specialist in the IS and maintained an up to date and innovative approach to the IS. Good feedback and communications channels were in place to ensure any updates. The administrative functions operated in a separate part of the organisation and

much of any change was driven from there as opposed to autonomy for technically driven IS developments.

6.3. Points of interest

6.3.1. Case 1

In this case, there had been dominant negative sentiment towards *usability* of the IS as being fit to be used, and *adoptability* of the IS as being suitable to follow or take up, which also had least average sentiment. There had been dominant positive sentiment towards *acceptance* of the IS being received as suitable and towards *purposefulness* of the IS as being reason for which IS was used, which also had the greatest average sentiment. As illustrated in Fig. 18, *usability*, *adoptability* and *purposefulness* had a negative trend average with the strongest attributed to *usability*, which also had the largest negative overall change by the final research stage.

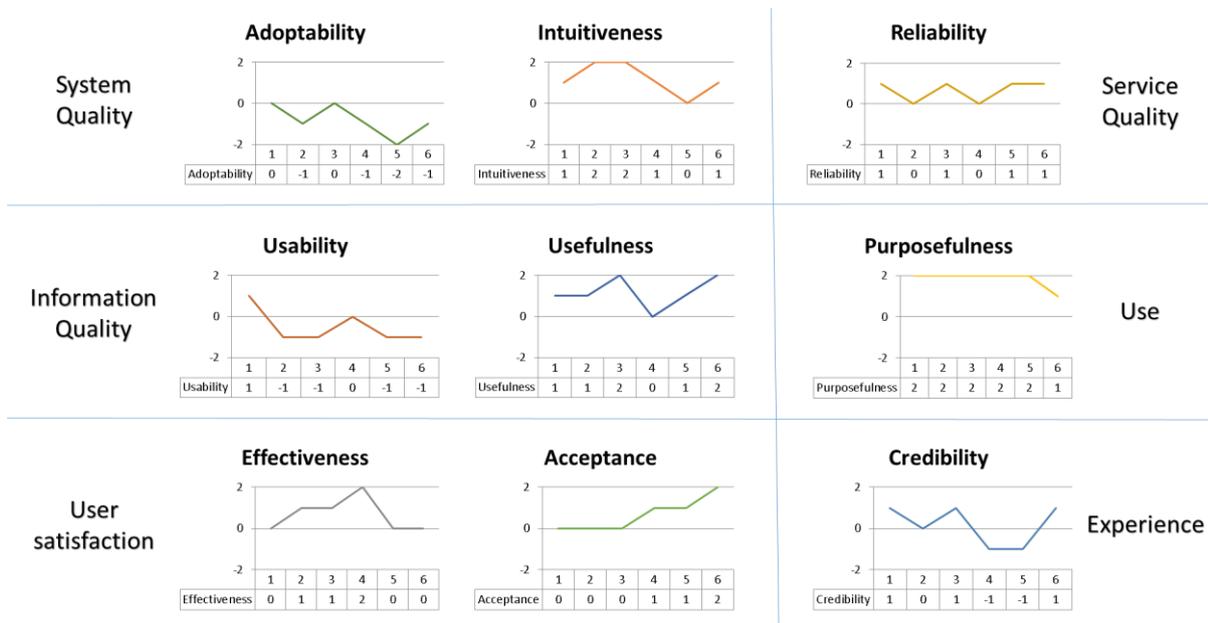


Figure 18 - Variable case sentiment across success attributes – Case 1

Both *adoptability* and *intuitiveness* shared similar trend patterns from stage 3-6, but with opposing dominant sentiment. *Purposefulness* maintained a dominant positive sentiment, until a decrease of 1 in stage 6. From stage 3, *acceptance* continued a positive trend in to stage 6, which also had the same trend pattern as *effectiveness* between stage 1-4. Until stage 4, *effectiveness* maintained a positive trend which then decreased to neutral in stage 5.

When compared with other variables in the same IS success dimension, *usability* and *usefulness* shared the same sentiment at stage 1 and stage 4. *Effectiveness* and *acceptance* shared the same sentiment at

stage 1. *Reliability* and *credibility* shared the same sentiment from stage 1-6, apart from stage 4 and stage 5.

There was no step change observed in the variables across research stages.

6.3.2. Case 2

In this case, there had been dominant negative sentiment towards *reliability* of the IS performing consistently well, and adoptability of the IS as suitable to follow or take up, which also had the least average sentiment. There had been dominant positive sentiment towards *usefulness* of the IS having practical worth or ability, and *purposefulness* of the IS as being reason for which IS was used, which also had the greatest average sentiment.

As illustrated in Fig, 20, *usability*, *intuitiveness* and *purposefulness* had a negative trend average with the strongest attributed to *intuitiveness*, which also had the largest negative difference occurring in stage 4 to the final research stage. Only *reliability* had a positive trend average, which also had the largest positive overall difference by the final research stage.

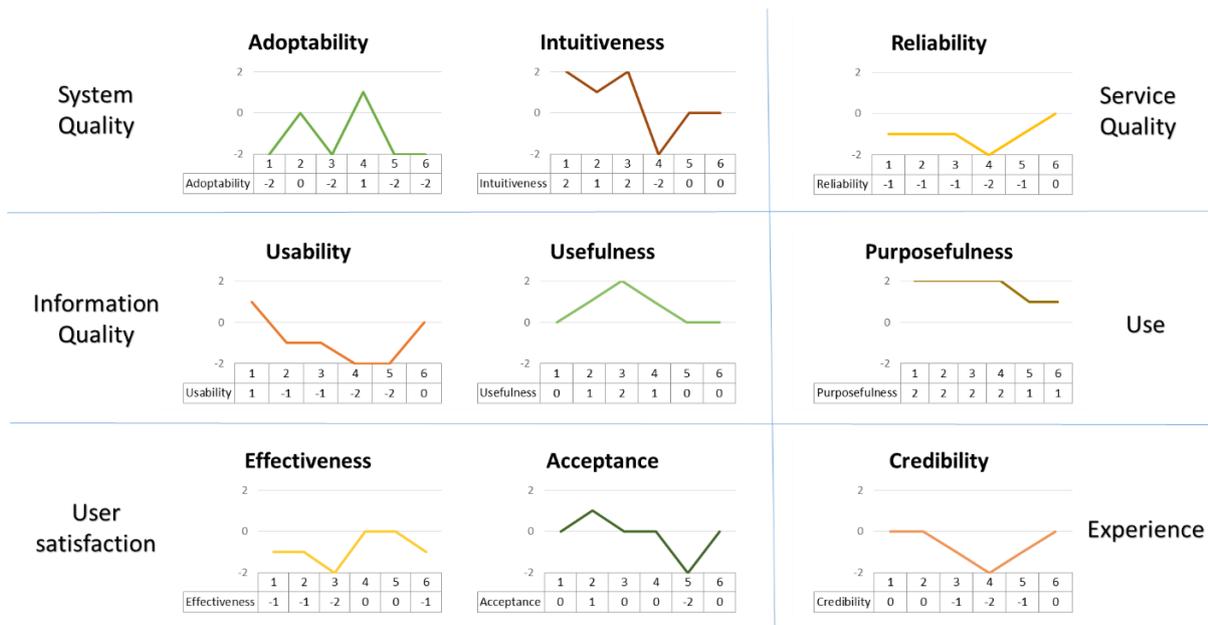


Figure 19 - Variable case sentiment across success attributes – Case 2

Both *reliability* and *credibility* shared similar trend patterns from stage 3-6, but with *credibility* having a more positive sentiment by 1 in previous stages 1 and 2. *Purposefulness* maintained a dominant positive sentiment, until a decrease of 1 in stage 5 to stage 6. *Usability* continued with a negative trend, until an increase of 2 in stage 6. *Usefulness* displayed a positive peak at stage 3, which then returned to neutral by stage 6.

When compared with other variables in the same IS success dimension, *adoptability* and *intuitiveness* had a tendency to oppose each other in sentiment value. *Effectiveness* and *acceptance* shared the same sentiment at stage 4.

A step change had been observed in *intuitiveness* from stage 3-4, and *adoptability* from stage 4-5.

6.3.3. Case 3

In this case, there was dominant negative sentiment towards *usability* of the IS being fit to be used, and *adoptability* of the IS as suitable to follow or take up. There was dominant positive sentiment towards *purposefulness* of the IS reason for which system is used, and *usefulness* of the IS having practical worth or ability, which also had the greatest average sentiment.

As illustrated in Fig. 22, *usability* and *adoptability* had a negative trend average with both sharing the same trend and overall difference. *Intuitiveness*, *purposefulness*, *credibility*, *effectiveness* and *usefulness* all had a positive trend average, whereas *acceptance* and *reliability* remained neutral. *Purposefulness* displayed the strongest trend average and largest positive difference by the final research stage.

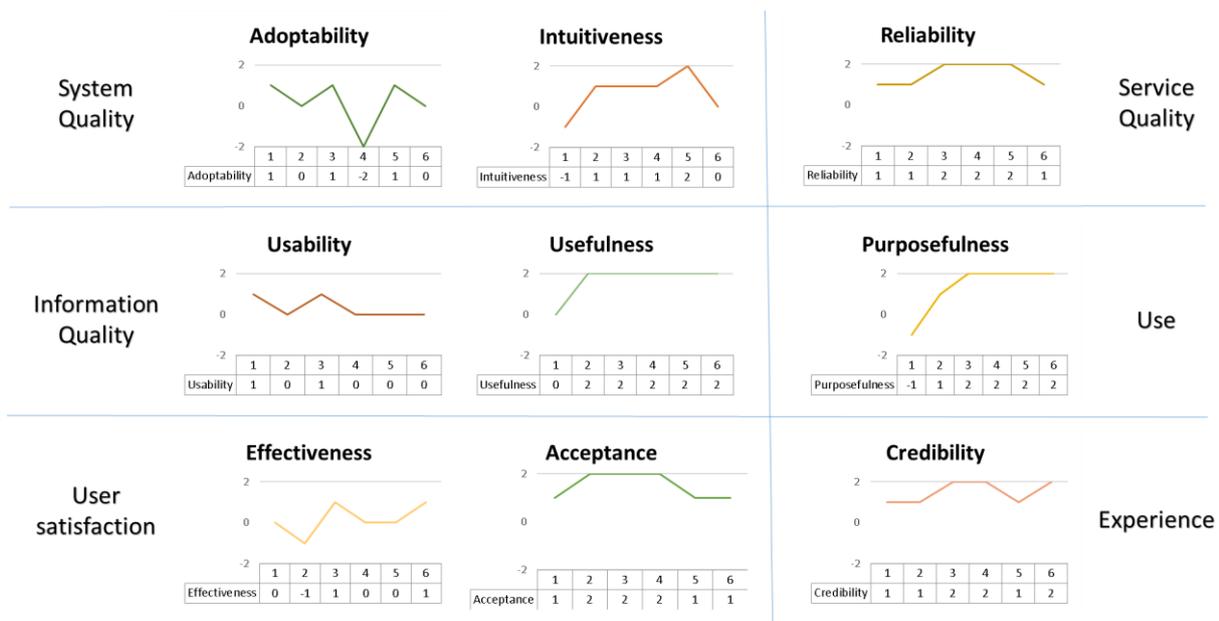


Figure 20 - Variable case sentiment across success attributes – Case 3

Both *reliability* and *credibility* shared similar trend patterns from stages 1-4, with sentiment decreasing at stage 6 and 5 respectively. This same pattern was also observed in stages 1-5 of *acceptance*. Both *usefulness* and *purposefulness* shared similar trend patterns from stages 3-6, both having a negative starting point at stage 1. *Usefulness* maintained a dominant positive sentiment, apart from a neutral start at stage 1. *Intuitiveness* continued on a positive trend until a decrease of 2 at the final stage.

When compared with other variables in the same IS success dimension, *effectiveness* and *acceptance* shared the same sentiment at stage 6, and *adoptability* and *intuitiveness* shared the same sentiment at stage 3 and 6.

A step change was observed in *adoptability* from stage 3 to 4.

6.3.4. Case 4

In this case, there was dominant negative sentiment toward *adoptability* of the IS being suitable to follow or take up, which also had the lowest average sentiment. There was dominant positive sentiment towards *credibility* of the IS being convincing or believed in, and *purposefulness* of the IS being reason for which IS used, which also had the greatest average sentiment.

As illustrated in Fig, 24, *effectiveness* and *usefulness* had a negative trend average with *usefulness* having a stronger negative trend average and largest negative difference by stage 6. *Credibility* had a positive trend average, with all remaining variables at neutral.

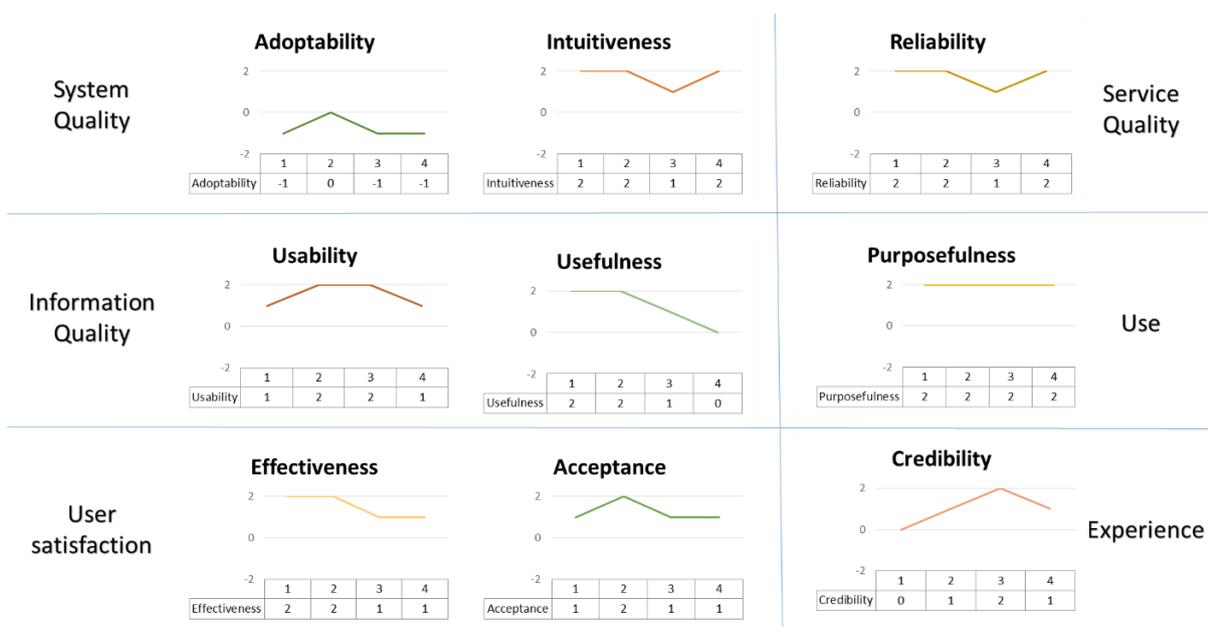


Figure 21 - Variable case sentiment across success attributes – Case 4

Both *reliability* and *intuitiveness* shared similar trend patterns from stages 1-4, with a decrease in both at stage 3. Both *adoptability* and *acceptance* also shared similar trend patterns but with opposing dominant sentiment, with an increase at stage 2. *Adoptability* maintained a dominant negative sentiment, apart from an increase of 1 at stage 2. *Credibility* continued on a positive trend until a decrease of 1 at the final stage.

When compared with other variables in the same IS success dimension, *adoptability* and *intuitiveness* feature in opposing dominant sentiment, with trends being opposite between stages 1-4.

6.4. Adoptability of Information System

6.4.1. Case 1

Adoptability displayed a negative dominance particularly in stage 2 and 5. In stage 1, sentiment had been attributed to a belief that significant resources were required for IS implementation where: “It seems that I've spent quite a lot of time moving around the Trust just trying to get it working”, which indicated divergent translation and typification. There was also a belief that accessibility impacted adoption where: “One of the barriers we can see access is having to have a smartcard”, which indicated divergent typification. In stage 2, sentiment had been attributed to whether the GP Practice organisations were engaging as they should: “Whether that’s actually the CCGs [Clinical Commissioning Groups] aren't encouraging as much as they say they are or it might be a bit of a combination of both I probably feel”, which indicated divergent typification. Here the CCGs are representative organisations of their membership GP practices, which are the individual organisations that actively use the IS. Also, IS faults were attributed to software and interoperability issues: “Some people have said it's to do with Java, some sort of identity agent, all this that and the other but, how good is eRS [e-Referral Service] at actually linking with lots of other systems, and fitting in with lots of other Trusts”, which indicated divergent transformation. Additionally, the participant referenced the policy event: “This is all its taken is for someone to say actually you don't have a choice now”, which indicated convergent typification. This referenced the policy announcement that took place around stage 2 for IS implementation by stage 6, which leveraged organisations for rapid IS adoption. There had been acknowledgement in stage 2 of opportunity for internal process improvement: “There is a degree I think for us it’s the administration of things and appreciating how eRS can fit round our internal processes which we know need improving and changing”, which indicated neutrality towards business process development. Comparatively, in *usability* frequent reference had been made to design constraints, but at this stage in *adoptability* there was optimism in how the policy direction had provided an opportunity to make internal improvements.

In stage 3, the participant referenced the emerging organisational response in relation to the policy event around stage 2: “But fortunately cos I think we've got the buy in from CCGs, and we've now got all of our specialties on board, the two are going hand in hand. But I know other Trusts have very different views as to how they are going to roll it out, you know very separately”, which indicated convergent typification and transformation where there had been positive engagement internally, but divergent transformation from other IS organisations. There had been concern about implementation support across the IS organisation: “We are educating our staff within the Trusts, our consultants, admin teams etc. However,

I still believe that training and education, and understand is still a huge issue that needs to be addressed within the GP surgeries, as a whole... Because, that referral management centre took away a lot of the administration that the GP surgeries didn't do", which indicated divergent typification, transformation and translation, where unintended use had contributed to lack of adoption in GP Practice organisations. This had not directly impacted the participant's organisation, but there was a belief that the dissolution of the 'referral management service' amplified the external work to be done to ensure the system was adopted.

In stage 6, there had been limited appetite to conform to IS design intention: "It has limitations that make you put in workarounds all the time, which isn't great in operational areas... I just wish it was slicker for our processes, and not having to build things around it to make it work", which indicated divergent transformation, typification and translation. Due to system limitations, lack of ability within the IS for flexibility at the process level impacted *adoptability* when trying to enforce a process within operational services.

Intuitiveness displayed a similar pattern to *adoptability* from stage 3 to 6. In stage 3, for *intuitiveness* there had been positive sentiment: "It's very intuitive to use, it's not difficult to use at all", which indicated convergent translation and typification. There had been reference to time factors in clinical use of the IS: "Clinician time and triaging, that is my, that is one area that I believe isn't very intuitive to the clinician", which indicated divergent translation and typification.

In stage 4, there had been a negative trend relating to language differences between clinical and managerial staff: "The consultants say why am I referring on, that doesn't mean anything to me, whereas its language that we're used to using. From their point of view it's not", which indicated divergent translation, highlighting the importance of how meaning is conveyed through the organisation across staff groups.

In stage 5, there had been reference to a process involving Provider clinicians: "But when it comes to the triaging process, that's still my issue which I don't think is intuitive if something needs to be changed from clinicians point of view", which indicated divergent transformation, typification and translation.

In stage 6, which related to administrative users: "It is intuitive, I think probably more for admin users", which indicated neutrality with clinical staff being a main user group, the IS would benefit from design changes focussed toward this group of staff.

6.4.2. Case 2

Adoptability displayed a negative dominance particularly at stage 1, stage 3 and stages 4-5. In stage 1, sentiment had been attributed to quality of service: "They should do something with training, they need

to sort the training situation out”, which indicated divergent typification related to the responsibility for training. There also had been a concern related to IS design: “We all argue about not being able to see the referral till we have booked it”, which indicated neutrality towards the design intention of timing information availability. In stage 2, in reference to work element that supported IS implementation: “We are trying to, we're working with the CCG to get that changed”, which indicated convergent typification and transformation. Reference had been made to a particular IS functionality: “So we're working with them to get their surgeries using it, but we still have this issue around reject, if our consultants reject it”, which indicated a divergent typification, transformation and translation. In stage 3, reference had been made to local policy decision relating to Use of an IS functionality: “We've had to say just ignore that reject button, which isn't the right way to do it”, which indicated divergent typification and transformation related to IS organisation responsibilities. Comparison was made with design intention and: “So it's not user error, is what they are allowed to do”, which indicated neutrality toward IS design that resulted in unintended Use which would not have been possible in the manual process. In stage 4, there had been an anomalous positive increase by 3, related to the national policy: “They don't seem to grasp the fact that you haven't got a choice soon and we are going to be returning all your letters along with Oxford, Berkshire, Bedfordshire, and Milton Keynes, Luton, Dunstable and all the rest of them West Hertfordshire”, which indicated convergent typification and translation. In stages 5-6, the lowest *adoptability* sentiment had been related to IS process and clinical users versus administrative staff use of time: “For our consultants it is still around, if they want to add an additional requirement and how that works”, which indicated divergent transformation to enabling relevant processes to take place where at the time there was perception that the IS was more cumbersome: “So we get quite a lot of umm, how many clicks it's taken them. They've got time to count the clicks”, which indicated divergent transformation and typification. There had been an incoherence with design intention: “So we're sort of using workarounds and you know it doesn't really work”, which indicated divergent transformation. In stage 6, the sentiment related to clinical Use had been: “We still have doctors here that are just rejecting. Most of them are rejecting it incorrectly, so it's really difficult”, which was a result of divergent translation and typification as the organisation took a local decision not to apply this functionality.

Intuitiveness had a negative trend, with the most significant difference occurring from stage 3-4. In stage 1, the IS was described as: “Simple, it has to be for me”, which indicated convergent translation and with a level of convergent typification: “If I can use you can use it”. In stage 3, there had been a lack of certainty around IS design change: “I love the slot management button, if that's what it's called isn't it” and “Well you can/can't do that, you could do it this way. I'm thinking, well is it the right way”, which indicated divergent translation and typification. In stage 4, following IS technical issues the view was: “That gobbledygook to me, all I know is I've got that patient stuck in eRS with incorrect information on it and I

can't do anything about it", which indicated divergent translation related to lack of expertise. This had been further described in relation to interfacing IS: "I don't know the answer to that question. I don't understand the answer, and it would appear nor do SystemC", which indicated divergent translation and typification. In stage 4, there were practical issues relating to design change: "Not intending to do it, I've done to cancel and pushed the delete, because the delete was the only one showing", which indicated divergent transformation related to the design changes of the user interface and layout. In stages 5 and 6, the sentiment returned to neutral, and the participant described: "Trial and error and you get there", which indicated divergent typification, and following design changes after stage 4 the participant described: "I think the screen looks better, certainly this is a much better screen, than it ever was, it is much clearer. So, from that point of view yep", which indicated convergent transformation relating to IS design changes. In the presence of design constraints, there had been an application of workarounds:" So they don't need rejecting, and this very kindly XXX did in front of one of the blimmin gobbiest consultants, who went out and said oh that's how we're going to do it. Told one or two of them, or three or four. They started doing it, but not properly", indicating divergent typification and transformation as a result of working around design constraints. In reference to duplication of activity in GP Practice organisation the view had been:" Now that could be because its taking too long to pick up but if the GP get that they'll come out and do another booking cos they think it's not working", which indicated convergent transformation, but divergent typification. Communicating with IS organisations was described as: "Oh you need to get onto NHS England, oh no I don't, they'll come back with some convoluted answer and I won't understand it", which indicated divergent translation, and in relation to IS design changes that occurred in stage 5 the attitude was: "What are they on about? I hadn't noticed it, I just got on with it, I actually prefer it. I think it is far simpler, because it's nice and big and bold, and you haven't got those stupid little boxes down the bottom", indicating convergent transformation.

Reliability displayed a negative dominance, and from stage 1-3 remained at -1. In stage 1, relative to the IS support service: "I just want the backup training. And that's not a dig at anybody at all, as there isn't a lot out there now" and "We get a new system no extra training, no help, here it is", which indicated divergent transformation. In stage 2, there was a concern relating to IS performance: "But I did have a problem, I think the whole system went down last Tuesday", which indicated divergent typification in relation to a national IS outage, but on day to day IS performance the view was: "Reliability is ok, apart from this one system unavailable issue", which indicated neutrality towards the expected IS availability. In stage 3, their own Use was described as: "Yeh see I've got two open and that's the error message you get. So, I'll have to close it down and go back in", which indicated neutrality in an unintended Use of the IS, which may be due to a lack of knowledge and training. Around stage 4, another national IS outage occurred where the participant expressed surprise: "eRS crashed and the whole network went down.

I've been using eRS for 10 years and it's never done that", which again indicated neutrality towards IS downtime, which impacted the participant by having to deploy manual processes: "I think I had to validate far too many appointments", which indicated divergent transformation. In stage 5, there had been a positive trend from successful Use of IS functionality: "See its done that pretty quickly today, but it wasn't working a while back. We couldn't get that report for about 2 months", indicating divergent transformation related to management information. But, there had been a concern in relation to the interfacing IS: "The biggest problem our surgeries find is that it doesn't pick up the appointments in our PAS system quick enough, so they put another one on", which indicated divergent typification and transformation related to IS interoperability. There was inconsistency in IS performance: "Now I don't know if that our servers here or whether that's eRS, or what. So, we do get a few issues like that", which indicated neutrality towards downtime caused by dependency on multiple interfacing IS. In stage 6, relative to the IS performance: "Yeh I would say yeh on the whole I would give it 100% reliability", which indicated convergent typification that was counteracted by negative sentiment on IS design changes related to management information:" It won't always show me the reports, and you get this click here click here, and you keep going and going until eventually it will pop up" indicating divergent transformation related to availability of reporting. Referencing interfacing IS: "Now I know linking across to PAS system maybe Medway system or our PAS, that doesn't always work umm as quickly as it should", which indicated divergent transformation. Overall, the negative dominance had been attributed to factors related to perceived performance of IS, and participant understanding of IS design, or issues related to interfacing systems and communication channels.

6.4.3. Case 3

Adoptability displayed a negative dominance and significant difference from stage 3 to stage 4. In stage 1, on referring to 'priority' functionality: "Where it is less easy is the Urgent, referrals (not 2WW)[Two Week Wait – Cancer]", which indicated divergent transformation in the Provider organisation, which impacted across the IS boundary. In stage 2, on expectations of IS: "People aren't prepared to waste too much time trying to get it to work", which indicated neutrality towards IS issues. In stage 3, on referring to IS alternatives: "Some clinics still have alternative routes that they actively encourage, through email/fax", which indicated divergent typification and transformation in the Provider organisation. In stage 4, there was significant difference in sentiment attributed to the usability of the IS: "I think it is still perceived as a bit clunky in places. So you know it's quite a few steps if you like for 2W...quite a lot of steps in a time pressured environment, kind of thing, those are the main factors really", which indicated divergent transformation involving the manual and IS processes. In stage 5, there was a continuation of the previous theme of the 'urgent' feature: "...GPs don't have trust that for an urgent referral, that referral would be pulled out and adequately triaged and put into the appropriate place", which indicated

divergent typification and transformation. Additionally, there had been negative sentiment towards the perceived Use of the IS in the Provider: “But, umm, there is that feeling that there isn’t human clinical input into the system until patient is actually in front of them”, which indicated divergent typification and translation. In stage 6, the sentiment had been attributed towards the ability to take up appointments in the IS: “They don’t lend themselves well to Choose & Book. Also, the very long wait stuff, at the other end, where there’s a long wait like Dermatology, where there are quite frequently not appointments on there”, which indicated divergent translation and typification. Also: “At the service provider end they are having to take people off the system, and that they can book them in the order they were referred”, which indicated divergent translation, transformation and typification.

Interestingly this participant directed much of their sentiment towards the Provider organisation rather than their own organisation, but in the final stage related back to own GP practice organisation: “I think to be honest our practice ethos is we’re a fairly doctor centric practice. Doctors still do quite a lot of the things that are delegated elsewhere in other practices. Certainly, we are not resistance to change”, which in a context of Provider divergence, indicated own convergent transformation and typification.

6.4.4. Case 4

Adaptability displayed a negative dominance, with a sentiment increase only in stage 2. In stage 1, on referring to technical expertise and remit: “A lot of stuff operationally, but implementing it technically is absent”, which indicated neutrality accredited to the participant themselves. Also, that a certain level of specialist technical knowledge was required for IS take up. Although, “Anyone can access and setup services”, which indicated convergent typification. Additionally, in terms of running costs: “Nationally available, free - operational cost absorbed in running of NHS”, which indicated convergent translation. In stage 2, on referring to policy events: “Its having a national drive to make sure it’s used, and pushed as this is the service you can use” and “historically organisations especially in the early days didn’t have that support”, which indicated convergent typification. Also, in relation to support: “Having a good training programme, to ensure people stay trained as it were”, which indicated neutrality towards IS support. In stage 4, sentiment had been attributed to senior management engagement as: “It should very much obviously from a provider perspective it’s all about the exec support and exec push”, which indicated convergent typification. In relation to the preceding policy event the view was: “Pretty positive and as long as there’s some push on primary care side to make GPs use it, especially with the contract change there is”, which indicated convergent typification. Negative sentiment was attributed to interoperability issues where: “They don’t quite fit with how eRS books things and Cerner doesn’t have that other tech stuff to fit, so again you either have to put in some clunky workarounds to do stuff beyond the core purpose of booking into outpatient clinics”, which indicated divergent transformation.

Both *reliability* and *intuitiveness* shared similar trend patterns from stages 1-4, with a decrease in both at stage 3. Positive sentiment for *intuitiveness* was attributed to: “It is very simple and straightforward in compared to very archaic and detailed clinical systems” and “I think it's very clear and straight forward”, which indicated convergent typification and translation. In stage 3, on referring to IS expertise: “There isn't anyone who understands implications, from GP side”, which indicated neutrality towards IS support. Positive sentiment for *reliability* was attributed to underlying infrastructure and scale: “Its nationally the underlying infrastructure is very solid and stable system with interruptions and few issues and downtime” and “It sort of fits very well in the bounds of what you can accept from a national service”, which indicated convergent typification. In stage 3, on referring to IS expansion or innovation: “Scope expanded to things outside of this, is when it starts to creak”, which indicated neutrality towards IS design.

6.5. Use of Information System

6.5.1. Case 1

Purposefulness had positive dominance across the research stages attributed to IS core function being a safe and effective system for electronic referral, which can also facilitate patient choice. In stage 6, there had been tension attributed to operational performance objectives: “Although, that doesn't always fit around what the Trust is trying to achieve with regards to RTT [Referral to Treatment time]”, which indicated divergent transformation. There were process concerns across the IS organisation: “A lot of them revert to see comments, letter dictated. They get their secretary to do letter and put in patients file. That's not really how to do that, type in and save secretary work”, which indicated divergent typification, transformation and translation.

At stage 4, both *reliability* and *credibility* had a negative trend of -1 and -2 respectively, in an overall trend that is otherwise similar. In stage 4, negative sentiment in *reliability* had been attributed to: “quite a lot of technical issues between eRS [e-Referral Service] and our PAS [Patient Administration System] at the moment, that means that whilst eRS is doing its job most of the time there are an awful lot of occasions where things are having to be tried and re-tried”, which indicated divergent transformation.

In stage 3, *credibility* had been attributed to legacy of IS: “We still hear a lot of people, referring to it as Choose & Book, and the old Choose & Book... It's almost because it's so similar, well it is isn't it, it's doesn't really it. It's a face lift”, which indicated divergent translation, which may infer a negative association with the legacy system. In stage 4, *reliability* similar to *usability* had been attributed to: “What didn't help was I was told it would be fixed by 12 o'clock and it wasn't. That was our PAS supplier”, which indicated divergent typification. The participant established that the IS itself is considered reliable, but

credibility may be impacted due to unreliability of interfacing IS, as opposed to the IS itself. In stage 5, whilst *credibility* remained the same there had been a positive increase in *reliability*: “I don’t want to tempt fate, but it does seem to be fairly reliable at the moment. Yeh, broadly speaking I think it is reliable”, which indicated convergent typification.

In stage 4, *usability* displayed a positive anomaly attributed to interfacing IS: “It’s not eRS that doesn’t do what we want it to do, it’s our PAS system that hasn’t been setup quite as eRS needs it to be”, which indicated convergent typification and translation.

Usability had a significant decrease in stage 2, where there had been reference to system constraints and task allocation: “We should have that with the triage, there should be another box, that says, admin action required. They click on that, and then it moves into an admin action worklist, where it’s picked up, done”, which indicated neutrality towards functionality which do not allow clinicians and admin staff to communicate and assign activity within the system. The participant made a distinction between clinical and administrative work and requested the ability to assign tasks between these two staff groups in order for it to be considered fit to be used. There was frustration that this change had not yet been made: “I’ve been on a call with other Trusts and they’ve had feedback from their clinicians going it’s not fit for purpose, I’m not doing this”, which indicated divergent typification and transformation, suggesting concern in the wider IS community. There had been reference to IS taxonomy constraints: “So we have no option but to put it under Not Otherwise Specified. But that then results in all sorts coming through”, which indicated neutrality where certain categories are too limiting or open to interpretation with no known mechanism on feedback of their development. In stage 3, there had been concern relating to user error: “If you cancel a UBRN [Unique Booking Reference Number], there ain’t nothing you can do about it. Once that’s cancelled, once you record a DNA [Did Not Attend], you can’t take it back. Once you’ve accepted or rejected something you can’t bring it back. It’s very like final straw”, which indicated neutrality toward inability to take corrective action. In stage 3, there had been reference to the use of workarounds: “I think what sometimes becomes of eRS is actually the processes, sometimes you have to then build around it”, which indicated divergent transformation as a result of perceived lack in IS functionality. In stage 4, sentiment had been attributed to product development focus: “I do feel from the development side of things with eRS there could be a lot more done I feel with Providers. It’s been very primary care heavy... But, I still don’t feel there is a great deal of development or interest in the way the providers are actually working in their admin teams and their clinicians”, which suggests a bias between the organisation and staff focus of IS development.

A design change which took place between research stages 3 and 4 had been referenced in stage 6, as being initially difficult to use: “Its usable, but I still think it’s very clunky, too clicky, and obviously if you

lose your smart card locked, certificates expire, there's no other way of accessing the system information", which indicated neutrality toward the design change. Through stages 2-6, perception had been consistent of the IS being unfit to be used in relation to IS design constraints, speed of authentication and use, and inability to change these identified issues.

6.5.2. Case 2

Purposefulness displayed a positive dominance from stages 1-4, with an anomalous decrease at stage 5. In stage 1, for IS to have been used there were multiple reasons to: "deliver a referral that is secure" and "patient choice", which indicated convergent translation towards core IS functionality and design intention as: "it comes back to security, safe in the knowledge...as a manager it gives assurance", which indicated convergent typification. In stage 4, following from an IS design change the view was: "Now my assumption is that with the change this week, that will now say call your provider, your preferred provider", which indicated convergent typification, but divergent transformation as: "The patient phoning us is great, except of course there are no phone numbers on the DoS, in that new section, and I don't know if it's going to put the phone numbers that were there, apart from I don't expect it is". In stage 5, the sentiment related to IS Use as intended was: "If everybody uses it properly its quicker its easier, they're not getting chased for lost referrals, cost they can't get lost", which indicated convergent translation and transformation. Further, on financial benefits the view was that it's: "Certainly cheaper for the hospital if used properly. I would say saving money all the way down the line actually", which indicated convergent typification and transformation related to perceived cost savings, but divergent since: "GP surgery wouldn't agree with me on that. I'm sure cos they're saying they don't have the manpower to do this".

In stage 6, referring to an IS feature there had been a concern related to funding: "Because if you referrer back to referrer, for more advice, that is basically giving advice and guidance through the back door, and they're not getting paid for that", which indicated neutrality related to funding associated activity already accounted for. Further reference had been made to incorrect Use of functionality: "Those that want to have their referrals reviewed, T&O as far as I'm aware there's only spinal being reviewed. Everything else is going straight through", which indicated divergent typification and transformation.

Usefulness displayed a positive dominance, peaking at stage 3. In stage 2, in reference to workarounds: "You're better off the consultant putting a comment on that does into the additional requirements, and we pick it up from there and do what needs to be done, and that's what we try and encourage at the moment", which indicated divergent transformation and typification. Referring to operationalisation of IS the description had been: "I've got services managers now going into eRS looking at their slot issues", indicating convergent typification. IS feature developments had a positive effect as: "With advice and

guidance, now that it's been upgraded, it's going to work brilliantly I'm sure, there's far more functionalities on it now, the referral there now at the point of advice", which indicated convergent transformation and typification. In stage 3, on referring to IS design change: "But that's my favourite button of all time. The girls like it, as we don't have to take stuff out", which indicated convergent typification towards the design change. In stage 4, on referring to IS uptake: "Now we are using it more, or it is being used more, we're coming up with things that don't necessarily work as well as we would like them to", which indicated convergent typification, but divergent transformation. In stage 5, in response to an IS constraint the IS service organisation had offered a workaround and the response was that: "[ISO] very helpfully came up with an alternative way, and that's caused carnage...Now I've got to re-write all the SOPs, do an alternative SOP. We're not going to go round and re-educate 250 consultants, cos we've only just managed to get them on the bloody thing", which indicated divergent typification related to the IS service organisation, inadvertently contributing to divergent transformation, typification, and translation. On referring to reporting functionality: "I can't believe they haven't got better reporting in there, that is more accessible", which indicated divergent transformation towards reporting design changes. Also, in being able to transfer information within the IS the view was: "So I would have the you know, clinician open in one bit, and definer open in the other bit. It doesn't like that very much", indicating divergent transformation as IS design could be improved to transpose information within the IS.

Usability, in stage 6, displayed an anomalous increase of 2, where the participant referenced IS reporting capability:" It's usable until you want to get reporting, and that's where I find an issue, and that is more around the time it takes for reporting, for reports to be downloaded. I did notice that it was a bit quicker this month", which indicated neutrality towards the design change.

6.5.3. Case 3

Purposefulness displayed a positive sentiment with greatest difference and trend average. In stage 1, initially negative sentiment had been attributed to reason for which the IS used: "I think it's a referral management system", which indicated divergent translation. In stage 2, the IS was described as: "The purpose of eRS is obviously a mechanism for making referrals...It's a vehicle for offering choice to patients", which indicated convergent typification and translation. In stage 3, on referring to features and functionality: "Primary function is a referral mechanism, but it also has access to data collection, valuable data collection", which indicated convergent translation and transformation. Further the IS was described as, "A communication system because we have the advice and guidance function", which indicated convergent translation. Also, the participant elaborated on previous divergent translation in stage 1: "A effective referral management system, that allows you to create an audit trail for that referral, and enables choice to be offered for patients", which indicated convergent translation and typification.

In stage 4, on the IS 'service directory' feature which: "Hopefully gives you information on services to refer, more appropriately", indicated convergent translation and typification. Interestingly, the participant elaborated further in relation to the use of management information: "It allows data gathering on referral patterns and referral to feed into CCG and practice approach to referrals", which indicated neutrality towards management information. In stage 5, on referring to IS process and social effect: "Primarily a referral mechanism for referring a patient for further care, which gives you patient choice", which indicated convergent typification. In stage 6, from previous collation: "It is a referral system to access secondary care, patients can be offered choice, through referral management system so you can audit and track referral data... You can also provide a safety net for patients to not get lost in system", with the addition of auditability and tracking which indicated convergence across all conveyance activities.

A similar trend pattern was observed in *usefulness* and *purposefulness* between stages 3-6. In stage 3, *usefulness* sentiment had been attributed to the ability to Use the IS within direct care: "I think it's in most cases it works smoothly, and easy way I can do it there and then in the consultation, and do the referral and its dealt with", which indicated convergent transformation and typification. In stage 4, there was continued narrative on ability for IS Use at point of care: "Very useful, I tend to do my referrals at point of seeing the patient, it's done, referral is done and gone and don't think about it again", which indicated convergent transformation and typification. In stage 5, on the ability to Use IS within direct care: "I can generate a referral and give it to the patient, and write the letter, all within the consultation. It's quite an efficient way to get a referral done", which indicated convergent typification and transformation. In stage 6, on referring to the use of management information: "Yes, they are used by CCG to monitor referral patterns, and they do get discussed intermittently at CCG council meetings", which indicated neutrality towards use of management information. Both trends in *purposefulness* and *usefulness* related to the ability of IS features and functionality in direct care and use of management information to support planning and audit.

Usability had a negative trend average attributed in stage 1 to activity tracking in the IS as: "Referral tracking is still problematic", which indicated divergent typification. In stage 2, on referring to the distribution of IS tasks: "Our secretary uses them. So, we're a practice that who does the/generate the Choose & Book within the consultation, but the backup work is all done by the secretary", which indicated neutrality towards IS responsibilities and processes. Interestingly this was contradictory to previous statements relating to *adoptability*. In stage 4 and 5, on the number of IS steps: "I mean I find it quite easy to use, but I think it still is quite a few separate steps, it's not as efficient", which indicated divergent typification and transformation. In stage 5, on referring again to the 'urgent' feature: "It would be nice on Choose & Book if you did click urgent at the top had a button on the top that you had a slightly

different page, using the send for triage button or something like that, rather than having to book a slot in the Trust that it will get sorted”, which indicated neutrality towards IS design. In stage 6, on referring to the ‘advice and guidance’ functionality: “I think what probably would help is more the improving the 2-way communication functionality”, which indicated divergent typification.

The overall difference in *usability* was shared with *adoptability* where there was commonality related to the task distribution between clinical and administrative staff and use of IS alternatives as: “Minimising downtime, obviously if you get a time when it’s not working, I know some colleagues will just either pass it on to secretary or just fax a referral”, which indicated neutrality towards IS reliability.

6.5.4. Case 4

Purposefulness displayed dominant positive sentiment and greatest average, which was attributed to IS core attributes such as “GPs referred a patient via e-referrals, to book their appointment, I can see their referrals and juggle them about and re-direct people, and the right people turn up in my clinic and I get on with doing the doctoring that I want to do”, as “Auditable, trackable, speedier and safer”, and “Patients can have their choice”, which indicated convergent typification, transformation and translation.

Usefulness had an overall negative sentiment, from a positive start with reference to IS benefits as: “Core part of how Trust received referrals, and manages patient booking... Extremely useful, in terms of the hospital reduced paper, staff volume of dealing with patient appointments, advertise services” which indicated convergent typification. In stage 2, on referring to IS features and functionality: “I have asked X so and so for advice about my patient, here is their response, here’s a copy of it, I can then act upon it...Its clear for us to setup our services in our departments...Its clear to GPs how to find us, how to refer their patients to us whether they are our local GPs literally across the road, or you know ones in Exeter or Newcastle...It is secure, speedy and electronic”, which indicated convergent typification, transformation and translation. In stage 3, with reference to IS value: “It works even if its works I suppose, in a grudging way”, which indicated divergent typification. In stage 4, on referencing IS design: “It is starting to creak around the edges as although the national guidance focus on GP referrals to consultant led outpatient clinics, obviously Providers want to put more and more on there...But that is because it's trying to expand beyond the core scope that’s been there for many years, and it's not the core scope is failing, it’s the expansion just needs some work”, which indicated neutrality towards IS design.

6.6. Acceptance of Information System

6.6.1. Case 1

Acceptance had a positive dominance and a significant difference from stage 3 to stage 6. Sentiment improved from midway through the period after remaining neutral, and a similar pattern had been observed in *effectiveness*, stage 1-4. From stage 1-3, *acceptance* remained neutral with issues relating to the merging of 2 separate sites and respective cultures into one organisation. At one site IS had been described as: “not particularly very well adapted here as in consultant wise there is still a lot of resistance... until now, constant requests to turn off the system, we don’t see Choose & Book patients”, which indicated divergent typification and translation. Around stage 2, the policy event had a positive effect: “We are making progress and I think over the last two three months maybe having XXX more engaged and onboard has helped a lot with progress”, which indicated convergent typification and transformation where the participant remained positive and there is progress made in IS implementation. There had been a perception that policy events had leveraged senior management engagement: “And before it was a case of he didn't want to do it and it was on the back burner, where's now the CQUIN [Commissioning for Quality and Innovation] and all of that has forced everyone's hands to be more involved”, which indicated convergent typification. There had been tension in advocating the IS and perception regarding the IS service organisation: “We’re used to having the fight of having to selling and defending, and it's not always defensible as I sometimes agree with the arguments that people come back with”, which indicated a frustration in the ability to resolve or respond to feedback and challenges in a constructive way, in some cases having to reel back and agree, impacting on personal credibility.

In stage 3, there had been challenge breaking down legacy perceptions: “What I'm finding is as soon as you, we are still breaking old barriers and perception of Choose and Book”, which indicated divergent typification and translation. In stage 4, positivity had been attributed to achievements made and uptake across the system: “I think that has improved quite a lot now hasn't it... We've been live a month. Yeh I think it's getting there”, which indicated convergent typification. In stage 5, the basis of *acceptance* had been described: “Oh I'd say its accepted that it has to be in place, and it has to be used. Well, say has to be used, in the loosest possible terms”, which indicated neutrality towards the IS as a beneficial thing to do, or something that had to be done, but in a way that may be superficial. In stage 6, the success of policy events had raised profile and awareness of the IS adoption in the organisation.

In stage 1, *effectiveness* had been neutral: “It does what it's supposed to do”, and reference is made to functionality of the IS: “patients can cancelled and re-book as many times as they like and that really doesn't help” which indicated neutrality where this unintentionally leads to Provider operational issues,

and there is a perception that the IS enables these operational issues. In stage 2, comparison had been made between current process versus IS process: “Clinicians will still say if you give them a pile of 20 referrals, they can read them and triage them far quicker than they can on eRS”, which indicated neutrality where there was a belief that the IS has not made things more efficient from a Provider clinician perspective. Although, other user roles were considered more effective: “Front end its effective in terms of booking. Its effective from that point of view”, which indicated convergent transformation. In stage 3, the IS had been considered safe and secure: “It's safer as it doesn't get lost”, which indicated convergent typification. Relating to intended use: “Yeah, it's as good as you make it isn't it, if people use it properly, that's good”, which indicated convergent typification, transformation and translation, highlighting that IS produced the desired result when used in line with design intention, which is further described in stage 4: “I think it is effective providing you've got the services set up right and we've got the appointments there. Providing everyone has done their bit I think its effective”, which indicated convergent typification. In stage 5, a negative trend had been attributed to feedback mechanisms: “Process is fairly straightforward, but the mechanisms in which we have to go through to alert somebody to that change is not particularly efficient or effective, and that's where we've had to have workarounds”, which indicated divergent transformation relating to the feedback into design changes. In stage 6, sentiment returned to neutral, even though the level of *acceptance* had increased to 2. Relating to IS interoperability: “A&G people are engaged with that, but our biggest problem is the ability to save it straight into the patients records which is what the clinicians want”, which indicated divergent transformation where clinical staff felt that there was an incomplete audit trail.

6.6.2. Case 2

In this case *acceptance* remained neutral apart from a positive peak at stage 2, and a 2 step decrease at stage 5. In stage 1, there was an organisational appetite to explore alternative IS solutions: “There are couple of other systems available, can't we use that”, which indicated divergent typification. However, the participant also acknowledged the forthcoming policy event after stage 5 where: “this time next year you have no choice”, which indicated convergent typification balanced with divergent typification where “lots of people that don't like it”. In stage 2, there was increasing levels of acceptance across staff groups: “Since we last met, definitely more acceptance because we pushing it, and of course we have got to because NHS England got us on timescale”, which indicated convergent typification related to policy events. In stage 3, on referring to senior management: “I still don't think that our trust takes eRS as a viable option. However, with PSO [Paper Switch Off] they haven't got a choice”, which indicated neutrality towards the policy events. There were organisational concerns internally on legacy IS: “I think it's, as long as you don't call it Choose and Book you're alright”, which indicated divergent typification and translation. In stage 4, on referring to unintended use: “From our side, from a vetting point of view,

they are just fed it on a plate of paper. They have no reason to go online and look”, which indicated divergent transformation and divergent typification: “They'll try and get their secretaries to do it”. There was a tension described between senior management, administrative and clinical staff: “The consultants, they bury their heads until they are told you haven't got a choice. They will try and get away with murder till then. I'm sure that's the same with most Trusts”, which showed neutrality towards policy. In stage 5, relating to clinical staff: “Umm, if you're asking me to see if it's a consultant accepts it, I would say, hand on heart I don't think there's any consultant in this Trust that would say they are happy with the way to use it. They are using it but under duress”, which indicated divergent typification and transformation, and in reference to senior management: “One of our interims going I think we ought to stop paper switch off, you know we don't have to do it, do we?”, which indicated divergent typification at a senior management level.

Credibility displayed a similar trend pattern from stages 3-6. In stage 3, there had been a technical issue due to design change: “Well I thought it was quite credible, but if they can defer to provider without slots being available, then its lost a little bit of its credibility hasn't it”, indicating divergent typification, translation and transformation. In stage 4, there were organisational concerns with IS uptake: “GPs are going ballistic, coming through to CEO and god knows what else saying this is ridiculous”, which indicated divergent typification and divergent transformation, and: “Well actually it's the same as the old system, its only changed its name. Choose and Book had such bad press isn't it, we still got Choose and Book on the flippin icon”, which indicated divergent transformation and translation in response to design change. In stage 5, on referring to IS blame culture: “But we do get a lot of its eRS fault”, indicating divergent typification, and in stage 6 staff perceptions were further described as: “No, it's a national system XXX, we've all got the same, it's rubbish everywhere. Whatever issues you have, all the others will be having elsewhere”, indicating convergent transformation, but divergent typification. Comparing *reliability* and *credibility*, similar trends were identified relating to national system outages, and communication across interfacing systems where there is divergent translation.

6.6.3. Case 3

In this case, there was positive dominance for *acceptance*. In stage 1, sentiment was: “It's pretty widely accepted by the practice as the way things are done”, which indicated convergent transformation and typification. In stage 2, sentiment was attributed to: “That is the way we do things, and we're quite happy with that as a system...I don't think it's a reluctant acceptance...It is just part of normal life now”, which indicated convergent translation and typification. In stage 3 and 4, there was convergence across all conveyance activities where: “People don't question it...But the straightforward, choice, straightforward referrals, I think most are happy to use it...It's just there and use it. It's part of our daily practice. It's fully integrated into daily practice”. In stage 5, there was negative sentiment attributed to ‘priority’

functionality as: “Unless there a few clinics not on there or urgent that we will not put through”, which indicated divergent transformation. This narrative is continued in stage 6 relating to alternative methods and ‘priority’ functionality: “The only area there is wobble around urgent referrals, 2ww urgent referrals”, which indicated divergent typification. Overall sentiment change was neutral, and in stages 5-6, a theme regarding the ‘priority’ functionality emerged.

Reliability displayed a similar trend pattern to *acceptance*, between stages 2-6 and stage 1-5 respectively. There was also a similarity observed between *reliability* and *credibility* between stages 1-4. In stage 2, *reliability* sentiment was related to IS process: “I would say you know, 80-90% reliable, most time it goes through without a hiccup”, which indicated convergent typification. Also, where workarounds had been utilised when IS downtime occurred the approach was: “Patient I told him to come back tomorrow for paperwork, and occasionally I would ask the secretary to do the Choose & Book later”, which indicated neutrality when there was IS unavailability. In stage 4, on referring to ‘proper’ use: “I think highly reliable if you’ve, if you use it properly, which isn’t difficult to do”, which indicated convergent transformation and typification. In stage 5, on referencing ‘priority’ functionality: “So I think if we knew consultants were looking at it and decided it wasn’t urgent, we would feel more comfortable with that. But it’s the fact that we know they are not looking at all. That’s the problem”, which indicated divergence across all conveyance activities. In stage 6, sentiment had been attributed to bi-directional functionality: “At the moment that has to come back through a letter, as 2-way system I don’t think is robust enough”, which indicated divergent typification.

Effectiveness had a negative dominance where in stage 1 sentiment was attributed to ‘continuity’ as: “not so good around continuity of care...not 100% as it is not catching all the data”, which indicated divergent translation. In stage 2, in reference to linear IS process: “Problems arise if there is a change in plan and they don’t want to follow through with that, or change referral, or if there are no appointments available initially when they phone up or go online, and then that can cause the patient more work in terms of having to remember to phone back”, which indicated divergent typification. On IS responsibilities: “They want the GP to do that because they don’t want the patient to leave and not do it”, which indicated neutrality towards responsibilities. In relation to design constraints: “Whereas IPASS [Integrated Pain and Spinal Service] I accept is not a genuine appointment, so it doesn’t make a lot of difference whether to book an appointment or defer to Provider, it still gets them to sort it out”, which indicates divergence across all conveyance activities.

6.6.4. Case 4

In this case positive sentiment in *acceptance* sentiment related to senior management and clinical opinion as the: “Biggest issue is NHS trusts not having the drive, not having push from top down”, “Even

if consultants don't necessarily like it, they see as it is done in role and Trust" and "Consultant opinion ranges, I might not actually like it but have to use it, to actually e-Referrals works", which indicated neutrality towards IS policy. Further in stage 2, on referring to staff attitudes: "I think a time thing and a generational thing, and with a younger generation of consultants that changing I think", which indicated neutrality towards IS users. Further in relation to policy events from the previous stage: "But it's not purely we're not doing it because we have to its in the contract, we do it because it works and provides advantages for us", which indicated neutrality towards IS policy. In relation to senior management: "If you don't have support from the top, getting clinicians to do their bit is the hardest bit", which indicated neutrality towards IS policy. Interestingly, the participants perceive a lack of willingness a good thing: "The grudging acceptance is quite a good thing" and "it's even if not actively liked and celebrated by consultants, it's certainly seen as this is what we do", which indicated neutrality to IS users. Finally, the participant claims, "It's very well accepted where it has been running for so long, since the history of Choose & Book, and through to today" and "It's not actively impacting us and it delivers us patients. There's no strong negative opinion, it is all neutral to positive. And as positive as consultants ever are about IT.", which indicated neutrality towards IS design legacy and users.

In a similar trend pattern to *adoptability*, an increased level of national support and senior management push was required to increase *acceptance*, although in a context of remaining issues in relation to interoperability and ability for innovation, the IS was received as suitable but not through factors relating to IS design.

Credibility initially had been neutral with sentiment attributed to IS legacy: "There is a lot of historical, political baggage, from the early days when it was Choose & Book, and how it was rolled out in Trusts", which indicated divergence across all conveyance activities. This developed in stage 2, on referring to IS functionality: "Highly credible because it has a clinical function which it delivers well in a secure efficient manner", which indicated convergence across conveyance activities. In stage 3, the view was: "It covers a large scope and mandate, and does it well", which indicated convergent typification. Finally, in stage 4, on referring to IS purpose: "It's very credible, partly again because it has a clear defined purpose that it does well" and "There is probably some local perception, variation on perception based on the uptake...", which indicated convergent typification and translation, and neutrality towards local variation.

6.7. Summary of Information System success

6.7.1. Case 1

In summary of this case, design changes following stage 1 had negligible effect on IS suitability to follow or take up in that their Use had not been compulsory. Subsequently, issues in IS service support on the

new functionality impacted their uptake. There had been negative effect attributed to perceived 'speed of accessibility' where neutral beliefs and expectation indicated an area for IS improvement. By stage 6, there had been limited appetite to conform to IS design where divergent intentions and effects were caused by IS design constraints in task allocation. The similarity of pattern with the IS being easy to understand or operate had an initial positive effect as there had been convergent sensemaking to IS core principles. This developed into negativity towards the IS being easy to understand or operate linked to divergent expectations, values, intentions and effects, and sensemaking and meaning associated with that of clinical staff, had an overall negative effect on perceived System Quality.

In stage 6, relative to the overall policy context relating to the IS and Provider performance there had been divergent expectations and effects associated with Provider performance. There were also negative effects from the reason for which IS was used as there were divergent behaviour and commitments, responsibility and effects and meaning associated with clinical staff, that had a negative effect on Use.

There had been neutrality towards the IS being fit to be used in existing IS design, in allocating tasks between clinical and administrative staff, ability to take corrective action and a Provider focus on IS design development. There were divergent expectation and values, and effects on responsibility associated with clinical views from other Provider organisations having a negative impact on perception of the IS being fit to be used. The belief in the IS having practical worth or ability had a positive effect in perception of Information Quality.

There had been a neutral perception of the IS performing consistently well as there were convergent expectations and effects to the role of the IS, in relation to interfacing IS whose performance had a negative effect on overall sense of the IS performing consistently well. Variance in sentiment had been attributed to the IS service organisation performing consistently well, rather than IS itself. Around stage 5, good national service status had a positive effect on effect on Service Quality.

In stage 3, design changes had a neutral effect on the IS being convincing or believed where there had been divergent signification of the IS towards legacy IS and lack of ability to feedback on IS issues and design, which had a negative effect on Experience.

Around stage 2 through to stage 6, policy events had positive effect on the IS being received as suitable as there had been convergent expectation and commitments from senior management, intentions and signification associated with IS awareness and uptake. There had been a negative effect in the IS producing the desired result where divergent intentions and behaviour in patients associated with appointment cancellations impacted Providers, where the IS enabled activity that would otherwise have a human failsafe with regards to policy. In reference to IS design change, divergent adoption of

responsibilities and effects in Use of workarounds had been attributed to lack of effective design change feedback mechanisms. Referring to design changes around stage 1 and 4, there was a negativity in the IS producing the desired result associated with divergent expectations and effects with the 'advice and guidance' functionality relating to ability to clinical audit trail and supporting interoperability. There had been a negative effect in the IS producing the desired result relating to divergent signification associated with legacy IS, beliefs and responsibilities associated with clinical and administrative tasks having an overall negative impact in User Satisfaction.

In case 1, the desirable characteristics of IS constituted of accessibility in terms of speed and points of access, and authority and flexibility in delegation of tasks between clinical and administrative staff. Complex IS authentication mechanisms and inability of middle management to influence design change were recognised as barriers to adoption. The degree and manner in which the capabilities of the IS were in use, had been established predominantly by clinical staff, and their sensemaking of principals in design intention. The commitments of clinical staff to IS responsibilities and subsequent effects impacted on IS Use. The desirable characteristics of system output were linked to task allocation of responsibility between clinical and administrative staff, and the ability to take corrective action in response to errors. Service Quality was resultant of expectations set of a national service and in understanding the effect of end user actions on IS operation. Ability to feedback on design change and how the transition from the legacy IS had been signified during transformation, impacted on how the IS feels to the stakeholders. The stakeholder's level of satisfaction with the IS had been influenced by commitments and expectations from senior management on awareness and uptake. The behaviour of patients in relation to appointment booking caused policy tensions between IS uptake and organisational performance. The effect of workarounds in response to design constraints had been associated with lack of effective design change feedback mechanisms. The expected effect of functionality had been hindered by lack of auditability associated with interoperability supporting clinical users.

In case 1, as illustrated in Fig. 19 there had been a positive influence of policy on the *credibility* of the IS, which was independent of neutral effect of IS and IS service support *reliability*, and a degree of convergence to policy events.

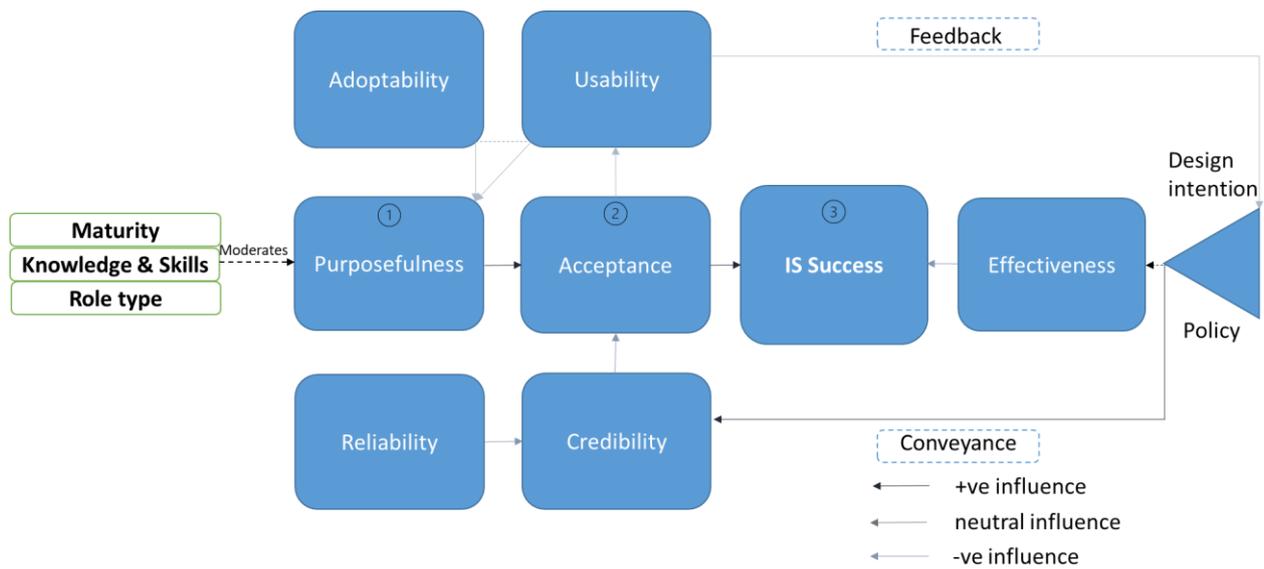


Figure 22 - Case 1 influencing model

There had been negative feedback on IS design intention which was a result of the negative influence of *adoptability* and *usability* antecedent to *purposefulness*, in parallel with a degree of divergence to design intention. A medium level of organisational maturity and high level of technical skills provided a high level of coherence in moderating the effect of *purposefulness* of the IS. In combination with the neutral influence of *credibility*, there had been a positive influence on *acceptance*. *Purposefulness* was a positive determinant of *acceptance* in this case, and the perceived *effectiveness* of policy and design intention has a neutral effect in moderating success. As a mediator, *acceptance* has a positive influence on IS success.

6.7.2. Case 2

In summary of this case, design changes following stage 1 had a positive effect on the IS having practical worth or ability as there were convergent intentions and effects in their application across clinical as well as administrative staff groups. The introduction of new functionality prior to stage 2 had a positive effect, but in being considered fit to be used, issues relating to management information and reporting impacted adversely on Information Quality. There was positivity in the reason for which IS used till stage 5, where as a result of divergent intentions and effects in addressing the need for workarounds, there was a lack of coherence between IS service support and participant organisation, which impacted negatively on overall Use. Negativity towards the IS performing consistently well was due to national service disruptions and divergent sensemaking, resulting in poorly perceived Service Quality. Variation in suitability to follow or take up was due to a lack of coherence between the IS service support organisation and the participant organisation. IS design constraints and perception of IS not being easy to understand or operate adversely impacted perceived System Quality. The close trend between the IS performing consistently well and being convincing or believed in indicated that the perception of national service disruptions and local messaging issues across interfacing IS not only impacted the perception of Service Quality, but also Experience that was coherent across the local organisations. Due to a low level of coherence between the senior management, clinical and administrative staff, there was a low level of User Satisfaction related to a neutral level of being received as suitable and producing a desired result, which could only be positively attributed to the context of the policy events. The organisation has accepted that the uptake was mandatory, but ongoing concerns remained in a lack of coherence across organisational boundaries, and within the organisation coherence with design intention.

In case 2, the desirable characteristics of the IS were associated with management information and the intended application across clinical and administrative staff. The degree and manner in which capabilities of the IS were utilised related to conveyance of intended effects to address workarounds. Sense making of national service disruptions and IS interoperability issues impacted on perceived System and Service Quality, along with the relationship with IS service organisation in how the IS felt to the stakeholders. The stakeholders' level of satisfaction with the IS was related to a low level of coherence between senior management, clinical and administrative staff across the IS organisations, and with design intention.

In case 2 as illustrated in Fig. 21, there was a negative influence of policy on *credibility* of the IS, which was dependent on the IS and IS service support *reliability*, and a degree of divergence to policy events.

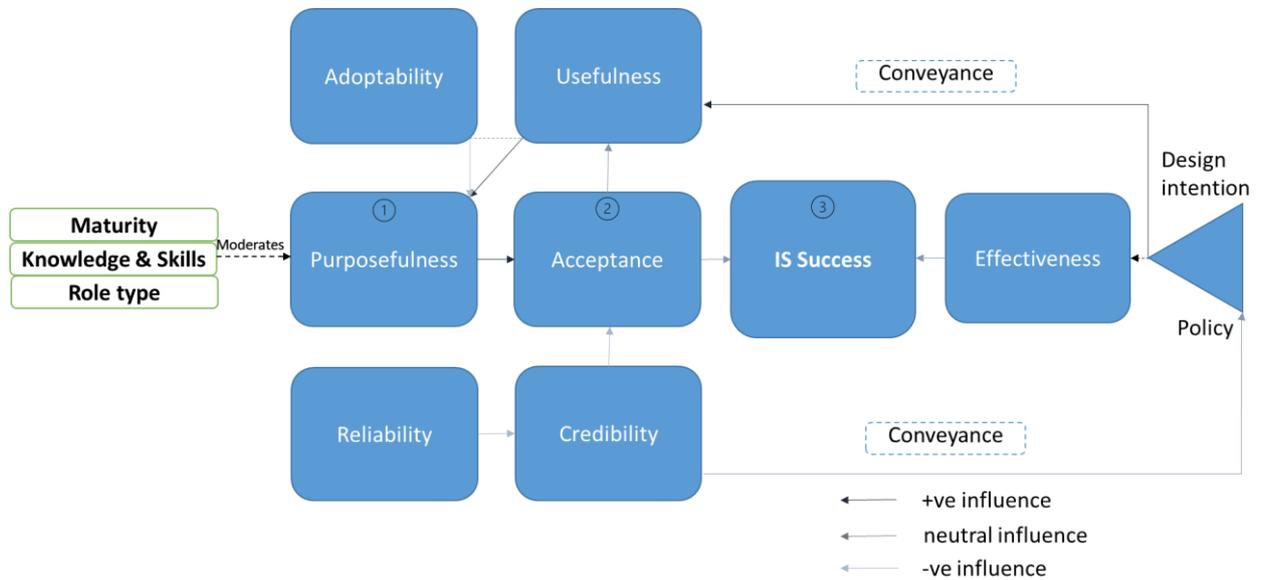


Figure 23 - Case 2 influencing model

There was positive influence of *usefulness* and negative influence of *adoptability*, antecedent to *purposefulness*, with a degree of convergence to design intention. A mid-level of organisational maturity and a low level of knowledge and skills provided a low level of coherence in moderating the effect of *purposefulness* of the IS. In combination with the negative influence of *credibility*, there was an overall neutral influence on *acceptance*. *Purposefulness* was a positive determinant of *acceptance* in this case, and the perceived *effectiveness* of policy and design intention had a neutral influence in moderating success. As a mediator, *acceptance* had a neutral influence on IS success.

6.7.3. Case 3

In summary of this case, design changes following stage 1 had a negative effect as the changes were referenced in stage 2 as not producing the desired result, where the change has not been adopted by the Provider organisation. In stage 6, against the IS performing consistently well and it being fit to be used, the bi-directional functionality could have been improved and made more robust, with policy and design changes impacting Provider function. In this case, the participant was not directly impacted by design changes, but referenced existing core functionality, or Provider activity in response to policy or design change.

Several factors in stage 4 contributed to the negative effect on suitability of IS to follow or take up, including divergence in the Provider organisation IS process and typification among clinical staff. The positive effect of IS being easy to understand or operate supported an overall neutral view of System Quality, which was constituted of both the participant finding the IS easy to use or operate, and perception of the IS being made suitable to follow to take up by the Provider.

The design changes around stage 3 had a positive effect in reason for which IS used where design changes in relation to 'reports' and 'advice and guidance' prompted convergence towards overall reason for IS Use.

The positive effect from the IS having practical worth or ability was attributed to the ability for IS Use at the point of care, which demonstrated convergence to design intention, which by stage 6 had developed to a neutral Use of IS, where management of information was used in a way that had not been described in policy or design intention. The number of process steps, 'priority' and 'advice and guidance' functionality impacted negatively on the IS being fit to be used as there was divergence towards intentions and effects, suggesting a review of these aspects in Information Quality.

From stage 1 there was positivity towards the IS being received as suitable attributed to the convergent values and commitments to design intention within the practice. In stage 6, reference was made to the 'priority' functionality where perceived divergence in the Provider responsibility to make relevant appointments available had a negative effect on this aspect of the IS being received as suitable. There was a negativity towards the IS producing the desired result where there was divergence in expected behaviour, particularly from patients. There was neutrality in relation to the allocation of roles between GP and patient where responsibilities were defined but expectation on their discharge was variable. Where perceived to not be producing the desired result there is divergence across all conveyance activities. In this case, this led to innovative Use of the IS to 'workaround' design constraints. Design changes in stage 1 were made to address this issue but as implementation had not yet taken place, divergent intention and effects remained in stage 6.

User Satisfaction was impacted by external factors to the GP practice organisation related to the Provider which had a negative effect on producing the desired result, even though being received as suitable internally within the organisation.

The close trend between performing consistently well and being convincing and believed in indicated convergent expectations and sensemaking of national service disruptions in that no IS can have 100% uptime, and that their intention was to fulfil responsibility to Use IS in the intended manner, which impacts positively on Service Quality, but also Experience which has developed significantly.

In this case there is a theme relating to perception of self-convergence, with the participant being able to convey divergence factors in the Provider across the IS organisation. Therefore, multiple success factors are associated with the (in)activity of the Provider contributing to perceived IS success. There are multiple examples of neutrality where the participant describes factors that although not within the realm of policy and design intention, refer to innovative Use that is attributed to, but not constitutive of IS success.

In case 3, the desirable characteristics of the IS were associated with the effect on adoption of IS features and functionality that were easy to understand and operate. The degree and manner in which the capabilities of the IS were utilised related to developments required in management reporting and interoperability. The desirable characteristics of system output were that it could be used by clinicians at the point of care, in efficiency compared to existing process. Unintended effects were caused by the norms associated with 'priority' of activity, a result of not having established meaning and commitments between IS Referrer and Provider organisations. The stakeholders' level of satisfaction with the IS was associated with the alignment of values and commitments to policy, with a need for establishing responsibilities and commitments across IS organisation boundaries. In particular, by setting expectations with patients and the IS Provider organisation, keeping abreast of IS design change. Service Quality had been associated with expectations of a national service and expectations of how it felt to stakeholders.

In case 3 as illustrated in Fig. 22, there was a negative influence of policy on *credibility* of the IS, which was dependent on neutral influence of the IS and IS service support *reliability*, and a degree of divergence to policy events.

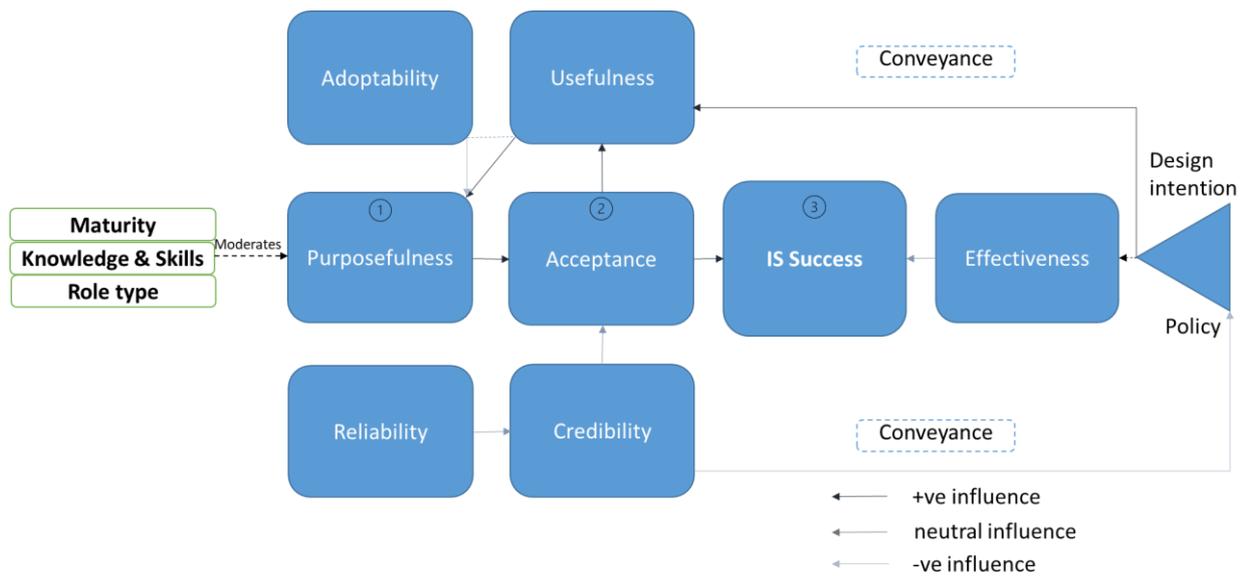


Figure 24 - Case 3 influencing model

There was positive influence of *usefulness* and negative influence of *adoptability*, antecedent to *purposefulness*, with a degree of convergence to design intention. A high level of organisational maturity and a mid-level of knowledge and skills provided a high level of coherence in moderating the effect of *purposefulness* of the IS. In combination with the neutral influence of *credibility* there was an overall positive influence on *acceptance*. *Purposefulness* was a positive determinant of *acceptance* in this case, and the perceived *effectiveness* of policy and design intention had a neutral influence in moderating success. As a mediator, *acceptance* had a positive influence on IS success.

6.7.4. Case 4

In summary of this case, communication around stage 2 on forthcoming policy initiatives had a positive effect on suitability to follow or take up as there was convergence towards stated commitments and expectations, further stating requirement to ensure a good level of perceived System Quality, through IS training programme. Around stage 4, there were further convergent beliefs and expectations relative to policy events. Suitability of the IS to follow or take up was negatively impacted by the level of interoperability between the IS and periphery systems, and specialist knowledge required for IS implementation. Therefore, suitability to follow or take up could be improved by greater interoperability with other systems, and access to specialist implementation knowledge. In contrast, the IS was perceived to be easy to understand and operates in positive sentiment, which demonstrated convergent sensemaking and beliefs of IS responsibilities, indicating overall coherence and neutrality of the desirable characteristics of IS. There were convergent beliefs and expectations of the IS performing consistently well, which gave a positive perception of Service Quality. In stage 3, negativity was associated with requirement for specialist knowledge and IS capability for expansion, in which neutrality to design intention was associated with innovation of the IS. There was a high level of coherence in understanding the reason for which system was used, and the degree and manner of IS Use.

Initially positive, the perception of the IS having practical worth or ability diverged to neutrality when constraints on IS process and limits on expansion in the IS design constrained the ability to innovate. The extent to which the IS was considered fit to be used was positive, but 'clunkiness' at a process level impacted on overall perception of Information Quality.

In the IS being received as suitable there was neutrality towards responsibilities, commitments, expectation and beliefs where there was a distinction between senior management and clinician staff, but also in relation to the age profile of staff. There was neutrality towards policy events and convergent intentions and effects where the IS was perceived as advantageous to the organisation. In the IS producing the desired result, there were initially divergent beliefs and norms, and expectation of the effects of the IS. This developed further into divergent sensemaking around the core effects of the core IS functionality, which impacted negatively on User Satisfaction.

Comparing the perception of desirable characteristics of IS and level of satisfaction with IS, commitments and expectations in relation to policy events and support that the stakeholders receive from the IS organisation was required to increase *adoptability*. But underlying concerns and neutrality towards design intention constrained the level of satisfaction with the intended desirable characteristics of IS.

There was convergence in meaning associated with the IS design intentions and effects, beliefs and expectations where there was a good understanding of the legacy, and mandate of the IS was convincing

and believed in. This impacted positively on the Experience of how the IS felt to the stakeholders. A prevalence of neutrality was observed where the participant did not converge, or diverge, but did innovate or reference an aspect not in IS design or policy but associated to its success.

The negative trend in stage 3 was attributed to requirement for specialist knowledge particularly across the organisational interfaces and lack of ability to expand IS scope affecting innovation ability, but there was acknowledgment that scope at that time and mandate the IS does well. Also, design changes were not referenced by the participant and a large part of the sentiment was attributed to the human and organisational aspects of IS.

Perception of Use and Experience was divergent from actual patient experience reported, which indicated a lack of effective feedback mechanisms to evaluate patient experience. It should be noted that findings in this case were limited to stages 1-4, therefore investigation into long term trends was not comparable to the other cases studied.

In case 4, the desirable characteristics of IS were associated with the expectations of and commitments to policy, and support that the IS stakeholders received from the IS organisation. Both were perceived neutrally as the organisation was mature in IS implementation. Interoperability, alongside the provision of specialist knowledge in conveying IS responsibilities was associated in supporting adoption, where third party solutions had been developed. The degree and manner in which the capabilities of the IS were utilised was demonstrated from a high level of coherence with design intention. The desirable characteristics of system output were associated with speed of access, IS design constraints and the ability to innovate scope and expansion. Stakeholders' level of satisfaction with the IS was associated with commitments and expectations between senior management and clinical staff of the IS being advantageous to the organisation. Expectations beyond the core IS scope led to innovation appetite for further IS design than existing scope. Fulfilment of core function and expansion capability informed through feedback from Use impacted on how the IS felt to the stakeholders.

In case 4 as illustrated in Fig. 25, there was a negative influence of policy on *credibility* of the IS, which was dependent on positive influence of the IS and IS service support *reliability*, and a degree of divergence to policy events.



Figure 25 - Case 4 influencing model

There was neutral influence of *usefulness* and negative influence of *adoptability*, antecedent to *purposefulness*, with a degree of divergence to design intention. A high level of organisational maturity and a high level of knowledge and skills provided a high level of coherence in moderating the effect of *purposefulness* of the IS. In combination with the positive influence of *credibility* there was an overall positive influence on *acceptance*. Both *purposefulness* and *credibility* were positive determinants of *acceptance* in this case, but interestingly as a mediator, *acceptance* only had a neutral influence on IS success. This could be explained by the overall negative effect of divergence to policy and design intention, resultant in negative *effectiveness*.

6.8. Key findings

Guidance of any nature is subject to interpretation and established meaning in practice, whereby differences in terminology and definition across common platforms for guidance can lead to confusion and divergence from intended and expected outcomes. The series of policy events and planned designed changes in some cases had not mutually supported each other, and in particular, timing or organisation specific policy led to a-synchronisation across organisations. Policy initiatives had a varying degree of success due to the existing organisational state and maturity of digital technology and transformation. Contractual levers were most successful in a context of enforcement and continuous monitoring of improvement. Although, useful design change to features and functionality had been partly successful, in most cases these were limited to user interface particular functionality. Design intention played a core

role to the 'IS philosophy' and part way of life for the actors that are in Use of the IS. Design change, on the other hand, because of existing feedback mechanisms on 'Use needs', formed the basis of design that could be best representative of the actors in the IS. Representation across a national scale is challenging to achieve and is balanced with the efforts of better understanding the actor concerns, and in a transparent mechanism for incorporating various views and perceptions.

Summary of barriers to adoptability, IS acceptance and unintended use

Barriers to IS adoptability:

A longstanding barrier to IS adoptability was the lack of seamless IS authentication functionality, which led to difficulties in ease of accessing the IS. This had led to complications in Use by intended actors, interoperability issues, and overhead in administering authentication. Clinical users in most cases viewed IS Use as an administrative task, unless use was integrated as part of their existing work, due to existing human resource carrying out similar functionality. Subsequently, clinical users resisted adoption where Use was more time consuming than the process in place at that time. There was also a concern related to lack of ability to take corrective action in response to user error. In terms of the implication of policy, initiatives had a positive effect on IS *acceptance*, even though there may be continued deviation from design intention and expected Use.

Implication of design intention and change:

Design intention and change had an implication in the absence of flexible workflows, had a negative effect on usefulness, where there was inability to relinquish authority and delegate user roles across clinical and administrative staff. The ability for task allocation was further impacted negatively by lack of messaging and notifications functionality within the IS, and through integration with other IS. There were positive effects attributed to design change associated with the production of management information, and improving the basics of core IS operations, such as user interface design.

Deviation from expected use:

Tension was identified between administrative staff and the requirement in their Use of the IS as expected, and their need to be flexible in the absolution of responsibility between clinician and administrative staff. Deviation from expected Use was caused by IS users not being aware of consequences for not fulfilling their responsibilities as expected. Consequently, workarounds would be implemented to support administrative processes. A lack of IS management of information, ability to easily conduct audit and review, resulted from absence of performance or quality management, which over time resulted in deviation from expected Use. It was not conceived that the IS support organisation (ISO) were responsible for expected Use, but that their role was as supporters in the advocacy of the

benefits of design intention and resolution of unexpected Use. In some cases, the ISO were also constrained by IS design and there was tension between ISO with business operations in Provider organisations.

The results also uncovered adverse sentiment towards policy events advocating the uptake of particular functionality, or those which had been incorporated into the IS by design. Some functionalities, or lack of constraints enabled activity which had adverse effects on the business operations of the adopting IS organisation. For example, uptake of the 'advice and guidance' feature was promoted in a series of policy events and design enhancements, although underlying concerns in continuity of patient care, availability of auditable information, quality and timeliness of response remained. There was also tension in the transfer of responsibility of patient care from one organisation to another in the Use of the IS. The sequencing of timed actions played a part in the availability of relevant information to actors and the 'refer back to GP in 14 days' policy, ensured that the responsibility of making an appointment remained with the GP and patient. A longstanding concern from GPs was that the appointment aspect was solely within the remit of the service provider organisation. The design intention had been that if there was no capacity at the provider, then it was at the discretion of the referring GP to seek an alternative option. This in some cases led to confusion for the patient in establishing a route for escalation if there had been no success in securing an appointment. Oppositely, in some instances through the Patient Booking Web App, patients would repeatedly cancel and re-book their appointments, which had unintended consequences in relation to meeting performance targets and effectively managing the operational business in Provider organisations. In part, the 'referral assessment service' functionality that intended to resolve concerns with appointment availability issues, was seen to complicate matters and in case 2 seen as a back door to services. There had been concern that the IS in terms of development focus was steered towards a unilateral approach and could benefit from a diverse account of actor perspectives.

Key themes attributed to *usefulness* and *adoptability* were the inefficiency of the IS authentication and access model. Additionally, with *effectiveness*, the 'urgent referrals' functionality had the perception that this action on the IS did not lead to the expected results, more out of a lack in confidence that the request would be treated as such. Prior existence of manual mechanisms such as fax machines, email or telephone in the combination of the previous proved to be the preferred method with appropriate level of confident assurance given the priority. A longstanding constraint though IS design enabled 'referral information' to be made available only once the request had been allocated an appointment within the IS by the Provider. The implication of this constraint was that in 'assessment' services, many were for triage purposes and did not require a patient attending appointment. Attributed to *adoptability* and *effectiveness*, this led to the booking outside of the IS, purely for the purpose of retrieving the 'referral information' at that point in time. This not only impacted on intended Use but also reduced the

effectiveness as there had been a break in the flow of IS Use. The 'reject' functionality attributed to *intuitiveness*, *adoptability* and *usefulness* became a IS function of contention, as from the design intention perspective it would be used where the provider had received a request, and that request had been found to be clinically inappropriate. Therefore, the referral needed to be rejected and returned to the referrer to ensure that they should identify a clinically suitable alternative service. This involved the act of 'triage' which as a clinical process would take place regardless of the presence of IS. Because of issues with clinician accessibility to the IS, lack of business change to IS process, and overarching concern in some cases about loss of activity, the 'reject' functionality was not fully accepted, adopted or used as intended. Attributed to *usability*, the inability for actors to take corrective action in the IS caused concern as if a mistake were made in the operation of the IS it was difficult or not possible to undo that action. Additionally, a lack of audit functionality prevented corrective action to be taken or to identify patients to take corrective action. Administrative staff in some cases had developed back up or alternative tracking mechanisms to fill this gap. The habit through historical experience manifested itself where in some cases there was use of 'Choose & Book', referring to the previously used moniker. However, it was not clear whether this had been uttered intentionally or unintentionally, but this had a neutral impact as the habit was associated with the legacy IS and there was a perspective that processes of the system had not changed, or that some of the historic issues still remained. There was a perception in case 1 that there was no effective feedback loop or transparent process by which development requests were managed, which had an adverse effect on providing feedback in the first place, in addition to increasing frustration with limitation of the IS.

These identified tendencies to an extent influence the outcome of IS Success via technical characteristics and human sentiment towards these IS characteristics, under the influence of relationship with and responsibility to the IS, IA and ISO. These tendencies between IS Success dimensions are illustrated in Fig. 26:

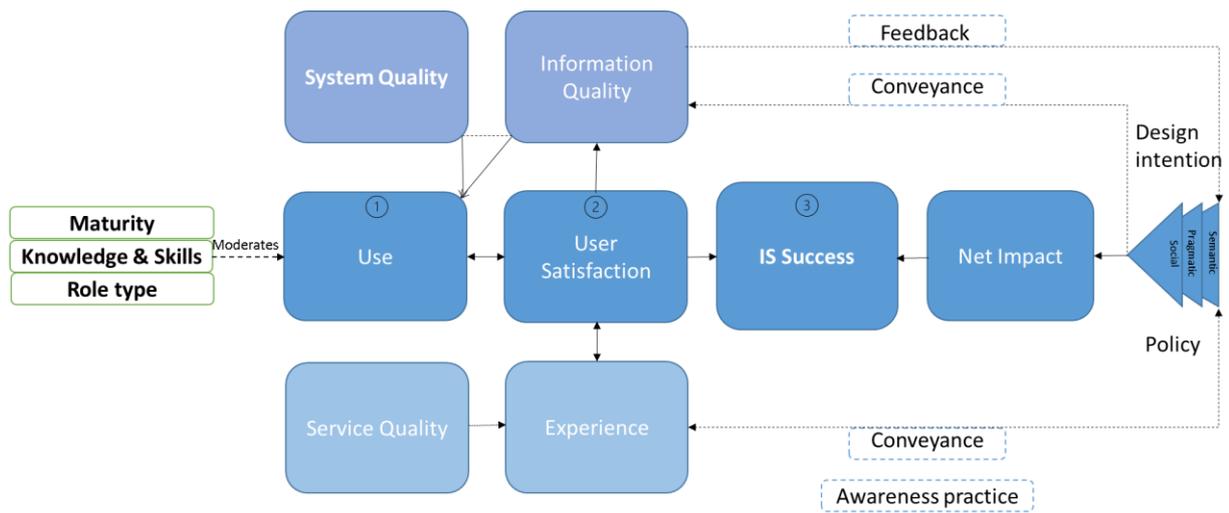


Figure 26 - Influencing model of awareness practice on dimensions of Information System success

The model illustrates the IS design intention which is manifested in the System Quality and Information Quality dimensions of technical IS design. Both these ‘quality’ dimensions jointly influenced Use of the IS. This Use is moderated by the 3 aspects of organisation maturity, people knowledge and skills, and role type respectively, and found to be the main factors contributing to the difference in each of the research cases.

The impact of policy and design intention was found to have either a positive or negative effect on the *credibility* and perceived *usefulness* of the IS respectively. The extent to which was moderated by the awareness practices and level of social typification, pragmatic transformation and semantic translation in conveyance on Experience and perception of Information Quality, and participant convergence or divergence to policy and design intention. Divergence to design intention was reflected in the negative effect in *usefulness* from a lack of *acceptance*, or a lack of User Satisfaction with Information Quality, which resulted in negative feedback. Similarly, the effect of *credibility* on *acceptance* was influenced by perceptions towards *reliability* and convergence to policy, or User Satisfaction with Experience, that was impacted by Service Quality.

The 3 factors of organisation maturity, people knowledge & skills, and individual role type moderated the effect of *purposefulness* on *acceptance* or moderated Use and subsequent User Satisfaction. Both *purposefulness* and *credibility* were determinants of *acceptance* or Use and Experience determine the level of User Satisfaction. *Purposefulness* was antecedent to *acceptance*, or Use preceded User Satisfaction, which acted as a mediator to IS success. The effect of *acceptance* in combination with the *effectiveness* of policy and design intention determined IS success. Overall, the combination of User

Satisfaction and Net Impact, determined IS success. In cases where there was congruence with policy and design intention, this had been achieved through the converging effect of conveyance activities.

6.9. Summary

In this chapter, each of the 4 cases was presented in the organisational context of the participant, with background knowledge on IS policy and design context. The semi-structured interviews proved to be most fruitful in answering the research questions and assessing impact of events on the factors contributing to IS success. Each of the cases represented diverse views and perceptions, and varying levels of convergence, divergence, or neutrality and congruence with IS policy and design intention. Tension in Use between adoption of policy and design intention was a barrier to *acceptance*. Therefore, long term *acceptance* may be achieved by resolving tensions where beliefs and perceptions were divergent to design intention, and by enabling the ability to feedback on *adoptability* and further System and Information Quality aspects. The analytical framework provided a multi-context evaluation of temporal beliefs and perception of factors impacting adoption and contributing to IS success, and pragmatic factors contributing to unintended Use. Therefore, the influencing model would provide a useful tool to evaluate innovation adoption phases such as the stages of implementation, operationalisation, utilisation and optimisation of IS in organisations.

7. Discussion on the role of boundary work in addressing barriers to adoption and factors contributing to Information Systems success

7.1. Introduction

In this chapter, the key findings are discussed in the context of the literature and a critique of the key literature is applied in the knowledge-based approach to sentiment in the patterns of change in people, processes and the organisation subject to the impact of events. The role of Boundary Objects at the human-Information functions of Information Systems is explored, and the influence of boundary work on beliefs and perceptions relative to policy and design intention is discussed.

The specific research objectives in identifying barriers to IS adoption and unintended Use are discussed to develop on the existing theory into the dimensional factors contributing to IS success. Subsequently, practical suggestions are offered in the application of the frameworks to support adoption of IS, and to develop effective feedback mechanisms in Use. IS *acceptance* is discussed to identify the factors contributing to IS success. Finally, a critical evaluation of the research is conducted, and limitation of the research described to identify suggested future work.

7.2. Role of conveyance in boundary work

The IS characterised as a boundary object (Star and Griesemer 1989) enabled identification of the change, in relation to policy and design events which were conveyed through awareness practices. Typically, this was through communication of guidance and/or support from the IS Service Organisation (ISO) commissioned by the Information Authority (IA).

Boundary conditions of technology *acceptance* appeared to be governed by the IA, and congruence was achieved where there was participant convergence to policy and design intention. Coherence can be defined as a logical and unified whole that is easy to understand. Conveyance activity as an awareness practice was carried out by enactment of translation, transformation and typification activities in relation to events. Awareness practice can address such issues as divergence to policy and design intention and reduce barriers to adoption, unintended use and improve factors contributing to IS success. The boundary worker, spanner, or *conveyor* through *conveyance* activities can be particularly helpful in delivering one of two things. First, *convergence* activities that support the alignment with policy and design intention to transform the operations of the business change by supporting organisations adopt the IS processes. Engagement can also take place with senior staff to ensure policy alignment and expectation setting. Second, the *conveyor* can play a mediating role and display impartiality to policy and

design change where there is an *acceptance* that there are constraints made by design intention, and where the role of the *conveyor* is to feedback to the design authority on suggestions for improvement in IS design and development.

Boundary work was found to have an important role in creating clarity and alignment across specialist groups, setting expectation and resolving misunderstanding that create a balance between *acceptance* and perceived *effectiveness* of IS. Specifically, the IS was perceived reliable when there is good engagement from training and implementation teams, and the IS perceived credible when the actor/participant has a positive Experience from IS Use and in support from the ISO. Attribution of status to objects has critical implications in terms of mutual expectations and capacity of the IS to succeed. A study of objects in collaboration (Nicolini, Mengis et al. 2012) identified conflicting perceptions across specialist groups on whether an object is 'just' infrastructure or the artefact can get in the way of collaboration, creating unrealistic expectations, misunderstanding, and the lack of trust among participants. The *conveyor* therefore has a key role in addressing conflict and articulating the role of the boundary object in collaboration and co-ordinated work practices. In their study of child health and welfare professionals (Saario, Hall et al. 2012), attention is drawn to the non-electronic communication which takes place in order for interprofessional electronic documents to convey a common understanding, where the success of boundary objects depends significantly on such additional articulation work.

Conveyance as an awareness practice is of a human in relation to a boundary object, between various people, rather than a conveyance effect of the boundary object itself. In relation to the notion of converging on common meaning towards the boundary object and associated policy and design events, *conveyance* activity is important throughout the IS lifecycle, as is the convergence on meaning of policy and design intention. A study of knowledge sharing in a social media setting (Hara and Fichman 2013) found that boundary objects themselves were particularly helpful in supporting *conveyance* and/or convergence activities, and that conveying information is more relevant in the beginning of the collaboration process. Whereas, converging on meaning becomes prevalent in later stages. Whilst it is agreed that boundary objects a critical to focussing conveyance activities, it is argued that conveying information and converging on meaning is also critical through the adoption process.

From the actor perspective, differing meanings associated with design changes and policy interventions, were formed as part of their sensemaking towards guidance provided in documentation and by conveyors in *awareness practices*. Signification of the boundary object can be influenced by *translation* activity directed toward the actor/participant by the *conveyor*. Different responsibilities were assumed by the actors and these roles where reinforced indirectly by *conveyors* through the re-iteration of design

intention and policy effects. *Conveyors*, through typification activities, can specify expectations and commitments from actors, influence behaviour towards the IS and share values and norms from existing practice elsewhere or from their own expertise. In a study of collaboration in healthcare (Rycroft-Malone, Burton et al. 2016) the interplay between starting position, organisation, operationalisation and resultant impacts was influenced by a network of actors, including boundary spanners. Where boundaries were negotiated and knowledge sharing occurred, this was as a result of the creation of boundary objects and through the agency of those in boundary spanning roles. One further issue of contention in the literature on boundaries to date is whether individuals can act as boundary objects (Huzzard, Ahlberg et al. 2010). There was not sufficient basis to support this claim in the findings of this study, although as previously explained there is a clear role of individuals as *conveyors* between the people that orbit boundary objects. The use of boundary objects to promote coordination operated as a mechanism that facilitates communication while, at the same time, securing knowledge and social-structural boundaries (Keshet, Ben-Arye et al. 2013). In their study of Complimentary Medicine (CM) practitioners, Keshet et. al use the concept 'boundary actors' to denote the individuals who mediate between incommensurable paradigms in the context of power, where boundary objects were used by CM practitioners as translation devices and as a resource whereby to shape and express their social and professional identity. The distinguishing factor being that their view was that of the CM practitioners empowering their roles through a range of artefacts as a way of expression, in opposing view to the IS centric approach taken in this study.

In bridging the gap between policy and design intention, IS adoption and Use, where there is increasing alignment between the IA/ISO and the actor/participant supported by conveyancing activities, a closer state of *congruence* appears to form where this can be defined as aligned understanding of norms within the organisation and IS across the semantic, pragmatic and social human-information functions that lead to convergence at the boundary interface. Additionally, *neutrality* was identified in participants where there was neither convergence nor divergence to design intention, in that a balanced view was held which appeared to suggest innovative practice towards the IS. This is in contrast to congruence which as a result of awareness practices, such that although the participant was aware of policy and design intention which they were aligned to.

7.3. Barriers to Information System adoption

A direct relationship was found between Service Quality, in terms of the support provided by the ISO, and subsequent User Satisfaction of the actor, in terms of their Experience. Furthermore, the relationship between Use and User satisfaction, where Use was a result of high-quality System and Information having a positive effect on User Satisfaction. The combination of Service Quality and System/Information

Quality can significantly reduce the barriers to adoption, where Service Quality is antecedent to Experience, resulting in a level of User Satisfaction. In their study of acceptance in U.S physicians (Yi, Jackson et al. 2006) found that perceived ease of use did not affect the technology acceptance if sufficient technical assistance is provided. Technical assistance is provided through a level of Service quality and to an extent can compensate for poor perception of System and Information Quality.

The role of service *reliability* also previously referenced in Computer Supported Co-operative Work (Schmidt 2011) served two functions, that in the *reliability* of the IS as a technical system in terms of uptime, resilience, redundancy and minimal impact on end user service. The other aspect of *reliability* related to that of the IS Service Organisation and the impact of their role and function on end user Experience. Absence or poor perception of service *reliability* was a barrier to adoption, also in terms of *credibility* and user Experience of the IS, to a level of *acceptance* where the user is satisfied.

Usefulness was found to be suitable measure of IS success which appeared as an integral part of Information Quality, which is antecedent to Use, via System Quality. Use was moderated by the organisational maturity, knowledge, skills and role type, which determined temporal perception of usefulness. A study of user acceptance (Davis, Bagozzi et al. 1989) suggested that for voluntary systems, use is an appropriate measure. Where the system use is mandatory, usefulness is a better measure of IS success than use. Both usefulness and use were key attributes in this study, whereby in this context of a mandatory system, usefulness influenced via Information Quality and System Quality on Use, which in turn influenced the level of IS acceptance.

The application of the term 'experience' can be two-fold, where we relate to the 3 moderating factors, in terms of the capability and capacity of the organisation and people in relation to IS processes. Alternatively, the user experience of the IA and/or ISO, where that experience can be a barrier to adoption and in early stages when use may be low. Improving both the moderating factors, and perceived *credibility* and *reliability* could lead to ensure a balanced Experience in terms of adoption. A study of behavioural intention and expectation (Maruping, Bala et al. 2017) identified that most effective is predicting IT use at one of the most critical stages of adoption, namely when users are inexperienced with the system. Being able to take a view when users are inexperienced with the system, will provide key insights to the intention and expectations of users in the emerging adoption of the IS, although it is unclear if at this stage the any lack of adoption is due to their inexperience, in that through development of the moderating factors and a positive experience of Service Quality adoption may improve with experience. The findings from this study suggested that behavioural intention and expectation emerge in synergy with positive IS experience.

Social influence and facilitating conditions were provided by the IA and ISO which impacted on User Satisfaction. Performance expectancy is also managed by this route but did not have a determining effect on user adoption. Similarly, effort expectancy did not appear as a prominent theme, although it did concern participants when comparing the IS processes against existing practice. A study of user adoption in mobile banking (Zhou, Lu et al. 2010) found that except for effort expectancy, the other three factors of performance expectancy, social influence, and facilitating conditions have significant effects on user adoption. Additionally, that the effect of performance expectancy is relatively large, which is consistent with this study, although not impacting on adoption within a mandatory context. Zhou et al. reported that effort expectancy strongly affects performance expectancy, which contradicts the findings from this study where performance expectancy is managed by the ISO, whereas effort expectancy is a perspective from the actors in relation to their effort in the Use of the IS. Therefore, if there is increased effort expectancy, this does not contribute to the expected performance of the IS from the actor perspective. The most significant factors in relation to user expectations and their impact on adoption were determined by the 'quality' dimensions of IS success: Information, System and Service Quality.

Middle managers and the ISO took a role in local determination of policy implementation and is similar to the notion of street level bureaucrats (Lipsky 1969). Although written specifications provided a common language for process redesign, they did not provide a mechanism to inspire learning or capture design rationale. The IS Manager was able to exert influence largely by managing meaning for other actors in the process (Smircich and Morgan 1982). It also demonstrates how management control interests may be embodied in non-human artifacts, such as standards, documents and IT system, and importantly, that these artefacts are required to negotiate a changing consensus. A study of business-aligned IS (Gasson 2006) identified a hidden network of middle managers which appeared to be cooperating without their Director's approval, to extend the local network of the design team. The role of *conveyors* is reinforced to be largely influential role in shaping the successful outcomes of design intention and policy imperatives. In their case study on clinical simulation (Jensen and Kushniruk 2016), ownership was obtained by including all communities of practice in the process, leading to a wide adoption of the system in the organisation. But also highlight the issues in digital health which influence the cost and resources needed in acquiring and implementing new technology at hospitals as well as adoption afterward and may be due to lack of acceptance and lack of understanding among end-users. Therefore, potentially resource intensive but clearly evidenced as having an important role in adoption in the ability of conveyors to span the organisation during implementation and adoption activity to create meaning and improve understanding for users, in order to drive acceptance.

7.4. Unintended use of Information System

Use was determined by the design intention conveyed to the end user, and the users level of *acceptance* with that intention. A lack of *acceptance* and User Satisfaction with the IS was a result of the design intention embodied in the quality of the System and Information aspects of the IS. The Information Quality relates to the desirable characteristics of the IS output as the fundamental basis, of the 'system' which is the technological means to convey that information. The former relates to the worth or ability to be practically used, whereas the latter relates to the mechanism by which that information is accessed. Unintended use occurred where there was sufficient negative sentiment towards System and Information Quality that alternative Uses were developed to continue existing business processes, or workarounds the IS constraints. Interestingly, multiple examples of unintended Use either involved technical constraints or limitations, reaction to a process break, or lack of knowledge or skills in IS Use. The impact of interoperability on unintended Use was high and was a prevalent theme in terms of *usability* and *usefulness* pertaining to 'interoperability'.

During the study, a specific design intention impacted the perceived *effectiveness* of the IS and related to policy integrated into IS process. Two significant themes emerged relating to the 'choice' policy, and in relation to transfer of clinical responsibility. The resulting impact was due to a process constraint triggered by operational pressures which resulted in lack of appointment availability to the IS. This had the resulting effect of the patient returning to their referring practice, where poor user experience and tensions rose in the 'boundary push' where IS responsibilities were transferred as a result of imbalance between operational performance and policy implementation. Within the design intention occurred certain intended behaviours in Use, or more behavioural intention (Ajzen 1991). Furthermore, these target behaviors depended on the 'role type', and resulted from maturity of the organisation, and underlying knowledge and skill of the people to affect those behaviors intended in Use. In the study of IT professionals in manufacturing and distribution (Pawlowski and Robey 2004), knowledge brokers sought to reduce causal ambiguity by explaining the relevance of knowledge acquired in one part of the organisation to another's practice. Therefore, conveying the relevance of policy and design intention is a key component to limiting unintended use.

The term 'Use' can describe different meaning in terms of 'Use of the System' in a technical sense, or 'Use of the Information' in a cognitive one. In the IS effectiveness process (Seddon 1997), there is dependency of user satisfaction on the use of the product, as a dependency relationship. For user satisfaction to occur, both aspects of use must occur where there is a purposeful use of the IS, as perceived to be effective by the user. IS Use for systems success (DeLone and McLean 2016, p.40) was conceptualised as: "The extent to which IS incorporated into the user's business processes". Both System

Quality and Information Quality influence the extent to which the IS incorporated into business processes both in terms of physical Use of the IS and practical Use of the 'information' it conveys.

7.5. Factors contributing to Information System success

A number of trends were identified in changing participant views and perceptions towards the IS in response to emerging policy and design change events. Use is confirmed as a fundamental dimension of IS success, in its absence there is no basis for the constitution of IS success as without Use there is not an instance of the IS. The importance of the 'quality' dimensions and moderating factors previously discussed impact on the level of Use, in conjunction with the Experience as a result of the positive engagement from ISO training and implementation teams, and IA. Use and Experience, or user Experience was mediated by User Satisfaction. User satisfaction with the IS was strongly influenced by engagement of clinicians and senior management buy in, and was positively influenced where there was *congruence* with policy and design intention, and therefore User Satisfaction. There was also a significant role to play in disseminating policy and design intention in Use and/or feeding back on inadequate Information Quality. The overall net impacts of the IS were moderated by the level of boundary work across the people, process and organisation levels, through conveyance of policy and design intention.

Both System Quality and Information Quality as dimensions representative of the technical IS jointly influenced Use, and that System and Information Quality were inter-relational aspects of design intention. DeLone and McLean (1992) suggest that System Quality and Information Quality singularly and jointly affect both Use and User Satisfaction. Whereas findings from this study support the notion that impact on User Satisfaction is singularly via Use. The incorporation of IS standards, in relation to integration and interoperability, into the information and system architecture may improve perceptions of IS quality in Use. Use in turn then had a mediated relationship with User Satisfaction, which was influenced by System Quality and Information Quality via Use, but not directly.

No direct link was established between System Quality and Net benefits, but that System Quality had influence via Use, and User Satisfaction on IS Success, which from the Net Impact could be beneficial, or non-beneficial. DeLone and McLean (2003) identified interrelationships between variables where system quality leads to net benefits and net benefits lead to use. No such direct relationships were established in the scope of this study. But it was established that with system use which is inappropriate or ill-informed, there may also be no benefits. Further, that *conveyance* of 'net benefits' did impact on Use mediated by User Satisfaction. Unintended, inappropriate or ill-informed use was either as a result of low User Satisfaction or issues in Use which would diverge from intended benefits. Furthermore, no

system use is totally mandatory. Management always has the option of discontinuing a system that is not providing the desired results and benefits (DeLone and McLean 2003).

The boundary conditions of an IS in a mandatory policy context, were timing of measurement in the proximity to events and the type of IS, as being a national digital service used in the NHS. A study of the IS Success literature (Petter, DeLone et al. 2008) found a number of boundary conditions such as the voluntariness of the system, the timing of success measurement (the difference between the time in the lifecycle of the system and the time of measurement), and the type of IS examined. The series of policy events moving towards a mandatory context for IS use has significant impact on IS adoption, although the lack of voluntariness created tensions in use. The timing of measurement was also critical in the assessment of the events relative to the IS as a boundary object.

The organisational role and position of clinical staff, engagement of senior management, and role of organisational maturity moderates Use in a way which impacts on multiple dimensions of success. User involvement, relationship with developers, and domain expert knowledge were moderate predictors of IS success and most often associated with User Satisfaction. Organisational role is a demographic user characteristic that has a moderate influence on IS success, and the position of a person within an organisation has an impact on multiple dimensions of IS success (Petter, DeLone et al. 2013). This is in line with the finding that *conveyance* and feedback practices feed through User Satisfaction as a mediator to IS success. For example, by having users involved in the development process, it is likely that user expectations can be better managed. Management support was identified as the best supported organisational characteristic that predicts IS success.

No direct link between Service Quality and Net Benefits was found in this study. A review of the IS success literature (Petter, DeLone et al. 2008) found that there is an association between Service Quality and net benefits. Through the development of policy and design intention, 'net benefits' were planned and expected as part of IS adoption. By design, these net benefits would occur as a result of IS use. This Use is dependent on the System Quality and underlying attributes of IS design. Therefore, there is an independent relationship between Service Quality and Net Benefits.

Purposefulness in Use was a dependant variable between System Quality and User Satisfaction. In a study of IS Success in e-Learning (Freeze, Alshare et al. 2010), system and information quality were found to indirectly impact success, predominantly through user satisfaction. This is supported by the Use of an IS where System quality was identified as the best determinant for user satisfaction, which is inter-dependant with use. With increased experience in using a system, problems come to light and possible improvements are recognised. Contributing to requests for changes and updates to the system, which is commonly called 'maintenance', which requires the need for an additional set of feedback loops. In the

concept of feedback loops where IS Use is to be continued, it is assumed that the 'net benefits' from the perspective of the owner or sponsor of the system are positive, thus influencing and reinforcing subsequent use and user satisfaction (DeLone and McLean 2016). In acknowledgement of the fact that negative sentiment can indeed arise from Use, application of the term 'net impacts' would be appropriate to represent the influencing effects of User Satisfaction and Net Impacts on IS success. The critical success factor for IS measurement is not system Use, but that net benefits or impacts should flow from Use. A successful system will provide benefits such as helping the user do more or work better in the same time, or take less time to achieve as much work as the same quality as was done in the past (Seddon 1997). Therefore 'net impacts' is defined as the extent to which IS are contributing to the success of individuals, groups, organisations, industries, and nations. For example, perceived *usefulness* or job impact is the most common measure at the individual level (DeLone and McLean 2016). At the organisational level, *effectiveness* may be a good overall indicator.

Use, which was congruent with policy and design intention, was a primary factor contributing to IS success. The *conveyance* of policy, and subsequent Experience supported by Service Quality aspects of the IS and ISO, influence the antecedent factor to IS success, User Satisfaction. User Satisfaction is a mediator between Use and Experience. This 'user experience' in negative cases leads to feedback through Information Quality. In positive user Experience, User Satisfaction leads to IS Success. This is in balance with the 'net impacts' of policy and design intention. Where there is *coherence* defined as logical and consistent, unified whole between the actor and IS organisation, *congruence* is achieved in the aligned understanding of norms within the organisation and IS across the semantic, pragmatic and social levels. The dimension of User Satisfaction was the most significant dimension in relation to adoption, Use and acceptance of the IS. To extend this, it is posited that the 'net impacts' were influenced by the level of awareness practices across the semantic, pragmatic and social levels. The policy expectations in *conveyance* influenced Use and User Satisfaction dimensions via Experience and Service Quality of the IA and ISO respectively.

Inability to feedback on the desirable characteristics of the IS harboured negative sentiment due to lack of transparency and timeliness on prioritisation of user needs arising from their dissatisfaction. Another area of negative sentiment was attributed to Service Quality in terms of responsiveness to service requests, change management expertise, and issue resolution.

IS success was previously conceptualised as "a value judgement made by an individual, from the point of some stakeholder" (Seddon 1997, p.248). The findings from this extend this definition to state that it is 'a value judgement about individual User Satisfaction in balance with the intended Net Impacts from the point of the IS Authority'. In summary, IS success is defined as 'fine balance between intended net

impacts of policy and design intentions, and User Satisfaction with IS suitability for take up in a way that capabilities are utilised, at a level of being received as suitable in balance with producing desired result'.

7.6. Evaluation of research

This study was conducted to answer research questions in relation to the factors that contribute to IS success, and the impact of policy and design intention on IS adoption and use. Boundary object theory served as a useful theoretical lens to frame the IS relative to the actor/participant perspective. Scope was also provided for several areas of theory extension particularly in the transgression of boundaries by organisation actors and the effect on various dimensions of IS success. A broad range of subject areas were reviewed to establish background into technology acceptance and IS success, and it is possible that further domains or dimensions of IS success may exist. The findings of this study are consistent with the previously defined dimensions of IS success and has further clarified those previously defined attributes. In terms of methods of data collection, this study was primarily a qualitative study and this avenue was practiced being able to elicit the details of narrative enquiry required to answer the research questions. Organisational semiotics was utilised in the analytical techniques, and from preliminary analysis based on a relatively small number of cases the research design in terms of semi-structured interviews had provided rich data and information saturation within the planned number of cases. Naturally, a larger number of cases may have been beneficial to support the narrative of this study, but the results provided a level of detail that represented the individual view at that place in time which provided an in-depth representation of research factors.

The study focussed on the adoption of a national IS as a Service in the NHS, which proved to be particularly interesting from a research perspective due to the scale and complex nature. The identified barriers to adoption are relevant to any NHS IS of this scale, but the unintended use of IS identified is specific to the focal IS under study, as are the impact of policy and design intention. The factors contributing to IS success and the role of boundary work can be generalised to any IS that has an instance of Use dependant on the participation of actors across organisational boundaries. Additionally, there is an IA responsibility for sponsoring, developing policy and strategic plans for the adoption of the IS by the wider 'system'. The intention is that feedback and evaluation between the formal and informal system measures to reflect a socio-technical system, and the study is restricted in findings beyond this.

7.7. Limitation of research

7.7.1. Research design

The longitudinal aspects of this study represented change in the perception and sentiment in the context of policy and design change events. The research stages of semi-structured interviews were contained to within a one-month period around the event, although each of the interviews took place anywhere within this timeframe. In most cases reference in participant responses were not specific to the event that had just occurred, but more that their responses were relevant to the consistent line of questions at that point in time and their response may reference a prior, current or future event. Therefore, it was not possible to directly relate an event to an outcome, as the research design did not directly target events as opposed to variables. Responses in some instances made reference to previous events across a number of cross-referenced variables. Therefore, the findings need to be taken as a whole, as opposed to in response to specific events. This was in line with research design, which in the semi-structured interviews was focused more on the change in attributes than discussion about particular policy and design events.

7.7.2. Participants

A limitation of this study is the role type of the participants that were studied, in that a wider representation across a larger or more diverse geographical area may have yielded different results. In this sense, the study was limited to a national system in a localised geography, and a wider casting of participants would incorporate potential diverse views. The participant in case 4 dropped out of the study for research stages 5 and 6, which did not have a significant adverse effect in the results for the overall study, but during analysis was a concern in terms of completeness. Given the organisational context in case 4 and the level of IS maturity and nature of participant response, it was felt that the data insofar captured in stages 1-4 was sufficient given that the participant was operating in an already high level of IS adoption and use within their organisation, and different aspects were apparent in the data associated with IS success.

7.7.3. Analysis

The analytical framework proved to be very time consuming to execute and the relevance and utility of radar charts and the value in that representation should be reviewed in future work. As the coding developed, some attributes were dropped, and some attributes had definitions that were differently expressed by the research participants which in some cases highlighted an issue around multiple definitions for a term. An example of this was Service Quality, in terms of reliability of the technical IS, or the ISO. Subsequently, Experience both in terms of the actor in relation to the IA and ISO, and experience professionally of the actor were key attributes. The most useful aspect of the framework were the

framework matrices which acted as the basis for sentiment scoring and analysis. A weakness in the sentiment scoring is the dependence on background context in relation to policy and design intention, and ability for consistent interpretation and understanding of the policy and design events. Further, the ability to distinguish for what is 'by design' and as a result of 'unintended use'. From the peer review, inter-rater reliability was consistent in those that did not have insight into the policy and design context. Therefore, a key component of the evaluation aspect of the framework is for the existence of sufficient understanding into the IS background to distinguish between an actor need or an actor want and if this is by design. Also, as this was a qualitative study involving coding, thematic analysis and evaluation carried out by a single researcher there is a possibility that this introduced some bias to the analysis.

7.8. Summary of recommendations

In producing a desired result, the IS in its design intention is satisfactory in its primary features and functionality although tensions arise where process level issues and design intention relating to clinical staff lead to challenges in implementation caused by cultural and legacy issues. Some requirements from clinical staff had not been captured in design intention, and there was participant frustration at a lack of a feedback loop on IS design and development. The IS became increasingly received as suitable and this was apparent at senior management level due to policy directives as opposed to end users perceiving the IS as producing the desired result, because of the requirement for all stakeholders to be aligned with design intention and the IS be implemented in that way. The perceived effectiveness could be improved with change relating to how clinical processes and workflows are incorporated into the IS, and how these workflows are incorporated from clinical departments to support Provider clinical triaging processes.

Differences in cases were due to organisational maturity, technical knowledge and skills, and end user role type as moderating factors which influence intention to Use, as are the perception of net impacts on IS Success. Therefore, it is recommended that organisations are facilitated to feedback on their experience to develop policy and design intention, where innovation is fostered in an environment where there is neutrality towards the IS. Due to the conveyance and feedback effects of boundary work, it is recommended that a continuous research and development loop is established in relation to user Experience and User Satisfaction with a focus on resolving barriers to adoption and aligning user design intentions. Perceived effectiveness of the IS was weakened by its capability at the interface with other IS, therefore it is recommended that interoperability standards are reviewed within the constraints of IS authentication. The quality of both System and Information dimensions were influenced by the design intentions as well as technical design of the IS. Therefore, it is recommended that a positive response is generated to each feedback to improve technical quality. The strongest mediating aspects in User

Satisfaction occurred where there was both positive Experience and Use, in convergence with policy and design intention, therefore it is recommended that the conveyancing role of the Boundary Worker is reviewed to incorporate feedback into awareness practices to resolve tensions in IS constraints, achieve coherence and congruence (in relation to events), through credibility of social influence in presence of semantic translation, pragmatic transformation and social typification in awareness practices.

With reference to particular attributes, it is recommended that usability and adoptability of IS could be improved by minimising the number of steps required for IS accessibility. In addition, of effectiveness, it is recommended that key dependencies on operational business performance are minimised and IS design is less constrained by configurable items in external systems. With regards to constraints, the data revealed that the IS enabled processes that would have not otherwise existed independently of the IS, which is a significant finding in relation to the reduction and efficiency of business processes. Therefore, it is recommended that IS constraints should match those present in existing processes and where relevant, should be configurable at the appropriate level. Negative perception towards adoptability prompted users to subvert the IS which in turn reduced its effectiveness, therefore, it is recommended that design changes are implemented to maximise full end to end Use. Clinicians in their Use require the flexibility to allocate tasks within the IS, have minimal effort expectancy at the point of care, and have managers to make use of management information, audit and systems management functionality, therefore, it is recommended that this capability is developed to improve adoptability and usefulness.

IS adoptability is a key determinant in how participant perceptions are formed to display User Satisfaction, and representative of System Quality, and therefore it is recommended that Use is examined in order to identify negative perceptions towards the technical IS quality.

8. Conclusion

8.1. Summary of research

This study confirms the role of Information System (IS) as a boundary object, investigates factors in adoption and Use, and utilises a model to apply the techniques of organisational semiotics to evaluate IS, with the aim of developing a balanced view from the organisational actor of IS success. Boundary Object theory is expanded to incorporate the role of *conveyance* across organisational boundary to achieve *congruence* with a particular purpose of strategic alignment (Henderson and Venkatraman 1999). Boundary workers have a social role to align policy and IS design through feedback and evaluation, established through conveyance via convergence of meaningful, intended, behaviour, which was defined as spanning the 'human-information boundary'. Successful and full adoption were achieved when there is conveyance to acceptance, improving overall User Satisfaction in accordance with policy and design intention, contributing to congruence across the human IS.

Key findings from establishing the policy and design context, insights on unexpected Use and factors in IS adoption and success were triangulated in a presentation of each case. Adoptability, use and acceptance of IS were developed on as key focus areas towards IS success. Discussion of the key findings led to the development of a current definition of IS success and achievement of *congruence* as an establishing factor. In response to the findings, practical recommendations are offered to support IS professionals to lead closer to IS success through User Satisfaction and Net Impacts, which relates to individual user as well as financial and operational organisational drivers. An application of this model can be made to agile actor centric development to align net benefits in organisations and IS development. Through the achievement of the research objectives this study satisfied the aim to reveal the barriers towards effective IS adoption, impact of policy and design intention on IS Success, and factors influencing unintended Use. Subsequently, an analytical framework and conceptual model was developed that can be incorporated into IS blueprints to improve acceptance and perceived effectiveness, and evaluate the factors leading to IS success.

8.2. Conclusions

The protocols and procedures that take place in Use are bound to the established rules and expectations in participant norms in that particular local instance. This is influenced and constrained by historical and current factors attributed to the signification of the focal IS. The malleability of the IS from its design intentions, as a boundary object has lent to a multitude of process variations, omissions and

workarounds attributed to the ways in which it is observed, interpreted, and enacted. This flexibility has increased its adoption in tune with local needs but resulted in deviation from design intention. This also poses questions to whether the design intention was correct, but also calls for its continuous evolution of IS design. Importantly, where beneficiaries as key influencers have least intellectual buy in, resulting interpretations of the IS in that instance are subject to greater variation. In these cases, greater facilitation, interfacing and support are required to enable IS design intention. Activity at the IS boundary is instrumental in sensemaking of the system, in setting expectations and resolving misunderstandings. The practical aspects of the IS are addressed by collaborating with the group in representation of the IS to minimise the emergence of group related issues. The wider social group works in isolation in each organisation, and within departments within an organisation. Internally, the system exhibits its own semiotic characteristics which impact on its wider social use. The greater role of beneficiaries and facilitators is under recognised in the implementation and utilisation of these IS as boundary objects.

The key barriers to adoption were identified as the lack of seamless authentication functionality, and integration into the workflow of clinical professions. Delegation of authority and tasks between clinical and administrative staff, and the lack of management information from IS to support operational activity impacted on IS Use and User Satisfaction respectively. Unintended Use of IS was a consequence of constraints placed in the IS as a result of design intention at the process level, also in deviation from responsibility to IS at the human level. Conversely, a lack of constraints also enabled activity in IS Use which would not have been possible due to checks and measures in existing operational business processes. This resulted in tension at an organisational level between IS design intention and business operations.

IS design intention was manifested in the System Quality and Information Quality dimensions of technical IS design. Both these 'quality' dimensions jointly influenced Use of the IS, which was moderated by organisation maturity, people knowledge and skills, and role type. User Satisfaction was achieved through Use and Experience that was in *congruence* with governance role of the Information Authority and Information Service Organisation, which had influence in positive impact of policy and design intention manifested through meaningful purpose, and *acceptance* of the IS *effectiveness* in success.

Through the course of this study IS success had been re-defined as 'the fine balance between intended net impacts of policy and design intentions, and user satisfaction with IS suitability for take up in a way that capabilities are utilised, at a level of being received as suitable in balance with producing desired result'.

8.3. Contribution of research

The six dimensions of IS Success have been extended to incorporate the role of the IS authority in policy and design intention, and the effect of 'net impacts' in IS Success where further support is provided on the interplay of causal relationships between variable attributes to dimensions of IS success. The methods designed as part of this study can be utilised by organisational semioticians and further IS professionals to assess and evaluate human-IS and their role within the immediate and wider organisation, as a way to uncover the intricacies of IS adoption, Use and success, and to guide the effective introduction of new systems and evaluation of technologies in organisations.

8.4. Future work

Future work is suggested in application of the research methods to a wider and more diversified range of actors that incorporates a greater range of organisational maturity, and role types over a wider range of geographies. This may involve enterprise systems requiring actor participation in different organisation types such as local authorities and higher education institutions.

A key role in establishing the background context had been knowledge of policy and design intention and experience of IS respectively, therefore further study is encouraged into the effect of background knowledge on the sentiment view of the IS. Further that sentiment review, in part of the research approach may be applied by multiple researchers, who have access to common documents in review of policy and design intention.

Relating to timing of data collection future work may consider closer proximity in real time to events, and potential use of triggers within the interviews to elicit responses specific to events.

The coding aspect of the analytical framework highlighted emergent attribute themes from the participant narrative such as 'accessibility' described as easy to be reached or entered, 'contentment' described as in a state of happiness, and 'dependability' described as confidence and trustworthy as expected. These attributes emerged in relation to System Quality, User Satisfaction and Service Quality dimensions respectively, and recommendation for future research may focus on the feedback gap in 'quality' of system and service on 'net impacts'.

The use of 'net impacts' emerged as a development following the recent literature, as intended outcomes may be emergent as either positive or negative. Positive outcomes imply 'net benefits', although outcomes may not always be positive therefore impacts assessed as positive or negative outcome. Further research is required on the impact of policy and design intention on 'net impacts' in terms of the

desired effect in outcomes, such as policy and design effectiveness on intended programme benefits. Future work may also include investigation into the net impacts of feedback and conveyance in negotiating meaning in different actor perspectives, and effective feedback mechanisms and designing in, to resolve tensions between various actors.

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Appendix

Key actors identified

Table 1 – NHS England (NHS strategy and policy)			
Role	Type of IS use	Level of use	Role description (Responsibility)
NHSE eRS Sponsor (regional director midlands and east)	Strategic	National	National team accountable for commissioning of a system to enable safe and effective transfer of referral information from primary to secondary care. Accountable for operationalising and improving utilisation of system. Providing engagement support for implementation teams at NHS Digital.
SRO	Strategic	National	
Senior Programme Lead	Strategic	National	
Project Support Manager	Strategic	National	
National Director for Commissioning Operations and Information	Strategic	National	Responsible for assuring Local Digital Roadmaps, one work stream attributed to eRS. Providing regional strategic direction on systems use and engaging across local health economy to realise strategic benefits of system. Resilience, referral to treatment times (performance management), Choice (policy)
Regional Director of Patients and Information (South)	Strategic	Regional	
Head of Patients and Information (South)	Strategic	Regional	
DCO Head of Digital Technology	Strategic	Regional	
Planned care Lead	Strategic	National/Regional	

Table 2 – NHS Digital (IS Provider)			
Role	Use of system	Level of use	Role description
Director of Digital Technology	Strategic	National	Responsible for the managed hosting, design, development and implementation of the system.
Business Change Managers	Strategic	Regional	
Programme Leads	Strategic	National	
Implementation Managers	Tactical	Regional	
Business Relationship Managers	Tactical	Regional	

Table 3 – Clinical Commissioning Groups (NHS Commissioning)			
Role	Use of system	Level of use	Role description
(Planned Care) Commissioning Manager	Tactical	Local	Responsible for delivering against the contractual levers and incentives with regards to the system set out by NHS England, within their particular locality area. Use the system for technology solution for electronic information transfer. Commissioning of primary care services, and management information. Demand management
Planned care director	Strategic	Local	
Head of planned care (localities)	Tactical	Local	
Transformation Lead	Tactical	Local	
AD of Contracts	Strategic	Local	
Head of Performance	Tactical	Local	
IM&T Leads	Strategic-Operational	Local	
AD of Quality	Strategic	Local	

Table 4 – NHS Provider ((including referral management services)			
Role	Use of system	Level of use	Role description
Outpatients lead	Tactical	Local	Utilise the system to publish their services and appointments. Receive and triage referral information. Deliver against contracts and quality initiatives. Capacity management
Clinical service managers	Tactical	Local	
eRS systems manager	Tactical	Local	
Planned care lead	Tactical	Local	
IM&T lead	Tactical	Local	
Quality lead	Tactical	Local	
Contracts lead	Tactical	Local	
Booking management staff	Operational	Local	
Consultants	Operational	Local	
Medical secretaries	Operational	Local	

Table 5 – GP Practices			
Role	Use of system	Level of use	Role description
GP Partners	Tactical	Local	Utilise the system to electronically send referrals to Provider services
Practice managers	Tactical	Local	
GPs	Operational	Local	
Medical secretaries	Operational	Local	

Table 6 - Commissioning Support Unit (CSU)			
Role	Use of system	Level of use	Role description
Digital Transformation - ADs	Strategic	Local (in multiple instances across regions)	Enabling and support to CCGs/NHS England/Providers in operationalising and improving utilisation of system.

Digital Transformation PMs	Strategic/tactical	Local (in multiple instances across regions)	
Provider Management	Tactical	Local (in multiple instances across regions)	
Referral Management Centre (RMC)	Tactical/operational	Local (in multiple instances across regions)	
eRS service lead	Strategic	Local (in multiple instances across regions)	

Summary results of case sentiment

Case1

	1	2	3	4	5	6	Sum	Avg	Trend Avg	Max	Min	Max-Min	Diff 1 to 6
Adoptability	0	-1	0	-1	-2	-1	-5.0	-0.83	-0.17	0.0	-2.0	2.0	-1.0
Intuitiveness	1	2	2	1	0	1	7.0	1.17	0.00	2.0	0.0	2.0	0.0
Usability	1	-1	-1	0	-1	-1	-3.0	-0.50	-0.33	1.0	-1.0	2.0	-2.0
Usefulness	1	1	2	0	1	2	7.0	1.17	0.17	2.0	0.0	2.0	1.0
Purposefulness	2	2	2	2	2	1	11.0	1.83	-0.17	2.0	1.0	1.0	-1.0
Effectiveness	0	1	1	2	0	0	4.0	0.67	0.00	2.0	0.0	2.0	0.0
Acceptance	0	0	0	1	1	2	4.0	0.67	0.33	2.0	0.0	2.0	2.0
Reliability	1	0	1	0	1	1	4.0	0.67	0.00	1.0	0.0	1.0	0.0
Credibility	1	0	1	-1	-1	1	1.0	0.17	0.00	1.0	-1.0	2.0	0.0

Case 2

	1	2	3	4	5	6	Sum	Avg	Trend Avg	Max	Min	Max-Min	Diff 1 to 6
Adoptability	-2	0	-2	1	-2	-2	-7	-1.17	0.00	1	-2	3	0
Intuitiveness	2	1	2	-2	0	0	3	0.50	-0.33	2	-2	4	-2
Usability	1	-1	-1	-2	-2	0	-5	-0.83	-0.17	1	-2	3	-1
Usefulness	0	1	2	1	0	0	4	0.67	0.00	2	0	2	0
Purposefulness	2	2	2	2	1	1	10	1.67	-0.17	2	1	1	-1
Effectiveness	-1	-1	-2	0	0	-1	-5	-0.83	0.00	0	-2	2	0
Acceptance	0	1	0	0	-2	0	-1	-0.17	0.00	1	-2	3	0
Reliability	-1	-1	-1	-2	-1	0	-6	-1.00	0.17	0	-2	2	1
Credibility	0	0	-1	-2	-1	0	-4	-0.67	0.00	0	-2	2	0

Case 3

	1	2	3	4	5	6	Sum	Avg	Trend Avg	Max	Min	Max-Min	Diff 1 to 6
Adoptability	1	0	1	-2	1	0	1	0.17	-0.17	1	-2	3	-1
Intuitiveness	-1	1	1	1	2	0	4	0.67	0.17	2	-1	3	1
Usability	1	0	1	0	0	0	2	0.33	-0.17	1	0	1	-1
Usefulness	0	2	2	2	2	2	10	1.67	0.33	2	0	2	2
Purposefulness	-1	1	2	2	2	2	8	1.33	0.50	2	-1	3	3
Effectiveness	0	-1	1	0	0	1	1	0.17	0.17	1	-1	2	1
Acceptance	1	2	2	2	1	1	9	1.50	0.00	2	1	1	0
Reliability	1	1	2	2	2	1	9	1.50	0.00	2	1	1	0
Credibility	1	1	2	2	1	2	9	1.50	0.17	2	1	1	1

Case 4

	1	2	3	4	Sum	Avg	Trend Avg	Max	Min	Max-Min	Diff 1 to 6
Adoptability	-1	0	-1	-1	-3	-0.75	0.00	0	-1	1	0
Intuitiveness	2	2	1	2	7	1.75	0.00	2	1	1	0
Usability	1	2	2	1	6	1.50	0.00	2	1	1	0
Usefulness	2	2	1	0	5	1.25	-0.33	2	0	2	-2
Purposefulness	2	2	2	2	8	2.00	0.00	2	2	0	0
Effectiveness	2	2	1	1	6	1.50	-0.17	2	1	1	-1
Acceptance	1	2	1	1	5	1.25	0.00	2	1	1	0
Reliability	2	2	1	2	7	1.75	0.00	2	1	1	0
Credibility	0	1	2	1	4	1.00	0.17	2	0	2	1

Variable centric analysis of framework matrices

Reliability

(Case 4)

A differential is made for “service quality” attributing to Quality of the IS, or attributing to support that system stakeholders receive from the IS organisation. By definition service quality relates to that which ‘performs consistently well’.

The ‘Quality of service’ pertaining to the IS was considered highly in terms of uptime. Rarely reverting to business continuity ‘because it works almost all the time’. Reliability relating to confidence in the IS on data processing was high, where ‘If you’re in the system it’s hard to get lost’.

There is also a further reference to having a sense of reliability on the IS, that is attributed to the aligned effort of other users where ‘I think highly reliable if you’ve, if you use it properly, which isn’t difficult to do’. This can also be attributed to the quality of support from IS implementation.

From a security perspective there is attribution to confidence that the IS will conform to Information Governance where, ‘I think it is very reliable. It doesn’t lose a patient within the system. I have confidence that if I have put through eRS it will be sorted and dealt with.’

(Case 1)

In contrast to the same attribute the reliability perspective is placed directly on the aligned effort of end users where ‘It is user error that causes it to not be reliable’. Also, indirectly to the IS design and quality of service where ‘its more user error or it could be that it’s too easy to do that on there’, relating to unintended uses.

Within the reliability theme there was a frame of reference to quality of the IS service, where ‘It doesn’t seem robust enough to cope with the volume, a lot of the time.’ But also integration between systems where ‘The communication between the two is really inconsistent as well.’

But, you know we had GPs trying to refer in and of course it wouldn’t work cos the certificates had expired.

‘The other things that I’ve sort of seen, is and I don’t know again whether this is a Trust IT issue but with eRS because it is the way it is, sometimes it’s very umm, it appears that it is quite inconsistent on how it works.’

Perceived reliability in relation to latency where ‘It doesn’t seem robust enough to cope with the volume, a lot of the time.’

Further identified as internal network and communication issues ;

Communications about downtime 'With regards to reliability and communication about it, when it went down before it was partially I never got communication. It went to IT department, who never forwarded it down to me.'

Concerns about ownership of integration issues where 'But it just sort of getting somebody to take ownership. Because one will always blame the other and it's really difficult to actually get the issue resolved.'

(Case 2)

Reference is made to the performance of the support from the IS organisation, where 'I just want the backup training. And that's not a dig at anybody at all, as there isn't a lot out there no.' relating to availability of support from the IS organisation. It is perceived to be not performing consistently well, where 'there was an online one, and there was train the trainer you could do and it all just disappeared'. Further, 'We get a new system no extra training, no help, here it is.' This could be in relation to availability, or receipt of those communications and support through networks and channels.

Around stage 2 there was a national system outage, where this had been perceived to impact further locally 'Cos I had this problem with 2 appointments showing before the system went down last week, they'd already put a call in , they'd already raised it as an issue' relating to quality of service nationally and between the integration of local systems.

Relating to quality of service there is a perception that 'It doesn't always do it instantly, which is quite interesting. Sometimes, we have to wait till next day.', where there is a perceived lag in responsiveness. A lack of expertise is displayed in user expectations when 'Yeh see I've got two open and that's the error message you get. So I'll have to close it down and go back in', and 'And it's like where has that come from? It's as if it has polled over when it shouldn't have done' in understanding the basic IS responses cause by basic IS function.

Around stage 4 there was a national system outage, where 'eRS crashed and the whole network went down. I've been using eRS for 10 years and it's never done that.', although there is a level of confidence in the IS where 'On the whole I would say yes its reliable. I assume it will cope with the extra activity going through it.' Although there is frustration at timing in relation to implementation activity and the unfortunate timing of the issues relating to IS quality of service, where 'They got the funding and everything and then it went and crashed. I don't believe it, I'm trying to sell this bloody system.'

At stage 5 there is another concern in relation to the reporting functionality where 'I mean this one, the new advice and guidance one that is so much easier, when it reports. I say that, but or doesn't always come up with any data.', implying that new functionality has been introduced without the underlying data and a sense of inconsistency 'See its done that pretty quickly today, but it wasn't working a while back. We couldn't get that report for about 2 months.' The participant is light hearted whilst conveying frustrations, and was pleased that they has identified an issue and reported it prior to the national incident management. Further concern in relation to IS quality of service where 'The biggest problem our surgeries find is that it doesn't pick up the appointments in our PAS system quick enough, so they put another one on.' This has wider financial and patient experience

impacts relating to IS integration and reliability on the technical messaging, where fault an ownership is unclear.

By stage 6, the emergent themes relate to self confidence and reliance in the use of the IS and perception of issues relating to use error, where ‘As a system I find it has a few more glitches than it used to have’ and ‘It won’t always show me the reports, and you get this click here click here, and you keep going and going until eventually it will pop up’. Re-affirmation that there are ongoing issues in relation to the communication between IS and external systems’ where ‘Now I know linking across to PAS system maybe Medway system or our PAS, that doesn’t always work umm as quickly as it should.’

But full acknowledgement that the IS in and of itself has a good IS quality of service and ‘Yeh I would say yeh on the whole I would give it 100% reliability.’

Although the participant confirms 100% reliability of core IS, there is confirmation in this stage that there are intermittent glitches, and this is in relation to use of the system rather than uptime of the IS as a whole.

- Negative Intuitiveness, purposefulness by positive exception for Case 4

Intuitiveness relates to a desirable characteristic of the IS where it is easy to use and understand. From the perspective of this particular IS user role ‘I think it has improved a lot in the few years been using it’ brought in by recent design changes. Although there is a perception ‘I think it could be lot more intuitive’.

‘What I find less intuitive is the tracking of patients afterwards, personally don’t find easy to do’ is associated with implementation and user training as this functionality is available in the current state.

Following this, the IS continues to be easy to understand where ‘But maybe that’s because I know what to put in, rather than it telling me.’

Easy to use where there is previous experience in the IS where ‘I’ve used for several years now, so whether that helps’.

Once the IS has been successfully implemented, ‘I think once you have learned it, it is quite intuitive and user friendly’ and ‘Easy to find way around it, and so it functions fairly well the way it does.’

This progressed to ‘I find it very intuitive. Comfortably able to navigate around it. No difficulties finding what I want out of it. Referencing external poor understanding and use ‘So it obviously wasn’t intuitive to everyone, but I didn’t have a problem myself.

‘For me I noticed it was different, but worked it out and got on with it.’

‘Most of the time when you see a change I think its fairly obvious what you have to do. Rarely have to resort to the help function.’

Purposefulness:

Purposefulness relates to the degree and manner in which stakeholders utilise the capabilities of the system, and is the reason for which the IS used.

Initially a relatively simplistic of the IS as 'I think it's a referral management system' and a 'way of referring to secondary care' is divergent to other participants.

Which further develops into 'It's a vehicle for offering choice to patients., and a high level of understanding into why the system is used where it is also 'A communication system because we have the advice and guidance function' and an 'Information database on what clinics are there'. To a comprehensive value statement of 'A effective referral management system, that allows you to create an audit trail for that referral, and enables choice to be offered for patients'.

Furthermore into 'Its allows data gathering on referral patterns and referral to feed into CCG and practice approach to referrals.' In each stage the same basic principle of 'referral mechanism' is uttered.

- Wide Negative changes in usability, adoptability, (purposefulness, acceptance 50/50)

Usability (Case 4) – characteristic of system output fit to be used

A characteristic of system output 'In terms of booking relevant appointments it very good/slick and works well' and there is 'Ease of use, sitting with patient making referral is not a problem'. Although there is an issue that has also been identified in the intuitiveness theme related to 'Referral tracking is still problematic'.

IS deemed as usable but from a practical perspective, there is slight divergence from design intention where work is pushed across the people boundary where ' Our secretary uses them. So we're a practice that who does the/generates the Choose & Book within the consultation, but the backup work is all done by the secretary'. Relating to a particular functionality also referenced in the effectiveness theme, there is a perception that the output it not fit where there is design intention divergent activity across the boundary where 'There are sometimes (eligible- I have some problems) with making named consultant referrals, in the independent sector'.

Progressively there is reference to characteristic of system output where 'It often does feel like there is quite a lot of steps' and 'It would be nice on Choose & Book if you did click urgent at the top had a button on the top that you had a slightly different page, using the send for triage button or something like that, rather than having to book a slot in the Trust that it will get sorted', which is also referenced in the adoptability variable. Where also, 'It would be nice to have a slightly different page for urgents'.

Suggestion is made to improve characteristic of IS output where 'we could get a email or something where a response come back (eligible) flag or otherwise...'. This related to

messaging where there is lack of functionality to support business processes via messaging and alerts.

Adoptability (Case 4)

IS doesn't support full scale of referral activity 'Where it is less easy is the URGENT, referrals (not 2WW)', this is lack of user confidence relating to the 'priority' feature within the IS, dependent on boundary activity.

Full adoption is not achieved where 'I know some colleagues will just either pass it on to secretary or just fax a referral', indicating allocation of roles to alternative members of staff and intolerance to lack of business continuity. This indicates divergent from policy. Also, 'People aren't prepared to waste too much time trying to get it to work' indicating a lack of effective feedback or resolution mechanisms.

Alternative methods of access allow users to bypass the IS where 'Some clinics still have alternative routes that they actively encourage, through email fax'. This is in relation to services where use of the IS maybe inappropriate, or where the IS has not been fully adopted. This was within a policy context to drive uptake, therefore there is divergence between the organisation and service level.

There was joint references to usability and adoptability where 'I think it is still perceived as a bit clunky in places. So you know It's quite a few steps if you like for 2WW.' So, it has not been fully adopted in convergent with design intention for 2WW.

It was still perceived to be clunky where there was '...a lot of steps in a time pressured environment, kind of thing, those are the main factors really.'

There is continued lack of confidence in the 'urgent priority' feature also reference in usability, acknowledging the current policy context to go 'paperless' there are still challenges where 'GPs don't have Trust that for an urgent referral, that referral would be pulled out and adequately triaged and put into the appropriate place.'. Therefore within the current policy context, the design is unable to satisfy the user requirement. There is also a concern around divergence to design intention where 'there is that feeling that there isn't human clinical input into the system until patient is actually physically in front of them.' Therefore there being potential clinical and financial impacts.

There is further divergence to design intention referenced, attributed to the boundary 'At the service provider end they are having to take people off the system, and that they can book them in the order they were referred.' This highlights an operational tension in managing performance vs. adoption the design principles of the IS and adapting business processes to this. Also, where there are impacts on patient continuity of care where '... people seen privately who then want to transfer in to the NHS system.' Lack of widespread adoption is perceived to be policy issue where 'Those hospitals can't access the systems, unpractical, but that's probably a contracting issue.'

Adoptability (Case 2) – Desirable characteristics to follow/take up

Boundary issues are referenced at the design level where 'Interacting with other systems it don't do well' and in relation to design intention where 'We all argue about not being

able to see the referral till we have booked it'. A recent design change has not been communicated effectively so 'like the manual poll but you just get a quick conversation that it is mentioned', therefore has been difficulty in adopting the functionality.

Referencing the reject functionality, they are working across the boundary to improve uptake, but there is tension caused by divergence from design intention 'So we're working with them to get their surgeries using it, but we still have this issue around reject, if our consultants reject it'. A sense of frustration that until there is conveyance around this characteristic 'Until that is in place, by them and the directive is pushed, we're not going to get any joy.'

This has developed to a complete lack of adoption of this functionality where 'We've had to say just ignore that reject button, which isn't the right way to do it'. At the organisational level workarounds have been put in place where 'I know Frimley Heath have a workaround, we have a workaround, I'm not sure about Milton Keynes'. There is reference across the boundary to 'it's got to be easier for the GP surgery, if they used it properly, but they're still not and I'm sure you have come across that'. There is combined reference to policy, design intention and boundary. Unintended uses have been identified where 'So it's not user error, is what they are allowed to do', highlighting divergence from design to business process and ability to workaround.

The current policy context has contributed positively in the ability for IS take up where 'They don't seem to grasp the fact that you haven't got a choice soon and we are going to be returning all your letters along with Oxford, Berkshire, Bedfordshire, and Milton Keynes, Luton, Dunstable and all the rest of them West Hertfordshire'. There is an understanding of responsibilities across the boundary 'But obviously it's not our training issue, it's the CCGs training issue'.

Consultant take up have concern about transferring work across the process boundary where 'For our consultants it is still around, if they want to add an additional requirement and how that works'. This is in relation to clinical versus administrative roles and the allocation of IS activity across these roles, relating to whose time is more valuable. Also, around 'So we get quite a lot of umm, how many clicks its taken them. They've got time to count the clicks'. Where there is misalignment between design and adoption there is an acknowledgement 'So we're sort of using workarounds and you know it doesn't really work'. In terms of adoption maturity 'I think as a Trust they have underestimated the work involved in Paper Switch Off by October', where this is convergence to the policy context by concern about the effort involved. In relation to a particular feature there is a clinical concern about responsibility where 'The other problem we have about, around umm patient information is the advice and guidance, that isn't downloaded.'

Further reference is made to adoption at the people and process level with design intention where 'We are from a consultant point of view we are still getting issues with the reject, add additional requirements stuff.' Also, in relation to clinical time where the IS process is perceived to take longer than the current manual process. Boundary issues persist, around correct use of design intention, conveyance across the boundary at the organisation and process level relating to triage outcomes where 'We still have doctors here that are just rejecting. Most of them are rejecting it incorrectly, so it's really difficult'.

Acceptance (Case 2) – satisfaction in being received as suitable

There is a moderate level of acceptance described in relation to the policy context where ‘this time next year you have no choice’. Also, at the people level where ‘There are couple of other systems available, cant we use that’ and ‘There are lots of people that don’t like it’.

The satisfaction at the people level improves where ‘Now we’ve got 2-3 advocates, that use it regularly, they do everything online and they’re saying no, no you should use it it’s much better blardy blardy blah’. This is also in parallel to the emerging policy context where ‘definitely more acceptance because we pushing it, and of course we have got to because NHS England got us on timescale.’ At the organisation level across the boundary ‘But we’ve got more GP surgeries using it now, so we’re getting more through’.

The organisation still does not see the IS being received as suitable where ‘I still don’t think that our trust takes eRS as a viable option. However, with Case 40 they haven’t got a choice’. Also, at the organisational level across the boundary ‘It seems generally that Trusts are taking it slightly more seriously’ in reference of the current policy context. Although, at the people level within the organisation ‘I could just feel, that actually some of them wasting my time, but they weren’t really 100%’. Across the organisational boundary ‘CCGs are really pushing it, they want their surgeries up to 80% usage on eRS, and they’re getting them’ in relation the policy context. There is tension across the boundary at the process level where ‘They want to be paid to do this, to use eRS, to book appointments. We actually had surgeries saying, well that’s what the hospitals do, they book appointments so are they going to give us some of their funding to do their job.’

At this point, there hasn’t been a push across the organisation boundary at the policy level where ‘I still think a lot of it is that they can’t be bothered, from the CCG side.’ Also from the clinical community the triaging element of design intention has not been received as suitable where ‘From our side, from a vetting point of view, they are just fed it on a plate of paper. They have no reason to go online and look’. This is further supported where ‘The consultants, they bury their heads until they are told you haven’t got a choice. They will try and get away with murder till then. I’m sure that’s the same with most Trusts’. From an administrative perspective ‘I think everybody loves to hate it, I think it’s a bit like marmite. Admin staff love it, because it’s so simple for them’. From an organisational perspective ‘I have heard, we’ve been told that the Director from upstairs went out last week, that come July 1st we’re not printing anything for them and if they don’t read online, they won’t see their referrals’.

There is an obvious disparity at the organisation, people and process level in that ‘Now when you say accepted, accepted as in we haven’t got a choice we have to use it. Or.... Accepted in, we haven’t a choice we will use it, but I don’t think we should be because I think it is a load of rubbish, type of accepted?’ Particularly on the clinical user as ‘Umm, if your asking me to see if it’s a consultant accepts it, I would say, hand on heart I don’t think there’s any consultant in this Trust that would say they are happy with the way to use it. They are using it but under duress.’ At the organisational perspective ‘They were very late to the party, very late in fact they called off our go-live 2 weeks ago, the day after we started it , umm, because they suddenly come up with questions, which is great, but why can’t we have asked those questions a year ago, when we asked them to engage with us’ and ‘Our CEOs wife is a GP in Marlow, so we’re putting it down to pillow talk,

off the record. (laughs) which hasn't really helped out cause.' Relating to policy context across organisational boundaries.

Finally, IS negatively perceived by its main end userbase where 'Umm, yeh they can see it, we can see it everyone is happy apart from the consultants and the GPs, but you know but they're paid not to be happy, aren't they? (Chuckles)'.

Usability (Case 1)

IS where 'access is clunky', but positive in relation to purposefulness and usefulness.

There is concern relating to allocation of work across the people boundary between clinicians and admin staff where 'The only other thing that still really bugs me with eRS, with regards to actually the getting it adopted out there especially by the clinicians is there's no easy way of them notifying a bookings team of what they want changing'. This is divergent to current design intention and considered 'Its faffy, and it's not ideal'. A clear requirements and solution is offered 'We should have that with the triage, there should be another box, that says, admin action required. They click on that, and then it moves into an admin action worklist, where its picked up, done.' And there is frustration this design change has not been made. This has also been validated where cross organisational boundary validation has been stated 'I've been on a call with other Trusts and they've had feedback from their clinicians going it's not fit for purpose, I'm not doing this'. There is interaction beyond the local context where similar concerns have been raised, so there is a level of dissatisfaction amongst the clinical community around the IS processes expected of them.

Reference is made to lack of ability to take corrective action where 'Its silly things I supposed like if a consultant accidentally accepts something and they go, I've just accepted that and I didn't mean to, there's no way of finding out, unless they've got a vague glimmer of roughly if they know when the patient was booked in, or whether their name or something, can't find it can you'. By identifying where the error was made, retrieving the activity and then taking corrective action. This leaves the IS open to data quality issues, greater opportunity for use of alternatives, and perceived lack of user confidence if they are unable to rectify their actions. Bother for IS end users and system administrators, to record and recall activity.

Reference is made to number of process steps in IS to get to an end point and to be able to review the relevant clinical information in a consistent manner 'Because of the clicks and everything else. Lot of windows to get through, to get to a point'. This aspect is dependent on the source of that information. The challenge is that each referring organisation is an individual business with their own processes in a number of different systems.

There is a perception that the categorisation of services within the IS is too rigid 'So we have no option but to put it under Not Otherwise Specified. But that then results in all sorts coming through.

‘ and a case is stated where a specific service has to be placed in ‘not otherwise specified’. There should be a process for considering these requests so ensure that the broad range activity doesn’t end up in a specialist service.

Usability concerns remain, relating to integration/interoperability between IS. Also, tension with design intension on allocation of work at the people boundary between clinicians and admin, to assist clinicians with their time. There is a feeling that ‘I think the way it was originally built, doesn’t necessarily fit around how clinicians work in day to day practice’. Also, in relation to design intention ‘I think what sometimes becomes of eRS is actually the processes, sometimes you have to then build around it’. Also at the process level there is tension with the design intensions where there a constraints placed by the system on what would have been process where’ There’s not the option to flick between the selections the patients have made, so through our Provider if they have picked for or 5 sites, if we are they trying to book however we’re got slots at another site, and they’ve deferrer over to one place it not easy to chop and change between them’. There is a perception that the design and development has been focused across the organisational boundary where ‘I do feel from the development side of things with eRS there could be a lot more done I feel with Providers. It’s been very primary care heavy’.

There is a consistent view, that a lot of processes need to be put in place where ‘ I think Providers, I feel I have to, we have to put in a lot of internal workarounds to make it fit our processes’ and the design is not focussed on the requirements of Provider functions where ‘I still don’t feel there is a great deal of development or interest in the way the providers are actually working in their admin teams and their clinicians’.

With reference to recent design improvements, ‘I struggled a little bit with the worklist filters’, and ‘Its usable, but I still think its very clunky, too clicky, and obviously if you loose your smart card locked, certificates expire, there’s no other way of accessing the system information’. Process level across the boundary is referenced where lack of standard alignment leads to ‘Clunky, from a clinicians point of view, they click on the UBRN. They have to open every single one of those (attachments). They have to wait for the application to open up.

Finally, ‘Clunky, from a clinicians point of view, they click on the UBRN. They have to open every single one of those (attachments). They have to wait for the application to open up.

That is not good use (of their time). We have actually timed a clinician , paper vs online. Paper wins, looking, writing move on.

Functionality wise, from Provider point of view I think it hasn’t changed that much.’

Purposefulness (Case 1)

In the final stage reference is made to recent design changes where ‘Worklists take up a lot of the screen, I’m not sure what value they add to what was there in the first place. From provider side of this, I was assured testing was done.’ This has had a negative impact.

Relating to process concerns across the organisation boundary, lack of purpose across the boundary results in ‘A lot of them revert to see comments, letter dictated. They get their secretary to do letter and put in patients file. That’s not really how to do that, type in and save secretary work’. On the further development of an IS feature, there is a concern relating to lack of alignment across the process and organisation boundary ‘I do worry though with A&G, probably same everywhere. Unless there’s clear guidance, it is basically a triage process. That’s not really advice and guidance that’s triage, I guess that’s for the Trust to manage with the CCGs.’ Also, there areas ‘I still think there is a lot of areas where consultants, get secretary to print them off and I’ll triage’.

Usefulness (Case 4)

Initially described as having practical purpose as a ‘Core part of how Trust received referrals, and manages patient booking’ at the organisational level and ‘Extremely useful, in terms of the hospital reduced paper, staff volume of dealing with patient appointments’.

There is a clear process level understanding of practice, and cross boundary at the people level where ‘Its clear to GPs how to find us, how to refer their patients to us whether they are our local GPs literally across the road, or you know ones in Exeter or Newcastle’. . Additionally at the process level where ‘Its clear for us to setup our services in our departments.

There is a developing concern that ‘It is starting to creak around the edges as although the national guidance focus on GP referrals to consultant led outpatient clinics, obviously Providers want to put more and more on there’, where IS design is not keeping up with innovation and the way in which organisations would like to use the IS where ‘Departments can manage them, and I think in terms of you know, around its core aims it works very well, and it’s just again where it expands, the more things there is that chunkiness starts to creaks in’. Further ‘But that is because it’s trying to expand beyond the core scope that’s been there for many years, and it’s not the core scope is failing, it’s the expansion just needs some work’. At the policy and design, at organisational level boundary work is required to continue innovation.

Case 1:

High: Purposefulness

Low: Adoptability

IS doesn’t support full scale of referral activity ‘Where it is less easy is the URGENT, referrals (not 2WW)’, this is lack of user confidence relating to the ‘priority’ feature within the IS, dependent on boundary activity.

Full adoption is not achieved where ‘I know some colleagues will just either pass it on to secretary or just fax a referral’ , indicating allocation of roles to alternative members of staff and intolerance to lack of business continuity. This indicates divergent from policy. Also, ‘People aren’t prepared to waste too much time trying to get it to work’ indicating a lack of effective feedback or resolution mechanisms.

Alternative methods of access allow users to bypass the IS where ‘Some clinics still have alternative routes that they actively encourage, through email fax’. This is in relation to services where use of the IS maybe inappropriate, or where the IS has not been fully adopted. This was within a policy context to drive uptake, therefore there is divergence between the organisation and service level.

There was joint references to usability and adoptability where ‘I think it is still perceived as a bit clunky in places. So you know It’s quite a few steps if you like for 2WW.’ So, it has not been fully adopted in convergent with design intention for 2WW.

It was still perceived to be clunky where there was ‘...a lot of steps in a time pressured environment, kind of thing, those are the main factors really.’

There is continued lack of confidence in the ‘urgent priority’ feature also reference in usability, acknowledging the current policy context to go ‘paperless’ there are still challenges where ‘GPs don’t have Trust that for an urgent referral, that referral would be pulled out and adequately triaged and put into the appropriate place.’. Therefore within the current policy context, the design is unable to satisfy the user requirement. There is also a concern around divergence to design intention where ‘there is that feeling that there isn’t human clinical input into the system until patient is actually physically in front of them.’ Therefore there being potential clinical and financial impacts.

There is further divergence to design intention referenced, attributed to the boundary ‘At the service provider end they are having to take people off the system, and that they can book them in the order they were referred.’ This highlights an operational tension in managing performance vs. adoption the design principles of the IS and adapting business processes to this. Also, where there are impacts on patient continuity of care where ‘... people seen privately who then want to transfer in to the NHS system.’ Lack of widespread adoption is perceived to be policy issue where ‘Those hospitals can’t access the systems, unpractical, but that’s probably a contracting issue.’

Case 2:

High: Purposefulness

There was a high level of understanding that was convergent with design intention and policy context where the IS can ‘deliver a referral that is secure’ and ‘cant get lost in the system’. Also, that it can assist in ‘patient choice’ and has functionality where ‘GP saying don’t always need to book an appointment, just need advice.’ Also there was a high level of confidence where ‘it comes back to security, safe in the knowledge’ that it ‘cant get lost in the system’ and ‘as a manager it gives assurance’ ‘and a brilliant audit trail’.

Further that it provides ‘one point of referral and it can be accessed by anyone, as long as you have the authority to do that’, relating to a high level of convergence to the IS design intention. From a policy perspective ‘from the patient point of view it gives them, if they use it properly is their choice of hospital’. Further that ‘...it’s a lot cheaper to refer in that way than it is to do the post and man hours for the letter’, referencing financial benefits. Although, later reference is made where a ‘GP surgery wouldn’t agree with me on that.

I'm sure cos they're saying they don't have the manpower to do this'. Indicating that there is concern around task allocation across the boundary.

A IS design change relating to *details for patient contacts* implemented a shift of work across the boundary where 'The patient phoning us is great, except of course there are no phone numbers on the DoS', lack of clarity on who will resource the work.

The clinical community also has experience of the IS previously which promotes familiarity where 'Consultants, they all know what it is, they've all used it when they've been in other hospitals'.

Clinical triage is an area of divergence to design intention 'because if they do that wrong that impacts on what the extra work the admin staff have to do, umm so we try to tell them don't accept anything, unless its accepted through to being accepted.' Also, 'Well he said well I'm not going to waste my time then. The argument being that ours go through a triage company before they get to us.' The activity has been pushed across the boundary, resulting in divergence to design intention.

This also makes reference for inability to take corrective actions, contributing to some clinicians not wanting use IS.

With the acknowledgement that 'If everybody uses it properly its quicker its easier, they're not getting chased for lost referrals, cost they can't get lost.'

There was a concern around introduction a new functionality and the replication of existing functionality through another means so '... that is basically giving advice and guidance through the back door, and they're not getting paid for that'. Impacting on the financial reporting.

Overall in purposefulness the greatest area of convergence is on security.

Low: Usability/Adoptability

There is divergence from design intention where the IS doesn't perform as expected and participant states they 'Cannot copy and paste', and that a '2 month delays in reporting doesn't support activity on the ground.' Subsequently, the 'report information that I need it is long winded'. Also, where the IS doesn't allow for at scale duplication and 'it would be good to have a read only version of the DoS.'

There was continued dissatisfaction where 'Reports I don't think are very good, I've said this before, we need a reject report, which we don't have'. The design intention behind this is that the expectation work transferred across the boundary, with responsibilities there. Also, the basic reports required time consuming adaption where 'What I'm actually doing is taking information from those reports and putting them into stuff' and 'if I had an ASI report in there I wouldn't need to spend 3 hours. Which I how long it takes me'.

There is a clear representation of where the system is unfit for use, for example 'We I think this is rubbish, because I can't even extract that easily, it would just take me too long', and active suggestion for improvement in what reports. There is an active concern on the inability report and 'reject' activity as there is a lack of confidence across the boundary that activity would be picked up.

Subsequently 'We're still using a workaround for REJECT, because we don't have the confidence that surgeries are picking up their worklist, and there's no reports still, that we can pull out from out end to say what's been rejected'.

There was a perception that 'It was clunky, it didn't do this, it didn't do that. It took so long, it was 15 clicks just to look at that, and I say yeh but it's not now.'

Again, referencing the reject functionality, there is a concern about addressing mistakes where 'A decision over turned, you've got nowhere in eRS you can go back and undo the outcome'.

Where there have been issues in convergence to the usability aspects of design intention, workarounds were discovered so 'We found the loophole, because we're quite intelligent people when it comes to playing with computers. So we found that loophole, so it wasn't such an issue.' This highlights a tension between design intentions and user adoption of IS process.

Critical reference is made to support provided by the IS service organisation where 'The help section is good when I can find what I want, but I can't always find what I want', and 'The website I think is not very good, but that's a separate issue.'

Reporting, developing DoS at scale and reviewing functionality

Case 3:

High: Usefulness

There is convergence to context in policy 'so we can have conversation around choice' and '...the advantage is it allows tracking to reduce risk of patients being lost in system'. Also, as a 'Powerful data collection tool to see patterns' and for 'auditing and data'.

On design intention there is divergence where, I haven't actually needed the multi way bit yet, I just click on ask question, get an answer and that kind of thing, which I imagine is going to be the case for most people'. The features is used, but incremental improvements were not uses in the way intended by design.

The IS considered 'an auditable data set of referrals, to allow for referral management planning' which converges to policy and design intention, where it is perceived to 'Provide and audit trail for those referrals so not lost in system'. Also, '...I can do it there and then in the consultation, and do the referral and its dealt with', indicates understanding of responsibility and this converges to own use.

Design intention has been incorporated into use where 'I tend to do my referrals at point of seeing the patient, its done, referral is done and gone and don't think about it again.'

Also, that there is a positive taken when work is pushed across the boundary ‘so it can get picked up by the secretary. So I think it is a good system.’ And ‘I can generate a referral and give it to the patient, and write the letter, all within the consultation. Its quite an efficient way to get a referral done.’

Supporting boundary work ‘Yes, they are used by CCG to monitor referral patterns, and they do get discussed intermittently at the CCGs council meetings.’

Low: Effectiveness/Usability

The IS ‘nor so good around continuity of care’ in following through a patient pathway. At this is there was no adoption drive through policy therefore perceive ‘Not 100% as it is not catching all the data’.

Where organisations across the boundary are not providing the relevant appointments information to the IS, it is ‘recently it’s been saying it’s not available’, which is perceived divergence to design intention across the boundary. This also cause additional work for patients and referrer ‘if there is change in plan and they don’t want to follow through with that, or change referral, or if there are no appointments available initially when they phone up or go online, and then that can cause the patient more work in terms of having to remember to phone back’, as the IS assumes a standard in effectiveness. Although, ‘I’ve never heard from a patient they didn’t get an appointment, it’s always worked’. There is a perception that the GP has been given more work in relation to patient appointments, ‘They want the GP to do that because they don’t want the patient to leave and not do it.’ This is later addressed though a design change.

There is divergence to design intention ‘Whereas IPASS I accept is not a genuine appointment, so it doesn’t make a lot of difference whether to book an appointment or defer to Provider it still gets to them to sort out’. This relates to activity across the boundary, although is perceived to be beneficial, where unintended use of system where dummy appointments are used to act as a mechanism to simply get the referral information from referrer to Provider. This has unintended consequences where patients have turned up for these appointments, reminder letters have been sent out (Provider cancellation of appointments), mitigation of any patient benefits. Although this is preferred by both referrers and Providers due to mitigation of any clinical risk associated with patients not booking appointments, and Providers not effectively making their appointment slots available, which is divergence to policy and design intention, impacted by boundary activity.

There is impact referencing divergence to design intention across the boundary where ‘Patients have seen that person before, and would particularly like to see that consultant again, and so you look for their name and it doesn’t come up’, relating to Named consultant functionality supporting continuity of care, that has not been implemented. Also, linked to contracting issue (Adoptability) where patient has already been seen in the IS, but needs to be seen by same consultant in NHS due to lack of equipment. This has a financial implication for CCGs.

In pushing workload across the boundary there is divergence to design intention where ‘Comments like see your GP again which isn’t particularly helpful because the GP can’t do anything about that. I believe that’s changed as of the last week or two’. Previous

design intention had placed GPs in the position of being able to have most effect, but feedback on the IS has led to a design change which pushes this workload relating to patient contact details across the boundary.

There is divergence to policy and design intention due to lack of confidence across the boundary and lack of implementation uptake 'So, most GPs who have been email and faxing for those have been reluctant to move over on the eRS system because we haven't had assurance from Royal Berks that adequate triage is going on.' This is due to lack of assurance across the boundary that the relevant work activity is being carried out aligning policy and design intention.

Again, divergence across the boundary is perceived to have negative effectiveness 'In dermatology, where they have long waits, and at Royal Berkshire they're taken off the Choose & Book System. They haven't really put a mechanism of keeping them in order on eRS, so they take them off and keep it locally at CASE 4.' This divergence to policy and design intention has an impact on perceptions across the boundary and impacts effectiveness across the whole IS. This examples has also been cross referenced in adoptability.

There is divergence to design intention, although it is unclear if this is due to poor implementation where 'You know, advice and guidance is now designed to be more of a two way process. I'm not so sure hospitals see it quite like that yet.' This aspect is also cross referenced in purposefulness and usability.

Case 4:

High: Purposefulness

There is convergence to design intention where the IS described as a 'giant interface between primary and secondary care systems, to get patient referral from A-B' and 'services and slots can be made available'. There is reference to how various parts of the system have to co-operate across the boundary for the IS to satisfy its purpose. This is further clarified as 'GPs referred a patient via e-referrals, to book their appointment, I can see their referrals and juggle them about and re-direct people, and the right people turn up in my clinic and I get on with doing the doctoring that I want to do', describing a brief scenario from an administrative and clinical perspective. Also, in terms of administrative design intention the IS is 'Auditable, trackable, speedier and safer'. There is also convergence to policy where 'Patients can have their choice' and 'improved ability to manage demand'.

Further clarity is made converging to design intention where 'function is there to say rather than having untraceable/un-recordable phone calls and paper letters you have a clear electronic system' and 'It does all the things its designed to do, to get people into routine outpatient clinics'. Relating to the process level 'Effectively find the services or departments at one or more providers that a patient should be sent to for their condition' and 'Attach their referral letter and clinic information'. In convergence to policy '...at the patients convenience and ensure they're seen at time and place at a time that is suitable for them'.

A reference is made to clinical confidence in a particular aspect of the IS where ‘90% of two week wait referrals come through eRS, and I think clinicians wouldn’t use it they didn’t think it was fit for purpose’. Although, way in which this feature has been implemented is divergent to design intention. So, there is a tension in implementing functionality to minimise clinical risk versus ensuring adoption, that is divergent to design intention.

Where there is innovation, there is a perception that the IS is unable to keep up where ‘the core purpose which it fits very very well, but as it tries to expand its starting to show the limitations of its design around the edges’. During this part of the data collection the interview was interrupted by a senior manager, also responsible for the IS within the organisation. A final summarisation of the purpose was described as ‘Your GP has referred to this sort of clinic here you can have these choice of providers, and if you go online here’s a nice usable interface, you can pick hospital of choice, and here’s all the dates and times for the clinics. You can choose it and ensure that when you’re going to be seen, and that you’ll be seen in the right place and that there’s going be no delay to referral and your care can proceed from there’.

Following this, the participant dropped out of the study.

Low: Adoptability

There is a divergent view where ‘People don’t have remit or technical ability’, relating to a disparity between operational and technical implementation, where both aspects need to converge to satisfy design intention and policy. This participant is from a technical background and works with the PAS system at the periphery. There is reference to the clinical community if adopting the IS there is ‘Fear of being flooded with inappropriate referrals’. There is divergence in relation to particular features where ‘A&G works but it is clunky’.

There is convergence to the policy context where ‘Its having a national drive to make sure it’s used, and pushed as this is the service you can use’, and acknowledgment that ‘Historically organisations especially in the early days didn’t have that support’. But within this context, local stakeholders have a general adverseness to IT adoption where ‘Not all consultants are willing to use IT in general’, where ‘Some of it is organisational inertia’ and ‘Having a good training programme, to ensure people stay trained as it were’. Convergence to policy context is best achieved when ‘I think it’s probably quite driven from the top’.

Issues occur due to implementation issues where ‘Trusts not deploying properly’ typically when adoption is divergent to design intention. But also, this is caused when there is a perception that the IS design is unable to keep up with innovation ‘Where it starts to do more, it will need innovation’.

Adoption is best achieved where ‘it’s all about the exec support and exec push’ and there is buy in they conveyance across the whole organisation when ‘You need people who believe in e-Referrals and believe it’s the right thing to do and it’s what the Trust should be doing it has the support aid to where required either to get consultant adoption and have people championing it, or push them, if needs be.’ There is also convergence to the policy context across the boundary where ‘Oh yes this can work for you, benefits. Pretty

positive and as long as there's some push on primary care side to make GPs use it, especially with the contract change there is'. Work across the boundary is required to align adoption to the policy context and design intention. Adoption is also impacted by divergence at the boundary level, where issues relating to IS systems integration and interoperability leads to the perception that 'so again you either have to put in some clunky workarounds to do stuff beyond the core purpose of booking into outpatient clinics'. Resolution requires boundary work at the policy and design level.

Theme centric analysis of framework matrices

Case 4 – stage 4 – effectiveness

“Comments like see your GP again which isn't particularly helpful because the GP can't do anything about that. I believe that's changed as of the last week or two.”

This is in relation to messaging as part of the design intention where activity was reverted back to the GP if no appointments were available. The GP perception being that the Provider should be providing the patient with an appointment in due cause. Again more work being pushed across the boundary from Provider to GP. The design intention being that the referrer is able to provide a greater choice of services and appointments, where there is a greater likelihood of appointment availability.

User feedback informed a system change where service contact details are now available for appointment queries, which came into effect on XXX??

Therefore the original design intention deemed to have failed, and is an example of where policy has been integrated into the technology and process.

CASE 2 – stage 4 – credibility

“GPs are going ballistic, coming through to CEO and god knows what else saying this is ridiculous.”

The external escalation to the senior management is in relation to system functionality, pushing activity back across the organisational boundary to the referrers. This is as a result of design intention.

A system change is planned to give contact information at the Provider, therefore removing the 'boundary push'.

CASE 2 – stage 5 – credibility (linked to functionality-A&G, incorporation, possibly workflow/booking outside)

“It was brought up to me last week, that's basically advice and guidance through a different door, and is there any way of reporting that for payment”

A new functionality (RAS), was flagged by a clinical service to the participant, regarding provision of same functionality within the system, but by another means. This is in line with design intention, but unintentional as a similar functionality exists through another configuration. The issue lies in mechanism for reporting, and auditing activity in a consistent way. There is a

perceived financial risk, although from a policy perspective unless locally agreed, there shouldn't be any financial implications. This should also not be the concern of the participant.

CASE 2 – stage 3 – effectiveness

“They can go in when they want and re-book it 15 times like one did recently, before we picked it up. That’s a not so good thing, because we can't follow the access policy”

A lack of ability to apply system constraints through the patient cancellation/re-booking process leads to unintended consequences for the Providers in terms of managing activity in the context of choice policy. It does not allow them to implement their local access policy. There is a perceived imbalance in the system applying policy but not allowing for configurable constraints to apply local policies.

CASE 2 – stage 4 – effectiveness

“We are getting a lot of issues, where we get deferred patients going back to the GP because of the messaging on eRS.”

Deferred patient messaging was also mentioned in Credibility - Stage 4). A system update planned to address this.

CASE 2 – stage 6 – effectiveness

“Yeh, it's okay until they get deferred, and then we have this issue obviously if the GPs only picked the one site...”

I know that there's a fix coming in for that, so that we can change the site can't we so that if we've got capacity, which would be amazing”

An unintended issue is referenced where only one service/site is selected by a referrer, and no appointments are available. The impact of this is that the patient is funnelled into a service, where if inappropriate there is inability to re-allocate apart from taking off the IS. Effective business change on the referrer side would convey the implications and benefits of utilising this functionality effectively (absence of 'boundary spanning' or 'boundary work'. More so the impact and implication on the provider of not doing do.

Subsequently a system change has been put in place to allow the provider to re-assigned services, removing the push across the boundary on appropriate service identification. Participant is positive about this change in design intentions.

Unaware or not engaged with design principles

Case 1 – stage 4 – usability

“There's not the option to flick between the selections the patients have made, so through our Provider if they have picked for or 5 sites, if we are they trying to book however we're got slots at another site, and they've deferrer over to one place it not easy to chop and change between them.”

Reference is made to a restriction where the Provider is unable through the IS to appoint a patient where there maybe capacity in another service. This is linked to service shortlisting, defer to provider functionality, and implication on booking outside of the system. There is a system change to facilitate this. The design intention was that the Provider would release capacity and provide an appointment, without further scope to allow the organisation the flexibility to use capacity elsewhere. Unclear on the positive rationale effect of this.

“I do feel from the development side of things with eRS there could be a lot more done I feel with Providers. It's been very primary care heavy.”

There is a belief that the product development is primary care focused, with not an equivalent level of consideration made for the provider stakeholder group.

Case 1 – stage 2 – adoptability

“This is all its taken is for someone to say actually you don't have a choice now.”

“But now we sort of, well we're not in a good position to go for it, but ready to take the plunge, and see what happens.”

“Yeah I think, there's too many obstacles to overcome. That might be internal process as well.”

Participant references the national programme and that they don't have a choice now in that they have to use the system. This have put pressure on the organisation and participant whom is apprehensive about the rapid deployment.

CASE 1 – stage 6 – purposefulness

“I do worry though with A&G, probably same everywhere. Unless there's clear guidance, it is basically a triage process. That's not really advice and guidance that's triage, I guess that's for the Trust to manage with the CCGs.”

The purpose associated with the functionality A&G, and the meaning associated with this is questioned by the participant, as in the lack of clear guidance around use, it is left to interpretation at the various organisational levels on hoe and for what purpose it should be

used. There is a belief that this is up to the wider local system to decide. This issue has also been mentioned by another participant, but in relation to the RAS functionality and how that also provides an alternative method to provider A&G. Issue in semantics and how this is conveyed through system design, and implementation.

CASE 1 – stage 2 – acceptance

“So its obvious it’s the way to go, but there is a lot of opposition now”

Belief that there is a lot of opposition within and external to the organisation and the end users in another stakeholder group do not want to use. This will have an impact on the policy direction the organisation is under.

“We are making progress and I think over the last two three months maybe having Darryl more engaged and onboard has helped a lot with progress”

“And before it was a case of he didn't want to do it and it was on the back burner, where's now the CQUIN and all of that has forced everyone's hands to be more involved.”

Participant remains positive and there is progress made in acceptance, but this is perceived to be in relation to the external policy and financial pressures, rather than benefits and system value. Now having senior level support in this respect has supported with progress. There is a perception that the policy direction has forced the senior management to be engaged.

CASE 1 – stage 2 – acceptance

“But now that it’s a we've got to or you can't refer your patients to us. Then everyone's sort of like ok”

There is a belief that now the policy direction has been put in place people are ok with this and accepting that they have to use it.

CASE 1 – stage 6 – acceptance

“People still feel they have been made to use it, which they have in a lot of ways.”

When it comes to Trust and GPs, they are much more aware of the system, and Paper Switch Off has helped that as well.”

The scale of acceptance has increased now, but they is a sentiment that they have been made to use it rather than the change coming from within.

CASE 4 – stage 1 – adoptability

“Its having a national drive to make sure it's used, and pushed as this is the service you can use.”

Policy and Case 40 programme reference to improve adoption, where additional resourcing and support is available to drive uptake.

CASE 4 – stage 2 – adoptability

“I think it's probably quite driven from the top”

CASE 4 – stage 4 – adoptability

“Its should very much obviously from a provider perspective it's all about the exec support and exec push.”

“You need people who believe in e-Referrals and believe it's the right thing to do and it's what the Trust should be doing it has the support aid to where required either to get consultant adoption and have people championing it, or push them, if needs be.”

Senior and exec level management need to be bought in to understand the business value. Is this clear and has this been conveyed. Further work maybe to understand these views to establish if there are any contradictory or conflicting drivers for adoption. Also, how much of an impact this has in a context that is outside of a compliance scenario.

Oh yes this can work for you, benefits. Pretty positive and as long as there's some push on primary care side to make GPs use it, especially with the contract change there is.”

An equivalent effort is required cross boundary with GPs to ensure the contract change is effective, and there is uptake across the system. A concerted effort, which is co-ordinated with this dependant stakeholder group.

CASE 4 – stage 4 – usefulness

“We can make a service that if you define eRS it will say, this will book a day patient diagnostics, it will send a different type of message so PASs don't do any process around them because there's no pressure on the PAS suppliers.”

There isn't any development work at the IS boundaries at a policy level to support and stimulate the market.

Authority and delegation

Medical secretaries/admin staff (merge with the below?) (Usability/effectiveness/adoptability)

Internal process change for referring clinicians to be completing increased activity within the IS, and that this has been formed as the practice ethos. (Object re-alignment)

Case 4 – stage 2 – effectiveness

“They want the GP to do that because they don't want the patient to leave and not do it.”

There is a perception that the GP has been given more work in relation to patient appointments, which previously would have been within the boundaries of the Provider to manage. This activity has been shifted across organisational boundaries. On one hand to empower patients, but also in certain instances for GPs to manage with their patients. This also relates to clinical risk and responsibility in Cancer referrals for example.

Case 4 – Stage 3 – effectiveness

“So actually, in most cases, it probably doesn't add to my workload”

Following from previous data point, participant acknowledges that it doesn't add to workload, and this approach is preferential to patients. Therefore by association this is a Provider dependency in how they are providing their services, more specifically in divergence from most appointment activity.

The challenges contributing to this are mentioned in the previous stage

CASE 1 – stage 3 – Usability

“Cos what we'd want is it then to be moved into an administration worklist or a holding bay if you like, so the team can then act on that and change the appointment in accordance with the triage.”

Further reference is made to clinician service re-direction, with a clear requirement statement on how admin could manage this activity.

CASE 1 – stage 2 – adoptability

“When they say re-book to this clinic it takes us two seconds, but them, what if there weren't any appointments, then what would they do, the list goes on.”

CASE 1 – stage 3 – adoptability

“Because, that referral management centre took away a lot of the administration that the GP surgeries didn't do.”

There is a belief that the dissolution of a support service in the wider system, amplifies the external work to be done to ensure the system is adopted.

CASE 1 – stage 6 – purposefulness

“A lot of them revert to see comments, letter dictated. They get their secretary to do letter and put in patients file. That's not really how to do that, type in and save secretary work.”

There is an understanding of what should be happening in terms of IS use and satisfying its purpose, and a level of frustration that this is not what is happening in the organisation. Clinicians are still dictating the letter, and secretaries putting on file. This is linked to issues mentioned already around accessibility, but fir 1st hand view from clinicians in further work would need to be sought to understand rationale.

This is not in line with design intention and participant is frustrated that this mitigates the efficiency savings. There could be factors preventing adoption when the system is intentionally used in a way to not satisfy its purpose, to maintain the status quo.

“I still think there is a lot of areas where consultants, get secretary to print them off and I'll triage.”

CASE 4 – stage 1 – adoptability

“People don't have remit or technical ability”

This participant is from a technical background and works with the PAS system at the periphery. Therefore acknowledges the importance of ensuring not only the technical readiness of the core IS, but also those that integrate to enable a seamless flow. The operational and technical roles are silos within IT and operational services and therefore SME is required or a boundary spanner to manage that business change.

Incorporation into local practice

Case 4 – stage 3 - adoptability

“Some clinics still have alternative routes that they actively encourage, through email fax”

Alternatives are made available, where at the service level are encouraged, but the wider organisation is working to move to a common route being the focal IS.

Therefore misalignment between the service level and organisational programme in aims.

Case 4 – Stage 5 – adoptability

“But, umm, there is that feeling that there isn't human clinical input into the system until patient is actually physically in front of them.”

There is also a concern that the triage functionality is not being used in line with design intention, therefore a lot of inappropriate referrals may be seen by the provider.

From a Provider perspective , there is a potential financial risk with they is a loss of activity as a result of clinical teams rejecting referrals on based on personal criteria. The IS does not have any constraints to prevent this, but also the Provider, has to manage their wait times.

Case 4 – Stage 1 – Purposefulness

“I think it's a referral management system”

Relatively simplistic and primitive description of IS purpose. The referral management system description is divergent from any views held across the research participants and also with reference to policy documentation.

Case 4 – Stage 3 – Purposefulness

“A effective referral management system, that allows you to create an audit trail for that referral, and enables choice to be offered for patients”

Something occurs prior to this stage, carrying through the following stages where the participants perception of purposefulness significantly improves and is sustained.

Case 4 – Stage 2 – Effectiveness

“I think some of the independent providers their not submitting the data possibly, or like the ultrasound Provider”

Case 4 – stage 2 – effectiveness

“Whereas IPASS I accept is not a genuine appointment, so it doesn't make a lot of difference whether to book an appointment or defer to Provider it still gets to them to sort out.”

Unintended use of system where dummy appointments are used to act as a mechanism to simply get the referral information from referrer to Provider. This has unintended consequences where patients have turned up for these appointments, reminder letters have been sent out (Provider cancellation of appointments), mitigation of any patient benefits. Although this is preferred by both referrers and Providers due to mitigation of any clinical risk associated with patients not booking appointments, and Providers not effectively making their appointment slots available.

CASE 2 – stage 1 – reliability

“We get a new system no extra training, no help, here it is...And who do you phone up?”

Perception that when new IS and updates are developed there hasn't been a level of training, support and communications to support.

Also that development updates take too long to materialise.

Is this because the participant is not involved in the relevant channels, or IS not fit for purpose?

Other participants have not referenced this.

CASE 2 – stage 4 – credibility

“Well actually it's the same as the old system, its only changed its name. Choose and book had such bad press isn't it, we still got Choose and Book on the flippin icon.”

The participant has previously aired frustration at the stigma associated with the references to the naming of the legacy system, but here, describes an explanation to a stakeholder where the participant states they are in fact the same. Also, that the necessary changes haven't been made to give consistency in terminology within internal systems. Again, is it the stigma, or fact that its same business processes.

CASE 2 – stage 5 – credibility (Covers a number of themes)

“It does what it says on the packet as I said earlier, but its the little niggly things that annoy people that bring it into disrepute if you like, for want of a better expression, bring it down.”

Niggly things bring it down and into disrepute, although there is not clear escalation and resolution mechanisms to resolve these from feedback.

CASE 2 – stage 4 – effectiveness

"Its supporting the referrals. If the referrals there, its there. It would be better if our consultants read online."

More effective if the consultants read online, not clear fully in this context why that is not happening. Additional information references triage taking place within the clinical system, with referrals scanned in.

The provider may not want to implemented consultant triage on eRS due to perceived financial risk.

CASE 2 – stage 4 – effectiveness

"Because they don't necessarily print Julys appointment today, no matter how many times we tell them. So if it's wrong in July and we don't print it till June and then we got to re-direct it, that patient could get pushed out another month or more."

Misalignment between existing internal processes and those prescribed by the IS. The issues around late identification due to printing shouldn't occur, as this is not in line with design intention. There is a compliance and process issue in relation to IS and operational timelines.

"The way it is used can sometimes be debated especially from the surgeries, because they have a habit of not putting letters on for example, and then say they have put referral letters on."

Participant criticises the way in which the system is sometimes used, and blames the referrers on the issue of delayed referral letters. There should be a mechanisms and feedback cycle for the escalation and resolution of this issue cross boundary.

There was a wider issue in relation to the referrers being aware that the referral letter was not attached, either through incomplete process or messaging errors, therefore not always intentional. From their external system it would seem as if the referral had been made, whereas in the IS the referral did not exist.

CASE 2 – stage 6 – effectiveness

"Obviously, Dermatology and Gastro. Get 250 referrals a week, in Dermatology I think it is. Something ridiculous, and they don't get time to vet. Now they say that when they do vet, probably 4/10 don't need to be seen."

There is understanding that certain clinical services are not using the system as intended referring time constraints. They have self realised that if they did they would become more efficient. So there is a absence of drive to disrupt, either because there isn't the right

organisational drive at a senior or service level, to carry out the up front work to deliver the transformation, to realise the benefits and value.

CASE 2 – stage 6 – effectiveness

“So they don’t get the paper, and then they still, I think they probably still print off and doing it, I don’t care how they do it”

Although the system and supporting programme are to go paperless, there is a belief that paper is still a requirement of system use both in giving the patient appointment information, and where not used correctly to get the triage done. This inadvertently impacts on the consultants vetting online. Success has been shown where there has been a senior clinical push, but complexities with access and process hinder this support.

CASE 1 – stage 2 – usability

“I've been on a call with other Trusts and they've had feedback from their clinicians going it's not fit for purpose, I'm not doing this”

There is interaction beyond the local context where similar concerns have been raised, so there is a level of dissatisfaction amongst the clinical community around the IS processes expected of them.

CASE 1 – stage 2 – usability

“So we have no option but to put it under Not Otherwise Specified. But that then results in all sorts coming through.”

There is a perception that the categorisation of services within the IS is too rigid and a case is stated where a specific service has to be placed in 'not otherwise specified'. There should be a process for considering these requests so ensure that the broad range activity doesn't end up in a specialist service.

CASE 1 – stage 2 – usability

“We had to manipulate so much of our internal systems, and PAS systems, because the reporting within eRS still needs work. Its not easy.”

There is an expectation that local systems conform to the national system and processes, but here specifically 'reporting' is mentioned as still needing work as they do not work straight out of the system. A significant level of expertise and analysis is required to generate reports.

CASE 1 – stage 6 – usability

“Other improvements, I struggled a little bit with the worklist filters.”

A national system development change was put in and the participant perceived this to be difficult to use initially.

CASE 1 – stage 1 – adoptability

“It seems that I've spent quite a lot of time moving around the Trust just trying to get it working”

“The only thing like to change about eRS is that is there a better way is rather than using smart card

“One of the barriers we can see access if having to have a smartcard”

Participant has a belief that they have invested a lot of time just trying to get the system to work.

Dependencies associated with IS access model are perceived as a barrier to adoption.

“Whether that's actually the CCGs aren't encouraging as much as they say they are or it might be a bit of a combination of both I probably feel”

There is a belief that the referrer stakeholder group is not engaging as they should be, contributing to unintentional consequences when their stakeholder group does not use the IS effectively.

CASE 1 – stage 2 – adoptability

“There is a degree I think for us it's the administration of things and appreciating how eRS can fit round our internal processes which we know need improving and changing.”

There is now acknowledgement that there is opportunity to improve internal processes by working around the IS.

CASE 1 – stage 3 – adoptability

“But fortunately cos I think we've got the buy in from CCGs, and we've now got all of our specialties on board, the two are going hand in hand. But I know other Trusts have very different views as to how they are going to roll it out, you know very separately.”

Participant confirms a positive engagement from the wider stakeholder group and that the system is working together to use the IS. There is a belief that this is not consistent and that other areas are working separately.

“We are educating our staff within the Trusts, our consultants, admin teams etc. However I still believe that training and education, and understand is still a huge issue that needs to be addressed within the GP surgeries, as a whole”

There is a perception that the GPs are not getting the support required and that although the engagement is taking place externally there is a concern that the external work is not underway.

CASE 1 – stage 5 – adoptability

“Smartcards is still a factor. I would say particularly for clinicians.”

Access model for clinicians is referenced as a barrier to adoption

CASE 1 – stage 6 – adoptability

“It has limitations that make you put in workarounds all the time, which isn't great in operational areas. Also, as you know from clinicians point of view.”

Participant has given a clear statement on their belief that workarounds are due to system limitations and that there is no local appetite to conform.

CASE 1 – stage 6 – adoptability

“Smartcards, they are a bane in every bodies lives. People loose them, people forget.”

Another reference is made in relation to IS accessibility model and perceived bane.

CASE 1 – stage 6 – purposefulness

“Worklists take up a lot of the screen, I'm not sure what value they add to what was there in the first place. From provider side of this, I was assured testing was done.”

Participant references a recent system development where there is concern around the purpose of this. This has also been cross referenced in intuitiveness elsewhere.

CASE 1 – stage 1 – acceptance

“When we get to Frimley Health site we have far more engagement to be done”

“not particularly very well adapted here as in consultant wise there is still a lot of resistance”

One organisation is split over two sites. Historically one site has had good uptake, therefore the participant has challenges in consistency across both sites in removing resistance and lack of acceptance.

CASE 1 – stage 2 – acceptance

“Not him, but when we hear from CCGs it like a lot of yeah the GPs don't want to do it.”

“In this Trust, not at all.”

Participant remains positive and there is progress made in acceptance, but this is perceived to be in relation to the external policy and financial pressures, rather than benefits and system value.

“But we've got come back from everywhere from booking staff up to clinician, AD level.”

“Were used to having the fight of having to selling and defending, and it's not always defensible as I sometimes agree with the arguments that people come back with.”

Participant described having had to fight to sell the system (in absence of benefits and value) and airs frustration that they are not able to resolve or respond to feedback and challenges in a constructive way. In some cases having to reel back and agree, impacting on their own credibility.

CASE 1 – stage 3 – acceptance

“I hand on heart say I don't have the confidence right now that all the GPs are actually knowing how they should be monitoring and actioning their worklists on a daily basis”

There is a belief that the external stakeholder groups are not using the system as expected, where ultimately this negates the effective use by the Provider.

“I think it has now got through to all consultant, consultant teams”

“I would say we're looking at 50% are on board, I would say we're about 50/50 at the moment”

Participant is positive that the message has got through to the internal clinical community, but still believes that only half way there with regards to full acceptance.

CASE 1 – stage 4 – acceptance

"I think that has improved quite a lot now hasn't it."

"We've been live a month. Yeh I think it's getting there."

Participant is positive that acceptance is improving and uptake across the system is moving in the right direction

CASE 1 – stage 5 – acceptance

"Oh I'd say its accepted that it has to be in place, and it has to be used. Well, say has to be used, in the looses possible terms."

"The admin teams of course have to use it, because that is how they work. However, I think it is fully accepted."

Participant comments on the basis of acceptance. In that has this been internally accepted as a beneficial thing to do, or something that has to be done. Further used, but in a way that may be superficial.

"However, the consultants on a practically to want to look at their referrals and want to triage, I don't think that part is accepted because they don't like it."

There is a belief that IS accepted from an administration perspective, but in relation to clinicians it is not accepted because they don't like the functionality

CASE 1 – stage 6 – acceptance

"That's A&G but we do use it, we do have clinicians actively asking for it more on the medicine side, rather than Surgeons."

"It is very widely accepted now."

Clinicians are now actively seeking to use specific parts of the system which they perceive to be beneficial.

CASE 4 – stage 1 – adoptability

"A lot of stuff operationally, but implementing it technically is absent"

This participant is from a technical background and works with the PAS system at the periphery. Therefore acknowledges the importance of ensuring not only the technical readiness of the core IS, but also those that integrate to enable a seamless flow. The operational and technical roles are silos within IT and operational services and therefore SME is required or a boundary spanner to manage that business change.

CASE 4 – stage 3 – adoptability

“Trusts not deploying properly”

Deployment is not occurring where the technical side has been incorporated into the business change to ensure the relevant stakeholders are engaged.

Booking outside (policy/design change)

Case 4 – Stage 6 – adoptability

“Also, the very long wait stuff, at the other end, were there's a long wait like Dermatology, where there are quite frequently not appointments on there...”

At the service provider end they are having to take people off the system, and that they can book them in the order they were referred.”

For Dermatology long waits, there should be appointments available, regardless of waiting time frame. The Provider has configured the IS so that there are no appointments available in their defined horizon.

Policy conflict between RTT and Choice, and process used by Provider to treat in referral received order.

Divergent to design intention, the Provider is taking activity off IS, rather than implementing the required process for intended use. This is likely to manage operational performance better, rather than implement system effectively.

Case 4 – stage 5 – effectiveness

“In dermatology, where they have long waits, and at Royal Berkshire they're taken off the Choose & Book System. They haven't really put a mechanism of keeping them in order on eRS, so they take them off and keep it locally at CASE 4.”

Another reference to an intended use where activity is taken off the system. This has previously been referenced also in adoptability.

Continuity of care (design change)

Case 4 – stage 2 – Usability

“There are sometimes (eligible- I have some problems) with making named consultant referrals, in the independent sector... Or, their Royal Berks role comes up, and not their (eligible) and so I

don't know how that, and that relies on the Provider presumably to have to most up to information on the system?"

Impact of providers not carrying out the necessary management and maintenance work to publish 'Named clinicians' impacts on the referrers ability to identify and refer to specific clinicians. The unintended consequence of this is impact on continuity of patient care. Another unintended consequence is financial and patient experience impact due to a repeat referral. (Boundary determinant)

Case 4 – Stage 6 – Usability

"I think what probably would help is more the improving the 2 way communication functionality."

At this stage the functionality is already available through recent system enhancements.

Case 4 – stage 1 – Effectiveness

"Not so good around continuity of care."

"Not 100% as it is not catching all the data"

If the IS has been utilised previously for the same condition or already had an episode through the IS, it is not effective in Historical linking or data availability to carry through across interfaces to enable continuity, rather than having to re-start .

Unclear to what is being referenced in catching all the data.

Case 4 – Stage 2 – effectiveness

"Patients have seen that person before, and would particularly like to see that consultant again, and so you look for their name and it doesn't come up"

Named consultant functionality supporting continuity of care. Also linked to contracting issue (Adoptability) where patient has already been seen in the IS, but needs to be seen by same consultant in NHS due to lack of equipment. This has a financial implication for CCGs.

Case 4 – stage 5 – effectiveness (Linked to implementation, continuity of care-> A&G)

"You know, advice and guidance is now designed to be more of a two way process. I'm not so sure hospitals see it quite like that yet."

Functionality is available in IS, but not adopted effectively by the provider side to facilitate dialogue and continuity.

How the functionality is introduced into organisation and how they can be expected to change their business to effectively use it, what are the benefits and to whom?

This is also referenced in purposefulness and usability (Stage 6)

Workflows, alerts and messaging

Case 4 – Stage 6 - Usability

“But it would be great if, at the moment it requires recep... our secretary to actively look at the system and go looking for responses, and may be if we could get a email or something where a response come back (eligible) flag or otherwise...”

Participant perceives the IS to be burdening with an additional task, which is then intentionally passed onto admin staff. Therefore the end user is not that expected. Where if alerts or messaging, based on thresholds are generated, this would make the IS more usable as intended.

Case 4 – Stage 2 – effectiveness

“Problems arise if there is change in plan and they don’t want to follow through with that, or change referral, or if there are no appointments available initially when they phone up or go online, and then that can cause the patient more work in terms of having to remember to phone back”

The system functions when there is no deviation from the design intention and relevant stakeholders participate at the correct time frames within the use case process. There is tolerance for this, for example attaching letters. But if there is a change to be made particularly relating to the service or appointment, the IS doesn't tolerate this effectively.

CASE 2 – stage 1 – credibility

“If it was more user friendly towards consultants, cos they don't see it as user friendly, it would have more credit”

Provider consultant engagement is an issue as they have historic views, and relating to usefulness, intuitiveness and adoptability.

CASE 2 – stage 6 – effectiveness

“But, I can't go out and say well, umm , well they say advice and guidance, how does this get to evolve, how does it get to patient record? Well is doesn't.”

Participant has frustration and hesitance on promoting and engagement on the advice and guidance functionality simply because they are unable to respond effectively on a query in relation to clinical continuity and safety where the system doesn't transfer this information across the interface to the external system. Participant believes this is a barrier to adoption of this feature.

CASE 1 – stage 2 – usability

“The only other thing that still really bugs me with eRS, with regards to actually the getting it adopted out there especially by the clinicians is there's no easy way of them notifying a bookings team of what they want changing...

Its faffy, and it's not ideal.”

“We should have that with the triage, there should be another box, that says, admin action required. They click on that, and then it moves into an admin action worklist, where its picked up, done.”

Reference is made to the design intention of Provider clinicians being able to identify suitable alternative services/clinicians/appointments, which is a slightly different issue to the 'reject' issue. There is a dependency on referrers having shortlisted suitable services in the first place. A system change is being made to allow the Provider to shortlist. But this issue is around task allocation away from the clinician to the admin team, which the IS doesn't allow for.

Participant understands and offers a clear requirement and solution, but this is divergent from design intention. There is frustration that this change is or has not been made.

CASE 1 – stage 2 – usability

“Its silly things I supposed like if a consultant accidentally accepts something and they go, I've just accepted that and I didn't mean to, there's no way of finding out, unless they've got a vague glimmer of roughly if they know when the patient was booked in, or whether their name or something, can't find it can you...

If you cancel a UBRN, there ain't nothing you can do about it. Once that's cancelled, once you record a DNA, you can't take it back. Once you've accepted or rejected something you can't bring it back. It's very like final straw.”

“An audit trail on service definer as well, who's done what, and also I would to see a record kept against removed services. Because once you delete a services, its gone and you can't then add it back.”

Reference is made to lack of ability to take corrective action. By identifying where the error was made, retrieving the activity and then taking corrective action. This leave the IS open to data quality issues, greater opportunity for use of alternatives, and perceived lack of user confidence if they are unable to rectify their actions. Bother for IS end users and system administrators, to record and recall activity.

CASE 1 – stage 2 – usability

“However, a lot of clinicians are saying, ok so when we respond to advice and guidance on e-referrals, can that be input into the patients records, at the hospital and GP end”

Reference is made to 'interoperability' and the integration of a particular functionality to allow information to be available in external systems across the IS boundary. This is perceived to be a barrier to use of this functionality, and has been cross referenced in IS effectiveness.

“I think what sometimes becomes of eRS is actually the processes, sometimes you have to then build around it...”

It is to accept and reject don't get me wrong, but if they want to re-direct I think there could be a much better way of doing it. And I know there is lots of workarounds in place”

The participant acknowledges that locally they have to build around the IS processes, and this can be challenging.

There is a belief that a number of workarounds are in place where there is a lack in IS functionality, or a lack of ability for local process adoption. This is were there is a tension.

CASE 1 – stage 2 – adoptability

“There's no reason as to why this has happened, if I cancel the whole clinic sort of thing. That's internal obviously messaging wise, but it's still eRS messaging problem rather than PAS messaging problem, I think.”

“Some people have said it's to do with Java, some sort of identity agent, all this that and the other but, how good is eRS at actually linking with lots of other systems, and fitting in with lots of other Trusts.”

“So I think, if we had that sort of functionality, to make life easier I think we could get clinicians on board much more quickly and from an administration point of view it would be more efficient as well.”

There is a perception that IS at fault relating to messaging and interoperability issues. A belief that the development work hadn't taken place to ensure the IS can communicate more effectively across its boundary.

Participant has a clear perception of what functionality improvements could be made and is frustrated that a small number of key concerns continue to remain, which continue to impact on end user stakeholder engagement. There is a belief that the current model does not represent administrative and clinical efficiency.

CASE 1 – stage 3 – adoptability

“You know the appointment slot issues, you either go, you book them, but there are other additional processes that each Provider has to put in place to support that”

IS design intention is that where appointment slot issues occur, they should be booked within the IS. Participant has a belief that to ensure this, a lot of organisations have to put in additional processes.

CASE 1 – stage 4 – adoptability

“The only other part of that though makes it harder is our workarounds, which is I know you're going to hate it but we keep bleating on about this, is if a patients booked in and the consultant wants it changed, we want an administration worklist so at the moment we have to get them to add clinical information.”

Participant acknowledges they have a workaround, and is keen to not have to use it, but due to system constraints this process remains. Perception that this has to be put in place due to system deficiencies

CASE 1 – stage 5 – adoptability

“It doesn't particularly fit round our internal business processes that we have to follow.”

There is tension between defined internal operational processes and those prescribed by the system. Having previously acknowledged an opportunity to improve internally. Participant now blames the systems for lack of fit.

Efficiency

Case 4 – stage 4 – Usability

“I mean I find it quite easy to use, but I think it still is quite a few separate steps, its not as efficient.”

How many clicks and efficiency of IS compared to ‘paper’ process

Case 4 – stage 5 – Usability

“It often does feel like there is quite a lot of steps.”

Case 4 – Stage 6 – Usability

“Its basically, its intuitive, you can use it, it’s a little bit clunky there are quite a lot of steps to go through.”

Case 4 – Stage 4 – Adoptability

“I think it is still perceived as a bit clunky in places. So you know It's quite a few steps if you like for 2WW.”

“It's quite a few steps, and so Tele-dermatology particularly , getting photos the right size and then uploading them, you know the letter and things. It’s a good idea, but its not 100% intuitive and quite a lot of steps in a time pressured environment, kind of thing, those are the main factors really.”

Number of clicks and steps mentioned more appropriately against the adoptability variable. This has previously been mentioned against usability also. There for this theme is common across usability and adoptability.

With reference to Tele-dermatology this related to the technology, IG and business change to support this functional use to streamline that particular process.

The Tele-dermatology related to a use case where there is an increased number of steps due to external image preparation outside of IS use.

CASE 2 – stage 2 – reliability

“It doesn't always do it instantly, which is quite interesting. Sometimes, we have to wait till next day.”

There is an issue relation to IS functionality and it is not clear whether this is in relation to technical setup, participant interpretation of the issue.

CASE 1 – stage 1 – usability

“access is clunky”

System access requires a number of technical steps to provide each individual user access, which is also single session . Participant describes in detail in reliability - stage 2.

CASE 1 – stage 2 – usability

“Because of the clicks and everything else. Lot of windows to get through, to get to a point”

Reference is made to number of process steps in IS to get to an end point and to be able to review the relevant clinical information in a consistent manner. This aspect is dependant on the source of that information. The challenge is that each referring organisation is an individual business with their own processes in a number of different systems.

CASE 1 – stage 2 – usability

“On the Provider side of things, there are improvements I would like to see, to be made, to actually assist our clinicians with their time”

“Cos I think the way it was originally built, doesn't necessarily fit around how clinicians work in day to day practice”

General feedback has quoted whose time is more precious, clinical or admin? There is a perception that clinicians use in the current model is not the best use of their time. The original design intention has not been successful in this aspect and needs revision to improve clinical engagement.

CASE 1 – stage 4 – usability

“I think the authentication really does need to be improved upon and make slicker and less cumbersome really.”

Further reference and frustration is aired around the complexity of the access model, with a belief that this needs radical change.

CASE 1 – stage 6 – usability

“Its usable, but I still think its very clunky, too clicky, and obviously if you loose your smart card locked, certificates expire, there's no other way of accessing the system information.”

Another reference to number of steps and dependencies associated with IS access.

Too many dependencies in the smartcard access model

CASE 1 – stage 2 – adoptability

“Smartcards, I know that is an internal process as well, however I do get the feeling from other people that I have spoken to in other Trusts, we share an equal frustration in actually getting the whole process of getting a card produced”

The user access model is mentioned where also in usability. The participant references frustrations wider than their own is shared issues with the overhead.

CASE 1 – stage 5 – adoptability

“The other is the speed of it , but I don’t know if that is our networks. How slick it is really, it is not very slick.”

barrier to adoption, as well as speed and flow of the system.

CASE 1 – stage 6 – adoptability

“Accessibility. Speed, and its, how slick it is. Clunky still. Too many clicks.”

“I suppose how it performs, more to do with network rather than eRS its self. All internal issues.”

There is a perception that the system is not slick and that it is clunky, but further that this could be attributed to internal network issues.

“I just wish it was slicker for our processes, and not having to build things around it to make it work”

CASE 1 – stage 1 – acceptance

“Feedback from clinicians is around their time”

There is a perception that it is not a good use of their clinical time and is too consuming

CASE 4 – stage 1 – adoptability

“A&G works but it is clunky”

CASE 4 – stage 4 – adoptability

“They don’t quite fit with how eRS books things and Cerner doesn't have that other tech stuff to fit, so again you either have to put in some clunky workarounds to do stuff beyond the core purpose of booking into outpatient clinics.”

Innovation barrier

CASE 4 – stage 4 – effectiveness

“That’s where it starts to get a bit clunky like especially services where patient needs to be triaged first.”

Reference to design intention where patient is appointment prior to referral information being made available.

System change to enable referral information to be made available on ASI list. What is the implication of this? Contract change still levers providers to book appointments in IS.

RAS functionality was introduced on XXX, what is the impact and implication of this on Providers?

Urgent referrals

Case 4 – Stage 5 – Usability

“It would be nice on Choose & Book if you did click urgent at the top had a button on the top that you had a slightly different page, using the send for triage button or something like that, rather than having to book a slot in the Trust that it will get sorted.”

Case 4 – Stage 1 – Adoptability

“Where it is less easy is the URGENT, referrals (not 2WW)”

Confidence that urgent appointments would be triaged appropriately, and that the appointment booking timeframes would be treated differently to other referral priorities. Participants believes there is a lack of confidence provided in absence of assurance for them to use this functionality.

Case 4 – Stage 5 – Adoptability

“The key area is around urgent referrals. Royal Berkshire trying to paper switch off and they want everything to come through eRS. But, GPs don't have Trust that for an urgent referral, that referral would be pulled out and adequately triaged and put into the appropriate place.”

Another reference to Urgent referrals, where this has also been mentioned in usability. Participant recognises that the Provider is wanting to go paperless but doesn't have the confidence that the Provider will treat this section of activity appropriately, as there is a perception that the IS doesn't allow it to be identified and treated appropriately.

This is also related to an issue where this activity is booked outside of the system, as through RTT processes.

Case 4 – stage 5 – effectiveness

“So, most GPs who have been email and faxing for those have been reluctant to move over on the eRS system because we haven't had assurance from Royal Berks that adequate triage is going on.”

Another reference to 'Urgent'. Where there isn't any appetite in response to any levers or incentives or system development utilise this functionality effectively. This has also been referenced across usability and adoptability. Therefore no behaviour change, and adoption.

Reject referrals

CASE 2 – stage 2 – effectiveness

“Do not press reject! Cos the patient will not know anything about it, because the GPs aren't picking it up still”

“6 weeks later in comes that patient for their appointment. Because we push reject and the GP surgeries has not followed it up.”

This is not inline with design intention, where there is expectancy that the referrer will contact any patients for which their referral has been rejected. Where this does not happen, the patient still attends the hospital for their appointment.

There is a belief that GPs are not picking this up.

There is belief that is the consultants press reject, the patient won't get picked up.

A perception that the GPs won't pick this up, therefore instruction divergent to design intention for consultants not to reject. This implies that either triaging doesn't take place, or takes place as part of another system. The design intention is that there is a feedback loop as part of this rejection process, where inappropriate patients are not seen. It fails because of a lack of assurance from the referrer side, or that the Provider intentionally is not utilising this functionality.

There is an ongoing issue with the messaging between the core IS and the external IS, and a perceived lack of effectiveness in the way that the core IS has functioned within this context. There isn't a clear understanding of the issue and escalation path for its resolution with the external supplier.

CASE 2 – stage 3 – effectiveness

“We're still using a workaround for REJECT, because we don't have the confidence that surgeries are picking up their worklist, and there's no reports still, that we can pull out from out end to say what's been rejected”

Participant has continued on the perceived effectiveness of the reject function, and elaborated that given the method of adoption further reports are required to manage this activity. The root cause is implementation and assurance around this process, if indeed the triaging is not being done elsewhere. The reporting aspect related to alerts and messaging, and reports to validate activity.

CASE 2 – stage 5 – effectiveness

“It's causing chaos at the moment because the GPs just are not one the whole responding to them.”

Another reference to referrers not responding to the worklists relating to rejected referrals. As this has continued across multiple stages the business change and communications has not occurred to support referrers in using this functionality. Therefore causing unintended effects and the participant and wider organisation resorting to unintended use Requiring additional information and reports the manage the activity as a result of this.

Business continuity

Case 4 – Stage 2 – Adoptability

“Minimising down time, obviously if you get a time when it's not working, I know some colleagues will just either pass it on to secretary or just fax a referral”

Also links to authority and delegation

“People aren't prepared to waste too much time trying to get it to work”

Reliability was viewed as positive overall (apart from CASE 4), although in the small instances it doesn't operate, the use it delegated to other staff. The BC does not encourage initial end user tolerance to re-try. As part of any business continuity there should be any timeframes within which the activity could be re-attempted by the end user. It would appear that the activity is being passed onto another administrative member of staff rather than being undertaken by that intended. Additionally through an alternative mechanism. Therefore is the system is not working there isn't any tolerance for its use, reporting the issue and rectification.

There could be some linkage to effective feedback mechanisms.

CASE 2 – stage 4 – reliability

“eRS crashed and the whole network went down. I've been using eRS for 10 years and it's never done that.”

“We did have a major crash beginning of November.”

“What happens when it goes down, I say its never gone down in the ten years I've worked in the NHS, in this role... I think I had to validate far too many appointments”

“They got the funding and everything and then it went and crashed. I don't believe it, I'm trying to sell this bloody system.”

There was a national system outage. The participant ask the question what happens when it goes down. There should be some form of Business continuity in place. Statement of a significant lack of system confidence. Participant has had a significant increase in workload as a result. Also mid implementation there has been an impact on engagement.

CASE 2 – stage 5 – reliability

“So, I'll come out of it and I'll click on it again, and I'll click on it again and I'll keep doing it and eventually It'll let me in.”

Participant experiences frustration and impatience with responsiveness of system

“I mean this one, the new advice and guidance one that is so much easier, when it reports. I say that, but or doesn't always come up with any data.

See its done that pretty quickly today, but it wasn't working a while back. We couldn't get that report for about 2 months.

Its not pulled the data through, so obviously there's a problem with it again.”

The reporting functionality is not always up to date and refreshed with data. There is an increasing dependence on this functionality.

Sometimes the reports are unavailable for a significant period of time, or not pulling the relevant data through.

“(laughs) Up to yesterday morning it was fine, on the whole (laughs) It had a bit of a thing yesterday morning didn't it? Which we actually reported before it was reported nationally, so I was quite chuffed about that.”

The participant is light hearted whilst conveying frustrations, and was pleased that they has identified an issue and reported it prior to the national incident management.

“The biggest problem our surgeries find is that it doesn't pick up the appointments in our PAS system quick enough, so they put another one on.

So the patient can end up with multiple appointments or they don't wait for it to pick up our PAS system because it whirrs too long, they get bored and do another one and then we end up with, I mean I've noticed on here now how I've got a couple that are sitting at reserved.

Now I don't know if that our servers here or whether that's eRS, or what. So we do get a few issues like that.”

Referring again to the slot availability issue mentioned in stage 2/3, there is an implication on system effectiveness as activity is being duplicated as referrer become impatient. This has a financial impact and experience impact for the patient. It is caused by activity on the referrer side, where relevant validation processes are not in place.

Ongoing, unresolved issues between focal IS and the interface system. Participant is unclear if it whether it is the focal IS config, or the external system at fault.

CASE 2 – stage 6 – reliability

“I don't know, obviously something blipped and dropped off... They had seen them the day before, they had seen them, you know, they just couldn't see 2 patients, and none of them could see it, but my staff could on a different workgroup.”

Although the participant confirms that the core IS is 100% reliable, there is confirmation in this stage that there are intermittent glitches, and this is in relation to use of the system rather than uptime of the IS as a whole.

Time is spent attempting to figure out solutions to an issue where the IS hasn't refreshed, and this is considered a glitch.

"As a system I find it has a few more glitches than it used to have. It won't always show me the reports, and you get this click here click here, and you keep going and going until eventually it will pop up."

"That takes 3 weeks to get put on, sometimes its not on there by the end of the month."

Reference is made against reports where the system is not responsive when loading/querying. This follows on into the timeliness of up to date reports, and lag in up to date information

"Now I know linking across to PAS system maybe Medway system or our PAS, that doesn't always work umm as quickly as it should."

There is confirmation in this final stage that the link to the interface system doesn't work as it should. Although there are no clear next steps on resolution of this issue.

CASE 2 – stage 5 – credibility

"Umm, so it does get blamed when there's is an issue."

Participant confirms a general blame attitude towards the IS. But does go on to say there are niggles relating to functionality that being it into disrepute also.

CASE 2 – stage 5 – effectiveness

"Why? Then I start getting cross with it, so I find that exceedingly frustrating, cos there doesn't seem to be any reason for it, and I think now with so much being on, potentially everything being on, the reports are so much more important."

As this has continued across multiple stages the business change and communications has not occurred to support referrers in using this functionality. Therefore causing unintended effects and the participant and wider organisation resorting to unintended use Requiring additional information and reports the manage the activity as a result of this.

CASE 1 – stage 1 – usability

"It would be really good to have a user log."

The IS allows an extent of audit on the activity going through, but not on configuration activity. This allows the participant to track and review management activity.

CASE 4 – stage 2 – adoptability

“Having a good training programme, to ensure people stay trained as it were”

Importance for a structured training programme to ensure stakeholders stay competent in use

Legacy

CASE 2 – stage 1 – credibility

“jumping the queue by using eRS”

There is a mixed response with reference to self credibility, credibility of the IS, or credibility of the staff supporting the implementation of the IS.

Perception at implementation that patient are treated sooner and jump the queue/waiting list, if the are referred through the IS. This is a perception that can be managed through effective implementation. It is only mentioned at this stage.

“it has stigma behind it”

The legacy system has a bad reputation. Even though the system has been re-branded, it is evident to the stakeholder community that the business processes remain the same.

CASE 2 – stage 2 – credibility

“If you don’t say Choose & Book you get away with it...”

People still think its Choose and Book and all the problems related to Choose & Book...

We have got a couple of consultants now that have started shouting other ones down in meetings, directly in meetings when they go, Choose & Book systems doesn't work.”

The reputation of the legacy system is still problematic and the use of that terminology is associated with those historic issues. This reference can be made intentionally or unintentionally to display that either the business processes of the system haven't changed, or that some of the historic issues still remain.

Participant describes how the some of the clinical community in the organisation have embraced the updated system and challenging peers.

CASE 2 – stage 3 - credibility

“cos they still think it's Choose and Book, are getting shouted down by people that are using it all the time or are keen to use it all the time.”

Further reference to legacy system following the last stage and feedback that clinicians are influencing the behaviour of others by promoting its use.

CASE 2 – stage 5 – credibility

“someone sent me an email the other day saying its this new system that is the problem, well actually its not a new system actually its been around for 15 years or more, and this isn't an eRS issue , this is a user issue, and once you break it down...

But we do get a lot of its eRS fault.”

Following from the last stage the participant has again confirmed to a stakeholder that it is not a new system. Therefore there is belief that the system is at fault, where there is a user issue. This is compounded by the fact that there isn't consistency in the naming of IS and its transition from old to new.

CASE 2 – stage 6 – credibility

“No, it's a national system Ravi, we've all got the same, it's rubbish everywhere. Whatever issues you have, all the others will be having elsewhere.”

When engaging within the organisation the participant (in jest) criticises the system, more out of frustration that it cannot be adapted or changed and that use, is 'as is'.

There is a belief that it is bad everywhere.

CASE 1 – stage 1 – acceptance

“until now, constant requests to turn off the system, we don't see Choose & Book patients”

There is a belief from the clinical community that they don't see patients that have been referred via the IS (legacy terminology is used).

CASE 1 – stage 2 – acceptance

“It's been an option there if people want to use it. Because it's never really worked properly from either end, CCG, GP and Provider, they've never really bothered to use it that much.”

As the system has previously been optional, successful implementation was dependant on all organisational stakeholders working across boundaries to achieve successful implementation. But there is a belief that historically this has not occurred and organisational groups have not bothered to use it.

CASE 1 – stage 3 – acceptance

“What I'm finding is as soon as you, we are still breaking old barriers and perception of Choose and Book”

There is still challenge and ongoing difficulty in breaking down the old perceptions and that of the legacy system.

CASE 4 – stage 1 – adoptability

“Fear of being flooded with inappropriate referrals”

Inappropriate referrals where service managers and clinicians do not utilise the DoS and reject capability appropriately

CASE 4 – stage 2 – adoptability

“Historically organisations especially in the early days didn't have that support”

“Or people that would Project manage it , but didn't spend the technical time and detail working through every single ins and out that needed to be questioned.”

Another reference to change management without the required time and attention to allow for technical and business change readiness.

“Some of it is organisational inertia”

Inertia where organisations have been left to their own devices in the absence of any levers or incentives for uptake.

CASE 4 – Stage 3 – adoptability

“Where it starts to do more, it will need innovation”

As organisations are wanting to use it for more functions and as a result of their increased uptake the system will need to rapidly innovate to keep up with adoption.

CASE 4 – stage 4 – adoptability

“If things are wrong and not working on both sides you then get a negative feedback cycle, and it can take a lot of work to haul it out and fix it. Which is obviously all the work that is going on nationally at the moment where Trusts have needed improvement, you know what you've been doing.”

Importance of a routine and frequent positive feedback cycle., to support improvement, innovation and step change in adoption.

CASE 4 – stage 3 – Effectiveness

“GP to consultant outpatient, but there's a lot more it can do”

Negative change in perception due to reference where referrers also have their part to play in the 'system', and as long as everything is setup

There has been a decrease from two previous stages of being very effective. Is there a reference to lack of transformation and business change to maximise the capability of IS? What has occurred prior to this stage? Political issues regarding lack of system development and change regarding APIs, engagement with programme, and polling out – performance management.

CASE 4 – stage 3 – usefulness

“It works even if its works I suppose, in a grudging way”

The core IS poses challenges in its lack of features or functionality to enable meaningful use where stakeholders are unwilling, reluctant, or hesitant in its use.

CASE 4 – stage 4 – usefulness

“It is starting to creak around the edges as although the national guidance focus on GP referrals to consultant led outpatient clinics, obviously Providers want to put more and more on there.”

“Departments can manage them, and I think in terms of you know, around its core aims it works very well, and it's just again where it expands, the more things there is that chunkiness starts to creaks in”

“But that is because it's trying to expand beyond the core scope that's been there for many years, and it's not the core scope is failing, it's the expansion just needs some work.”

The system is unable to support innovation or provide flexibility at the interface boundaries to support expansion from non-core function.

Description of policy and design events

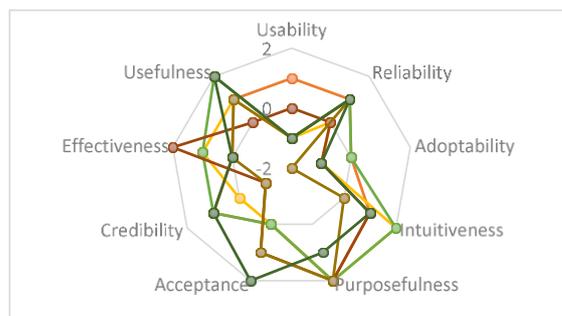
Document	Purpose	Measure	Description
NHS England Quality Premium Guidance for 2016/17	Guidance	Increase the proportion of GP referrals made by e-referrals	Meet a level of 80% by March 2017 (March 2017 performance only) and demonstrate a year on year increase in the percentage of referrals made by e-referrals (or achieve 100% e-referrals), or; March 2017 performance to exceed March 2016 performance by 20 percentage points Numerator: number of referrals for a new first outpatient appointment (or two week wait) booked through the e-referrals system Denominator: total GP referrals for a first outpatient appointment Frequency: Monthly (two month lag due to lag in MAR data)
CCG Improvement and Assessment Framework	Guidance	People offered choice of provider and team when referred for a first elective appointment	A composite indicator in development, based on indicators of utilisation and choices Denominator: Utilisation – number of referrals from MAR, choices – number of referral requests on ERS Numerator: Utilisation – referrals made through ERS, choices – number added to each referral shortlist in ERS Frequency: Monthly, subject to investigation
CCG Improvement and Assessment Framework	Guidance	Digital interactions between primary and secondary care	Data source: indicator in development based on data on use of Electronic Prescription Service, use of NHS e-Referral system, accessing GP summary information across care settings and sharing care summaries with GPs on discharge. Denominator: Numerator: Frequency:
NHS England Letter: GMS Contract Changes 2016/17	Contract guidance	Patient Online Services	Electronic referrals: GP practices will be encouraged to make referrals electronically using the NHS e-Referral Service. We have agreed to aim for at least 80 percent of elective referrals to be made electronically by 31 March 2017

Contract Guidance for GMS contract 2016/17	Contract	Electronic referrals	As in the 2015/16 agreement, practices are encouraged to make referrals electronically using the NHS e-Referral Service. It has been agreed to aim for at least 80 per cent of elective referrals to be made electronically using the NHS e-Referral Service by 31 March 2017, unless the secondary provider has not made slots available on the system, there is a clinical need to refer to a provider who does not publish services on the system or patients have indicated their choice to be referred to a provider that does not publish services on the system
NHS Standard Contract 16/17	Contract	Choice, Referral and Booking	<p>6.1 The Parties must comply with the Referral Guidance and Guidance issued by the Department of Health, NHS England and Monitor regarding patients' rights to choice of provider and/or consultant.</p> <p>6.2 The Provider must describe and publish all Primary Care Referred Services in the NHS e-Referral Service through a Directory of Service, offering choice of any clinically appropriate team led by a named Consultant or Healthcare Professional, as applicable. In relation to Primary Care Referred Services:</p> <p>6.2.1 the Provider must ensure that all such Services are Directly Bookable or (if that is not possible for technical reasons) that a development plan is agreed with the Co-ordinating Commissioner to enable, within a reasonable timescale, all Primary Care Referred Services to be Directly Bookable. In such cases, all Primary Care Referred Services must in any event be published in the NHS e-Referral Service as Indirectly Bookable;</p> <p>6.2.2 the Provider must use all reasonable endeavours to make sufficient appointment slots available within the NHS e-Referral Service to enable any Service User to book an appointment for a Primary Care Referred Service within a reasonable period via the NHS e-Referral Service;</p> <p>6.2.3 the Provider must offer clinical advice and guidance to GPs and other primary care Referrers on potential Referrals through the NHS e-Referral Service, whether this leads to a Referral being made or not;</p> <p>6.2.4 the Commissioners must use all reasonable endeavours to ensure that all Referrals by GPs and other primary care Referrers are made through the NHS e-Referral Service; and</p> <p>6.2.5 each Commissioner must take the necessary action, as described in NHS e-Referral Guidance, to ensure that all Primary Care Referred Services are available to their local Referrers within the NHS e-Referral Service</p>

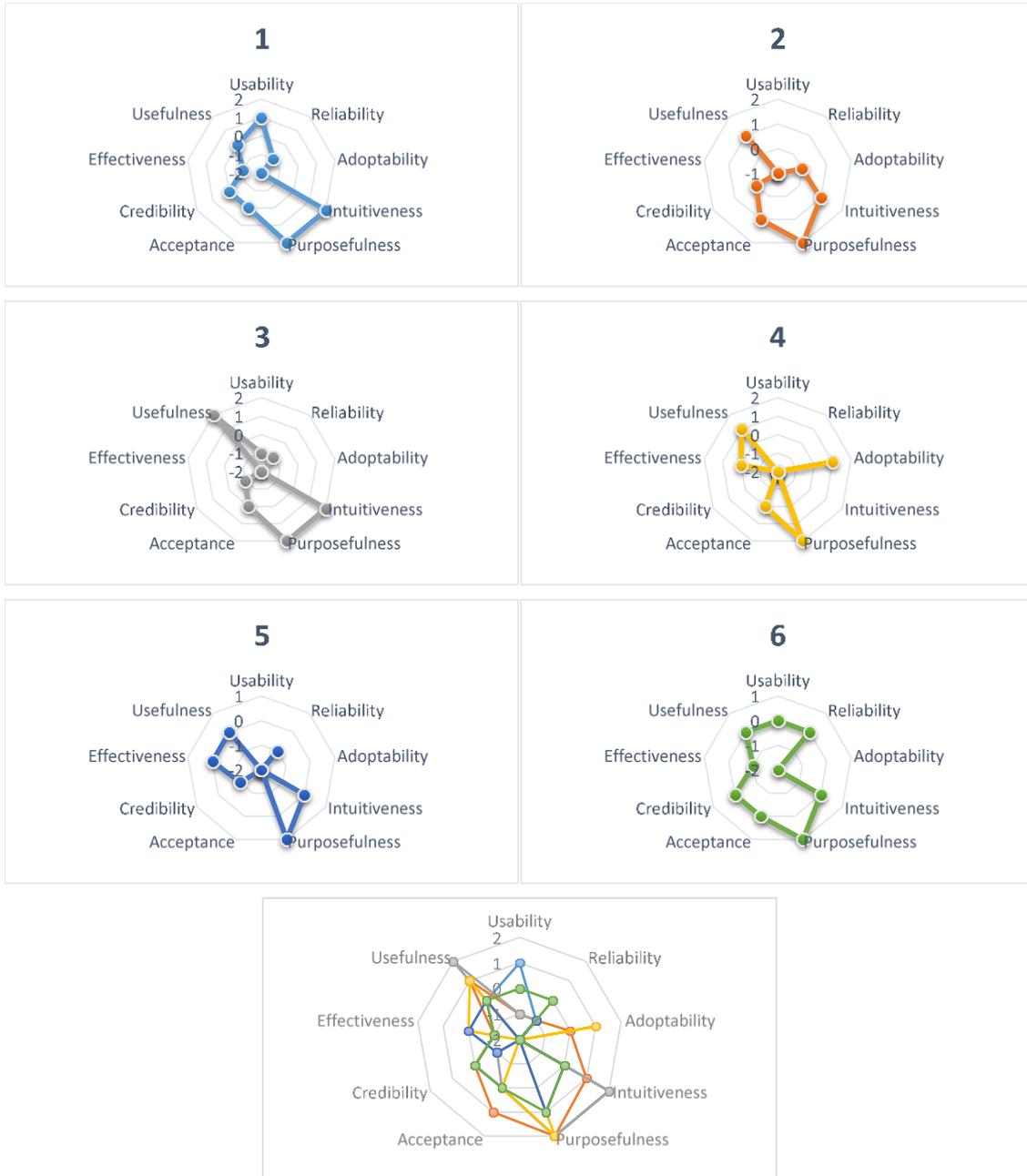
Local Digital Roadmaps	Assessment	GPs can refer electronically to secondary care	<ul style="list-style-type: none"> a) Every referral created and transferred electronically b) Every patient presented with information to support their choice of provider c) Every initial outpatient appointment booked for a date and time of the patient's choosing (subject to availability) d) By Sep 17 – 80% of elective referrals made electronically
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Dominant attribute sentiment in radar charts of research stages

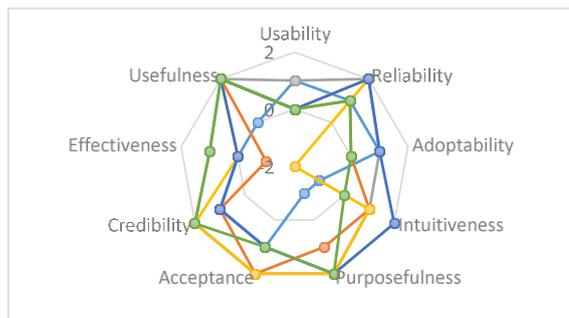
Case 1



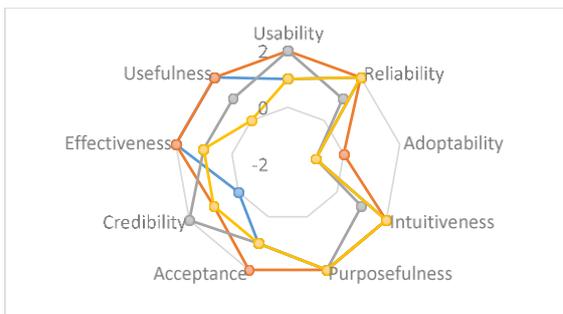
Case 2



Case 3



Case 4





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Researcher (role): Sanjayan Solangasenathirajan
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Appendix A: INFORMATION SHEET

Background

This study aims to understand from a socio-material perspective the behaviours and perceptions of stakeholders in the utilisation of a national electronic referral and appointments system in the National Health Service in England. The objective is to assess the complex ensemble of the roles and relationships of the actors in this collaborative system, and to investigate the alignment of organisations at their boundaries, in a system that has variation in operationalisation and utilisation.

Why are we doing this study?

At present there is a large variance in uptake, operationalisation and system alignment, which leads to conflict, misuse and ineffective use of the system. The aim of this research is to establish a better flow of information, and organisational understanding between stakeholders to lead to an improvement in the effective use of the system.

What is the purpose of the study?

To understand and provide classification for the issues and barriers around the system and its stakeholders, to identify causes for system failure and to provide justification behind any suggested improvements. The findings will be used to improve and support operationalisation through collaboration.

Who would we like, is eligible, to participate in the study? Why have I been invited?

The participation of system stakeholders in healthcare organisations. These would include Medical Secretaries, GPs, Consultants as well as managerial staff, systems suppliers, and policy and decision makers. You have been identified and invited as an individual having an interest or stake in the outcomes of the information system in its environment.

How can you be involved?

You can be involved in the participation of this research by contacting:
s.solangasenathirajan@pgr.reading.ac.uk

Do I have to take part?

There is no obligation to participate in this research and you can withdraw at any time without detriment. Withdrawal will have no impact on participation by virtue of professional role and in the course of daily duty.

What will be involved if you take part?

Observation, Or

Semi-structured interview

Confidentiality, storage and disposal of information

All data will be anonymised to protect individuals, encrypted, stored secure on backed up network drives and processed on encrypted devices. Any transmission would be through secure NHS.net email password protected, zipped files. Data will not be shared with any 3rd parties apart from the academic supervisor at the University of Reading (Dr. Keiichi Nakata) and where extracts have been accessed and sourced from NHS commissioning organisations, confidentiality maintained across all data collection and storage.

Are there any benefits/risks to taking part [e.g. health]?

By offering your personal views and opinions you will be contributing to an research base that will be shared with the wider organisation and NHS. At a local level you will also be contributing to a body of knowledge that lays out requirements from a socio-material perspective.

What expenses and/or payment or equivalent be made for participation in the study?

None, as participation is by virtue of professional role and in relation to the existing relation to the system.

What will the results of the study be used for?

Contribution to service evaluation and improvement, and towards published research as part of a PhD at University of Reading. Finding will be shared through local service improvements and in the further development of the focal system.

Who has reviewed the study?

This project has been considered a service evaluation by the NHS Health Research Authority.

This project has been reviewed by the University of Reading Research Ethics Committee and has been given a favourable opinion for conduct.

The University has the appropriate insurances in place. Full details are available on request.

Contact details for further questions, or in the event of a complaint

Researcher (Sanjayan Rajan): s.solangasenathirajan@pgr.reading.ac.uk; Principal (Dr Keiichi Nakata): k.nakata@henley.reading.ac.uk

Thank you for your help.

Consent Form

1. I have read and had explained to me by ...Sanjayan Solangasenathirajan.....
the accompanying Information Sheet relating to the project on:

The role of distributed information system in stakeholder collaboration: A study of co-ordinated healthcare systems.....
2. I have had explained to me the purposes of the project and what will be required of me, and any questions I have had have been answered to my satisfaction. I agree to the arrangements described in the Information Sheet in so far as they relate to my participation.
3. I understand that participation is entirely voluntary and that I have the right to withdraw from the project any time, and that this will be without detriment to me as a research participant.
4. I agree to the interview/session being audio taped.
5. This application has been reviewed by the University Research Ethics Committee and has been given a favourable ethical opinion for conduct.
6. I have received a copy of this Consent Form and of the accompanying Information Sheet.

Name:

Signed:

Date: