Success and Failure:

A grounded theory study of software implementation in three clinical settings

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in partial fulfilment of the requirements for the degree of
Master of Science in Health Informatics

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Declaration

I declare that the work described in this dissertation is, except where otherwise stated, entirely my own work, and has not been submitted as an exercise for a degree at this or any other university.

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Mary Rafferty

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Summary

This study sets out to explore how the people involved in software implementation in three clinical settings understood, thought about and experienced success and failure and how these understandings related to and informed factors involved in the success and failure of software implementation in these settings.

The study investigates the implementation process of the same clinical information software in three different clinical speciality settings within a large tertiary care teaching hospital. In one setting the implementation is described as a failure, implementation was abandoned and the software is not in use in any form. In the two other settings, the software is in use in quite different ways by single users and the implementation is described as a success by some users and stakeholders and as a failure by others.

Drawing on the literature on IT success and failure, software implementation processes and approaches to organisational change, the author explores the understandings of success and failure that underpin conventional approaches to software implementation. Using a Grounded Theory approach, the research uses several sources of data from these clinical settings to build new theory about software implementation success and failure.

The software is a patient information system, with demonstrated benefits and utility in two of the three clinical services. The technical architecture and design of the software itself was not the most important consideration for users in this study. The match between the software and their clinical needs and setting, and their capacity to achieve improvements and refinements in this match were much more significant.

The study found that requirements for successful implementation that are clearly identified in research were almost entirely absent in these settings. The project failed in one setting for clear, compelling reasons and had limited success in the other two by good luck rather than good planning.

The study concludes with a consideration of the application of learning from this research and a focus on potential further and future research to build on and scrutinise the findings from this study.

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Chapter 1.   Introduction

1.1   Background

This research was undertaken in partial fulfilment of the requirements for the award of the degree of Master of Science in Health Informatics at the University of Dublin, Trinity College.

This study sets out to examine the factors that influenced success and failure of software implementation in three clinical settings within a large tertiary care teaching hospital. In particular, the research examines how key participants understood success and failure and how these understandings related to and informed factors involved in the success and failure of software implementation in these settings.

1.2   Success and Failure in IT

Failure of IT and IS is widespread. Partial and complete failures of large-scale, lengthy and costly projects are well-documented and subject to critical analysis in the specialist literature and public media. Failure of small-scale, one-off, individual or local IT developments are not subject to such scrutiny. Indeed, as in this study, there may not be either a record of the failed process or any analysis of the financial, service or human costs of failure. Responsibility for failure may be allocated to a range of ready suspects: the software, the vendor, the implementation process, the project management, too little – or too much - money, time or experience. The shame and blame associated with failure means that IT projects that are not successful are often euphemistically referred to as 'cancelled', 'challenged', 'deferred' or 're-designed' rather than 'failed', leading to difficulties in estimating the extent of failure and in learning from the experience of failure.

Health care settings consider a range of existing and emerging information technologies with the aim of increasing effectiveness and efficiency, saving time and money and improving the care of the patient. Despite this motivation, the capacity of hospitals and primary care settings to implement and use computer-based systems is inconsistent. The study of information systems helps to identify a range of factors to consider in planning implementation, including managerial support, high quality system design,

user involvement and extensive project planning. Despite guidelines on the best way to ensure success and avoid failure in IT implementation, many healthcare settings experience significant problems.

Successful IT processes create significant potential benefits in many settings, including healthcare. Failure creates equally significant potential costs, but the results of failure in healthcare settings are potentially more significant, as they are associated with risk and damage to patients. Understanding success and failure is a necessary and important contribution to achieving the legitimate goals of IT in healthcare.

1.3   Relevant field/body of knowledge

There is a substantial literature on failure in IT and IS. Historically, studies analyse examples of failure, draw conclusions about the causes of failure and prescribe measures for avoiding future failure. More recently, studies draw on the fields of change management and organisational development and locate examples of failure of IT in a broader organisational context. This has led to a move away from understanding failure as failure of technology towards models of failure of organisation and/or failure of change processes. Despite this move towards a broader conceptualisation of IT failure, few studies have examined the concept of failure itself and still fewer have studied the relationship between understandings of failure and success in the context of the implementation and use of IT in healthcare settings.

1.4   Motivation

In the context of IT in healthcare settings, the researcher is interested in the significant influence of IT professionals, especially software developers and vendors and the lack of influence of healthcare managers and practitioners in understanding, design, implementation and measurement of outcomes of IT developments.

1.5   Research questions and why they are interesting

In this study there was an unusual opportunity to examine the implementation of the same patient information software in three different clinical settings in the same organisation, with the same software vendor, at around the same time. In one setting the implementation is described as a failure, implementation was abandoned and the software is not in use. In the two other settings, the software is in use in different ways

and the implementation is described as a success by some users and stakeholders and as a failure by others.

The core research question is 'what factors led to different results in the three projects?' with a specific focus on the understandings of success and failure held by the clinicians and software vendor.

1.6   Value of this research

There is a shortage of research into the factors influencing success and failure of small IT projects in healthcare settings in Ireland. Potentially, IT has a substantial contribution to achieving value for money and maximising the safety, effectiveness and efficiency of health services. This study is a contribution to understanding how this can be achieved.

1.7   Research overview

This is a grounded theory study of success and failure of software implementation in three clinical settings. A number of sources of primary and secondary data were used, including one to one semi-structured interviews with all available stakeholders in each setting. The analysis was undertaken using sequential, iterative cycles of coding with the aim of building new theory about software implementation success and failure.

1.8   Overview of dissertation

The dissertation is organised as follows:

Chapter 2 is a review of the literature on the benefits and limitations of IT in health, the experience and extent of IT failures both in general and specifically in health and definition, measurement and assumptions about success and failure in IT.

In **Chapter 3**, the structure, approach and research methodology is described and justified. The specific methods are described and strengths and weaknesses explored. Alternative approaches are briefly described. The limitations of the design and the study are acknowledged. The integrated approach to data elicitation, capture and analysis is described, including the framework for interpretive analysis using Grounded Theory.

Chapter 4 contains details of the implementation of the research design. The actual work carried out in the course of the study is described. The modes of data capture,

recording and analysis are described and demonstrated. The participation, sequencing and issues of validity are described.

In **Chapter 5**, the researcher describes the process and outcomes of analysis. Using the Grounded Theory framework, the development of the interpretation and theory are described.

In **Chapter 6**, the analysis of the findings is explored in the context of existing research and knowledge.

Chapter 7 is a discussion of the implications and potential application of learning from this study. The study will point to directions for further and future research arising from this work. A critique of the research approach and methods and the learning from these are included.

Full References are given and relevant reference and background material is provided in Appendices.

Chapter 2. Literature Review

2.1   IT in health

> *"A simplified, patient-centric, world-class health system is unattainable in the absence of a serious commitment to the effective deployment of ICT. …Irrespective of past difficulties, the future success of the health service involves a serious commitment to the effective deployment of ICT throughout the system as a whole."*
>
> *McDonagh, 2006, p29.*

The many acknowledged barriers notwithstanding, the case for the extensive use of effective IT in healthcare settings has been strongly made over many years (Committee on Quality of Health Care in America, 2001, Silverstein, 2010).

Unlike other information intensive industries (e.g. Financial Services, Aviation, Logistics) healthcare has had limited and partial adoption of digital technologies. Drivers for increased use now include the expectations of users and providers, the pressure to reduce costs and increase effectiveness, the information intensive nature of modern healthcare, increasing difficulty in managing paper-based systems and advances in technologies demonstrating benefits (HIQA, 2011, Scott et al., 2010). Alongside these, an important driver for use of IT in health is the emerging evidence of medical errors and the requirement to address the large number of deaths estimated to be caused by human errors in healthcare settings (Ash et al., 2004, European Federation for Medical Informatics (EFMI), 2011).

2.2   Benefits of IT in health

According to the Committee on Quality of Health Care in America, (Kohn et al., 1999) a health information system based on Electronic Heath Records (EHRs) gives rise to significant potential benefits.

This Committee, on behalf of the Institute of Medicine of America, frames the potential of ICT to improve the quality of healthcare in six key areas, summarised in Table 2-1.

Examples of Potential improvements arising from the use of ICT	
Safety	Reducing errors in prescribing, dosing and interactions Reducing errors associated with paper-based systems
Effectiveness	Improving compliance with clinical practice guidelines through automated reminder systems CDSS improving quality
Patient-centredness	Patient education and support through web-based systems Customising disease management information CDSS leading to more targeted and individualised treatments More effective and reliable communication between healthcare providers
Timeliness	Telemedicine and immediate access to information, tests and results
Efficiency	Reducing redundancy in tests and interventions
Equity	Reducing the impact of geography and increasing access regardless of race, ethnicity, socioeconomic status or other factors

Table 2-1 The potential of ICT to improve the quality of healthcare in six key areas

(adapted from (Committee on Quality of Health Care in America, 2001)

Other potential benefits include the capacity to synthesise clinical evidence, automating clinical information and support for improved, evidence-based treatments based on large data sets. EHRs and clinical decision support systems (CDSS), it is claimed, will increase effectiveness and reduce risk (Osheroff et al., 2005). Systematic, electronic patient information systems offer significant potential benefits:

"The way we make medical decisions … can be improved dramatically with the use of simple software tools for guiding the collection of patients' data and linking that data with an enormous medical knowledge base. This is a task that is too complex and time consuming for the unaided human mind to accomplish reliably. But new information tools and software can free doctors and their patients from such cognitive limitations"

(Weed and Weed, 1999) p.1280

The application of IT in health is not merely an unrealised potential. Success has been demonstrated in several areas including:

- Computerised and largely automated Laboratory systems
- Increase in availability and use of imaging systems
- Biobanks and other databases, incorporating knowledge discovery on databases (e.g. Biobank Information Management System, linked to TCD's Centre for Health Informatics)
- Rapid development of telemedicine and eclinics for chronic disease (e.g. Epilepsy EPR; Diabetes eclinics)
- Migrating business applications into health (SAP)

(Grimson, 2009)

2.3   Limitations of IT in health

Optimism about the potential benefits of IT in healthcare can override evidence about the limitations of IT in this context. Evidence from literature and practice, nationally and internationally, suggests at least some confusion about the role of technology and the appropriate use of ICT in healthcare settings. The assumption that 'computerisation' always and only brings benefits is a dangerous one when lives are at stake and when there is documented evidence of the limitations (Berg, 2001, European Federation for Medical Informatics (EFMI), 2011) .

The complexity of healthcare creates technical challenges to achieve reliable, consistent and context-specific electronic tools (Scott et al., 2010). Evidence from the experience of IT in health suggests relative ease and success in the acquisition, storage and management of medical data ('knowing what'), less success in creating systems for medical and health information (data interpreted in a context) and least success in

developing good models and reliable creation of systems of medical knowledge ('knowing how') based on models reflecting current understanding. There is difficulty in identifying which changes will bring best benefits and where to start (Sicotte and Paré, 2010). Common approaches are little more than the replacement of paper records with electronic ones. Digitising paper records is costly and adds little value (Nykänen and Brender, 2005). Significant added value is only generated when ICT is leveraged to provide embedded decision support, links to clinical pathways and automatic generation of alarms and alerts (Grimson, 2009).

The context, complexity and consequences of the use of IT in healthcare generate particular difficulties. Issues of privacy and security have special significance in this field and errors may have life or death consequences. In terms of policy, economic and fiscal dimensions, there are on-going problems in quantifying the costs and benefits, difficulties in establishing the state-of –the-art at any given time and issues in agreeing local or national policy and practice positions in an increasingly globalised healthcare environment (Committee on Quality of Health Care in America, 2001, Ash et al., 2004, Berg, 2001, Green, 2009).

The increased use of IT in health has led to increased evidence about the limitations of IT in relation to cost, design and implementation and social- technical system impacts:

Cost
- Time, effort and cost involved in developing and implementing IT systems in healthcare settings (Haggerty, 2007, Shekelle et al., 2006)
- High maintenance cost of IT systems (Heeks, 2006)
- Cost involved in moving from local, separate, fragmented systems to integrated ones, which bring most benefit (Valdes, 2005)

Design and implementation
- Weakness in systems analysis and consequent limitations of models on which IT and IS development is based (Scott et al., 2010)
- Failure to consider the requirement to integrate ICT with existing healthcare systems (Heeks, 2006)

- Frequent requirement to run parallel paper and electronic systems, creating duplication and increasing risk of error (Nemeth et al., 2005)

- Difficulty in getting vendors to agree on and deliver integrated IT and IS (Rigby et al., 2001)

- Dominance of vendors and developers in shaping the direction and pace of development of the field (Rigby, 2006)

Socio-technical system impacts

- Resistance on the part of users , commissioners and vendors (Whetton, 2005)

- The risks created Vs the risks reduced, including evidence that CPOE systems may facilitate mistakes as well as prevent them (Koppel et al., 2005, Wentzer and Bygholm, 2007)

- Reducing patient care, including evidence that IT may lead to a focus on the technology and not the patient (Anderson and Goodman, 2002, Paré and Elam, 1995, Sicotte and Paré, 2010)

2.4   Experience and extent of IT failures

In 2009, the Standish Group's annual review of IT trends across all industry sectors showed a marked decrease in IT project success rates. According to this review, only 32% of all projects were delivered on time, on budget, and with required features and functions; 44% were late, over budget, and/or with less than the required features and functions and 24% were cancelled before completion or were delivered and never used. While acknowledging evidence that IT projects fail more often than they succeed, this is also true of other kinds of organisational change interventions (Cummings and Worley, 2001, Argyris, 1993, Fraher, 2011, Nicholas, 1982).

According to a large literature on project failures in IT and IS, failures are rife in technology initiatives in every field (The Standish Group, 1994, 2009). Poorly managed and abandoned IT projects in British government departments alone cost £5 billion over 12 years up to 1994 (Bourne and Walker, 2005b, Whittaker, 1997). The bigger the project, the bigger the cost: widespread publicity attends large cost overruns associated with IT project failure, especially, but not exclusively, in the public sector (McDonagh, 2006, Coiera, 2007). Even an off the shelf software package within a small organisation

can both fail to deliver the anticipated benefits and also never recover the money and time invested (Pinto and Mantel, 1990, Wateridge, 1998, Khazanchi and Reich, 2008). IS and IT failure can also have on-going impacts on the morale and performance of the information systems staff and other individuals in the organisation (Petter, 2008, Remenyi, 1999).

2.5   Experience and extent of IT failures in healthcare

Within health, well-publicised and costly failures include PPARS here in Ireland (McDonagh, 2006); the dangerous failure of a computer-aided dispatch system for London Ambulance Service in 1992 (Finkelstein, 1993);   UK's *NPfIT*, which aims to create a single electronic records system for 50 million patients in England, as well as providing electronic prescriptions and other services and now running some four years behind schedule (Rose, 2011) and *NHS Connecting for Health* in the UK, an ambitious project characterised by difficulties, budget and time overruns, vendor collapse, political criticism and challenge and very public changes of leadership (Coiera, 2007, Brennan, 2005).

The EFMI Working Group for Assessment of Health Information Systems has collected information on failures of IT in healthcare since the early 1980s and provides a summary of examples of ICT errors and failures, emphasising that the systematic analysis of such errors and failures is "a precondition to be able to learn from negative examples and to design better health information systems" (European Federation for Medical Informatics (EFMI), 2011). Examples are drawn from software and hardware failure, poor usability and design of medical devices, unintended consequences and weaknesses in design, implementation and risk assessments. Significant examples are given in Table 2-2.

1985-85	Therac-25 incident	Several patients died and many more seriously injured from massive radiation doses arising from software errors
1992	London Ambulance Service	An estimated 20 people died because of delays or failures arising from software errors
2000	Cervical Screening Programme (Scotland)	Computer system suspended thousands of women from a cervical screening programme, leading to at least nine deaths
2011	USFDA report on Reported CIS Adverse Events	One hundred and twenty unique reports (from over 1.4 million reports) on adverse events including incorrect data, data displayed for the wrong patient, chaos during system downtime and system unavailable for use

Table 2-2: Examples of ICT failures in Healthcare

Adapted from (European Federation for Medical Informatics (EFMI), 2011)

2.6 IT development failures and how to avoid them

There is a substantial literature on the origins, causes and cures for project failure. The list of causes attribute responsibility, variously, to the commissioners, the vendors, the developers, the organisational structure and process, management, end-users, procurement processes, deficits in project management, speed of development, under and over resourcing, poor beginnings and mishandled endings (Remenyi et al., 1995 &1998, Ambler and Constantine, 2000, Arino and Torre, 1998). Increasingly, there is recognition that project failure is not located in one time, process or constituency but is a product of poor alignment, communication and integration within and between a wide range of processes and stakeholders (Marchand and Peppard, 2008, Khazanchi and Reich, 2008). IT initiatives do not fail only at some final, end point, they are often characterised by ignoring evidence of problems early in the development process and

dogged adherence to initial plans despite the signs of the inadequacy of such plans (Nykänen and Brender, 2005, Orlikowski and Baroudi, 1991).

Academic and popular literature abounds with prescriptions for avoidance of IT project failure. There is a range of recommended approaches including project management; risk management; benefits realisation; managing user expectations and each approach offers sophisticated and detailed guidance for adoption and use to prevent project failure.

Since project failure, however defined, is so widespread, concerns about the cost and business impact is a significant influence for commissioners of IT developments of any size and scale. An increasingly common response is the development of ever larger and more detailed System Requirements Specifications, sometimes running to several hundred pages (McGinnes, 2010a).

Few authors suggest that success and failure are social constructs, existing primarily in the minds of stakeholders and influenced by many factors other than the design of software or hardware.

2.7   Measurement and Evaluation of success and failure

Although it is acknowledged that IS and IT failure has become a common problem, there is no agreement on the number or percentage of projects that fail. This is in part caused by difficulties with the definition of failure (Agarwai, 2006, Cooke-Davies, 2002) reluctance to admit failure and re-branding or re-categorisation of project headings to disguise failure cost (McDonagh, 2006, Pinto and Mantel, 1990). Linberg (1999) questions the use of widely-cited figures on failure: he suggests that there are occasions when "these failure statistics are used as fear-based advertisements for consultant services or quick-fix techniques/tools" (p191).

Thomas and Fernandez (2008) draw attention to the political influences on evaluation and measurement of success, claiming that post-hoc evaluations are rarely carried out because of political agendas. They speculate that the avoidance of evaluation may have multiple origins, including the perception that "evaluations are about finding failures and thus result in negative outcomes, such as embarrassment, for managers (rather than being a learning experience)" (p734). Learning how to be successful seems to be

important, but the commercial and other sensitivities that surround failure makes it unlikely that lessons are learned from past project failures.

Defining failure

Despite widespread agreement that IT and IS project failure is extensive, there is no commonly agreed definition of success and failure (Thomas and Fernández, 2008). Definitions of failure are often assumed rather than explicit. The assumption is generally that IS/IT failures occur when projects do not achieve the expectations or objectives of the original user or commissioner (Remenyi, 1999). Failure is commonly assumed to have occurred when a project has:

- Started development but was abandoned before completion
- Been fully developed but never used
- Been fully developed and commissioned, but abandoned within a very short time
- Not been fully developed as originally envisaged, but substantially down-scaled until it no longer provides the originally envisaged functionality
- Been rescued by additional but unplanned application of resources.

(Remenyi, 1999, Remenyi et al., 1995 &1998, Shao and Müller, 2011)

Failure of What?

Yardley and others distinguish between *project management* failure and *project* failure (Yardley, 2002, Cooke-Davies, 2002). They suggest that the most commonly reported evidence of IS and IT project failure - exceeding budget, timescale and quality –are actually classic symptoms of project management failure.

Many of the factors that actually lead to project failure lie outside the scope of project management and it may be that the project approach itself may be an inappropriate model for the complexity of many organisational and business environments. McGinnes (2011) challenges the unquestioned use of an 'engineering project' approach to design and implementation and proposes a steady-state framework as an alternative.

Limits of Success

The terms under which success and failure are measured also relate to the system boundary. In healthcare, as in other domains, the measurement of a particular initiative may assess outcomes against local goals alone, without regard to the place of the

development within a wider system (Mark, 2009, Rigby et al., 2009). A weakness of the current environment of IT in healthcare in Ireland is the proliferation of stand-alone, discrete applications, programmes and systems, any one of which may be perfectly adequate in its own right but which do not have an adequate interface with existing local systems or which do not adhere to a common framework (not least because such a framework may not exist). For instance, patient assessment and information systems vary in size, scope, usage, motivation and in type, mode, proximity and timing. The absence of implemented standards, the very slow pace of progress towards implementing a coherent national framework for IS and IT in healthcare (HIQA, 2011) and the willingness of vendors and commissioners to engage in one-off 'cheap and cheerful' developments all combine to reduce the efficacy, in real terms, of any individual development and delay progress towards an integrated IT system in health in Ireland (Department of Health and Children, 2004).

Success, Failure and stakeholder expectations
The literature suggests that definitions of success and failure are different for different constituencies and that these differences lead to difficulties in ensuring success.

The discrepancy between the expectations of the end-user or commissioner and IT developments as delivered is so common that it has become a cliché, acknowledged - even celebrated- in many forms. (See Appendix 1).

The identification of critical factors associated with failure – and success – are contingent on the way in which failure is defined (Pinto and Mantel, 1990). Several studies confirm that different groups of stakeholders define project success differently (Agarwal and Rathod, 2006, Baker et al., 1983, Samaras and Horst, 2005), leading to almost inevitable differences in judgements about project outcomes. A study by Thomas and Fernandez (2008) demonstrated improved project outcomes, better use of project resources and increased satisfaction when success criteria were formally defined, agreed and measured. This suggests that it is necessary to know considerably more about how a range of stakeholders define failure and success.

Making assumptions explicit

The literature on the differences in perceptions of success and failure by different constituencies emphasises the subjective nature of these judgements.

Linberg (1999) explores the largely unconscious nature of the perspectives and assumptions about success associated with different disciplines and stakeholders. His exploration of the difficulty of changing paradigms is reinforced by research from cognitive science and neuroscience (Nonaka and Takeuchi, 1995, Handy, 1995, Ouellette and Wood, 1998), as well as organisational theory (Cummings and Worley, 2001, Fraher, 2011), on the nature of perception, cognitive dissonance, resistance to change and psychological routines and defences. Beliefs, perspectives, understandings and assumptions make up the world view – the dominant paradigm – through which we all perceive, interpret and respond to the world. Together, these act as the 'lens' through which we see the world. In general, real-world data that do not fit this world view are discarded or ignored. The filtering process concentrates the data that are consonant with our paradigm. "Therefore, what we actually perceive is dramatically determined by our paradigms. What may be perfectly visible, perfectly obvious, to persons with one paradigm, may be quite literally invisible to persons with a different paradigm" (Linberg, 1999) p191. Linberg makes the case for a change of paradigm of success, but acknowledges that such a change is likely to be difficult, requiring, in the first instance, that organisational leaders "become aware of their own perceptions of software project success and software project failure" (p191). Such awareness, in Linberg's view, would allow for increased integration within IT development processes.

ICT developments span the boundary between technical skills and interpersonal processes. These developments occur in personal, interpersonal, team, organisational, policy, economic, political and social contexts. Unless the interrelatedness of these seemingly separate skill sets is acknowledged, there is a risk of continuing to ignore important influences on success and failure. The influences on IT and IS development are precisely those that affect leadership, communication, teamwork and sense-making in all organisational contexts (Fraher, 2005, Fraher, 2011, McDonagh, 2006).

The Iron Triangle and alternative measures of success

The standard 'Iron Triangle' of cost, time and quality has been used to define project success for more than 50 years (Atkinson, 1999). Many authors acknowledge that this definition is primarily from the perspective of the contractor and does not take account of all participants in the process. Atkinson (1999) describes time and cost as "at best, only guesses, calculated at a time when least is known about the project" and quality as "an emergent property of people's different attitudes and beliefs, which often change over the development life-cycle of a project" (p337). In common with other authors (Linberg, 1999, Wateridge, 1998), Atkinson criticises the common measurement of projects success and asserts the requirement for a more extensive framework for defining and measuring success. He proposes an alternative framework to the 'Iron Triangle' which he calls the 'Square Route'. This framework, summarised in Figure 1, includes time, cost and quality but adds measurement of the benefits to the stakeholders, the benefits to the organisation and the wider information system, creating, according to Atkinson, a "more realistic and balanced indication of success" (p341).
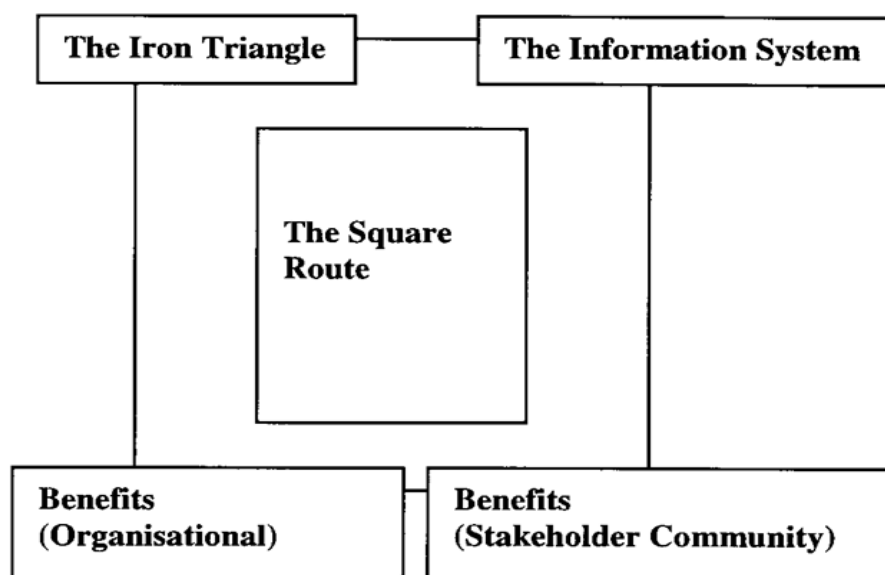
Figure 1: The Square Route of criteria for measuring IT project success

(Atkinson, 1999)

User satisfaction as a measure of success is often criticised because of a perceived weakness in theoretical underpinnings. Use is also questioned as a criterion for success, since, for many IT developments, regular or widespread use is not a precondition of success. Lubbe and Remenyi (1999) argue that "success criteria in terms of benefits delivered are the exception rather than the rule and in many cases measures of project success are defined after project implementation or not at all" (p146). Because of the difficulty in measuring benefits, Thomas and Fernandez (2008) question whether success should be judged against original, pre-project objectives, revised targets or some other performance benchmark.

Success and Failure: not either/or
Some authors acknowledge that IT projects can be successful judged on time, cost and specification, but still fail from the point of view of users and impact (Petter, 2008, Senge, 1992). Projects can be judged as failures in terms of common criteria for success, but be successful in other terms. Thomas and Fernandez (2008) note that net benefits and organisational success can be achieved in spite of failure in system specifications if the project failure can be transformed into organisational learning. Hart and Warne (2006) argue against the common assumption that success is the converse of failure, that a failure cannot be a success and vice versa (Hart and Warne, 2006). They suggest the criteria for success and failure are independent variables, so that an IT development can be not only either a success or failure but also both or neither. Following the work of Lyytinen and Hirschheim (1987) on the failure of stakeholder expectations, Hart and Warne assert that "it is necessary to [...] distinguish between different types of expectation, both in their relevance to success or failure as well as in their relative importance for the stakeholder concerned" (p156). Stakeholder expectations are many and varied, often implicit , unstated or even unconscious and frequently vague, contradictory, unformed or partially formed and subject to change over time (Nonaka and Takeuchi, 1995, Hart and Warne, 2006, Huy, 2001). Despite the practical difficulties that this implies, Hart and Warner assert that surfacing such expectations and distinguishing between expectations of different weights and importance to different stakeholders is required in order to understand their attitudes to success and failure. Hart and Warner argue for the articulation of 'defining characteristics' or most

significant expectations held by each stakeholder at the outset of the project. In an Irish context, Burke (2010) identifies the gap between expectation and needs of clinicians and their experience of IT in primary care in Ireland.

Wateridge (1999) challenges the representation of success and failure as 'black and white' when, in practice, the distinction is rarely so emphatic. "...projects may not always be seen as completely successful or complete failures and different participants may see the outcome of the same projects in a different way" (Wateridge, 1999, p59). Baker (1983) and others also distinguish between objective measurement (e.g. of cost or time) and the subjective stakeholder perception of success or failure that may be influenced by a range of factors. While recognising that it is important to pay attention to the perception of stakeholders, Thomas and Fernandez (2008) argue that perceptions may be influenced by unrealistic expectations. They cite the work of Nobel Prize winners Daniel Kahneman and Amos Tversky on prospect theory, which demonstrates that "optimistic expectations regarding time, budget or quality can be regarded as normal human psychological behaviour under conditions of uncertainty" (Thomas and Fernandez, 2008, p733). The consequences of this "human tendency to underestimate challenges and to overestimate their own capabilities" (p733), according to Thomas and Fernandez, is that "stakeholders could perceive as a practical failure a project that was in fact successful in achieving near-optimal results" (p.733).

2.8   Definitions

For this dissertation, the terms 'information systems' (IS), 'information technology' (IT) and 'software application' will be used in distinct and specific ways. A software application is a 'concrete piece of information technology made up of programs and data files that can be stored and executed' (McGinnes, 2010b). Information technology includes any part of the hardware or software used to store, retrieve, and manipulate information (Alexandrou, 2011). IS involves the 'people, processes, data and technology and their interactions' (McGinnes, 2010b).

2.9 Conclusion

The literature on IT project failure emphasises the measurement of the rate of failure, analysis of the causes of failure and development of approaches, models, tools and techniques to prevent failure and improve success. Few studies have examined the definition of success and failure or the impact of specifying measures of project success on project outcomes. There is a growing acknowledgement that the exclusive focus on time, cost and specification is an over-simplification and that definitions that reflect the complex reality are needed. It is accepted that success and failure are complex and multi-dimensional constructs. There are many proposals for what dimensions should be included in any representation of success and there is a need for better understanding of how stakeholders understand, define and measure IT project success. The current study is a contribution to this understanding.

IT projects, development and implementation occur in complex organisational, social and political environments. Attention to the issue of expectations of stakeholders and analysis of expectations of different weight and significance is likely to make a contribution to understanding the causes of failure. The concept of expectations failure along with recognition of the independence of the concepts of success and failure and definitions of 'defining characteristics' of success are likely to be useful developments.

While acknowledging the significant potential for ICT to have a positive impact in healthcare, many authors – often in the light of the evidence of large-scale and costly ICT failures –warn against the assumption that technology alone will deliver the required changes (Scott et al., 2010, Jelavic, 2011, Whitfield, 2011). Writing specifically about the application of ICT to health in Ireland, McDonagh cautions:

> *"..., if structural and technological interventions are shaped in an environment that gives scant attention to the wider human and organisational aspects of change, the potential for failure and disappointment is hard-wired from inception."*
>
> *(McDonagh, 2006) piii.*

Chapter 3. Methodology and Methods

3.1 Introduction

In this chapter the researcher will describe and justify the choice of research approach and methodology. The specific methods are described and strengths and weaknesses explored. Alternative approaches are briefly described. The limitations of the design and the study are acknowledged. The integrated approach to data elicitation, capture and analysis is described here, including the framework for interpretive analysis using Grounded Theory.

3.2 Aims of the research

This study sets out to explore the factors related to understandings of success and failure of software implementation in three clinical settings. There is an extensive literature on causes and prevention of and remedies for IT project failure but a paucity of study of factors related to the definition and understanding of success and failure.

3.3 Research Question

The core research question is:

'What factors led to different results in the three settings?'

with a specific focus on the understandings of success and failure held by the clinicians and software vendor. Related and subsidiary research questions are:

- How did different stakeholders understand and experience 'success' and 'failure' in this software implementation project?
- What influenced the overall assessment of each project as a 'success' or 'failure'?
- What are stakeholders taking into account when they describe the software implementation as successful or unsuccessful?
- What, if anything, can be learned from a failed software implementation process?
- What should stakeholder of different kinds attend to in planning software implementation in healthcare settings?

3.4   The choice of research methodology and method

There are two broad forms of data collection and analysis for the purposes of research: quantitative and qualitative. Quantitative approaches are most appropriate when the focus of the research can be observed or measured in some reliable way. Qualitative research is largely concerned with generating explanations of human processes and social phenomena, the lived experience of individuals and groups. There are many different research approaches and methods within each form of research. Both quantitative and qualitative research use rigorous, explicit and systematic approaches to investigation and use a research method that is best suited to the research question being asked (Hancock et al., 2009).

For this study, the timing of the research (taking place after many of the developments under investigation were completed), the small sample size, the difficulty in identifying or controlling many important variables and the wish to understand a range of perspectives on the process of implementation which are difficult to express numerically meant that a quantitative research approach was not considered appropriate.

3.5   Rationale for a Qualitative Research Approach

Orlikowski and Baroudi (1991) argue for a range of research approaches and perspectives to investigate IS and IT. Pointing to the diversity of the domain of IS and IT, they emphasise the value of undertaking research from a range of philosophical positions and using a range of research approaches, to encourage scrutiny and rigour in relation to assumptions about the nature of IS and IT phenomena.

Many commentators highlight limitations of the positivist research perspective (Orlikowski and Baroudi, 1991, Denzin and Lincoln, 2008). These include the fallacy of the search for universal laws which do not acknowledge the particular social and personal context (Hancock et al., 2009). These authors argue that the design and use of any technology in an organisational setting is intrinsically embedded in specific social, political, cultural and group environments and experiences. Similarly, the core aim of positivist research is to explain an external reality, assuming that people do not construct their own reality from their life experience (Shao and Müller, 2011, Denzin and Lincoln, 2008).

Given that the purpose of the research is to contribute to an understanding of the experience and understandings of the participants in the research, an interpretive qualitative research approach was identified as most appropriate.

Strengths of qualitative research include:

- the capacity to recognise differences in the ways in which participants experience, understand and make sense of the same events
- acknowledging complexity and the real-world context
- the examination of behaviour in natural settings without manipulating variables in those settings
- the use of the reported experience of participants as valid data
- a focus on description and interpretation
- the use of systematic but flexible analytic process which are responsive to emergent data
- the possibility of generating new concepts or theory

(Miles and Huberman, 1994)

Given these strengths, the researcher identified that qualitative research was the most appropriate choice for this study. There are a range of qualitative methodologies and often several 'versions' or forms of a particular methodology. Any particular methodology can be undertaken with different philosophical underpinnings, using different methods for collecting data, involve a range of forms of data, involve the participants – and the researcher – to a greater or lesser degree, adopt different approaches to sampling and selection and employ different techniques and processes for data analysis.

3.6   Ontological assumptions underpinning interpretive research

Ontologically, interpretive research assumes that all aspects of the social world, including the world of work and organisations, are socially constructed through interactions between people. For this reason, social reality – including all human interaction whether it involves technology or not – cannot be 'discovered' but can only be interpreted.

3.7 Epistemological assumptions underpinning interpretive research

Explanations and interpretations constructed by interpretive research seek to generate understandings of how subjective meanings are formed and maintained in a given setting. Knowledge can be generated through inductive and deductive processes. The emphasis on understanding the experience and perspective of participants leads to the use of interpretations, understandings, meanings and language as a primary and valid source of data.

3.8 Choosing the appropriate method

In this study a research design was sought which would:

- Address the research question

- Recognise the different experiences in three settings

- Generate second-level information which could be understood in the context of the literature

- Potentially give rise to theory about success and failure of software implementation

- Complement rather than replicate existing studies

- Be a novel and interesting research approach for the researcher

- Be possible within the time frame of the study and the limited access to participants

In discussion with her research supervisor and in exploring the relative strengths of a range of research approaches to achieving these aims, the researcher identified Grounded Theory, a humanistic and interpretive method of enquiry, as a research approach that would fulfil these criteria. There has been a recent increase in interest in using Grounded Theory in IT and IS research because of its potential in strengthening concepts and theory in the field (Urquhart et al., 2010).

3.9 Grounded Theory

Grounded Theory (GT) is both a research method and the output from that method. The end result of the research process is a 'theory' which is 'grounded' in the data. In GT, theory is developed inductively from the data through many cycles of rigorous analysis. In summary, GT is:

- "a research method that will enable you to
- develop a theory which
- offers an explanation about
- the main concern of the population of your substantive area and
- how that concern is resolved or processed."

(Scott, 2009)

Originally developed by Glaser and Strauss together (Glaser and Strauss, 1967), the authors diverged in their thinking in later publications, leading to the development of different 'schools' of GT. In this study, data were collected in line with Glaser's description of the methodology, with a focus on emergence and sensitivity to theory. The principles of iterative, sequential coding, theoretical emergence and the process of abstraction, common to both schools of GT, were central to the conduct of the research. The guidelines for GT studies in information systems from Urquhart, Lehmann et al (2010), were also helpful in ensuring the appropriate use of the GT approach and in supporting the quality of the analysis. An overview of these guidelines is given in Appendix 2.

3.10   Data Analysis in Grounded Theory

GT offers well-defined procedures for data analysis. A key strength of GT is that findings are clearly tied to the data. This offers strong validity, since for any concept proposed the researcher can offer many examples from the data (Glaser, 2001).

A feature of GT is the interplay of data collection and analysis throughout the research process. GT is not a linear process of data collection, followed by analysis, leading to conclusions. In GT, data collection and analysis intersect in iterative cycles: early data are subjected to first level coding (Open Coding) which helps to inform the selection and framing of further data to be collected (Theoretical Sampling), which in turn helps the review and deeper understanding of earlier data. Ideally, these cycles continue until no new codes or categories are found in new data (Theoretical Saturation)(Glaser, 1992, Goulding, 2002).

This cycle of data collection and analysis is summarised by Urquart, Lehmann et al (2010), reproduced in Figure 2.
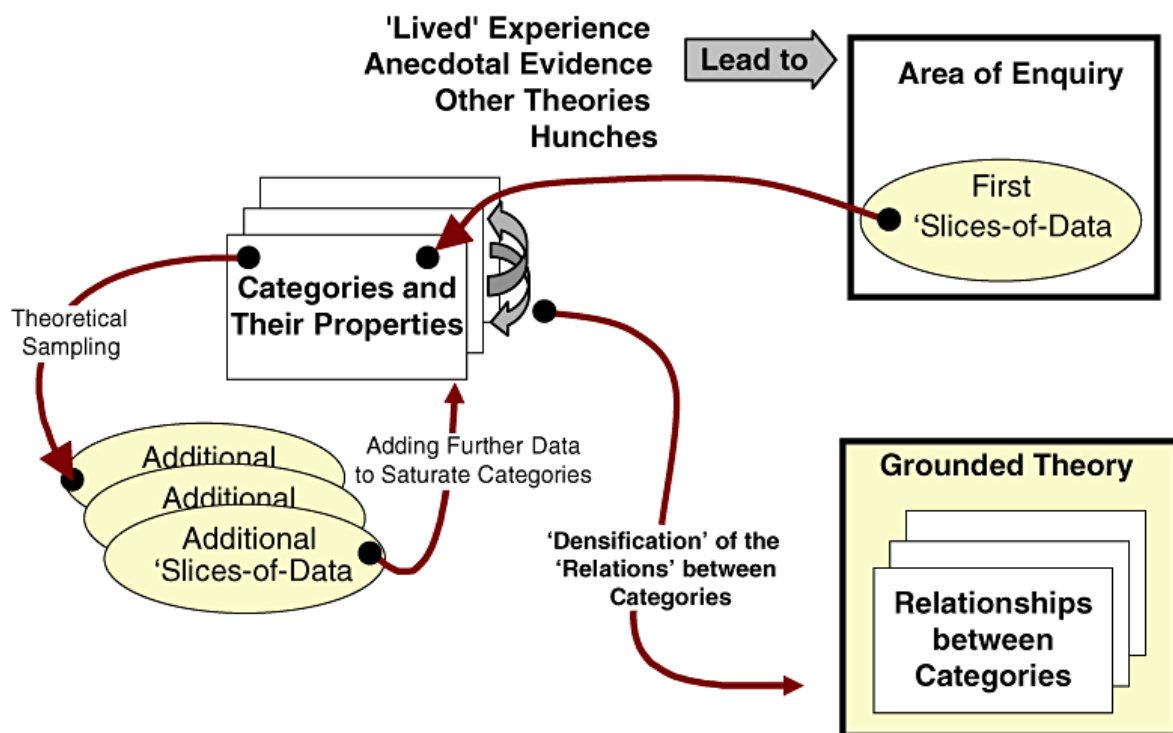
Figure 2: Cycle of data collection and analysis in the grounded theory method.

From: (Lehmann, 2001, Fernandez et al., 2002, Urquhart et al., 2010)p 363

Although the number and sequence of steps involved in analysis differs according to the particular form of GT, analysis always involves a series of stages of analysis, each moving towards increased generalisation and abstraction until arriving at a theory to explain the phenomena being studied. All stages must be followed to support iterative conceptualisation, the basis of a well-founded theory.

The precise focus of each stage in analysis is defined differently by different version of GT, although the process of generating theory from data always involves the stages described in Table 3-1 (Glaser and Strauss, 1967, Strauss and Corbin, 1990).

Stage	Label	Involving
First	Open Coding	First level coding Allocating meaning and labelling (Nouns and Verbs) Reflective memos about interpretations Identify strong, central concepts Early ideas about relationships between categories Output – initial substantive codes
Second	Selective coding or Axial Coding	Constant comparative method About dimensions and characteristics of categories and concepts (Adjectives and adverbs) Relationships and inter-connections between Some categories 'harden' Some categories 'collapse' and merge with others New categories may emerge Output – confirm substantive codes increasingly general and abstract categories
Third	Selective, Theoretical or Focused Coding	Identify 'the' category that integrates all other categories Create Theory from core categories Completed Grounded Theory is made up of a core category and related categories, with properties and dimensions All other categories can be related to the core 'Theoretical' category
Fourth	Theoretical Coding	Modified as above (Charmaz only)

Table 3-1: Stages in Grounded Theory Analysis

The sequence of analysis can be thought of as a series of stages through which the level of abstraction, scope and 'fit' of the theory is increased. Table 3-2 provides an overview of the outputs and purposes of the stages of analysis (Charmaz, 2006, Scott, 2009).

Stage	Output	Purpose
1	**Codes**	Identifying key ideas or themes that allow the key points of the data to be gathered and labelled
2	**Concepts**	Collections of codes of similar content that allows the data to be grouped together
3	**Categories**	Groups of similar concepts that can be used to generate a theory
4	**Theory**	A central explanation – and related concepts - that explain the subject of the research

Table 3-2: Outputs and purposes of the stages of analysis Grounded Theory

3.11   Memos

Grounded Theory requires reflection by the researcher throughout the research process. A key tool for such reflection is the process of writing memos. Memos are reflective notes generated by the researcher to force and capture ideas, thoughts, insights, questions, observations and reflections. Memos are an important tool in constant comparison and allow the researcher to develop and track evolving ideas. Grounded Theory stresses the value of memos in encouraging the researcher to think theoretically. Theoretical memos lay the groundwork for the final theory, which will reflect the work of several theoretical memos (Goulding, 2002, Morse, 1994).

3.12   Rigour, Validity and Reliability in Grounded Theory

As Grounded Theory has become more popular as a research approach, some researchers have misapplied the method, leading to criticisms of the approach (Suddaby, 2006). Grounded Theory requires the same discipline as any form of research (Fernández and Lehmann, 2005, Miles and Huberman, 1994). Valid theory can only be developed from effective, consistent data collection, data analysis that systematically follows the requirements of the approach and conclusions that can demonstrate their 'grounding' in the data (Goulding, 2002). As a research approach, it requires the researcher to be immersed in the data and to develop accurate and deep sensitivity to

meanings and interpretations relevant to the research setting (Lehmann, 2001, Suddaby, 2006). This in turn requires significant awareness, experience and judgement on the part of the researcher (Urquhart et al., 2009, Wimpenny and Gass, 2000).

In this study, the researcher also made use of the checklists proposed by Miles and Huberman (1994) for ensuring the validity and reliability of qualitative research (see **4.5**).

Chapter 4.   Implementation

4.1   Introduction

This chapter describes the implementation of the research design. The research setting and context is described. The actual work carried out in the course of the study is explained. The modes of data capture, recording and analysis are described and demonstrated. The design and practice in relation to participation, sequencing and issues of rigour and validity are outlined.

To preserve anonymity, pseudonyms and/or codes have been used for all individuals, teams, groups, organisations and settings in this study. Details which could serve to identify the setting or the stakeholders have been removed.

4.2   Research setting and context

The study investigates the implementation process of the same clinical information software in three settings within a large tertiary care teaching hospital in Dublin, Ireland.

The Software company

The software vendor ('Softmedco') is an international software development company specialising in healthcare applications, specifically patient information systems. Their core software ('Softmed') is a web-based application providing access to real-time patient information. The company reports that this is widely and successfully used in a range of healthcare settings in several countries in Europe and the Americas. Softmed is in use in a range of clinical speciality areas in a range of settings in Ireland including a national pilot project for a chronic health condition. The company is not based in Ireland and has no local office here. Softmedco emphasises its use of clinicians in sales and customer support roles. 'Project Managers' undertake a liaison role but (at least in ACME) do not undertake a recognisable project management role.

The Hospital

'ACME' hospital has all of the complexities of a typical large, busy hospital. It has a large catchment area. Demand for services exceeds capacity. Like all other publicly-funded hospitals, it is under increasing pressure to reduce costs and increase efficiency. Consultant-led medical specialities are under-resourced and under constant pressure, with long waiting lists. Medical consultants have significant power and influence within the system, with high levels of autonomy and authority within their own services and significant influence in the overall organisation.

Clinical Speciality Service 1

The first setting where Softmed was implemented is a new service. Clinical Speciality Service 1 (CSS1) was being set up around the same time that the software was proposed. There is one full-time clinical nurse specialist, working with a medical consultant (Prof3) who works with the service only one day per week. Although the service is described as a multi-disciplinary team, other clinicians (physiotherapist, occupational therapist, dietician, social worker and speech and language therapist) are working primarily in other clinical settings and are involved in the CSS1 team only when a referral is made to them. The clinical nurse specialist is the only clinician who is full-time in CSS1. This role was a new one, created for a new CSS1. There was an expectation that the role-holder would take on responsibility for Softmed and its implementation. The evidence is that the new CSS1 emerged, developed and expanded beyond the scope of other clinical services labelled 'Clinical Speciality Service 1' in other settings and is, effectively, a full geriatric assessment service.

The Clinical Speciality Service 2

The second setting in which Softmed was implemented is a different clinical Specialist Service - Clinical Speciality Service 2 (CSS2). The medical consultant (Prof2) heading both CSS2 and CSS3 is an active advocate of the use of ICT in healthcare settings and is known to assert the importance of developing electronic health records. He proposed and agreed the use of Softmed in both settings with the sponsoring pharmaceutical company and the IT department in ACME hospital. There is one full-time clinical nurse specialist in CSS2. New referrals are usually seen in an outpatient clinic by the consultant, his senior registrar or other doctors (junior registrar or interns). Review

appointments are usually undertaken by the nurse who also undertakes regular telephone consultations. The nurse is the only member of the team who is using Softmed.

The Clinical Speciality Service 3
The third clinical setting in which Softmed was implemented is a third Clinical Specialist area - Clinical Speciality Service 3 (CSS3), related to CSS2. This is also a new service, being run on a pilot basis with designated funding. One specialist nurse delivers this service, coordinates with the consultant and registrar and works with inpatients and outpatients. This nurse is an active and committed user of Softmed.

In both the CSS2 and CSS3 settings an individual nurse specialist works independently, linking with the medical consultant and medical registrars but essentially with control over caseload management and not working in a multi-disciplinary team environment.

The IT Department in ACME
Involvement of the IT department was limited to establishing access to Softmed on the hospital system. IT had no involvement in supporting clinicians in designing their assessment or in support around early use at the pilot stage. The IT manager involved from the beginning left his role in 2008. There were difficulties in establishing interfaces between Softmed and existing hospital systems (Patient Information and PIMS). The IT department in ACME hospital has an ICT Change Approval Process (CAP), involving senior ICT staff, that was set up to review, evaluate and prioritise requests for change within the operational environment. Communication from the IT manager to Softmedco in 2007 emphasises that the CAP "will only give approval to proceed if they are assured that the system has undergone comprehensive acceptance testing, the users have signed off this stage and that there are comprehensive implementation plans (including an implementation strategy)."

Communication between the IT department and Softmedco describes the implementation strategy for the Softmed project as "the system set-up (letters, questionnaires, data etc) would be done by the user as part of the acceptance test, so that the system set-up process when the application was installed on the Live LAN would be minimal".

Although recognising that these set-up processes had not been done, the IT manager proposed to get agreement with CAP, Prof1 and Prof2 to install the system on the Live LAN as a "pilot". In other words, the IT department proposed and agreed to suspend its own good practice and safeguards in relation to the implementation of new software in the hospital. No rationale is given for this in records available to the researcher.

The project implementation process: an overview
In early 2007, two medical consultants, 'Prof1', at that time heading a range of services including a new CSS1 and 'Prof2' heading CSS2 and CSS3, both advocates of electronic patient records, learned about Softmed patient information software, at a conference on medical informatics. A pharmaceutical company (Pharmaco) sponsored the licensing of Softmed software for 1 year in ACME hospital. With active promotion by Prof1 and Prof2, the clinicians in these settings were told that this software would be introduced, that it would have significant benefits and that Softmedco would work with them to customise the software to their settings.

In CSS1, the work of adapting the software for this setting coincided with the development of the new service. Prof1 was not now the medical consultant for CSS1, but continued to be involved in the Softmed meetings for some time. Prof1 and Prof2 were involved in making decisions about process, timing, version and linking with the IT department in ACME.

There are broad project sequences that software projects tend to follow (planning, requirements, design, development etc). There is little evidence of such a sequence in these projects and clinicians were unable to describe a sequence in action in their project. Data from electronic communication from a Softmedco 'project manager' for the work in CSS1 illustrates the detail of plans shared with the users:

> *"Due to the fact that the [CSS1] department in[ACME] Hospital are now having [Softmed] 3, the timescales that were given to you in the implementation document a while ago have changed.*
> *[Softmed] 3 will not be ready for launch until Mid-September 2007 therefore the set-up on Softmed & the training dates have had to be moved back.*
> *Please see the new timescales below & let me know if these are going to be suitable for you & your team....*

(Please note the set-up on [Softmed] is done at [Softmedco] head office & then approved by yourselves.)

Set-up on [Softmed]   15th October 2007

Training   31st October 2007

Go Live   7th November 2007"

Email communications record several proposed timescales and revisions to these but none has any more detail than in this example.

The CSS1 team undertook extensive paper planning of assessment forms, designing screens to be included in the software and identifying overlap between the assessment processes of different team members. Some seven different clinical roles were involved in this process. They had no technical support for this process and no-one on the team had ever been involved in such a process before. The Softmedco 'project manager' for CSS1 changed at least 5 times in the 3 years of project development.

While most communication was by phone and email, there were some face to face meetings and workshops with Softmedco personnel. A 'prototype demonstration' of Softmed for CSS1 in mid-2008. All member of the clinical team were present. Training for all clinicians took place in early autumn 2008.

The team in CSS1 worked over more than two years to develop and coordinate content for Softmed that was specific to each clinical speciality in the multi-disciplinary team. Despite considerable time and effort, the team decided to abandon use of Softmed in 2009.

The experience in CSS2 and CSS3 was quite different. The nurse in each service is using Softmed on a daily basis.

Although clinicians in CSS1 and the nurse in CSS2 attended Softmed training together, they were relatively unaware of the development of the software in the other setting.

4.3 Data capture, recording and analysis

Grounded Theory values data collected or available from a wide range of sources. In this study, the researcher actively collected data in the form of interviews and notes on interactions with stakeholders. She also had access, with permission, to contemporaneous records of communication throughout the project in CSS1.

There were a number of sources of data:

1. Copies of email communication (some 300 emails) between the software vendor and the CSS1 team, over some two and half years (with permission of the team and the vendor)
2. Diaries of the Clinical Nurse Specialist in the CSS1 clinic (with permission)
3. Samples of Notes from CSS1 clinic team meetings related to the software design and implementation
4. Researcher's notes on meetings, phone calls and interactions with personnel from all three clinical settings and the software vendor
5. Qualitative interviews with 6 clinicians: 4 members of the CSS1 team, the Clinical Nurse Specialist from CSS2, the Clinical Nurse Specialist from CSS3 team and with the Managing Director of Softmedco. These interviews were digitally audio-recorded (with permission) and transcribed using Microsoft Word.

Interviews

Interviews were sought with other members of the clinical teams, members of the IT department and representatives of Pharmaco. The ideal of interviewing all those involved had to be compromised with practical considerations of individual availability.

Initial contact was made with the key link person in each setting, who provided contact information for all clinicians and other stakeholders. The researcher made contact by email to outline the research and invite participation. The researcher offered to meet with the CSS1, CSS2 and CSS3 teams at the start and the end of the study: this offer was not taken up.

Those who agreed to take part were briefed in advance: the researcher sent each interviewee an overview of the research, an outline of the focus of the interview and a

consent form, which those interviewed were asked to complete. Copies of these documents are provided in Appendices 3-7.

No biographical information was sought from the participants and no profile of interviewees was undertaken.

The interviews were semi-structured and were conducted using an Emic technique: the broad focus was indicated and the interviewer responded to issues and details raised by the interviewee. Interviews lasted between 43 minutes and 1 hour and 18 minutes. All interviews with users of Softmed took place in the work setting of the interviewee. The interview and other conversations with the representative of Softmedco were conducted by telephone.

All interviews were digitally audio-recorded, with permission, and transcribed verbatim using Microsoft Word. The researcher also took written notes during the interviews and these notes were compared with the transcriptions for cross validation.

Missing data

In this study, access to stakeholders was limited to some current clinicians. While this included the key users of the software, important perspectives were missing. It was not possible to elicit the views of the IT department in the hospital, the hospital management or the pharmaceutical company that sponsored the licencing of the software for the initial period. The views of only one representative of the software company were included. These were significant and potentially different views on the process of choosing and implementing the software. In terms of a GT study, the researcher's failure to gain access to these perspectives meant that 'theoretical sampling', a requirement for effective 'saturation' of the categories, was not achieved. This is a significant weakness in the implementation of the GT approach and the researcher acknowledges that new or additional categories or relations could have emerged from these sources.

4.4   Data analysis

Chapter 5 presents the results of data analysis, using Grounded Theory analysis and coding. The sequence of analysis is described in Chapter 3. In Grounded Theory, data collection and analysis are interwoven: later interviews seek to deepen understanding

of issues raised in earlier interviews; notes, commentary, questions and memos linked to early understandings inform the shape and direction of later interviews and the reading of secondary data. To accommodate team members the interviews took place over several months (the first in February 2011 and the last in June 2011) and this allowed the researcher to test interpretations emerging from early interviews in later ones.

4.5   Validity and reliability

In a Grounded Theory study it is not possible to provide the reader with full evidence. Validity is most strongly supported by demonstrating the grounding of findings in the data.

Glaser (1978) and Goulding (2002) observe that narrative research design commonly seeks validation by confirming findings with participants. This does not work as a check on validity in Grounded Theory because participants may not recognise, understand or agree with the theory. Glaser emphasises that Grounded Theory is not just a reflection of the voice of participants: the meanings shared by participants provide data to generate abstract ideas which explain the experience. Goulding maintains that " credibility should be won through the theory's integration, relevance and workability and not by illustration used as if it were proof" (Goulding, 2002)p 91.

The researcher made use of a critical friend. This concept is proposed as an aid to managing quality and rigour in various literatures. It is employed to enable researchers to get feedback and provides another perspective on data analysis and the generation of knowledge (Zuber-Skerrit and Fletcher, 2007).

The researcher also made use of the checklists proposed by Miles and Huberman (1994) for ensuring validity and reliability of qualitative research, as follows:

Reliability
- Interview protocol was reviewed by peers.
- Interview protocol was adjusted in response to change in setting
- Data were collected from all available sources

Internal validity

- Data were well linked to the categories of theory

External validity

- Only three settings were included: broader sampling diversity was not possible given the constraints of this study
- Findings are partly supported in existing theory

4.6   Research limitations

The research was limited by the time and scope available for a Masters–level research study. There are significant gaps in the data and these are acknowledged. These missing data did not allow the researcher to achieve theoretical saturation in line with the requirements of a complete Grounded Theory. The researcher was not experienced in the use of Grounded Theory and in the formulation of theory in this context. There was no attempt to evaluate the software itself, or to assess its suitability for the clinical settings in which it was implemented.

4.7   Conclusion

The introduction of the same software led to different outcomes in these three settings. The purpose of the research activity, data collection and analysis is to investigate what led to these differences.

Chapter 5.   Findings

5.1   Introduction

This chapter presents the results of Grounded Theory analysis of data. The data analysed include extensive electronic records of communication between the software vendor and one clinical setting, samples of written records of project meetings, email communication with members of all three clinical settings, researcher notes on phone and email communication with software vendor and notes and transcriptions of seven semi-structured interviews. Direct quotations from research participants (transcriptions or written notes) are used to illustrate particular codes.

5.2   First level coding: Open Coding

Open Coding involved in-depth reading and re-reading of written notes.   Distinct variables or concepts were allocated codes, based on 'incidents' of these concepts occurring in the data. This stage of coding was readily undertaken and captured using word processing software. The codes used were as concrete as possible, using language from the data wherever possible. Codes at first level coding are considered tentative or working codes in Grounded Theory. Thirty two distinct categories emerged. Table 5-1 summarises these codes and the distribution of incidents of these codes across all sources of data.

Table 5-1: Codes and distribution of incidents of codes across all sources of data at Open Coding

Tentative Codes	Clinical Speciality Service 1 Team interviews				Clinical Speciality Service 2 interview	Clinical Speciality Service 3 interview	Electronic/ emails	Researcher notes	Vendor interview
	FT1	FT2	FT3	FT4	RT1	OT1			
Not here from the start : confusion about history, origins/choice/rationale	*	*		*		*		*	
Changes in personnel – theirs/ours	*			*			*		*
Not clear why this software was chosen	*							*	
Figure and Ground (detail vs big picture)	*					*			
My role/role of consultant	*			*	*	*		*	
Confusion about roles	*		*	*			*		*
Different experiences for different team members	*					*			
Interest from others (outside)	*				*				
Expectations of software	*	*	*	*		*		*	

Concerns from the start		*	*					*		
Failure of first workshop/workshop in clinic		*				*				
Promises		*	*		*	*		*	*	
Failure in Communication (changes in personnel)		*	*		*	*	*			*
Failure to understand CSS1 needs		*	*		*	*		*	*	*
Problems with software		*	*		*	*	*		*	
Problems with design of software/difficulties in using software								*	*	
Positive features and benefits		*				*	*			
Complexity of CSS1										
Simplicity of CSS3			*				*			
New service (difficulties/benefits)			*		*		*		*	*
Time		*	*	*		*		*		

Pilot	*						*		
Pressure and demands on Clinical Nurse Manager	*						*	*	
Decision to pull out/process of ending	*	*	*	*				*	
Site visit by vendor	*				*		*		
Outputs – quality of the letter		*							*
Involvement of IT		*			*	*	*		
Issues of authority			*	*				*	*
Tolerance of process	*		*		*				
Learning from the process			*						*
Process of development – linked to communication/Time		*	*	*					
Persistence (balance frustration/benefits)					*			*	

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5.3   Second level coding: Axial Coding

Activities during Axial Coding refined the categories from the Open Coding process and identified properties and dimensions of these categories (including features such as duration, intensity, frequency, affect, impact, timing, importance). Through Axial Coding, the researcher worked to identify more general and abstract categories of which the categories identified in Open Coding were instances. The significant confusion that characterised this coding process has been identified as 'a healthy state for a Grounded Theorist' (Scott, 2009).

In the overall context of a Grounded Theory approach, the researcher used three main techniques of qualitative data analysis in combination: coding, analytical memos and data displays (Miles and Huberman, 1994). Codes and categories were developed following the constant comparative methods described by Glaser and Strauss (1967). Codes were established as 'substantive 'or 'core' codes when they met the criteria suggested by Strauss and Corbin (1998) (see Appendix 8) for identifying a core category.

Four substantive codes were eventually identified in the course of Axial coding:

- Roles
- Communication
- Authority
- Investment: Return

Each of the substantive codes, with related codes is described here. The core category and satellite categories, as well as relationships to other substantive codes are depicted in a figure first, followed by a discussion on the category. Examples of 'incidents' from which the category is constructed are given in the form of quotations from transcriptions.

Substantive Code 1: Roles
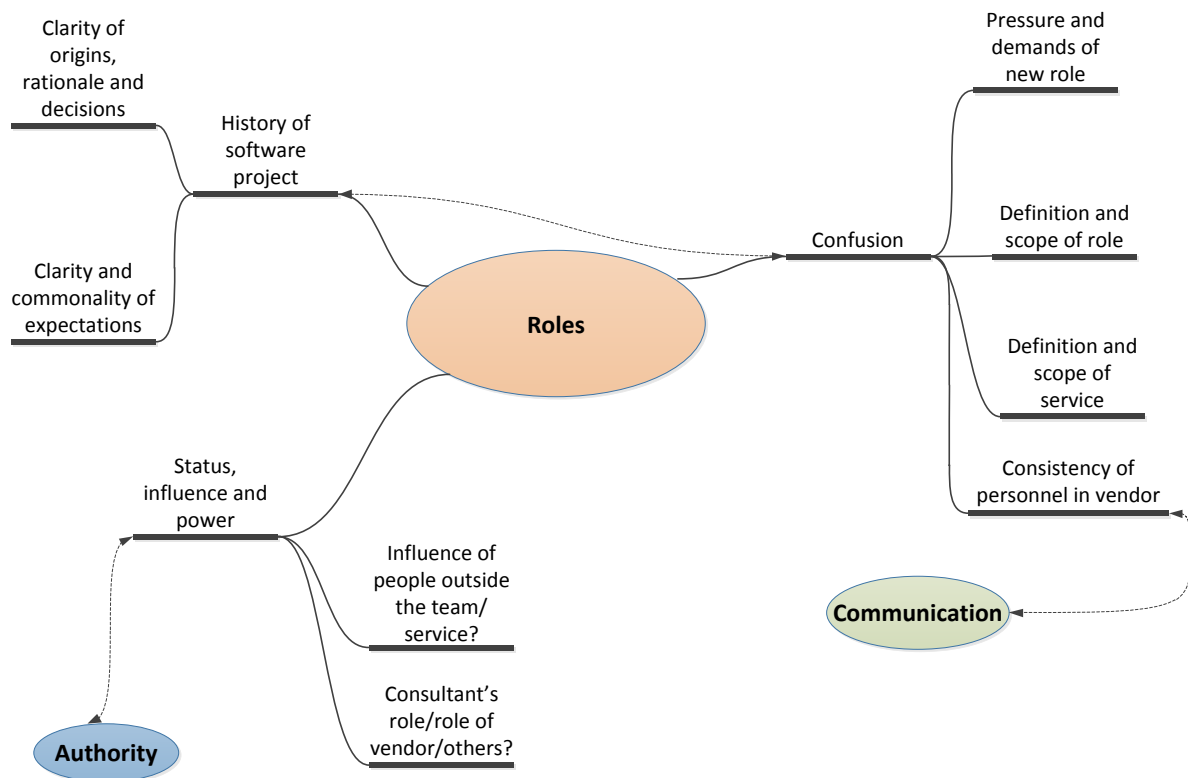
Figure 3: Substantive Code 1: Roles

The substantive category of Roles, summarised in Figure 3, reflects the importance and complexity of roles in this study. This includes the categories: History of Software Project; Confusion and Status, influence and power.

History and Origins of Software Project   (category: History of Software Project)
No-one now involved in the software implementation was clear about the origins of the work or able to describe how and why decisions about use and development were taken. Many clinicians assumed that the decisions were taken by the IT department or by management. Some were aware that a pharmaceutical company had sponsored the licencing of the software for the hospital and assumed that the software was chosen because it was free. Important decisions were made before they became involved and

they had never asked, or been told, what those were. The medical consultants involved with the services were thought to have had an important influence.

> *to this day I don't know why [Softmed], …it just appears that they were offering this on year's free trial and because it was… … available it was the best option. So we didn't get a chance to look into what else would be out there…(FT3)*

Email records make clear that the change approval process associated with software implementation was suspended in relation to this software. No rationale is given for this.

Data from a range of sources make clear that team members had diverse expectations for the software, that expectations were not made explicit and that some of the assumptions about outcomes were only surfaced towards the end of the project (in the case of CSS1).

> *We only discovered that the letter was so important almost at the end (vendor)*

Confusion about roles, responsibility and authority (category: Confusion)
There is a marked difference between the clarity of roles in relation to CSS1 (where the software has 'failed') and CSS22 and CSS33 (where the software is in daily use). The clinical nurse specialist is the only clinician who is full-time in CSS1. This role was a new one, created for a new CSS1 service.

> *all I remember really is when I started in the job …this [Softmed] thing kept being brought up. I didn't even know what it was. At one stage I didn't know was it a piece of medical equipment. I had absolutely no clue what it was. (FT4)*

Data suggest that the contexts were quite different in CSS1, CSS2 and CSS3 settings (see 4.2 Research setting and context). The new CSS1 emerged, developed and expanded beyond the scope of services called by the same name in other settings:

> *I think that as we started to work through [Softmed] [it] became more apparent, that very often …[what] is supposedly a [CSS1] assessment, it's really a comprehensive geriatric assessment and … the difficulty in capturing that. (FT2)*

The context of a new service, with new roles and changing membership of the clinical team is seen as contributing to the confusion around roles. The view of the vendor is that set-up is a good context in which to develop and use software:

> *It's the right time, to get people into the habit of using it and …making it just an everyday part of the work from the beginning (vendor).*

The CSS1 team attribute increased confusion to the multiple changes in personnel in the vendor company. This also relates to the core category of Communication and will be discussed in that context.

Status, influence and power in the organisation   (category: Status, influence and power)

There are different levels and forms of influence and power associated with different roles in these settings. Significant influence in decisions related to this software and its use was exercised by people outside the clinical settings. The decision to adopt the software did not involve those who were expected to adapt and use it. Clinicians with significant responsibility for developing the content of the software did not experience themselves as having the authority to make demands on the vendor, to require the delivery of any aspect of the project, challenge progress or withdraw. This clearly reflects issues of stratification of power within the health environment and within a specific team, as well as issues of influence in relation to the vendor.

> *… we were all frustrated …but … nobody wanted to be the one to say it and …coming towards the end of the design process, …[Prof3] came in then … [Prof1 and Prof2 who had initiated the use of the software] were gone off the scene…. So I certainly didn't want to be…, 'hey what do we do with this? It's not working. We're wasting loads of time' (FT3)*

Four out of seven clinicians, in all three settings, raised the issue of politics and power in the organisational context.

Front-line clinicians did not experience themselves as having status or influence with the vendor. Their understanding was that medical consultants (who were not involved in the process of development) had great influence with the vendor. There is evidence that consultants saw themselves as having the authority to criticise, demand or require and, in the case of CSS2 and CSS3, would exercise this on behalf of the clinicians using the software.

> *[Prof2] did say to me, 'send me on your latest e-mail' and he will take action because he was just fed up at this stage. … [Prof2] said to me, 'you're too nice….cc it to me and I will sort it'… I think he's just feeling on our behalf that he just wants… them to know that he has now discovered that this is still going on and changes are still not made and he's getting cross now. (RT1)*

Substantive Code 2 : Communication
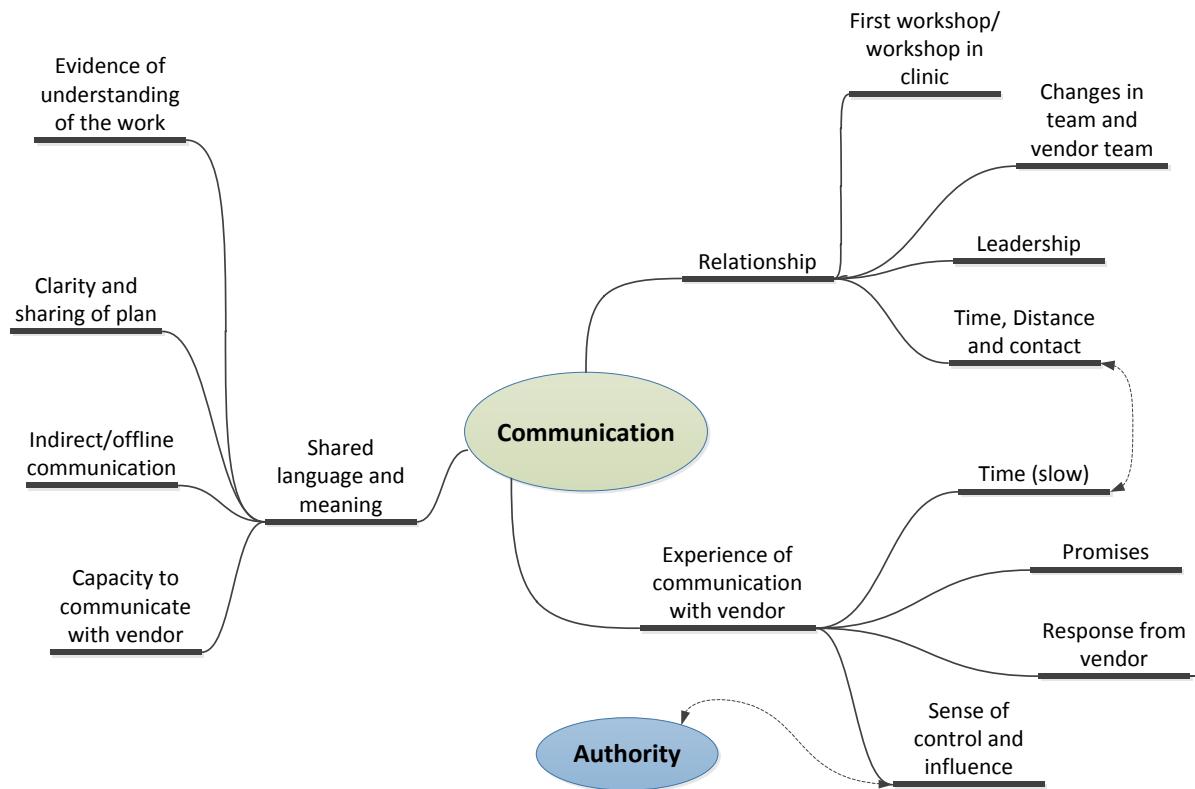
Figure 4: Substantive Code 2 : Communication

Difficulties in communication and associated problems were the most commonly cited issue across all forms of data. The substantive category of Communication summarised in Figure 4, is made up of the related categories of Shared Language and Meaning, Relationship and Experience of communication with vendor.

Language and meaning shared between vendor and users (category: Shared Language and Meaning)

In the view of clinicians, the vendor did not understand the work of their service.

> *… I didn't get the feeling that they ever really understood the complexity of the subject matter that we were dealing with (FT2)*

… throughout the whole thing there was a sense of, 'they just don't get it. They don't get what we need '… They're not clinicians so I'm not saying they should know what we need but they didn't put any effort into improving their understanding of what we needed. (FT1)

A number of those involved commented on communication that took place 'backstage' involving actors other than those involved in the clinical settings. Communication between medical consultants and Softmed at the start of the project has already been described. The software company had contacts with the IT department in ACME hospital without involving clinicians. The participants felt excluded from project planning and decision making.

In this project… Softmed is out there … You're here … and there's this gulf between … and there is a potential role …for the local IT system. …just even someone that you could ring and bounce things off, …I never have any contact with them [IT department] really, I mean any time that there have been any problems or any of that … Softmed were … e-mailing the IT department. (OT1)

Clinicians in all three settings questioned their own capacity to communicate with the vendor. Their assumption, when the vendor would not undertake a change that they had requested, was that they had failed to communicate adequately. There were no processes for confirming understanding of what was agreed.

Am I not … expressing to them effectively what I want and what my needs are and what we want? (FT4)

… you have to try and understand a language that they're talking, that we're not used to, you know, which I think is a massive barrier.(OT1)

Relationship between users and vendor   (category: Relationship)

Both those describing the work as a 'success' and those describing it as a 'failure' identified the relationship with the vendor as a significant influence on the process and outcomes of the work. The elements of the relationship included consistency in personnel in the vendor: CSS2 and CSS3 had a consistent relationship with a single contact person in the software company which allowed them to establish a relationship, to ensure that the understanding of the link person was increased over time and to refer back to earlier work in the development process. In contrast, the CSS1 team experienced many changes in personnel:

> *the generation process was happening at this end quite actively and a lot of work being generated and that was disappearing off into a… hole, we didn't know where it was going, we didn't know who was in charge, we'd get different names every time… (FT4)*

From the vendor's point of view, CSS1 setting lacked strong leadership driving the project forward.

Clinicians in CSS1 gave practical reasons for the failure to develop an effective working relationship:

> *the other reason why …the process went on so long as well was that they were working from [outside Ireland] … they weren't able to come over … we'd do sort of conference calls … I really felt they didn't get it. …., if they were in and out a bit more … it would have been clearer sooner. (FT2)*

Experience of Communication with Vendor   (category: Experience of communication with vendor)

The software implementation process extended over a long period of time (some three years). Clinicians recognised that the slow pace was a result of the nature of the service and the limited availability of clinicians, as well as delays by the vendor.

> *My sense of it is … it was drawn out over such a long period of time*
>
> *…because of the amount of times we tried to say the same thing to them.*
>
> *…it could have been done in a much shorter space of time (FT1)*

Clinicians in CSS1 setting experienced a repeated sense of being promised changes which never materialised. They report disappointment with the software actually delivered, which continued to be accompanied by the promises of changes in the future.

> *they kept on reassuring us…,' when you see the letter you'll be surprised, it will be much better than you think it's going to be' and… they were quite slow …to actually show us the letter, the finished product, …what we wanted to see was what is the letter going to look like so when they did show us a sample letter we were very disappointed …we kept on getting told, … 'when you re-format it and add in these other pieces it will be fine' but you know, that wasn't the experience. When we'd see the letter, … we had a lot of concerns with it (FT2)*

Team members in CSS1 report their sense of not influencing the vendor successfully: in particular, the clinical nurse specialist with most responsibility for the project reported a sense of frustration that her efforts to elicit responses and achieve the changes required did not work.

> *I wasn't strong enough in a way with [Softmed] . I was strong enough eventually and their lack of professionalism. I … was absolutely strong enough to walk away from them [in the end] … I knew, … ' that's not what we asked for'. (FT4)*

In contrast, although clinicians in CSS2 and CSS3 had criticisms of aspects of the software design and interface and were frustrated at the delays in making changes they had proposed, the software was of benefit in each setting. Both individual clinicians using the software in these two settings reported satisfaction with the elements of the

software they were using. Critically, each of these clinicians had high levels of control over the ways in which they used the software, required limited input from others in order to achieve the benefits they sought from the software and reported optimism that the vendor would make the changes they required and that they could convince others of the benefit and utility of the software.

In CSS3, the clinician reported significant control and autonomy, as well as responsibility and authority:

> *A lot of it was just done off my own bat though…, about eighty per cent to be honest… was done off my own bat. I just got stuck into it, you know. I suppose I believed in the simplicity of it... I just knew that it was the way to go. (OT1)*

In CSS2 and CSS3, clinicians had a view on how the software was positioned in the overall hospital environment and could envisage that the involvement of the IT department would support development and implementation:

> *you would need, I suppose, starting off, people to really meet on a regular basis from all backgrounds, you know, to kind of… to develop it …quicker and so that you can communicate your needs to the IT people. And sometimes I suppose with the IT people working here they're probably used to health professionals trying to maybe bring in electronic… they're used to rolling these things out for staff. So they're probably used to, to a degree, how we think. They can probably bridge that gap, you know. They've been a missing component…(OT1)*

Substantive Code 3 : Authority
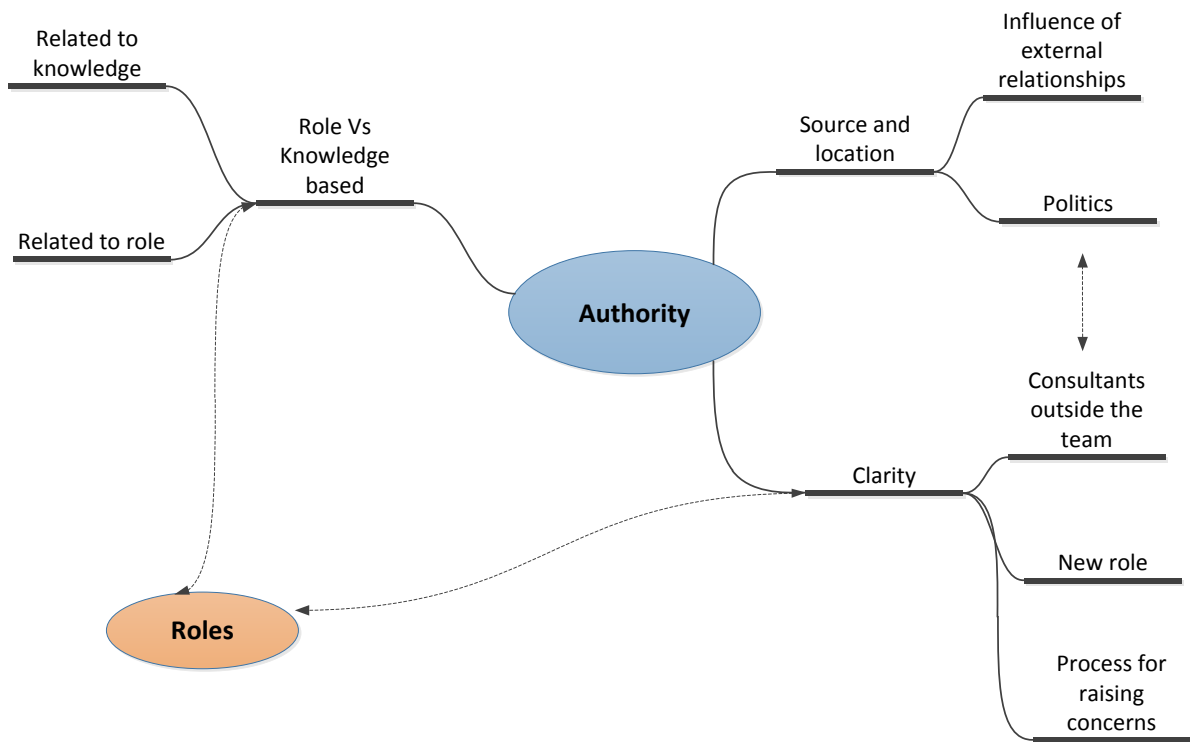
Figure 5: Substantive Code 3 : Authority

Issues of Authority influenced every phase of these software projects, from initiation to the present. Issues of authority are present in every group and organisation. Current thinking offers a typology of authority as summarised in Table 5-2.

Type of Authority	Arising from:
Bureaucratic Authority	Hierarchy, Rules and Regulations, Formal Mandates, Role expectations
Personal Authority	Charisma, interpersonal skills, leadership skills
Technical-Rational Authority	Logic, scientific research
Professional Authority	Technical knowledge and personal expertise, demonstrated skill
Moral Authority	Evidence of behaviour according to agreed values, ideas and ideals

Table 5-2: Types and Sources of Authority

(Sergiovanni and Starratt, 2007)

The substantive category of Authority, summarised in Figure 5, is made up of three core categories: Clarity, Source and Location and Role Vs Knowledge-based.

Lack of Clarity about Authority (category: Clarity)

Confusion and lack of clarity have been features of the history and development of the projects. Participants, especially clinicians, were not clear about many aspects of the work.

> *I couldn't stand up to [the] consultant – I assumed someone else knew where this was heading and that it was OK. There always seemed to be work for us to do on it so I assumed there was an overall picture and that someone else had it (FT3)*

Critically, the users were not clear about their own authority to critique or influence the process or outputs. In CSS1, this was related to the inexperience of the clinical nurse specialist, who was the first role-holder and inevitably carried significant pressure and anxiety; to the time and attention of the medical consultant, who was only available one day per week and to the nature of the team, which was multi-disciplinary in nature with resources and availability that were outside the direct control of the CSS1 team.

> *I was just in the door, brand new, and I wasn't going to question anything*
> *(FT3)*

In contrast, CSS2 and CSS3 are not multidisciplinary teams, so the nurses in these settings have significant authority to bound and manage their own work. A similar contrast is evident in relation to processes for identifying and acting on concerns. In CSS1, it was left to the clinical nurse specialist to establish a process for eliciting feedback from other clinicians on the team and to pass these on to Softmed. In CSS2 and CSS3, nurses had responsibility for identifying and documenting only their own needs and issues with the software; when they were dissatisfied with the response from Softmed, the medical consultant would take up his (greater) authority to 'get cross' with the vendor.

Source and Location of Authority   (category: Source and Location)

The significant influence and authority of actors outside these clinical teams is evident. The decision to sponsor the licencing of the software in this hospital was taken outside the organisation. The 'backstage' nature of these examples of the exercise of influence on the adoption and use of the software reinforces the sense that this is a highly political environment. Who can make decisions about investment in resources – including time and personnel - and with what authority, is closely bound up with status in the hospital setting. The users of this software were not authorised to decide, agree or withdraw, nor were there any processes for monitoring their experience of working with the vendor. As 'followers', they were largely left to their own devices. The 'leaders', who initiated the process, seem not to have been involved in any systematic way in the experience that resulted from the decision to use the software in these settings.

Authority … and confidence as well … in your professional role, it was a brand new post so I wouldn't have known [Prof3] that well. …so it was …just keep it going, keep it going, you know, it will get there. It will get there eventually (FT4)

Role Vs Knowledge-based Authority (category: Role Vs Knowledge-based)

The exercise of authority in this organisation arises primarily through formal roles and structures. Medical consultants carry significant professional authority which is confirmed through bureaucratic authority, associated with personal or moral authority. Medical consultants had the authority to propose and agree the adoption of a patient information software programme. There is no evidence that there was any technical-rational authority at work in this decision – that the consultants who commissioned the software project knew anything about software selection or implementation. Nor does it appear that there was any recognition of the need for technical knowledge related to software/IT.

In all three settings, clinicians equipped almost exclusively with technical knowledge related to their professional roles were required to undertake the work of designing and customising software with the support (in relation to the process of implementation) of the software vendor.

In CSS2 and CSS3, the individual nurses independently discovered existing adaptations to the software that were specific to the two specialities, through external links and professional contacts, not thorough the software vendor. Their work is largely under their own control: they do not require the involvement and agreement of others in order to generate useful outcomes from their use of the software. These two nurses, through their own motivation, work and application, were able to exploit their expertise in one professional domain to elicit a response from another professional domain.

In contrast, the CSS1 team were not able to elicit the changes they needed from the vendor. The work in this setting required the involvement and agreement of up to seven different disciplines. The skill, expertise and experience of clinicians in relation to the assessment of patients in the CSS1 clinic were not translated into an outcome that met

their professional needs. In fact, clinicians in the CSS1 setting took up most authority in relation to ending the project. They were able to articulate this quite clearly: the inadequate and unsafe output (in their view) made it possible for them to act in the interests of their patients (invoking moral authority).

> *And in the end I suppose, … when it blew it was just like … now I can stand by [the decision to abandon Softmed] because it's affecting patient care and that's not happening and that's the bottom line so….no. (FT4)*

In CSS2 and CSS3 both nurses developed a positive sense of mastery of the software programme

> *you see I'm using it every day. …so I know it like the back of my hand…and I see the benefits… the benefits just … so outweigh the limitations for me. (OT1)*

In CSS1, neither the process nor the outcome was satisfactory.

> *You couldn't send out those letters, …to the GP. There wasn't really any sense of cohesion to them. It just came out … a jumbled sort of… jargonistic, … and …you didn't get a feeling for what was the bottom line except what we would do at the end is put in a kind of a summary ourselves of free text… of typing the whole thing in. So in the end actually it was becoming much more lengthy, … to develop a poor quality letter(FT2)*

Substantive Code 4 : Investment: Return
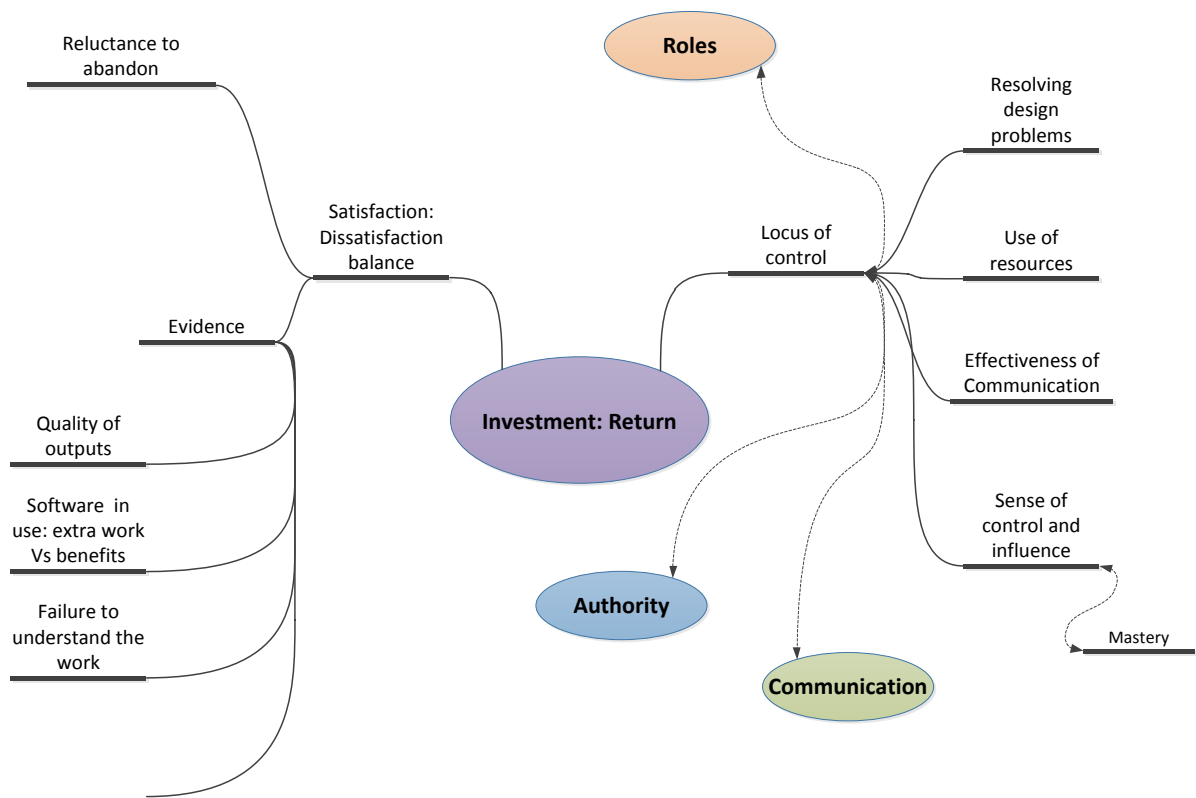
Figure 6: Substantive Code 4 : Investment: Return

All those interviewed reported what they had put into the process of implementing the software and what they had got out of it. The major codes related to Investment: Return are Satisfaction: Dissatisfaction Balance and the Locus of control. These are represented in Figure 4.

Balance between satisfaction and dissatisfaction with process and outcomes

(category: Satisfaction: Dissatisfaction Balance)

The balance between satisfaction and dissatisfaction varied across the course of project implementation: different people felt more or less satisfied at different times and in relation to different aspects of the project. Clinicians in all settings expressed their reluctance to abandon the work or to give up on what they hoped for. Even those

expressing frustration at the slow pace or progress were able to remember what they expected to achieve.

> *I was happy enough to take this on board and I could see the real benefits of it because you'll always have a record in front of you. There's no chasing … down to medical records looking for a patient's chart. Once I've first inputted everything into it … (OT1)*

In CSS1, the imbalance between satisfaction and dissatisfaction became intolerable. The team could find no evidence of progress towards a workable system: the quality of the main output (in the form of letters to GPs) was poor, the software required significant additional work, the design and framework continued to have faults and it was more time consuming than the system it was supposed to replace.

> *I was very cross, really angry, … that it was finished and we got nothing out of it. So I wasn't relieved … I was really just frustrated and cross, …(FT3)*

The CSS3 nurse identified the investment he had made in helping others to understand and use the software and had insight into the differences between features of software design that affects new users and the mastery that he achieved through familiarity and regular use.

… [Prof2] … should have been with patients for forty-five minutes. They were with patients for nearly an hour and a half… that [software] should be speeding it up, not … [making it slower]. But I put so much energy in going down to the clinics and facilitating them to try and use it …I was saying, 'oh you just do that and then go down there and then go over there' and I had it all in my head. (OT1)

Locus of Control and Influence on process and outcomes   (category: Locus of control)
Evaluation of the return on the work and time involved in this project was closely linked with participants' sense of where control and influence was located. In CSS2 and CSS3

nurses had a strong sense of being in control, able to use the software well and able to anticipate improvements that they expected to happen.

> *We don't want to have to work to their way of doing it, it should be intuitive in a way it's not intuitive (RT1)*

They were successful in resolving (some) design problems, both by discovering relevant resources elsewhere and by invoking the authority of their medical consultant in challenging the vendor. They evaluated their time in the software project as a good use of resources: they could see a return and benefit in using a range of different features of the software.

> *I'm still sticking with it because when you get past those initial bits it's…click, click, click, and you know, you can put it in… your letter can be there and then when I see the patient the next time all my data is there. And the other thing that I've done with it which I've found very useful is that I've asked them to put up a telephone consult page… both myself and [OT1] are using that … it's on a one page document and that all gets counted and it will also count the time that we spend on the telephone. And that is brilliant… simple, straightforward, click, click, click. But there's too much writing (RT1)*

They had good experiences of communicating with the vendor since they had a single consistent representative of the vendor. When they had problems in communicating or getting a response, they could ask their consultant to 'get cross' with the vendor.

They had a strong sense of control and influence over their involvement in the project: they were actively choosing to continue to use the software, despite the negative view of the software held by their consultant. Their regular use of the software gave them familiarity and mastery of the technology. They were optimistic and positive about the future and their capacity to get the vendor to make the changes they sought. They have an assertive view of their experience and expect the vendor to pay attention to this.

> *I sent her an e-mail you know … last week… myself and [OT1] just said 'listen, …the big problem is this page two, change it. Put in the icons'. But they haven't actually done that yet and we've asked …for a tele conference …so we're going to… lay this on the line and say … 'sort it out'. (RT1)*

These clinicians act with authority and see control of their use of the process and product as located largely with them. The experience of clinicians in the CSS1 setting is different. None reports a time of feeling satisfied with the progress of the project and all consider that the time and effort involved has not delivered a worthwhile outcome. Clinicians did not consider that they had control over the process or product. They were unsuccessful in resolving design problems.

> *they would say, 'but this is what you asked me'… it's nothing remotely what we asked for (FT4)*

> *they didn't understand how the work was done and also they didn't understand what information that we were getting from the patient needed to be put into the system and then …how it would work into our day (FT1)*

They felt that they had no choice but to invest the considerable time and effort they had and that this had not achieved a good return.

> *…I felt that it was a complete waste of my time …and my resources…and that I would be far better off quickly dictating a letter and moving on and seeing an extra patient then spending hours editing letters. (FT2)*

Clinicians in CSS1 did not experience themselves as communicating effectively with the vendor, related to multiple changes of personnel and their sense that the vendor did not understand the work of the service.

>*I used to always get the impression from them that I used to be annoying them. …, that …I was being really fussy and finicky (FT4)*

Since they never experienced a flow of work involving the software, none of the clinicians achieved a sense of familiarity or mastery of the software.

5.4   Summary: Axial Coding

The output of Axial Coding is a set of 'saturated 'categories, that is, robust and discrete categories which accommodate all the data. These categories (Roles, Communication, Authority and Investment:Return) were considered both as separate theoretical constructs and in terms of the relationships between them. Figures 3, 4, 5 and 6 all indicate links and associations between categories.

5.5   Conclusion

This software project lacked explicit systems, structures and processes for its planning, design and overall management (e.g. routine project management). In their absence, the users in all three settings used the only framework available: the existing organisational structures and processes. The roles, authority and communication that already existed in the three clinical settings were not adequate for a successful implementation process: the absence of relevant IT expertise and leadership, the missing project management foundation, unclear goals and failure to acknowledge the distinctive team and service contexts all made implementation failure more likely.

Moghaddam describes the work of developing grounded theory in three stages (Moghaddam, 2006). Stage 1 involves the collection and analysis of the data and demonstrates the origins and processes of constructing early concepts and categories. This has been described in some detail in this chapter and makes clear the connection between the data and the categories (Goulding, 1999). Stage 2 involves increased abstraction of the concepts and attention to the framing of theoretical meaning. The diagrams and narrative describing the process of Axial coding show how concepts were developed. Stage 3, described in Chapter 6,   'presents the theory, bringing together the concepts and integrating them into categories which have explanatory power within the context of the research' (Moghaddam, 2006) (p 57).

Chapter 6. Analysis and Discussion of Findings

6.1   Introduction

This study set out to understand what factors led to different outcomes in software implementation in three clinical settings, with a specific focus on how the process and the outcomes were understood by those involved. In this chapter, the final stages of analysis are described and the findings of the research are discussed in the context of existing research and knowledge.

6.2   Third level coding: Selective (Theoretical) Coding

In the final stage of coding, the description of relationships between saturated, core concepts form a 'grounded theory', taking the form of a statement about what has been found that integrates all other categories.

Representing relationships

A single key category did not emerge from the four substantive codes in the course of several passes over the categories. The researcher was conscious of the requirement not to force the data. The connections and relationships between categories became apparent in the course of this work. After several iterations, a first graphic representation of possible relationships was developed. This is given in Figure 7. The central category was not named at this point, but the researcher considered that it was related to the substantive codes but was not one of them alone.
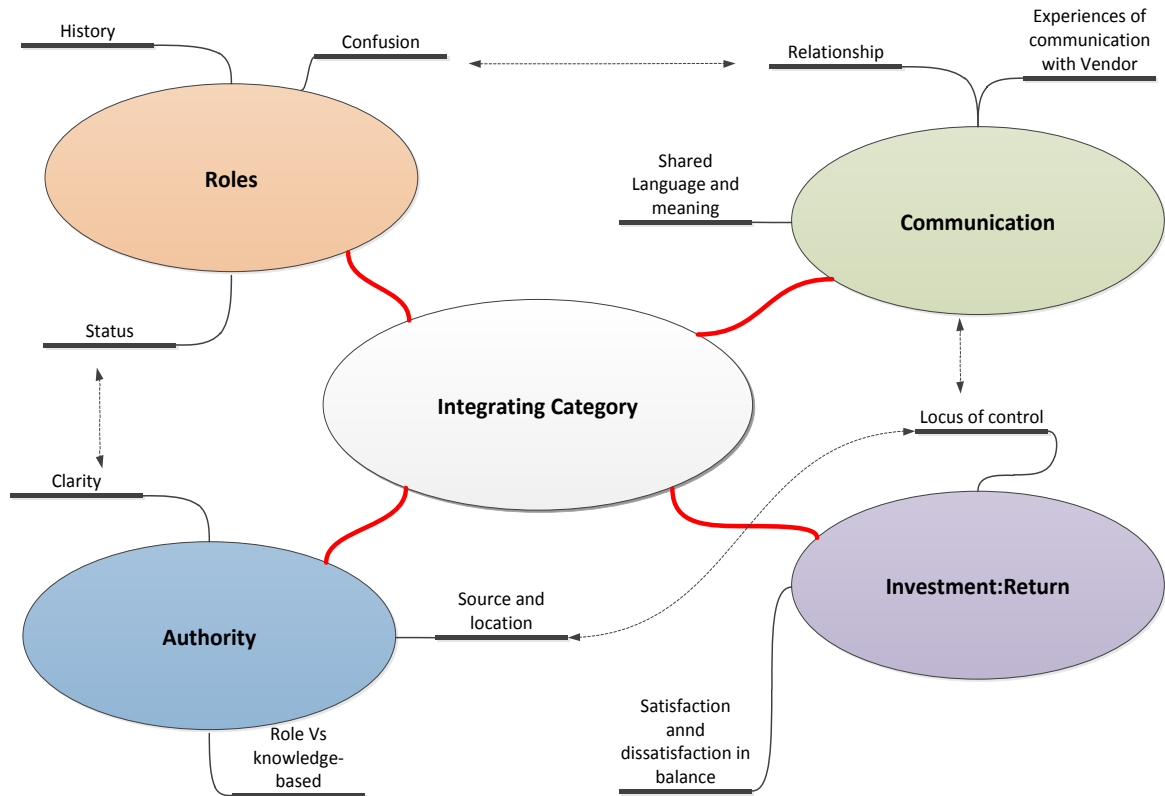
Figure 7: Relationships between substantive categories – first representation

Further work highlighted a discrepancy between the significance of the category 'Investment: Return 'and the other three substantive categories 'Investment: Return' was removed as a substantive category and its indicators re-categorised as dimensions and properties of other categories.

An interim framework

Following Scott's advice to find the theoretical code that 'best organises your substantive codes' (Scott, 2009), the researcher explored a number of frameworks for organising and relating the three substantive codes. In this study, Roles, Communication and Authority are made up of sets of variables that interacted in a dynamic way with both the **Process** of the project (how it was understood, proposed, designed and implemented; who shaped it, how and when) and the **Product** (both the actual artefact

of the software but also the implicit and explicit contract between stakeholders and the concrete outputs and outcomes of its use).

An interim framework is given in Figure 8. This figure represents the experience of the clinicians. Because of the way in which the software project was conceptualised and managed, existing roles, authority and communication were the default context in which the project took place. Roles, authority and communication specific to the needs of the project are shown faintly, to demonstrate their absence in this project. The dimensions of the software project process and the product are shown: none of these were analysed or planned for at any stage of the software project.
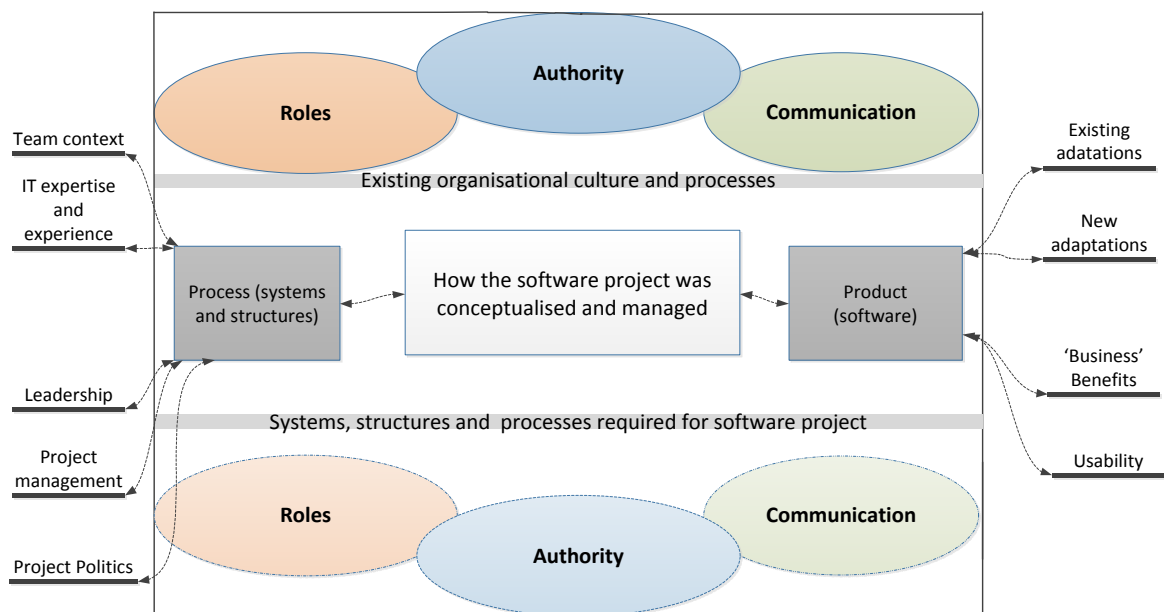
Figure 8: Interim framework for organising and relating three substantive codes.

The interim framework was a first attempt to explain the relationships between the three substantive categories, their dimensions and properties and the data from which they emerged. The overall aim of this research was to develop constructs to explain 'success' and 'failure' of software implementation, so constant testing against this goal was undertaken in the course of development.

6.3   The integrating category: A Grounded Theory

The final version of the explanatory framework is given in Figure 9. This locates Successful Change at the intersection of (assessment of) Needs and (change) Management, both significantly influenced by Roles, Communication and Authority. The dimensions of Needs and Management identified in Figure 9 are grounded in the data through participants' experience of their absence in these projects.

In this implementation process, there was no analysis of needs to be met through a patient information system, a range of options for meeting these was not considered, stakeholder expectations were not surfaced and clinicians were not involved in agreeing the goals and appropriate measures of success.

There was, effectively, no management of the software project as an innovation or change: no design process, no planning process involving users, no clear leadership, no involvement of relevant IT expertise in ACME in set up and no process of on-going review or evaluation.

The Grounded Theory represented in Figure 9 locates the change process in the overall context of the organisational structures and processes, acknowledges the Authority, Roles and Communication in the organisation and also (as made clear in Figure 8) addresses the distinct systems, structures and processes required for the change (i.e. the software project).

Analysis

Options for delivering

Expectations

Stakeholder involvement

Authority

Needs

Communication

Successful Change

Roles

Management

Organisational Structures and Processes

Review and evaluation

Analysis

Design

Leadership

Relevant expertise

Planning
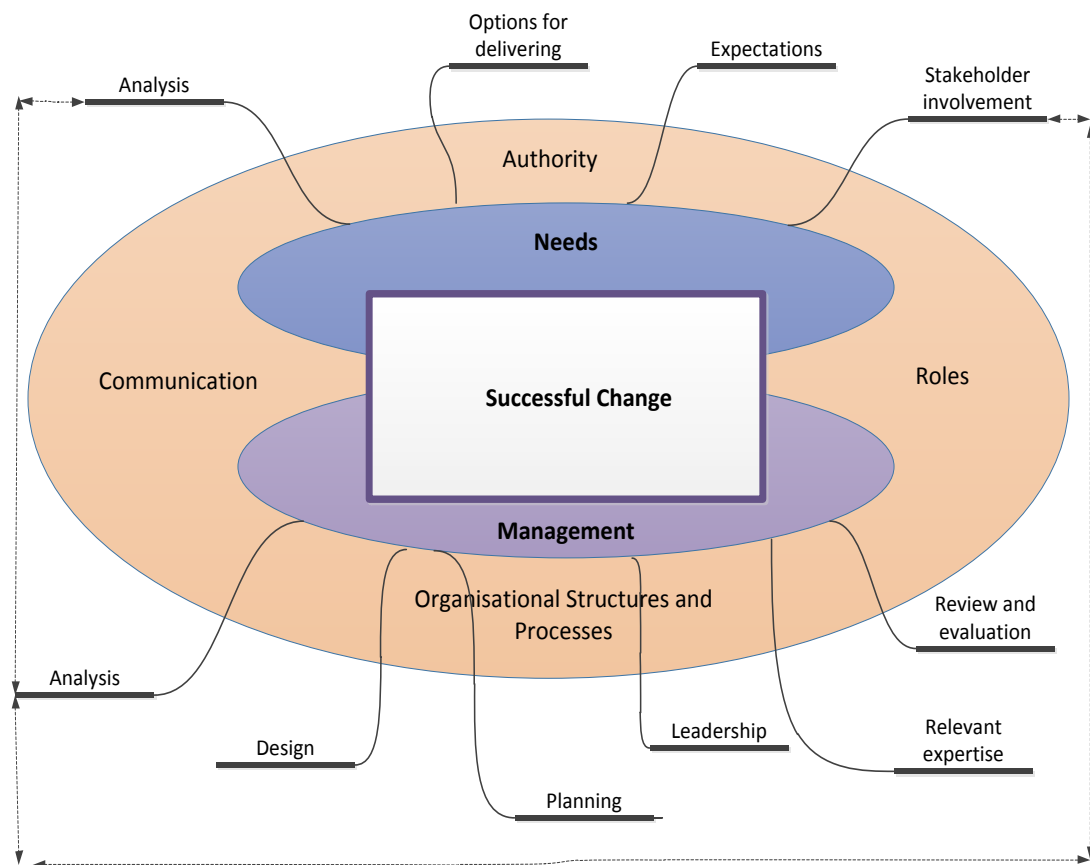
Figure 9: Framework for organising and relating substantive concepts to explain the dimensions of success and failure

The Grounded Theory describes Successful Change, rather than successful software implementation, because a valid Grounded Theory should transcend the specific context of the data from which it is generated. If this framework for understanding this experience of 'success' and 'failure' is theoretically sound, it should apply beyond the specific context of these three clinical settings and a software implementation project.

Accurate assessment of need and skilled management of the change process, in the overall context of existing organisational structures and processes emerge from this study as important considerations. The following sections examine these findings in the context of existing research on ensuring success in IT projects.

6.4   Measurement and Evaluation of success and failure

The literature commonly adopts measures of time, cost and quality in evaluating IT projects. Increasingly, research suggests the need to include other dimensions (Atkinson, 1999) or proposes mechanisms other than project management to support successful ICT development (McGinnes, 2011). With no mechanism for managing implementation in these settings, there was no systematic assessment of these or other aspects of the implementation process.

Time and Cost

There was no agreed timescale for implementation. Project timescales (essentially, dates) suggested by the vendor were revised, new timescales were proposed, project work did not seem to relate to the timelines and all clinicians expressed frustration at the slow pace of progress. Research predicts failure under these conditions (Remenyi et al., 1995 &1998). Advocates of effective project management, risk management or benefits realisation would suggest that the successful outcomes in CSS2 and CSS3 were unlikely (Remenyi and Sherwood-Smith, 1998, Ambler and Constantine, 2000).

Users of the software had no information about the overall cost of the software implementation. Some users knew the cost of the annual licence for the use of the software in their clinical setting, but no attempt was made in any setting to estimate the other costs of implementation (time, opportunity cost, training, hardware costs). There was no review process within or between clinical settings to estimate the cost and benefits of the software implementation. There is no evidence that any record of the process or outcomes was kept. The sponsoring of the licence fee by a pharmaceutical company was, apparently, an influence on the choice of software: it is clear that there were significant costs other than the licence fee. The complex interactions of organisational power and politics and the different interests of a range of constituencies interacted in ways that were not planned or analysed, a common experience in organisational change initiatives (Balfour and Clarke, 2001, Baker et al., 1983, Attarzadeh and Siew Hock, 2008).

Quality: Design and Implementation

The findings suggest a weak analysis of needs of the clinical environment. It appears that Softmedco assumed that clinical settings with the same name have, more or less, the same needs and that any variation could be addressed through customisation after the software is in use. This was not the experience in CSS1. CSS2 and CSS3 discovered relevant adaptations that had been made to Softmed in similar clinical settings in Ireland. The clinicians in CSS2 and CSS3 expressed surprise that Sofmedco had not alerted them to the availability of these adaptations.

The literature emphasises the requirement for experienced management of software projects (Boland and Day, 1989, Bourne and Walker, 2005a, Currie and Finnegan, 2009). In ACME, formal processes to ensure the quality and integration of new software within the hospital were explicitly suspended by the IT department. The IT department took no role in planning the implementation process and offered no support or guidance to individuals or teams involved. Their only role was a technical one in relation to making the software available on the server. The absence of IT skill, expertise and experience of software implementation in healthcare settings was a serious deficiency in all three settings, resulting in failure in CSS1.

Softmedco, with a great deal of experience in software implementation, offered no guidance for the process of generating content, agreeing design or sequencing of content, generating core/common information versus information specific to a single discipline. Teams and individual clinicians, with no previous experience of this process, were left to get on with it by themselves. Although Softmedco appointed personnel in the roles of 'Project Manager' to each setting, there is no evidence that these personnel undertook any form of project management: their role was to act as the link between the clinical setting and Softmedco, acting as a conduit for information, queries and requests in both directions.

Both paper and electronic systems were in use in parallel, creating duplication and increasing risk of error. Critically, more than one form of record is in use for any patient in these services. The literature on patient information systems highlights the risks associated with such duplication (Berg and Goorman, 1999, Coiera, 2007).

There was no evidence of resistance on the part of users in these settings. There is clear evidence of substantial work, over a long time, involving all team members (in CSS1) and by the relevant clinicians (in all settings). Practical difficulties included interfaces that had to be 'learned' rather than being intuitive; significant additional time required to use the software compared to the paper process; unresolved errors in content. As a result of these difficulties all of one team and the medical consultant and other doctors in the other teams abandoned or did not initiate use of Softmed. This confirms the significance attributed to usability in the development of interfaces and system design (Crowe et al., 1996, European Federation for Medical Informatics (EFMI), 2011).

Socio-technical system impacts
Overall, the participants in this study were positive about the potential benefits of IT in their specific healthcare settings and were highly motivated to be involved in using and improving relevant software. The origins of the projects created confusion about roles, implicit rather than explicit expectations and the exercise of political power within the organisation. The process of development reflected the disparities in power and influence that already existed: no structures were established specifically for the development process. There were political influences encouraging persistence since powerful figures in the hospital were seen as champions of the software. This reflects the literature on implementing ICT in organisations, with its emphasis on political and cultural dimensions of change (Heeks, 2006, Kirksey, 1990, Lehoux, 2006).

CSS1 clinicians abandoned use of the software when it became apparent that patient care was at risk, because of duplication, additional time required and inadequate and inaccurate reports generated through the software.

Despite well-established principles and a range of processes for avoiding project failure (Remenyi, 1999), there is no evidence that any planned strategy for ensuring success was in place in any of these settings. There was no project plan; no assessment of risk or strategy for managing risk; no benefits realisation process; no process to elicit or to manage stakeholder expectations. There is no evidence of the use of any recognised process for avoiding project failure. There is evidence of the poor alignment, communication and integration with and between vendors and developers,

commissioners and end-users described by many authors (Marchand and Peppard, 2008, Khazanchi and Reich, 2008).

In the case of CSS1, there is substantial evidence that problems identified early in the process were ignored or deferred and that both Softmedco and the team continued to work despite the failure to address and resolve issues. The adherence to initial plans (or in this case, a general direction) and the reluctance to revise (or develop) targets, plans or products in response to evidence emerging during implementation is a common feature of failing IT initiatives, according to the literature (Nykänen and Brender, 2005, Orlikowski and Baroudi, 1991). It appears that the wish for the project to be successful was more powerful than the evidence that there were real and substantial difficulties in development and use. Evidence from participants suggests that there was a wish to avoid abandoning the project.

The failure of mutual understanding (especially between the clinicians and the vendor) was evident from early in the work: the difficulties in communication reflected syntactic and semantic differences which were not solely a technical issue but mirrored differences of world-view, orientation, interests and principles (Protti and Peel, 1998).

6.5   Failure of What?

Many interrelated systems were inadequate in relation to the commissioning, contracting, planning and implementation of Softmed in these settings. The literature usefully distinguishes between project management failure and project failure (Yardley, 2002), between failures of process and failures of product (Cooke-Davies, 2002) and between failures of expectations, understanding and action (Agarwal and Rathod, 2006, Thomas and Fernández, 2008). Softmedco was the owner and developer of the software: the license was funded by a pharmaceutical company. The agreement to make it available within the hospital environment was made with the IT department of the hospital, with the agreement of senior management. Records of communication between Softmedco and the IT department of ACME make clear that the IT department had no contract with Softmedco: the contract is between Softmedco and Pharmaco. This is of particular relevance, given the emphasis on formal and enforceable contracts in the literature: Many authors argue that "the contract is the only mechanism to

ensure that expectations are realized" (Lacity and Hirschheim, 1995, Pai and Basu, 2007, Orlikowski and Baroudi, 1991).

6.6   Success, Failure and stakeholder expectations

Critically, the users of the software were never asked to articulate their expectations for the software. They were told what the software would deliver and worked on that basis. Differences in expectations between clinicians and between the team and Sofmedco emerged during the project. The literature suggests that outcomes are improved and resources are better used when expectations are made explicit (Thomas and Fernández, 2008) and warns of the risks associated with failure to elicit and understand the expectations of important stakeholders (Linberg, 1999). Hart and Warne (2006) further argue that planning should distinguish between the range of expectations of different stakeholders and assess the significant and relative importance of different expectations. There was no attempt to undertake such an assessment in these settings, so that the vendor only discovered the importance of the letter to GPs to the clinicians in CSS1 near the end of the process.

The findings suggest that there was no acknowledgement of the organisational context and specific needs of each clinical setting in choosing the software or planning its implementation, despite the association of these omissions with project failure (Whittaker, 1997, Whetton, 2005).

Users in CSS1 did not experience themselves as authorised to criticise or demand. The role-based authority arising from clinical knowledge and personal expertise was not acknowledged or valued in the software implementations process. Poor or missing stakeholder involvement is widely recognised as a risk factor in all kinds of organisational change (Cummings and Worley, 2001). Given the human tendency to underestimating difficulties and overestimating their own capacities (Thomas and Fernández, 2008), the failure to surface expectations and agree explicit goals increased the risk of project failure .

6.7   Measures of Success

There were no processes for measuring benefits to the stakeholders, to the organisation or to the wider information system, all necessary for a realistic and balanced

measurement of success, according to Marchand and Peppard (2008). There was no attempt to assess or make provision for the particular circumstances of CSS1, (a new, multi-disciplinary team, with limited availability of clinicians, developing a new clinical service) or to assess the needs in CSS2 and CSS3.

Given the absence of common and explicit targets, ways of measuring progress towards goals and any form of documented review, there was no way of confirming whether or not progress was happening. Users in CSS1 had an overall sense that progress was being made because they were continuing to work individually and together, to give feedback to Softmedco and request changes, a confusion between inputs and outcomes that is common in change management failure (Starr, 1997, Standish Group International, 2009, Rigby et al., 2001). The dissatisfaction with communication was conflated with the overall sense of lack of progress in the project. In CSS2 and CSS3, users could use the software as soon as they had identified the relevant modules through their professional contacts.

Limits of Success
Given that a critical expectation for health informatics is the support of communication and information sharing between health providers (Whetton, 2005), a particular concern arising from this study should be the evidence that individual, autonomous users were more likely to experience success and that implementation failed in the multi-disciplinary team setting.

Success and Failure: what and when?
In the absence of explicit, shared goals against which to measure progress, the clinicians in all three settings used other mechanisms to monitor both the time and effort they were investing in the software project and the evidence of whether this was making any difference.

 In CSS2 and CSS3, once nurses had access to the adapted software they experienced significant daily benefits from its use. The nurse in CSS2 was clear about the further changes that were needed: she was able to articulate these clearly and invoke the authority of the consultant in the service to demand that the changes were made. In CSS3, there were no further amendments required by the nurse: he only required a

response from Softmedco when new or temporary problems arose. In these two settings, there were only minor differences between the individual expectations and what the software delivered. Critically, both clinicians experienced themselves as having personal agency, that is, able to influence and control the process and outputs of the project. There was a relatively good match between the need for influence (what changes they wanted to make) and their capacity to influence (the forms of authority they could mobilise and use). In CSS2 and CSS3, the return (in terms of 'business' benefits) on the investment (in terms of time, frustration and effort) was good.

In contrast, the nurse in CSS1 who was the lead person on the team for the Softmed work experienced a significant and growing disparity between the time, effort, anxiety and energy she had to expend and the evidence that these were producing an effect. In the early months of the project, the imbalance could be tolerated: clinicians expected to have to input considerable content before expecting to see a product in the form of adaptations to the software. Over time, all team members reported asking for evidence of the adaptations, specifically in the form of the letter to GPs, which Softmedco had promised would meet their needs. This evidence was slow in coming and of poor quality when it did eventually materialise. As dissatisfaction with many aspects of the adaptations increased, the mismatch between their needs and expectations and their capacity to influence Softmed to meet these became evident.

Clinicians attributed responsibility for the failure of the project to Softmedco ('they didn't listen', ''they didn't' understand our service') to themselves ('I didn't make myself clear', 'I wasn't strong enough') and to the nature of the service ('it's too complex', ' it's not as simple as [CSS2]'). In a context of needing to significantly influence Softmedco, clinicians in CSS1 found themselves unable to do so. This reflects the difficulties in defining failure (Agarwai, 2006, Cooke-Davies, 2002) and confirms the reluctance to admit failure which characterises many IT projects (McDonagh, 2006, Pinto and Mantel, 1990). In the setting of CSS1, there were also political considerations, as reported by Thomas and Fernandez (2008). Powerful figures of authority (Prof 1 and Prof2) were champions of this project: clinicians did not want to challenge or confront this authority.

Success and failure: not either/or

The clinical team in CSS1 describe the Softmed work in their service as a failure. The individual nurses in CSS2 and CSS3 describe the software as a success. The medical consultant for CSS2 and CSS3 describes the software as a failure for him, in his clinical setting. There is compelling objective evidence of the failure of the project management process in CSS1. In CSS2 and CSS3, the software is in use by individual users only. The definition of the work as a 'success' or 'failure' was also, in part, subjective and not systematically related to objective outcomes, especially given that there were no explicit targets or goals for the project, against which success could be measured.

Recognising that there is rarely a clear distinction between success and failure (Wateridge, 1998) it is probably more accurate to acknowledge that there are successes and failures of the software and the implementation process in each of the three settings. Table 6-1 notes successes and failures in each setting.

	Success	**Failure**
CSS1	Focus on the content of the patient information system led to significant information-sharing between members of a multi-disciplinary team as the new service was developing	Failure of mutual understanding between the clinicians and the vendor Failure to achieve core expectation (generation of letter to GPs) Software not in use in any form by any member of the team
CSS2	Discovery and use of existing adaptations to the software Software in daily use: Significant benefits to one individual user	Rejection by lead medical consultant resulting from difficulties using software in a live clinical situation Not used as a tool of collaboration and communication
CSS3	Discovery and use of existing adaptations to the software Software in daily use: Significant benefits to one individual user	Rejection by lead medical consultant resulting from difficulties using software in a live clinical situation Anticipated difficulties in adoption by wider team

Table 6-1: Success and Failure in the Three Clinical Settings

Evaluation

There was no evaluation or review of the software project in any of the settings. After the work was abandoned in CSS1, there was little interest or scrutiny. There was no involvement by IT or hospital management in reviewing the work or the outcomes. As reported by Thomas and Fernandez (2008), the failure was seen as negative: there was no sense of it being a learning experience for any of those involved or for the wider organisation.

Differences in features of three clinical settings

These three clinical settings differed in many ways that influenced the process of software adaptation and implementation and which are relevant to the success and failure of the projects. The literature suggests that a failure to acknowledge the specific context creates difficulties in IT projects (Mark, 2009, Rigby et al., 2009). The literature cautions against approaching software implementation as if every setting was the same (Paré and Elam, 1995, Petter, 2008). The differences in history, team context and requirements are relevant , objective situational factors that should have affected the process of planning and implementing new software in each setting. Table 6-2 summarises the important differences between the clinical settings in terms of service context and development.

There was no project management and there was no IT expertise available in any of the three settings. In CSS2 and CSS3, the already-adapted software was used successfully by single users. The 'business' benefits are sufficient to motivate these users to persist in addressing remaining issues. In CSS1, the extensive work of coordinating planning work within a new multi-disciplinary team, led by a new medical consultant, delivering a new service was the responsibility of a new clinical nurse specialist. There was no evidence of benefits from using the software, despite the investment of considerable time and effort.

	CSS1	CSS2	CSS3
Stage of development/ maturity of service	Entirely new service	Established service	Entirely new service
Team context	New multi-disciplinary team	No multi-disciplinary team	No multi-disciplinary team
Role of lead clinical nurse specialist	New role Expectation that nurse would establish service and lead work on adapting software Requirement to coordinate and collate requirements	Established role Only responsible for communicating own requirements	New role Only responsible for communicating own requirements
Role of the medical consultant on the team	New role-holder Only present one day per week Not involved in leading software project	Same consultant in CSS2 and CSS3 Key role in agreeing introduction of Softmed to ACME Significant influence with Softmedco Critical of and not using Softmed, but authorised continued licensing of software for CSS2 and CSS3	
Expectations of users	Not met	Partially met: Expectation that software would be used by both doctors and nurse not met	
Existing adaptations of the software	Adaptations offered by Softmedco as in use in similar settings not suitable	Identified by clinician Good match for needs	Identified by clinician Good match for needs
Work involved in adapting software	Significant High levels individual of team work required to elicit, agree and coordinate requirements	Some Ongoing dissatisfaction with failure to address outstanding changes requested	Limited All present needs met by software in current form
Evidence of "business" benefits	None	Significant for individual user	Significant for individual user
Involvement of IT department	Limited to providing access to Softmed on hospital server		
Relevant knowledge/experience of IT projects in team	None	None	None

Table 6-2: Service context and development factors characterising CSS1, CSS2& CSS3

6.8   Conclusion

The findings of this study suggest that there was a widespread assumption that technology alone would deliver the benefits anticipated and the changes needed. Learning from research which cautions against ignoring the wider human and organisational aspects of change was effectively ignored. The differences in the context of each service emphasises the particular factors in CSS1 that would have made any project difficult. The particular context of each service was not acknowledged. The absence of any structure to manage the project confirms the risks associated with such unstructured approaches, described in the literature.

Research and literature suggest that in this context, success was a more unlikely outcome and that failure was built in to the unsystematic approach to implementation.

Chapter 7.   Conclusions and Future Work

7.1   Introduction

In the overall context of common failure of IT projects, alongside a concern about the cost of such failure, this research set out to add to understandings of success and failure in software implementation. The study was designed to examine the factors that influenced success and failure of software implementation in three clinical settings. In particular, the research examined how key participants understood success and failure and explored the relationship between these understandings and the outcomes of the implementation processes.

7.2   Overview of the Research

The software is a patient information system, with demonstrated benefits and utility in two of the three clinical services. The technical architecture and design of the software itself was not the most important consideration for users in this study. The match between the software and their clinical needs and setting, realising benefits for their service, and their capacity to achieve improvements and refinements in this match were more significant.

Using data from diverse sources, including interviews with users of the software, the research identified a range of factors influencing whether the software implementation was seen as a success or a failure. The findings suggest that requirements for successful implementation that are clearly identified in research were almost entirely absent in these settings.

- There was, effectively, no project management
- The requirements – what the work was setting out to achieve – were not documented and agreed
- No IT expertise was available at the service level
- The work of specifying adaptations to the software was haphazard and unclear
- Roles and authority in relation to the work were unclear and authority in relation to the project was confused with existing authority within the hospital environment

- Commonly-recognised good practice in relation to software development and implementation were not in evidence: there was
  - no analysis of needs of the clinical services
  - no attempt to elicit or assess the expectations of users
  - no contract with the clinical setting or the organisation
  - no process for monitoring progress
  - no assessment of the likely impact of the specific and different conditions of proposed use of the software in different clinical environments
  - no review of benefits.

This study may be read as a cautionary tale about what can go wrong when the need for professional expertise and experience that is relevant to a proposed change, is ignored. The 'failure' in CSS1 was predictable and the 'success' in CSS2 and CSS3 was fortuitous rather than planned. While the absence of project management is likely to lead to failure of change in any environment, the healthcare setting is relevant in this case. The particular culture of the hospital, especially the political and power structures, the hierarchical environment and the different forms of authority used and recognised by management, IT, medical consultants and other clinical staff made it more likely that proposals were not evaluated on their own merits but rather in relation to their source and accompanying authority. This also made it more difficult for clinicians/users to question or challenge at any stage of the project.

7.3   Value and Limitations of the Research

Although Grounded Theory has begun to be used as a research approach in Information Systems, the researcher is not aware of the application of this approach to small-scale IT initiatives. This research serves to demonstrate the value and contribution of a Grounded Theory approach to research in such settings. Grounded Theory and other forms of interpretive research offer potentially new and different perspectives on the experience of users of technology. Constraints of time and availability meant that theoretical sampling (gathering additional data from further or new interviews, for example) was not possible in this case. Nevertheless, the iterative processes of analysis in Grounded Theory led to an interesting and potentially useful focus on the capacity of stakeholders to influence the implementation process and allowed a succinct summary

of factors influencing success and failure. The study conforms to the criteria set by Strauss and Corbin (1998) to assess a grounded theory. This study demonstrates the relevance and utility of Grounded Theory as a research approach in IT.

This study reflects the experience of clinicians involved in software implementation. This is an important perspective which is often overlooked.

It is important to acknowledge the limitations of this research. It had very limited scope, involving only three clinical settings in a single hospital. Data were gathered post-hoc rather than contemporaneously. It was not possible to access important and potentially different perspectives from the IT department, the pharmaceutical company which sponsored the licence for the software, any of the medical consultants who initiated the project and committed to the involvement of the clinical settings or the senior management of the hospital at the time the project began. The perspective of the software company was accessed only through contact with the managing director: the data do not reflect the views of any of the several Softmedco 'project managers' involved. The research would certainly have been strengthened by the contribution of these stakeholders.

The researcher proposed to offer feedback to clinical teams: time constraints meant that this was not possible. While not required for validity in a Grounded Theory study, a feedback process, especially in a team setting, might well have offered additional data.

7.4   Potential application of learning from this study

In the absence of an overall plan and concrete proposals for the development of an integrated IT system within the health service in Ireland, many individual clinical settings are taking the initiative to seek the benefits of electronic patient information systems through individual, separate, local IT developments. The findings from this study have potential application at health system, healthcare organisation and local service levels and for software developers and vendors

Health system level

This research points to the limited documentation and scrutiny of IT project development, success and failure. IT projects such as those in this study do not appear in any assessment of costs or contribute to any learning, because they are, effectively,

undocumented. This study highlights the significant cost, in terms of time, opportunity cost and morale, of small-scale, one-off, 'under the radar' IT initiatives, especially in health service settings.

The evidence of the considerable work and investment involved in this single example highlights the need to record and document the extent and outcomes of IT developments such as software implementation projects in healthcare settings in Ireland. There is a related need to establish accurate review processes as a support for learning and process improvement.

There is a need for systematic guidance on software implementation at organisational and health service system levels to ensure success at project level and interoperability, consistency and quality across systems and services. Such guidance should emphasise the requirement to involve local IT expertise throughout the process. A mechanism for collecting and collating experience of software implementation processes and outcomes is an important requirement, to enable both estimation of the extent and cost of this work and to support learning about success and failure.

Healthcare organisation level
This research confirms existing research and knowledge in asserting the value and significance of a systematic approach to change that acknowledges and involves the end user and includes organisational and political, as well as technical perspectives. IT initiatives need to be managed.

The issue of the capacity of stakeholders to influence the implementation process is not a focus in current literature on ensuring success in software implementation. The results of this study suggest that this issue should both be a concern for the managers of such processes, for software developers and vendors and should also be investigated in further research.

For healthcare organisations and their IT departments, this research highlights the requirement to understand software implementation as an example of organisational change with the same complexity and need for planning, monitoring and stakeholder involvement and influence as any other organisational change. There is a need to

understand software development, even in a single clinical service, in the overall context of future integration of ICT.

It is inappropriate and wasteful for clinicians to undertake software implementation with no relevant experience and expertise. IT departments have an important role in supporting this work and in bridging the differences in world-view between clinicians and software companies.

Local service level
For individual clinical settings, there is a need to understand and plan for success, to clarify expectations and to address problems as they arise.

For users and vendors of software, there is a need to accurately assess needs and compare these to the software 'solution' proposed, rather than assume that because it has worked elsewhere, it will also be an adequate match for the presenting needs.

Software developers and vendors
For software developers and vendors, the range of factors influencing success identified in this study should act as a significant caution against seeing software implementation as primarily or exclusively a technical process. If software developers wish to see their products in successful use, then attention to the range of influences on success are needed.

Evidence of application of learning
Learning from these projects has already been applied. The managing director of the software company reports that, as a result of the experience in the clinical setting where implementation failed, the company is now using a benefits realisation process in software implementation. Several participants identified learning from the experience of being involved in the implementation process which they could apply to other examples of change, including the need to have a plan, to identify clear goals and targets, to clarify roles and responsibilities and to resist open-ended commitment of clinical time in the absence of evidence of progress.

7.5　Directions for future research

It would be useful to build on the findings of this research by testing them in other examples of software implementation in healthcare settings. Eliciting the views of IT departments, sponsoring organisations, commissioners and project managers in software companies would serve to strengthen the findings.

Research that compared practice and assumptions in relation to IT initiatives and other forms of organisational change would potentially highlight approaches that interpret IT developments as a merely technical processes.

Research into the relative benefits of different approaches to planning and implementation in small-scale projects in clinical settings could give rise to practical tools and guidance for developers, users and managers of development processes.

Given high and possibly naïve expectations for software, there is a need to understand that success in software implementation requires more than capturing the right software and setting it free in the right environment. The introduction of any technology changes and potentially challenges existing assumptions, roles, structures and relationships. Research that helps to articulate these changes and challenges and identifies useful strategies to support implementation and use will make a contribution to the effective deployment of ICT.

7.6　Conclusion

IT has a substantial potential contribution to achieving value for money and maximising the safety, effectiveness and efficiency of health services. There are many proposals for what dimensions should be included in any representation of success and there is a need for better understanding of how stakeholders understand, define and measure IT project success.

The overall conclusion from this study is that there was an overarching failure at management level, which allowed a project that was poorly conceptualised and planned from the outset to begin and continue. The Grounded Theory emerging from the data

points to the requirements for effective management of change, linked to accurate analysis of need, recognising the relevant roles, authority and communication.

This study should alert the wider health system to the costs of poorly-managed local IT initiatives, the need to develop a plan for the integration of IT development in health services and also the urgent need for improved technological capability, within a coherent IT policy and strategy, at all levels within health services. The optimum use of patient information systems requires integration and collaboration across many users, the very context that experienced most difficulties in this study.

Successful software implementation clearly requires attention to the parts, including technology, effective management and differences in expectations and also the whole, the process and outcomes created by the relationships between people, the organisation and the information technology.

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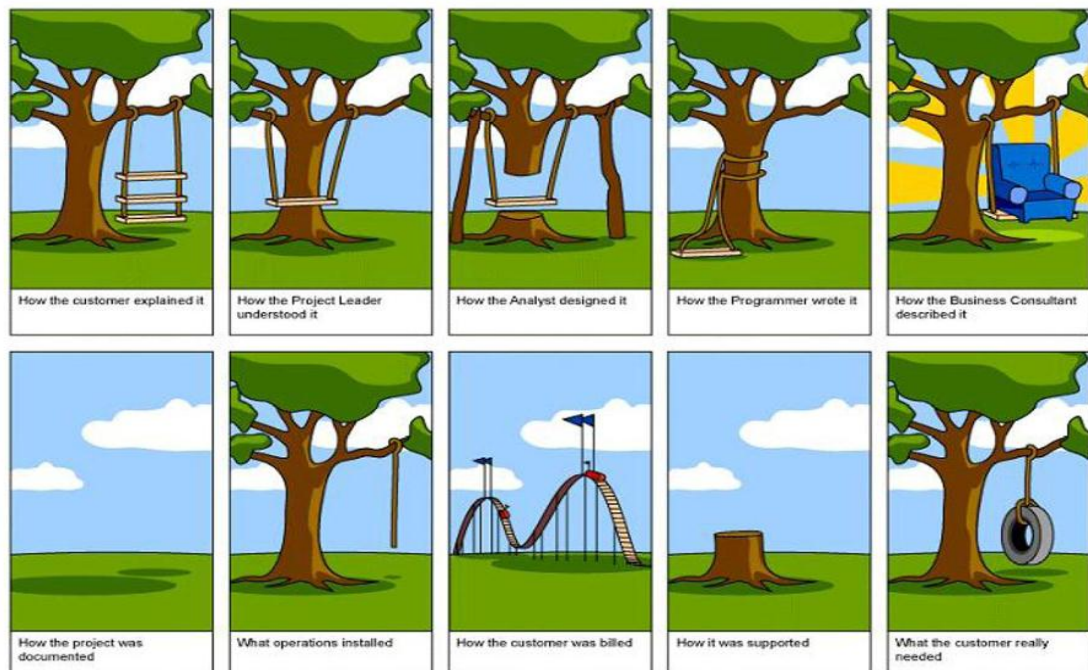
Appendices

Appendix 1: Lifecycle "impedance mismatches"
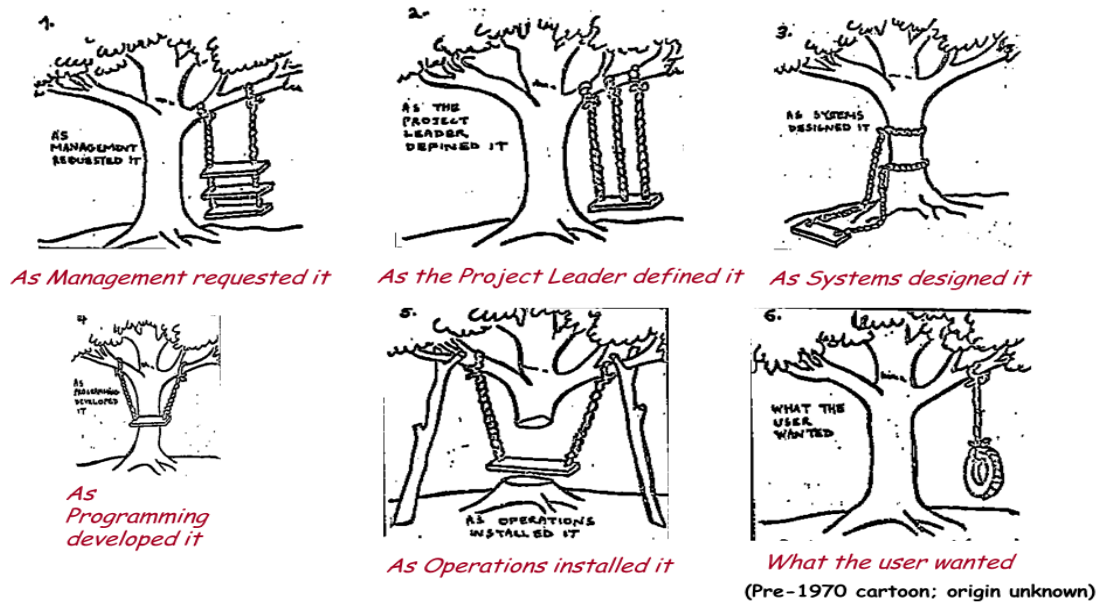
http://se.inf.ethz.ch/courses/2011a_spring/soft_arch/lectures/02_softarch_lifecycle.pdf

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Appendix 2: Guidelines for grounded theory studies in information systems

from (Urquhart et al., 2010)p369

1 Constant comparison	Constant comparison is the process of constantly comparing instances of data labelled as a particular category with other instances of data in the same category. Constant comparison contributes to the development of theory by exposing the analytic properties of the codes and categories to rigorous scrutiny. This guideline for data analysis encourages researchers to be both rigorous and theoretical.
2 Iterative conceptualization	This guideline suggests that researchers should increase the level of abstraction and relate categories to each other through a process of iterative conceptualization. In grounded theory, this is done using theoretical coding. The relationships between categories can be of many different types, not just causal. Theoretical coding contributes to an understanding of relationships between the concepts or factors of a theory. Theoretical memos are also very important to the development of theoretical coding and the whole process of iterative conceptualization.
3 Theoretical sampling	This guideline stresses the importance of deciding on analytic grounds where to sample from next in the study. Theoretical sampling helps to ensure the comprehensive nature of the theory, and ensures that the developing theory is truly grounded in the data.
4 Scaling up	This guideline suggests how a researcher might counter what is said to be a common problem in grounded theory viz. the production of a low level theory, which is then hard to relate to the broader literature. Scaling up is the process of grouping higher-level categories into broader themes. Scaling up contributes to the generalizability of the theory.
5 Theoretical integration	This guideline helps the researcher deal with what we think is an obligation of the grounded theorist – theoretical integration. Theoretical integration means relating the theory to other theories in the same or similar field. It is the process of comparing the substantive theory generated with other, previously developed, theories. This principle contributes to theoretical integration in the discipline and could help in the generation of formal theories.

Appendix 3: Overview of the Research

Towards an understanding of issues affecting in software implementation in clinical settings

Proposed study by Mary Rafferty, 2nd year student, MSc (Health Informatics) TCD

The research literature describes high rates of failure of IT projects in healthcare settings, yet projects that do not meet their objectives are often abandoned without review or learning that could inform future initiatives.

Information and Communication Technology has important potential in clinical settings. For instance a software programme aimed at increasing and improving collaboration and coordination between clinical specialities, speeding up assessment, facilitating audit and generating discharge letters for GPs offers significant benefit. The [CSS1] clinic in [ACME hospital] took the initiative to customise and implement such software. After more than 2 years of work and the investment of considerable time and effort, it was concluded that the software could not produce the outcomes sought and promised and the decision was made to abandon use of the software. In contrast, the same software is successfully used in CSS2 in [ANEW Hospital].

As part of my studies for an MSc in Health Informatics in Trinity College Dublin, I am interested in examining the experience of development and use in these two clinical settings in order to:

- describe the process of initiating and contracting for the project
- describe and analyse the process of project development, from the perspective of the clinical staff directly involved and vendors of the software [this description would be especially focused on identifying and understanding the differences in understanding and expectations of clinical staff and software professionals]
- Analyse decision points and data available within a project management perspective
- Understand and identify ways of measuring progress of the IT project development, including ways of identifying risk factors and providing alerts to provider and commissioner
- Propose measures to evaluate decisions and implementation processes in relation to IT in clinical settings, to optimise the success of such projects

If the scope of the project allows and if it is possible to gain access to the experience of staff involved and data and records related to the design and implementation processes, I would like to compare the process of implementation in [CSS2] and [CSS1].

I do not propose to access or use patient data in this study.

Methodology   Qualitative, interpretive research

Methods: Mixed methods including analysis of records of communication and decision making, semi-structured individual interviews (face to face and by phone) with clinical teams(s) and software vendor. Group (clinical team) feedback meetings to test and confirm validity of findings. Appreciative inquiry approach to identify learning for the team(s). Possible comparison of finding across teams.

The relevant policies of [ACME hospital] apply in relation to Confidentiality Policy; Transfer of Data and Information external to the [ACME] and [ACME] Agreement for External Visitors.

TRINITY COLLEGE DUBLIN

INFORMATION SHEET FOR PARTICIPANTS

Introduction

Name of Researcher	Mary Rafferty
Status	2nd year student on Masters in Health Informatics, TCD
Relevant experience:	Former Speech and Language Therapist and researcher in disability services
	Practising Organisation Development Consultant with extensive experience in organisational change in health service settings
This Research	Influences on the success and failure of software implementation in clinical settings:

Background and relevance

The research literature describes high rates of failure of IT projects in healthcare settings, yet projects that do not meet their objectives are often abandoned without review or learning that could inform future initiatives. This study is aimed at describing and analysing the experience of success and failure from the different perspectives of commissioner and supplier, to contribute to an understanding of the factors influencing failure and to propose ways of identifying risks to success at an earlier stage in the process of implementation. Specifically, it sets out to understand how the work to implement the [Softmed] software was understood by all those involved in the work to implement it. This setting also offers the potential to explore the factors influencing success and failure by comparing implementation of the same software successfully and unsuccessfully.

What is involved for you as a participant?

I propose to meet with each individual member of the team, to ask them to describe their involvement in and experience of the work to implement the [Softmed] software. I will ask permission to audio record this interview. The interview does not involve a questionnaire. The questions will relate only to their involvement and experience of the work to implement[Softmed].

After meeting with all member of the team individually, I will request to meet with the full team again, to feedback my findings and analysis and to seek correcting and confirming information and analysis. This meeting is likely to last for up to 2 hours if this time is agreed. Final results and report will be made available to all members of the team.

Additional meetings and information will be requested from the Clinical Nurse Specialist. Clarification or additional information may be sought from individual team members after individual interviews.

Declarations of conflicts of interest

I am not aware of any conflicts of interest in my role as researcher in this study. I am known to and related to [name], who is an [clinical role] who was involved in the implementation of the [Softmed] Software.

Participation is voluntary

Your participation in this study is voluntary. You are free to decline to participate in this study at all. You are also free to withdraw at any stage in the course of the research. You can request not to respond to any question or inquiry. You can decline to have your responses recorded. There is no penalty to you for not taking part in any or all of this research.

The expected duration of the participant's involvement

The study will take place from December 2010 to May 2011. Your involvement is likely to be invited during December – March.

1 hour individual interview (at your convenience)

2 hours team feedback meeting (at a time agreed with the team)

Anticipated risks/benefits to the participant

No risks to participants are anticipated. The anticipated benefits include the opportunity to contribute to learning which can be used by your own team and by other healthcare settings.

The provisions for debriefing after participation

Individual team members will have the opportunity to identify any concerns arising from the study and the researcher will offer support in identifying possible ways of addressing these concerns.

Preservation of participant and third-party anonymity in analysis, publication and presentation of resulting data and findings

Your data will be treated with full confidentiality. Records, notes and audio recordings or interviews, transcripts or partial transcripts or notes of meetings will be kept secure and will not be disclosed to any third party without permission.

The contribution of participants is anonymous. The analysis will anonymise contributions and will work with data pooled from all contributions. The anonymity of individuals, settings and organisations will be preserved in all reports, publications and presentation of findings. I will request written permission for any re-use of data (for publications, conference papers etc).

Cautions about inadvertent discovery of illicit activities

If activities that are illegal or illicit are disclosed or discovered in the course of this research, the researcher has an obligation to report these to the appropriate authorities.

Provision for verifying direct quotations and their contextual appropriateness

In general, I will not use quotations that could identify the contributor. In exceptional circumstances, where the role or identity of the participant is an important element of the data, I will only use a direct quote with permission.

Research study of [Softmed] implementation: Interview focus

At the start – the decision and the plan	How did you first hear about the proposal?
	Did you have previous experience of using IT in your clinical role?
	Do you know why this particular software was proposed?
	Who was/were the leaders or drivers of the process?
	How was the decision made and how were you involved?
	What did you hope or expect to achieve?
	What concerns did you have at that stage?
	How much work did you think would be involved and who did you think would be undertaking this?
	What was the plan and timescale as you started the project?
	How did you understand the roles of different people in the project at the start– your role? The role of the clinical nurse specialist? The role of the software company? The role of the team as a whole?
	What kinds of things do you think most influenced the way the project started?
During the work of developing the software – the process and the progress	Describe how the work of developing the software was done.
	How were you involved?
	How were others involved?
	What went well? What did you experience as positive or easy about the work as it progressed?
	What did not go well? What did you experience as negative or difficult about the work as it progressed?
	What kinds of things most influenced the way the project developed?
	How would you describe your contribution to the work?
	Describe the energy or motivation of the team as the work was ongoing.
	Did the team revisit the goals of the project, as the work was ongoing?

	What do you think was learned by the team as the work was developing – did you review how you were working or change anything in the way the work was done? What roles or role-holders were particularly influential in the course of the development of the work – positively or negatively?
At the end	What led up to the decision to end the project? What did you think or feel about the decision? Looking back, do you think there are things you or the team could have done differently to achieve a different outcome? What difference would your experience of the work in developing [Softmed] make to you if there was a proposal to undertake another IT initiative? What would you do differently in future? What connection would you make between the beginnings of the process and the outcomes in the end? What guidance would you give to clinical teams considering adopting any software? In the end, after a lot of work, the [CSS1] team abandoned the use of[Softmed]. What, in your view, are the key reasons for abandoning the work? Are there other issues in relation to your experience of working on and with [Softmed] in the [CSS1] team that I haven't asked you about?

Appendix 6: Interview Focus – Clinical Speciality Services 2 and 3

Research study of [Softmed] implementation: Interview focus

At the start – the decision and the plan	How did you first hear about the proposal to use [Softmed] in[CSS2 /CSS3]?
	Did you have previous experience of using IT in your clinical role?
	Do you know why this particular software was proposed?
	Who was/were the leaders or drivers of the process?
	How was the decision made and how were you involved?
	What did you hope or expect to achieve?
	What concerns did you have at that stage?
	How much work did you think would be involved and who did you think would be undertaking this?
	What was the plan and timescale as you started the project?
	How did you understand the roles of different people in the project at the start– your role? The role of the clinical nurse specialist? The role of the software company? The role of the team as a whole?
	What kinds of things do you think most influenced the way the project started?
During the work of developing the software – the process and the progress	Describe how the work of developing the software was done.
	How were you involved?
	How were others involved?
	What went well? What did you experience as positive or easy about the work as it progressed?
	What did not go well? What did you experience as negative or difficult about the work as it progressed?
	What kinds of things most influenced the way the project developed?
	How would you describe your contribution to the work?
	Describe the energy or motivation of the team as the work was ongoing.
	Did the team revisit the goals of the project, as the work was

	ongoing? What do you think was learned by the team as the work was developing – did you review how you were working or change anything in the way the work was done? What roles or role-holders were particularly influential in the course of the development of the work – positively or negatively?
Now	How would you describe the use of [Softmed]in [CSS2 a/d CSS3] now? Positive and negative aspects of the use of [Softmed]? What difference would your experience of the work in developing [Softmed]make to you if there was a proposal to undertake another IT initiative? What would you do differently in future? What connection would you make between the beginnings of the process and the outcomes achieved? What guidance would you give to clinical teams considering adopting any software? Are there other issues in relation to your experience of working on and with [Softmed] that I haven't asked you about?

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Participant Consent Form

Research Study   **Influences on the success and failure of software implementation in clinical settings**:

I confirm that I have read and understood the Information Sheet for participants in this study, that I have been given an opportunity to ask any questions I have about my participation and have had any such questions answered to my satisfaction.

I confirm that I consent to take part in the study based on the information provided in the Information sheet.

I confirm that I am taking part in this study voluntarily and that I understand that I may withdraw from the study at any time, may refuse to take part in specific parts of the study and may request not to have my responses to particular questions recorded or documented.

I confirm that I am 18 years of age or older and competent to supply consent.

Signed   Date

Name in Block Capitals

Job Title or Organisational Role

Appendix 8: Criteria for identifying a core category

Criteria for identifying a core category

- 'It must be central; that is, all other major categories can be related to it.

- It must appear frequently in the data. This means that within all or almost all cases, there are indicators pointing to that concept.

- The explanation that evolves by relating the categories is logical and consistent. There is no forcing of data.

- The name or phrase used to describe the central category should be sufficiently abstract that it can be used to do research in other substantive areas, leading to the development of a more general theory.

- As the concept is refined analytically through the integration with other concepts, the theory grows in depth and explanatory power.

- The concept is able to explain variation as well as the main point made by the data; that is, when conditions vary, the explanations still hold, although the way in which a phenomenon is expressed might look somewhat different. One also should be able to explain contradictory or alternative cases in terms of that central idea'

<div align="right">(Strauss and Corbin, 1998)(p.147)</div>