Testing business processes with information technology in user acceptance testing

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Abstract

Business change may involve the introduction of new people, new processes or new technology into a business, yet a business is defined by its business processes. Stakeholders should take an evolutionary approach to business change, beginning with necessary analysis and design work to explore key core business processes across the organisation, looking for those processes that might gain a "quick win" with support from the right technology.

Within any programme of change involving Information Technology (IT), a testing phase serves as a key quality assurance step. IT testing involves several steps moving from small-scale unit testing to testing larger integrated systems, to user acceptance testing, where key business processes are tested to ensure the IT supports the processes.

Within the NHS in the UK, a major programme of change is driving a service wide National Programme for IT (NPfIT). As the NHS is a critical public service it is clear that any related programme of change should be evaluated to ensure quality, cost and risk is managed carefully. The NPfIT has placed the "Model Community" (a user acceptance test site) at a key location within the programme and this provides a unique opportunity for NHS staff to explore their business processes in a safe environment and ensure that IT designed to support them is fit for purpose.

An exploration of the academic and practical issues of business analysis, design and testing as they relate to the operation of the Model Community was undertaken. A study of the interface between business processes and IT during Model Community testing was performed. A significant number of IT usability incidents were raised which suggests the tremendous potential for the Model Community to act as the key quality assurance step within the NPfIT.

On the basis of the related academic evidence, in conjunction with an exploration of business process analysis, design and user acceptance testing within the NPfIT, a number of recommendations have been made on how the work of the Model Community might be improved on in the future.

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1 Introduction

Within any business sector, few things remain constant apart from the need for change. Business change may involve the introduction of new people, new processes or new technology into an organisational system. The business process lies at the heart of any business and defines "what business are we in" e.g. manufacturing, transport, retail, healthcare etc. Efficient business processes involve skilled people working with useful technology to deliver value to the business and/or customer.

In order to effect change in business the fundamental area for change has to be the business process. The modern Information Technology (IT) revolution has highlighted the role of IT in facilitating business change, by enabling a skilled workforce to improve their business processes with the support of these key technologies. IT has already helped modern business in a variety of ways, such as the improved communication between stakeholders across complex organisational systems, enabling Just in Time delivery and production systems, as has already been achieved in modern supply chains (Gunasekaran and Ngai, 2004).

The health care sector is one business sector under real pressure to change. At the beginning of a new century, the health care systems of the western world need to improve the delivery of increasingly sophisticated health care to the ageing populations that they serve (Watts, 2001). Health care involves the collection, analysis, transmission and storage of patients records and as such is a particularly information intensive service (Feied, 1998). While many healthcare sectors employ very large skilled workforces, it is believed that current information systems significantly impede attempts to improve on system wide health care processes. As such, in an effort to improve the delivery of health care in the 21st century, it is now evident that the current paper based systems that support medical care will need to be replaced by IT based systems (Haux et al, 2002; van Ginneken, 2002).

Within the UK, the current government has recognised the importance of the healthcare system to the public and has agreed to increase investment and reform the National Health Service (NHS). Part of that investment and reform involves the NHS

National Programme for Information Technology (NPfIT), which aims to provide an IT based Care Record Service (CRS) for each person in England. (NHS National Programme for IT, 2004a) Naturally a programme of this scale is massively complex. It has been described as the biggest civil Information Technology procurement project anywhere in the world (Waples, 2003). Implementations of IT in healthcare over the last decades have rarely been straightforward and central to the explanation of the challenge is the business change issues involved (Ball, 2003). Any attempt to reform the NHS will only succeed if the staff involved agree to changes in working practice, many of which may be supported by modern IT. Any attempt to deploy IT in advance of a systematic exploration of the business process issues involved is likely to be a costly exercise.

Within the NPfIT, work has already begun on defining the business processes that need to be supported by the new CRS service. These have informed the design and build phase in the first release of the service. Related business process scenarios have been produced and these are to be tested against the new IT service in a user acceptance test site, the "Model Community". The Model Community aims to facilitate the validation of the fit between agreed business processes and the supporting IT service. The mechanism of managing potential "incidents" i.e. "incident management" is an area of particular importance. A systematic approach to this area is required, aiming to highlight problems related to business process and/or the supporting IT.

This important work in the Model Community raises several critically important questions regarding the whole programme for change. In particular;
How can we assure that business processes to be tested in the Model Community are systematically explored and adequately reflect the stakeholder base they represent?
How can we assure that the supporting technology undergoes rigorous user acceptance testing at the Model Community and that incidents that emerge from testing business processes and information technology are dealt with systematically?
In order to be able to reassure stakeholders as to the validity of the Model Community's operation, these two key questions must be answered at an early stage.

1.1 Objectives

This project was undertaken during my work as Clinical Consultant to the NHS NPfIT North East Cluster Model Community. To seek answers to our questions, this report therefore aims to cover these objectives agreed at the outset of the project (See Terms of Reference in Appendix 1);

- Research academic background to stakeholder involvement in business process production, user acceptance testing (inc. incident management)
- Investigate "Model Community" operation
- Relate Model Community operation to academic background
- Facilitate implementation of user acceptance test site for business process and IT testing (inc. incident management resolution).
- Research effectiveness of incident management resolution mechanism
- Recommend strategy for stakeholder involvement in business process production/review and Model Community testing.
- Recommend strategy for stakeholder involvement in incident management resolution, to inform further iterations of business process/software development.
- Evaluate overall project success (including client feedback)

1.2 Methodology

To begin with an exploration of the academic literature on these issues has been undertaken. Academic databases related to business and computing disciplines were searched for relevant material. Further directed searches and reading on the subject was conducted to ensure key issues had been adequately explored. This exploration has been complemented by an examination of the NHS NPfIT, related business process and usability testing explorations and an incident management study.

This paper is organised into 7 chapters. Following this introduction, chapters 2 and 3 explore academic material related to business change, analysis, design and testing. Chapter 4 examines these issues in the context of the NHS and the NPfIT. Chapter 5 documents practical experience of these issues in the Model Community. Chapter 6 evaluates the Model Community and the project. Chapter 7 concludes with recommendations on how the Model Community might be improved in the future.

2 Academic Research (a) including Analysis and Design

2.1 Business and Change

Businesses can be seen as organisational systems made up of three key elements, i.e. a workforce (people) performing business activities (processes) supported by a variety of technologies (technology).

2.1.1 The business process is at the heart of change

Any business is defined by its business processes. A business process can be defined as set of related tasks which add value (e.g. improve quality or reduce cost) to the customer or business. Business processes can be examined at varied levels, such as a strategic level (e.g. 5 yearly planned activities - long term plans), tactical (e.g. 1 years activities e.g. financial management over the financial year) or operational level (daily activities) (Talluri, 2000). Aside from these key elements of people, process and technology, there are few other constants in business- except perhaps the continuous need for change, to adapt to the changing environment within which any business operates.

2.1.2 The role of IT in supporting change

- The business view

Within the world of business, the need to introduce change in recent years has been increasingly facilitated through the use of Information Technology (IT). IT can help with the process of change by breaking down communication barriers, and helping reshape processes rather than simply automating or mechanising existing processes (Willcocks and Smith 1995, Attaran 2004). The options for introducing change within an organisation, based on business process change can occur either in small incremental shifts in improvement or radically (reengineered) steps. While Business Process Reengineering (BPR) has often attempted to use IT to facilitate radical business change, Business Process Improvement (BPI) takes the more conservative incremental change approach. Even though BPR received great attention in the 1990s in the world of change management, a look at the evidence on BPR projects suggests they have not always done well. Instead the current thinking is that incremental

change is more likely to succeed in the long-term (Gunasekaran 1997; Royal Academy of Engineering, 2004).

Of note, complex systems such as large organisations or information systems can be particularly difficult to manage with radical change. While it is impossible to control or change the whole system, it may be possible to influence and change key parts of the system. The challenge is to identify those key elements which, if changed, would have the greatest beneficial effect on the whole system (Boddy, 2002, p65). This is in keeping with an incremental approach to change, as the magnitude of small key changes can be observed across the whole complex system, looking for those with significant impact. In any event, when using IT in business process change, it is essential to ensure that business processes are supported by good IT and not forced to work around poor IT (Rauterberg et al, 1995; Clegg, 2000).

- The IT view

This approach to incremental change in the business world mirrors best practice in the IT industry. While "IT" refers to both the hardware and software elements of the technology, it is the software that now plays the key part. Historically the standard approach taken in the development of software was a "waterfall" sequential model where system development happened in steps and in theory a fully-fledged working system was delivered on day one. The key alternative to that approach is an evolutionary software development approach which is now recommended as the best approach to programmes of large scale IT change. It should begin with an effort to analyse business processes to inform the technical requirements needed. This should inform the design and build phases and then allow testing of the software before final implementation. An evolutionary approach such as the "spiral model" allows for useful developments from the start, often beginning with a small prototype development followed by further successive developments which increase the scope of the information technology (Pressman, 2000, p 35; Lenz, 2004). This in turn avoids the risks of a big bang approach. Of note the teaching from the software engineering domain is that any business change should be led by the parent business, while the IT should support the changes required, which fits with the business orientated view.

2.1.3 Cycles of change, software development and quality management

Approaches to the management of any business involve sequential processes that make up a cycle, e.g. Analysis, Planning, Monitoring and Control. If we look within the business world at the management of change (through either programme or project management) we also see change management models feature a cyclical approach (Boddy, 2002, p330).

Indeed if we examine the cycles of change, software development, quality and risk management in parallel we note that they share much in common (Boddy, 2002, p330; Pressman, 2000, p35; ISO, 2001; Williams et al, 1999). While the terminology and timing may differ between these cycles the core elements remain the same around the cycles. (See Table 1)

Each cycle begin with a fact finding mission to understand the business and identify any problems and possible solutions. This is followed by work directed at building the required solution. An assessment or test of the solution is the third step which should occur before any widespread change is implemented. The cycles are completed by bringing things full circle to another phase of problem solving etc.

Generic	*What is the problem & What is solution*	*Build the solution*	*Check the solution*	*Implement the solution*
Change	Discuss/Define	Do	Review	Done
Software Engineering	Analyse/ Design	Build	Test	Implement
Quality Management	Plan	Do	Check	Act
Risk Management	Risk Identification Risk Analysis	Risk Plan	Risk Monitor	Risk Control

Table 1- Change, Software Engineering, Quality and Risk management cycles

To begin these cycles, we take a broad view of the business, looking at stakeholders, business processes and technology within the business system, in an effort to explore what problems exist and what changes may need to be made to improve the business. In software engineering terms this first phase of change is explained as analysis and design elements of the software evolutionary cycle. Working with the stakeholders involved, the aim of the analysis element is to identify the business requirements/issues, which can inform the design of related information technology.

The issue of quality and risk management throughout the whole evolutionary software development process are key issues (Pressman, 2000). As quality is defined as conformance to requirements, in order to ensure that quality is achieved throughout the whole cycle of change, it is essential to that we begin the quality cycle with a comprehensive and rigorous analysis phase to generate requirements. This allows us to later test that the software meets initial requirements. In parallel a rigorous analysis phase should help us identify risks at an early stage in the process of change which allows us to design solutions to minimise related risks.

We begin the analysis stage with an effort to identify business processes, problems and related requirements, which is followed by the design stage when options for how those requirements could be met by the necessary technology are explored.

2.2 Analysis

2.2.1 Stakeholder involvement

In exploring a process of change we must begin by identifying the key people who are involved and who will be affected by the programme of change, i.e. the stakeholders. Any programme of change will only succeed if the potential on offer is communicated effectively and stakeholders are adequately informed and involved to ensure success.

Stakeholder involvement is consistently identified as a key requirement to successful business process analysis. This should begin with stakeholder identification, both within and without the organisation e.g. the customers, the staff involved in change

implementation, the other staff affected by the change, the external suppliers etc. Involvement should come from both those at a management level with a view from the top of the organisation and those involved in the day to day operation of the business to ensure all stakeholders are adequately represented. While there is no doubt that support from the top of an organisation is critical to create a mandate for change, it is equally important that the support for this change develops from the "ground up" (Clegg, 2000; Kauppinen, 2004).

These stakeholders should be brought into this work at the earliest opportunity. At that early point, it is important to begin "unfreezing" the current state of affairs and begin motivating the many stakeholders who will be affected with a vision of what the programme of change promises. This should be done in the first instance by a process of education, particularly ensuring that early stakeholder involvement is linked to early benefits from the change programme (e.g. the value of the right information to the right person at the right time needs to be communicated). The phase of education should be followed by adequate stakeholder participation. The logical place to begin the stakeholder participation is with an exploration of current working practices which should serve as a good starting point for exploring further change (Huczynski, 2001, pp 602).

Finding the right level of stakeholder involvement may be a challenge as effective working groups may work better if somewhat limited in size. Indeed the challenge of coordinating this work within a programme of this size is also considerable as the larger the project the larger the communication overhead (Brooks, 1975). In any event stakeholder education and participation should be fostered by a robust communications network, which should allow for distributed messaging under some centralised control (Boddy, 2002, p434).

Clearly this analysis work cannot be done properly as a standalone, one-off endeavour. Instead, this work should be taken on by a group that follow it through the ongoing development cycle and ensure that the evolution of the change is facilitated all the way through to the test phase. An evolutionary approach to change should

allow for feedback, both good and bad, to the stakeholders involved as they move through successive cycles of change. If this evolutionary approach to change is combined with adequate stakeholder involvement, then stakeholder ownership of the change programme can be fostered from the start and ultimately should drive the programme for change in the long run (Kauppinen et al, 2004).

2.2.2 The process of business requirements analysis

Stakeholder participation is critical in determining the current working practices within an organisation. At the same time this exercise can be instrumental in determining how working practices/ business processes could be changed for the better with (or without) the support of modern IT.

When examining business processes across a range of industries it is clear that significant commonality exists between processes (Gunsaekaran, 1997). This suggests that it is important to begin the process of business process exploration across organisational boundaries from an early stage. A flexible team based approach to business process exploration that makes use of the matrix project based structure found within many large complex organisations should enable this broad minded view. These teams should look at common core processes to begin with, which can be followed by an exploration of processes that may be specific to functional groups. This should help produce horizontal solutions that cut across organisational boundaries, rather than the traditionally vertically orientated solutions that evolve if this exploration is done solely along functional lines (Clegg, 2000).

The key issue within the business process analysis is to examine current or best business practice at its most fundamental level and then explore how stakeholders and technologies can support it. Any analysis of current or improved business processes should try to look at the elements of cost, time, quality and risk involved within the processes. A multidisciplinary approach with these and other viewpoints are taken into account is recommended as the more viewpoints involved the broader the validity of the end result (Gunasekaran & Nath, 1997).

As mentioned the options for change range between those that are radical and transforming to more conservative incremental change options. It is believed that change is more likely to succeed if those changes with a high benefit/cost ratio (also known as “low hanging fruits” or “quick wins”) are early targets. Those that are easily identified within a process should be delivered with successive turns of the evolutionary cycle, rather than a big bang approach, which carries greater risk (Kauppinen et al, 2004).

When exploring options for changing business processes, a variety of views can be taken. One useful approach may be to examine business processes as sets of transactions. Within any business process, goods or services are exchanged between stakeholders for cost (including time), while information is exchanged to support the transaction. When we then examine how a process can be improved we look to see how value can be added to these transactions. While value is a difficult concept to measure, it is conveniently and simply equated by Deise as a balance between cost (inc. time) and quality (Chaffey, 2002, pp 225). While quality management within business is a key concern, so too is risk management. As there is considerable overlap in best practice approaches to promoting quality and minimising risk and it may be useful to examine these factors in parallel. Therefore if we improve on a business transaction we should either be reducing the cost or time involved, improving the quality of the goods or services or reducing related risks.

This view can be explained using a very simple example to illustrate. A patient goes into a hospital for a hip replacement and deals with healthcare staff. In very simple terms, the patient receives goods (a new hip) and services (clinical expertise and care) at a cost (inc. time) and information exchange (e.g. via a clinical record) supports the process. Any improvement on this process should add value by either reducing the cost or time involved or more importantly adding to the quality of the goods or services the patient receives, thereby reducing the related risks. Though this view of the world of business processes may appear ridiculously simplistic it should help illustrate the key issues involved in business process change.

The methodology used for business process design is not a focus of this paper but the question of the most effective business process mapping methodology is an important one. While a number of techniques exist currently including flowcharts, data flow diagrams, swim lanes, Use Cases and scenarios, no single option addresses all the issues involved (Lejk & Deeks, 2002). The challenge remains to identify a technique that can map the stakeholders involved, their processes at operational, tactical and strategic levels (over varying time frames) and the supporting technology. The inter-relationships between individual processes needs to be demonstrable. The technique should be able to show current and alternative processes, with measures such as cost, time, and quality as related to the information flows. To achieve all this, the ideal technique should be both simple yet flexible. While it may be agreed there is no ideal technique at present, a standard approach across the organisation is essential.

The outputs at this stage should be a list of key business processes with related IT requirements that should support improved changes in the business. These outputs are fed forward to the design phase where they can be translated into technical specifications for the technology required.

It should be clear that considerable effort may be required to explore this work. As such, considerable resource and support needs to be provided to support this ongoing work.

2.3 Design

2.3.1 Converting business process requirements into IT solutions through design

The business process analysis should provide sufficient detail to enable the design and build of the technology required to support the business process.

The design phase may involve work at varying levels in the technology e.g. data, application or user interface layers in the software. Of particular interest are the principles involved in user interface design. While we stress the need for the business change to drive the IT support, there is little doubt that IT can have a profound

influence on cognitive processes and the way people work/ the business process. While users require little knowledge of the lower layers of the supporting technology, they are significantly affected by the usability of the technology (e.g. user interface etc). Therefore in an effort to ensure that well designed user interfaces positively support the business processes, it is worth briefly exploring best practice technology usability principles.

- The technology should fit naturally within its environment and it should relate to the real world environment it lives in.
- The technology should provide a flexible toolkit which is customisable to users' preferences, while complementing the business processes.
- The technology should present a consistent look and feel, especially between processes. The toolkit should provide the right tool at the right time to the right user- it should not overload users with too much choice or detail.
- The technology should provide an interface that is easily navigable via layers of information rather than an interface that is unnecessarily crowded.
- The technology should support recognition rather than memory recall.
- The users should feel in complete control of the technology and be allowed the freedom to exit, undo, redo work as they choose. As such there should be very few irreversible actions where work is lost without further trace.
- The technology should provide adequate help and documentation. It should help recognise, diagnosis, and recover from errors.

(Kushniruk, 2004)

2.4 Build

The build takes the outputs from the design phase and converts them into the hardware and /or software required which then undergoes the test phase before implementation/deployment.

3 Academic Research (b) - Testing

There is no doubt that the testing phase in the software development cycle is a key quality assurance and risk management step within the whole process (Parrington, 1989; Royal Academy of Engineering, 2004). Testing aims to increase the quality of software under test through the identification of related errors. However much effort is put into the work of testing, it is important to point out that it is never possible to identify every error within a system or to prove that it is 100% error free (McDaniel 2002, Proberta 2003). In general terms the testing aims to ask are we doing "what we said was the right thing to do", i.e. whether the products were built according to the specification from the analysis and design stages.

The business of testing begins on a small scale and moves to a larger scale. In the first instance testing begins with unit testing, whereby individual modules within an application are tested independently. This is followed by integration testing, where modules are brought together and the relationships between modules are tested. It is recommended that the testing phase includes both a normal and abnormal set of test data to ensure that the system can handle both. Once the software has been tested rigorously in this lab-based environment it is then brought out to face the users in alpha and beta tests (Parrington, 1989).

3.1 User acceptance testing

A user acceptance test site (otherwise known as an alpha test) provides a safe environment whereby business processes and the IT designed and built to support them can be tested together. This test phase is followed by a beta test phase where early adopters trial the software in a live environment before it is widely deployed.

Within the software engineering discipline it is accepted that the most important ally in testing is the end user (Parrington, 1989). User acceptance tests provide this stakeholder group the opportunity to bring their agreed business processes to a safe environment to ensure that the software solution supports them. It should highlight key areas of usability in the supporting technology and may be considered as the key

quality control point in the whole software development cycle. At the same time, this test phase should also provide an opportunity for these stakeholders to independently examine the way they work and so allow them to explore changes in their working practice.

User acceptance tests (otherwise known as alpha tests/ usability tests), are considered industry best practice and it has been recommended that they serve as the concluding event of contract objectives for IT delivery (Proberta et al, 2003).

3.2 User acceptance testing- best practice

3.2.1 Stakeholder involvement in user acceptance testing

As we have previously stated, the user plays the central role in user acceptance testing. As users are involved, this contrasts with other testing phases where professional testers conduct much of the testing. While a role for professional testers can be found here, if the judgements of both professional testers and users are taken into account, the opinion of the end users carries more weight when it comes to the decision to implement (Liljegren, 2004).

Stakeholder involvement in the process should help define the variety of users that needs to be represented during the testing process. Interestingly, there is reasonably clear guidance on the optimum number of users to involve in this form of testing. It is suggested that even a surprisingly small number of users (e.g. 8-10) will identify up to 80% of usability issues (Kushniruk & Patel, 2004).

3.2.2 Testing the business processes through scenarios

The outputs from the analysis phase in the form of business requirements should inform the design and build phases of the project, as well as provide the natural input material to test the solution with. It is important that those user-generated processes that began the process are used for testing to ensure continuity through the life cycle of change. While a variety of approaches may be used to document the processes, if a scenario-based approach is used in the analysis phase these can prove to be particularly useful in testing. Scenarios should be detailed to include an entry point, sub-processes which make up the scenario and an exit point (Beynon-Davies 2002,

2003). Any high level scenarios will need populating with data to bring them to state of readiness for testing. The population of scenario data may be drawn from a test data resource. Other options include harvesting scenario detail from operational media (e.g. supporting documentation, journals etc) (Kushniruk & Patel, 2004).

3.2.3 Testing the usability of the technology

While this stage of testing allows users to run through their routine business processes, it must be remembered that the technology is under investigation. As the technology should have gone through module and integration testing to get to this point, the focus at this stage will be to ask the users to examine the usability of the software. As we mentioned earlier it is recommended that fundamental usability principles should have been adhered to within the design phase. As this will have been the first occasion that users "get their hands" on the new technology, this user acceptance test phase is a critical test of those principles and an important judgement on the likelihood of user acceptance.

In bringing together stakeholders, key business processes in the form of scenarios and the technology under investigation we are providing the components needed to test, yet we still require a methodology to gather information from the test. To that end we now explore the options available to evaluate the usability tests

3.3 The evaluation of user acceptance tests

An exploration of the literature clearly demonstrates that varied approaches to usability evaluations are in use, which vary between objective and subjective in style. The traditional methods that are used for the purposes of usability evaluation include;

3.3.1 Questionnaires

Once the stakeholder has completed running their business processes with the supporting technology they fill in a structured questionnaire to rate the test according to pre-agreed parameters, such as usability principles (see Section 2.3.1). Questionnaires offer advantages in terms of their ease of use and speed of completion. They are also reasonably straightforward to analyse, particularly if they are structured

carefully. However, it has been noted that they can produce a subjective result and may therefore be unreliable (Henderson et al, 1995; Markopoulos 2003, Kushniruk & Patel, 2004).

3.3.2 Interviews

Once the stakeholder has completed running their business processes with the supporting technology they may instead be asked to complete a focused interview to rate the test according to pre-agreed parameters. A focused interview can be useful, provided that the time between user testing and interview is minimised. A semi-structured group interview may also yield a useful result and allow for cross-referencing of usability issues between individuals. However interviews are also somewhat subjective and are not particularly recommended (Henderson et al, 1995; Markopoulos, 2003; Kushniruk & Patel, 2004).

3.3.3 Logged data with user input

In this technique as the stakeholder runs their business processes with the supporting technology, automatic recording by the technology under evaluation takes place. This allows very accurate recording of the users interaction with the technology. While this is an objective approach, this technique does not allow for any exploration of business process issues or user views on the technology, which must also be recorded and collated to interpret the results (Henderson et al, 1995).

3.3.4 Verbal Protocol Method

While questionnaires and interview produce subjective results and the logged data produces a limited objective result, none combine both approaches in a systematic technique. Another technique for assessing usability evaluations, which is deemed more robust, is the verbal protocol analysis method. In this technique users navigating through business process testing scenarios are encouraged to verbalise their experiences of the system as they interact with it, i.e. “think aloud”. This method involves video and audio recording of the test encounter, which links the business process, stakeholder experience and the technology together to offer a reasonably

objective record of the test. It has been noted that using this approach, 8-12 business process scenarios can highlight 80% of related usability problems. It should be noted that although this offers the most comprehensive testing evaluation, is hard to coordinate as it requires staff, training, equipment and room space. A low level coding system (e.g. "user interface, open file dialogue box, need to sort by date, is an inconvenience") from the outset is most useful as this would reduce the effort involved in the subsequent analysis of the data collected. While it is the most robust, it is clearly the most time and resource intensive to perform (Henderson 1995; Markopoulos 2003, Kushniruk & Patel, 2004).

3.3.5 An incident management approach

One view of the user acceptance testing is that it allows stakeholders to run through their business processes and ensure that they are getting the right technology to support them. While ideally all tests will run smoothly without any issues raised, errors found should be seen as opportunities to improve the quality of the system and should be tracked down (Parrington, 1989). It would seem logical to focus the exploration of this interface between business process and information technology on the related incidents that are generated at testing. It would also seem reasonable to suggest that any issue or incident maybe related to either a poor business process or problematic IT solution (Mathieson and Keil, 1998). An "incident management" approach should be able to highlight an incident that is related to business process, IT or both.

Despite a thorough search of the available literature, consultation with academic staff, NPfIT sources and contracted Gartner IT research services, there is a dearth of available information on an incident management style of approach to user acceptance testing. While accepting that the approach may not have any firm academic background, it should still be worthy of further exploration. As no clear guidance exists as to the best way to manage the conflicts between business processes and information systems in this context we can instead infer a method of managing them from both best practice principles and logical reasoning/ common sense.

The first of which is that user acceptance testing is in place to ensure business processes are supported by the IT.

The second principle is that the user is the testers greatest ally, therefore the users should inform the decision making required.

Any incident raised may originate from either a poorly defined business process from the analysis phase or a problematic technology solution to the requirement (e.g. usability problem).

The user should be best placed to identify whether they feel the business process they are asked to perform during the test is proper/improper, and/or whether they feel the IT which is supporting the process is usable/unusable.

The user should also be best placed to decide what level of impact any related incident will have on their business domain.

- The type of incidents

While a variety of incidents may occur during a usability test, those of particular interest are those relating to either business process or usability of the technology.

- The severity of incidents

In order to measure the significance of incidents raised, a scale is required to determine the action required. Bezier (1983) suggested a ten-point scale of failures, which is larger than is necessary. A simpler measurement scale for rating software usability incidents (see Table 2) has been proposed by Neilson, which ranges across 4 points (Kushniruk & Patel, 2004; Liljegren 2004). As this technique has a firm foundation in measuring IT usability it lends some academic weight to this approach. This scale should be adaptable to deal with a variety of incidents encountered.

Rating	*Interpretation*
0	Critical
1	Major – adverse impact
2	Minor – minor impact
3	Cosmetic

Table 2 – Usability Scoring system (Neilson)

It should be evident that it is difficult for any one usability evaluation technique to provide a definitive analysis on the matter that it studies. What is equally clear is that evaluation is tied to and shaped by the resource under study. Therefore when we attempt to a study a complex environment such as health care, we must be flexible in our approach. While an ideal evaluation technique should gather quantitative data, it is recognised that qualitative approaches also have value. (Baskerville, 1999)

The alternative to choosing just one of these techniques is an approach that combines several. Indeed some suggest that pluralism is the only gold standard in evaluation (Mark, 2001; Garmer et al, 2004). The use of multiple methods may yield the most comprehensive result possible, however the law of diminishing returns suggest that multiple methods will not be appropriate in every study.

The outputs from this user acceptance test will be fed back to the analysis and design phases and fed forward to beta testing and implementation phases.

4 Operational Research- Change- Analysis, Design , Build, Test in NHS

4.1 The structure of the NHS

The National Health Service (NHS) provides a health service to the population of the U.K. Like every other service industry the NHS is under pressure to continually evolve over time to deal with external environmental factors (e.g. social, political issues) that shape it.

At present the NHS chiefly demonstrates a functional organisational structure, although it also exhibits some features of an organisational matrix, as individuals and groups can be seconded on a project by project basis. (Boddy, 2002, p 244) In England, the Department of Health in conjunction with the Modernisation Agency, coordinates the NHS through Strategic Health Authorities (SHA) in 28 geographical regions across England. The SHAs manage the performance of the many trusts who deliver care to the public and are a key link between the Department of Health and the rest of the NHS (See Figure 1).

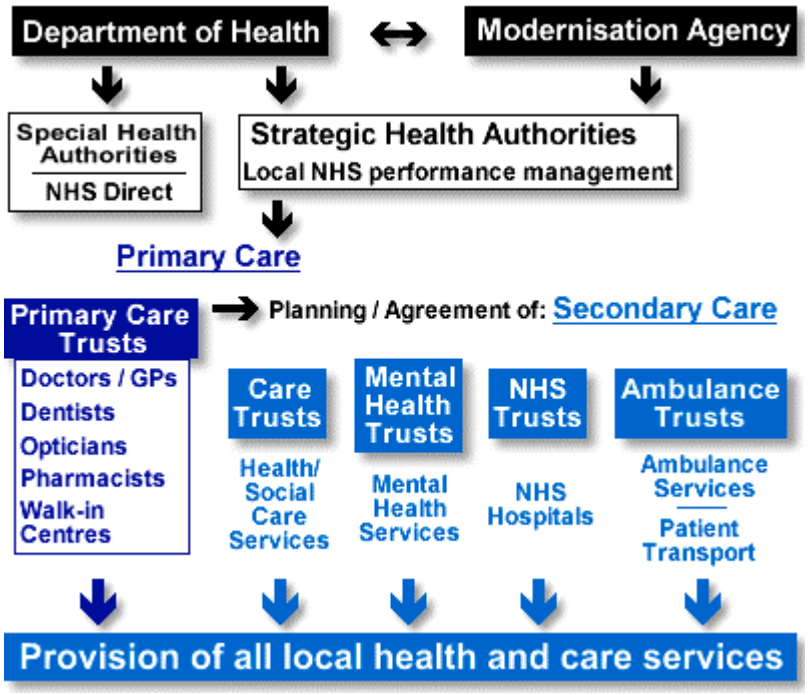

Figure 1 – Structure of the NHS (NHS Information Authority, 2004)

The vast majority of health care is delivered by "trusts" across England. Primary care is the bedrock of the NHS and is delivered to a local population by primary care practice staff, made up of a mixture of clinicians (e.g. General Practitioners (GP), practice nurses) and supporting administrative staff.

Primary care aims to manage health care by means of regular preventative health care processes, e.g. vaccinations, health checks, management of chronic disease (e.g. diabetes etc) and emergency care when necessary. Social Services work closely with primary care staff to deliver care in the community.

Secondary care is required when the primary care services decide a patient requires special expertise and is provided by secondary care trusts (e.g. ambulance, acute and mental health). It is provided on both an elective/routine (e.g. outpatients or planned admission) and emergency basis (NHS Information Authority, 2004).

At the heart of the NHS lies the patient care process, where in very simple terms, the patient receives goods and/or services provided by health care providers at a cost (inc. time) and a clinical record is produced to support this process.

4.2 Change in the NHS and the NPfIT

As part of the current UK governments drive to reform and improve public services, the NHS Plan recommended both investment and reform throughout the NHS.

It has been recognised that in order to support the change required within the NHS that there is tremendous potential to facilitate change with help of modern information technology. In an effort to realise some of that potential, a special NHS Information Authority was set-up and began an Electronic Record Development and Implementation Programme (ERDIP) in 2000. This programme co-ordinated a variety of exploratory electronic health record projects to identify the information technology requirements needed to support the NHS.

In an effort to move the ERDIP agenda forward a centrally led National Programme for Information Technology (NPfIT) was begun in early 2003 to procure a Care

Record Service (CRS), essentially a health record information system for the NHS in England. After several stages of selection, Local Service Provider (LSP) consortia negotiated with the NHS in cluster regions to finalise one CRS contract per region. The North East "Cluster" region of England (one of five in England) which stretches from Berwick-on-Tweed to Sheffield includes a population of 7.5 million people, 167,000 NHS staff, 23 acute hospital trusts and 1265 GP practices. The North East Cluster region LSP contract was awarded to Accenture in late 2003. In a parallel development a national contract was awarded to British Telecom (BT) as National Application Service Provider (NASP) for the provision of centralised services such as a core messaging service, the "data spine" (NHS National Programme for IT, 2004a).

In order to facilitate this massive programme of change, the development of the CRS co-ordinated by the NPfIT has been split into various phases (Phase 1, 2 and 3 (P1, P2 and P3)) with increasing scope over the 10-year life of the programme. These phases are split into releases e.g. Phase 1 Release 1 (P1R1) and sub-releases e.g. P1R1a, P1R1b to be able to break the programme work into projects of a manageable size. In the early phases a small number of early adopters deploy early releases of the CRS service which offers just a subset of the total service. For instance the initial plans for P1R1a begin with a limited Primary Care CRS in five early adopter sites (who are able to demonstrate they are organisationally ready) within the North East Cluster. This approach is in keeping with the evolutionary approach to change and software development already mentioned.

4.3 Analysis and Design in the NPfIT

4.3.1 Stakeholders

The process of stakeholder involvement began with the ERDIP programme and its varied projects explored many aspects of electronic record development. Since the advent of the National Programme for IT the process for stakeholder involvement changed somewhat. As part of the NPfIT tendering process some stakeholders from the NHS were invited to evaluate the tendered bids for the service. At the same time a number of people were recruited to advise the NHS Information Authority on the

ongoing analysis and design required. The National Clinical Advisory Board (NCAB) and the Public Advisory Board (PAB) were also set up at a national level to facilitate stakeholder involvement (NHS National Programme for IT, 2004a).
Within the cluster, early roadshows and "design workshops" were organised by the LSP in an effort to further facilitate stakeholder engagement by a process of education and participation in the early design of the service.

4.3.2 Process

In the lead-up to the NPfIT programme, the ERDIP programme involved varied explorations of business processes in the NHS, to identify how these might be supported through IT. It is understood that the outputs from that work informed the Output Based Specification (OBS) which the NPfIT used for tendering the CRS and formed the basis of the agreed contracts. In order to facilitate delivery of the programme, that delivery has been split into manageable projects of work as discussed. The programme aims to deliver the core CRS along both vertical organisational lines (e.g. Primary Care, A&E, Theatre systems) and other work-streams such as electronic booking of appointments ("Choose and Book"), electronic radiography (Picture Archiving Communication System (PACS)) etc., which should cut across vertical lines in the NHS (NHS National Programme for IT, 2004a).

Since the contracts have been agreed, the LSP has held design workshops for P1R1 to build on this work and re-analyse the business processes which need to be supported in the first release.

To date within the NPfIT no single standardised process of business process mapping is in use and no significant work in the education of clinicians in a business process modelling has begun, but there are current plans to recommend a Unified Modelling Language (UML) based methodology across the NPfIT (NHS National Programme for IT, 2004b).
Once the business processes exploration has been completed at the analysis and design stage, these logical designs inform the physical design of the technology.

4.3.3 Technology

While the design workshops look at a logical view of the proposed design, it is assumed that the physical design of the solution managed by the LSP will adhere to the best practice key principles outlined in Section 2.3.1.

4.4 Build in the NPfIT

Once the design has been agreed between the NPfIT, the users and the LSP, the build of the service is managed by the LSP before it goes through a rigorous testing phase before deployment.

4.5 Testing in the NPfIT

The testing cycle set by the NPfIT is comprehensive. Initial module testing is followed by systems testing where the LSP system is tested in isolation. This is then followed by integration testing where the LSP system is tested in conjunction with the NASP application (i.e. the data spine where a national register of patient demographics and key medical information is kept).

The system and integration testing is first performed by LSP professional testers. The professional testers then run through agreed scripts, while NHS employee witnesses observe the results independently. The aim of this "test witnessing" process is to begin testing with NHS stakeholder involvement, allowing stakeholders to raise issues and concerns. However it should be pointed out that this phase does not allow stakeholders to get their hands on the system. The "Model Community" is the important user acceptance testing stage within the NPfIT. This key phase of testing, which has never been done in the NHS before, allows stakeholders to bring their agreed business processes to a safe testing environment to examine business process and IT usability issues in particular. Model community testing is also a contractual obligation, which is required if the LSP is to receive its "authority to proceed" to deployment (Department of Health, 2004a).

4.5.1 The need for user acceptance testing in health care information systems

There is no doubt that the health care service is rightly regarded as an essential public service. The health of a nation has an impact throughout society. In order to ensure that a health service is able to deliver high quality care, it needs high quality staff, processes and supporting technology, which should also lower related risk.

Cases such as the Therac 25 radiation machine and the London Ambulance service highlight the consequences when quality is not managed carefully in healthcare. In these healthcare projects of the past, IT was deployed without proper quality control and ultimately caused several deaths. An examination of the underlying reasons highlighted a lack of quality management systems and particularly no significant IT evaluation process (Wastell 1996, McDaniel 2002).

Beyond the straightforward point around healthcare quality and patient risk a further issue arises when we discuss the benefits and costs from healthcare change projects. As healthcare is such a complex environment to evaluate, evaluations of programmes of change in healthcare are not routinely done. Previous NHS experience highlights this specific issue. NHS officials have had to go to parliament four times to justify the expense involved in IT projects that had gone astray. In each case a rigorous evaluation was recommended (Wyatt 2003).

As healthcare information systems are now increasingly recognised as essential tools for the 21st century health care industry, yet carry significant risk, it is now clear that evaluations of related healthcare change projects are essential. While a significant amount of IT evaluation literature explores the health care perspective, it is noted that within this domain there is little evidence of methodologically sound evaluation studies to support the introduction of IT (Kaplan, 2001, van der Meijden, 2003). In particular while user acceptance testing is an accepted part of IT development, the evidence for its rigorous use for healthcare applications is not evident. The difficulties of evaluation within a complex health care environment do not negate the need to improve on this process of IT evaluation, which suggests that user acceptance testing within a healthcare environment is to be welcomed (Brender 1998, 2000; Bend, 2004; Lenz 2004).

4.5.2 The Model Community

The Model Community within the NPfIT aims to offer the opportunity to stakeholders to examine whether their existing or new business processes are adequately supported by the new IT solutions before they are released for deployment.

As the Model Community is the last gateway before the release of systems into the live environment, it serves as a major quality assurance/ risk management step within the NPfIT. No evidence has been found to suggest that a testing environment of this nature has been used in a health care business change programme in the past.

- Stakeholder involvement

No formal mechanism of stakeholder involvement had been established for the Model Community. This is explored in further detail in Section 5.2.

- Testing the business process through scenarios

The chief input to the Model Community testing process should ideally be best practice business/clinical processes, documented using industry standard, best practice process mapping methodology. This is explored in further detail in Section 5.2.

- Testing the usability of the technology

The other key input is the IT solution supporting the business processes. The IT should have been validated before it arrives through the aforementioned testing process. The Model Community seeks to test the IT and ensure that it is fit for purpose. This is explored in further detail in Section 5.2.

The work of the Model Community is necessarily split up to manage the large volume of business processes that need to be tested with their related supporting IT. This work is phased to support the planned phase /release deployment plans.

The outputs from the Model Community test should either feed forward to deployment testing in the early adopter sites (analogous to beta testing) and/or feedback to complete a cycle in the evolutionary process back to the analysis and

design groups who should take the test results into account in further iterative developments of the evolving service.

4.5.3 Evaluation methods in the NPfIT Model Community

The technique chosen by the NPfIT for evaluations of the user acceptance tests is based on an incident management approach. The National Programme for IT team have produced a national set of recommendations regarding incident management which clusters are entitled to adapt for their own purposes. The incident management approach they recommend suggest that Model Community incidents are identified as software, training, business process or usability related. A 5-point scale for marking severity of incidents is recommended (See Appendix 3) (NHS National Programme for IT, 2004c).

The incidents identified at the Model Community should be collated and related acceptance/exit criteria from the Model Community are recommended (See excerpt in Appendix 8) (NHS National Programme for IT, 2004d). Of note an alternative set of acceptance criteria were recommended by the LSP as per Appendix 9.

5 Practical Experience of the Model Community

This project work has allowed the time to explore business process analysis, design and user acceptance testing within the North East Cluster during my appointment as Clinical Consultant to the Model Community.

5.1 Analysis and Design

- Stakeholder involvement

The initial stakeholder involvement for this project work involved Primary Care staff within the cluster. Stakeholders were invited to review business processes determined at the Primary Care P1R1 design workshops, initially through an email review, which was of limited success, followed by a much more productive workshop where further clinical input into core business processes was gathered. This was initially co-ordinated through the current cluster communication channels, which routes messages to stakeholders through the SHA IT leads. Feedback received suggested that stakeholder involvement was being restricted without a clear programme of education or formal mechanism for participation. Further feedback suggested that the current communication process was slow and ineffective at times.

It is acknowledged that the level of stakeholder involvement of the clinical staff is still a national concern with not enough stakeholder education or participation to date (Vere-Jones, 2004). Of late there has been no clear mechanism in place for interested parties to participate and no continuity in stakeholder involvement throughout the analysis and design of the service. Within the cluster it can be acknowledged that the communication of messages from the cluster to the trust staff is sub-optimal without the support of a robust communications network in place.

These concerns are currently being addressed within the cluster through the formation of clinical networks (clinical stakeholder working groups) along functional lines, e.g. Primary Care, Emergency Care etc. The planned mechanism for this is a “network of networks”, whereby clinical stakeholders within trusts will be able to participate in working groups which will be co-ordinated at an SHA level and/or cluster level as appropriate. In a parallel development, a national Care Record Development Board

(CRDB) will replace NCAB and NPAB and through a system of action teams will try to ensure best practice is shared between the clusters. The CRDB will also aim for an important mandate for the programme of change from the professional bodies (e.g. Royal College of Nursing) who have a vested interest in assuring that clinical best practice is facilitated. In an effort to support these developments, plans are in place to recruit additional communications support staff at each of the SHAs in the cluster to provide the additional communications capacity required

- Business process

In order to ensure the validity of the outputs from the Model Community test results, attempts have been made to ensure the validity of both the business processes under test, in advance of their arrival to the model community.

Best practice recommends that business process analysis should explore how key core business processes along horizontal lines can be supported by IT, looking for the quick wins in the early stages of a change programme. Within an organisation as complex as the NHS, exploring the variety of current business processes that exist is no easy task. However, as there is no clear link between specific work done in the ERDIP projects and the OBS, the rationale for the current plans in the planned delivery of the programme is not transparent. It is difficult to determine if a robust analysis and design phase with adequate stakeholder involvement during the ERDIP has produced a key core process related IT requirement (e.g. offering a cross-organisational quick win) which informed the OBS and is scheduled for early release. As the OBS was not detailed enough to inform the design and build phases of the programme, P1R1 "design" workshops were led by the LSP to reanalyse the business process requirements. Without clinical leadership from the cluster, it is again unclear how the stakeholders involved examined core business processes to determine how the new IT service could best support them.

As the first small evolution in this massive programme of change, the choice of Primary Care systems as the first target is an interesting one. As the primary care community in the UK has many years experience in healthcare IT it seems a

reasonable first step. However without a mandate from either national professional bodies or a cluster wide group, without traceability from the ERDIP/OBS/P1R1 workshops through to the release plans, there is limited ownership of this work within the Primary Care community in the cluster. These concerns were highlighted during the primary care review workshop when stakeholders enquired why document management, an established key business process, was not supported by document scanning technology in the first release . Other stakeholder groups have raised similar concerns about the quality of the initial business process analysis and design work.

It is necessary to ensure that this system is more transparent in the future, to ensure that a robust system of business process analysis is seen to drive the IT support, rather than risking the perception that the business is having to fit around the IT.

Documentation from P1R1 workshops and attendance at P1R2 workshops related to emergency care has provided some evidence on the current approach to process mapping methodology being used in the cluster. While the LSP is using a flowchart approach, it is likely that the cluster working groups may need to move to an UML based approach in accordance with NPfIT guidance, to ensure a uniform approach across the NHS.

5.2 Testing

The NPfIT plans for module, system and integration testing in advance of user acceptance testing mirrors best practice in industry. With respect to user acceptance testing, several issues were highlighted.

- Stakeholder involvement

Without a clinical network in place the process of stakeholder recruitment to the usability testing was communicated in the first instance through the current cluster communication mechanism. While this was not particularly successful, communications directed at stakeholders who had attended the business process review workshop proved much more fruitful. Dates for the primary care testing in the Model Community changed on several occasions on the lead up to testing which was

a cause of some frustration amongst the users who were keen to participate. The stakeholder profile was defined based on the scenarios we were testing. Based on the evidence available we aimed to recruit approximately 12 users over the testing period. In the week prior the testing arrangements we had recruited 16 users for testing with a good split of staff to reflect the profile required for testing. Training in the primary care application was offered to all testers before they attended the testing stage.

- Business process

The primary care business process material made available by the LSP from the P1R1 design workshop and built on with our subsequent review stage, formed the basis of business scenarios which were brought to the test. It incorporated administrative scenarios such as appointment management, and clinical scenarios such as clinical care encounters, pathology results management etc. (See Appendix 5)

- Technology design principles

In order to ensure the validity of the outputs from the Model Community test results, attempts have been made to ensure the validity of the IT under test, in advance of its arrival to the Model Community. The software to be tested was due to complete all other phases of testing prior to its release to the model community testing process. While it was assumed that best practice usability design principles would be adhered to, this did not form any formal part of the incident management mechanism in place.

- Incident management arrangements

Having examined the academic evidence on incident management and the NPfIT approach, evidence was presented to the North East Model Community cluster test team and a consensus was reached on the approach to be taken. The North East cluster team modified both the NPfIT incident rating and exit/acceptance criteria. (See Appendix 4). The remit of the incident management system covered software, training, business process and usability issues. The scoring system had a 5-point scale to differentiate between those incidents that needed immediate remedy and those that could be fixed at a later time.

6 Evaluation of the Model Community

6.1 Study of incident management in the Model Community

While facilitating the testing process, in order to evaluate the testing process, a study was set-up to examine the incident management procedure within the cluster.

- Setting

The setting of the study was the NPfIT North East Cluster Model Community P1R1a Primary Care testing. The location was originally to be at Goole District Hospital, where a clinical environment was to be used to simulate a variety of care-settings. For technical reasons, related to the NASP (national data spine) test environment the location was moved to the LSP test offices in Leeds. The initial plans were for two weeks of Primary Care P1R1a testing. As a result of slippage in the test timetable this was rescheduled into a four-day period. It was decided to use that first of the 4 days to "dry run"/ rehearse the testing.

- Stakeholders

The North East Cluster Model Community test team was made up of the manager, business analyst, NPfIT liaison and clinical consultant. As a result of the technical difficulties mentioned we were asked to work with the Eastern Cluster Model Community test team on this occasion and took a conjoint approach. (The North East and Eastern clusters share the same LSP and while they have separate contracts the LSP prefers to take a conjoint approach if possible).

The 16 North East testers recruited were primary care staff from across the cluster with a mixture of practice management, receptionist, practice nurse and GP roles.

- Business process scenarios and data

Approximately 35 key business process scenarios, developed from the P1R1 primary care workshops and review sessions, were used for testing. (See Appendices 5 and 6 for list of scenarios and sample scenario). The LSP test team managed the data required to populate the scenarios.

- The technical environment

The LSP was providing the Primary Care Service, which was dependent on the NASP data spine service for centralised patient demographic information.

- Day 1

The dry run planned had to be abandoned as a result of technical difficulties with the NASP environment, which was beyond the control of the LSP.

- Day 2 –4 (The first official Model Community test within the NPfIT)

Testers were given an overview of the NPfIT, the testing phase and the role of the Model Community testing. They were given an explanation of the incident management system and a set of scenarios (provided on paper) and asked to involve a member of the test team if they ran into any incidents.

At the time of any incident, the users were invited to explain where they thought the incident originated i.e. business process or usability and what severity it would have on the business. These paper-based replies were facilitated and interpreted by the test team to ensure a consistent approach to the system before the incidents were logged with the LSP and the national NPfIT team for further attention.

- Day 2

  With the previous days technical difficulties apparently resolved overnight, 10 testers began testing on day 2. However technical difficulties returned again during the day. As a result of several issues; the first day of testing, the high number of testers relative to the test team numbers (2:1 ratio) and the numerous technical difficulties this first day was difficult to manage proactively.

- Day 3 and 4

  Following the problems of day 2, the testing process improved over the course of days 3 and 4. Fewer testers were present (3 testers per day) and a "buddy" system was set-up to ensure that a member of the test team sat through the tests with the testers. Access to test team colleagues and LSP technical staff was also improved for a more streamlined testing process.

Once the tests were completed the results of the tests were collated and analysed. Of particular interest to this report were the business process and usability incidents raised.

6.2 Results of study

Over the course of the 3 days testing, 16 users tested 70 business process scenarios. During that period 64 incidents were raised and fed back to the LSP and NPfIT teams for action . Table 3 and Figure 2 show the incidents by category and score

Type	*Software (S)*	*Training (T)*	*Business Process (B)*	*Usability (U)*
Score				
1	5	0	0	2
2	11	0	0	5
3	10	0	0	7
4	7	0	1	11
5	1	1	0	3
Total	*34*	*1*	*1*	*28*

Table 3- Incidents by category and score

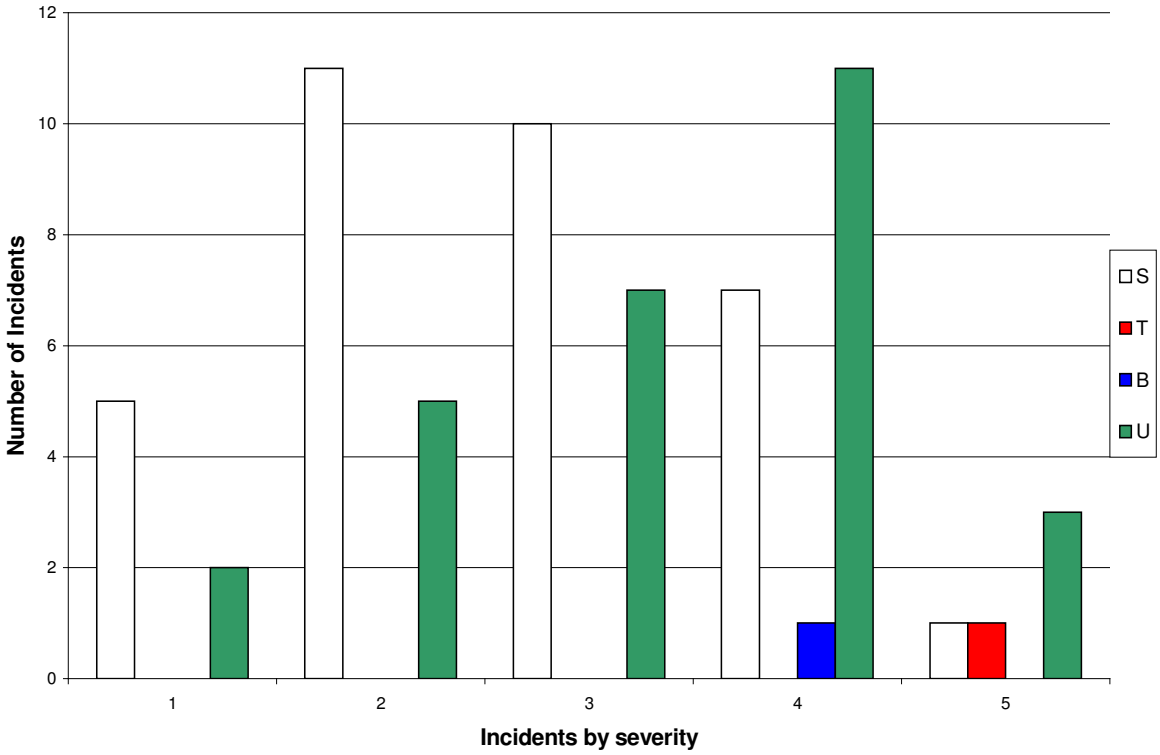

Figure 2- Incidents by category and score

Of note the clear majority of the incidents were software related, some related to connections to the NASP application, some related to the role based access control to the software (which allows clinical staff more access than non clinical staff). The number of these software incidents was far more than expected. This was explained by the fact that as this was the first Model Community in the NHS, the software had not in fact finished system or integration testing and therefore a lot of the incidents raised were on known issues. This was regrettable as the number and severity of these incidents distracted users from examining business process and usability issues.

The number of usability issues was not surprising and should be expected at this stage in the testing. Of particular interest were a number of level 2 usability incidents which users felt forced them into an unacceptable work around. It was gratifying to see that the Model Community gave users an opportunity to identify these incidents before the technology is released. Improvements in the usability of the software will undoubtedly have a significant impact on how the service is received when released (Pose et al, 1996). This work highlights the potential of the Model Community to serve a key quality assurance role within the cycle of change that the NPfIT offers.

The very small number of business process incidents was disappointing given that the key role of the model community is to explore business processes within the NHS. While it is possible that the number was low because the business processes under test were wholly robust, my feeling is that the unnecessary technical issues were the chief reason why there was not more time to explore these issues. It is impossible to judge whether the current incident management scoring system is suitable for measuring business process issues or not- this will need further attention in future testing. Given an adequate number of testers working with business processes in a more stable technical environment, I believe that many more of these issues could be explored.

Despite the structured approach taken during the testing, it must be admitted that the data collected is still qualitative in nature. While it provides valuable information, the study highlighted the varying perspectives on incidents amongst the test team.

Differences in opinion were managed during the wash-up session at the end of the test day, when the test team revisited the incidents to agree final incident categories and scores.

While the results of the study reveal a probable lack of exploration of business process issues within the model community study, likely related to the level of technical issues, it is encouraging to see it succeed at highlighting a variety of usability issues for further attention. It is crucial that any significant usability issues are attended to pre-release as the usability of the software will have a real impact on how the service will be received. Overall the study suggests that the North East Cluster Model Community has clear potential to facilitate stakeholder exploration of their key business processes while highlighting important IT usability issues.

6.3 Evaluation of Project success

I was very glad to be able to join this important work and explore this key part of the NPfIT. This project was just one part of the massive National Programme for Information Technology and given the dissertation related time constraints the time for this work was squeezed into a narrower timeframe than was originally planned. The issues discussed regarding stakeholder involvement, the transparency of business process of analysis and design, and the technological challenges may have had some effect on the outcome of the study. However my view is that within this evolutionary approach to business change supported by NPfIT, adequate stakeholder involvement was achieved for the purposes of the study, and the business processes under test were a reasonable starting point in the process. The technical challenges that were faced could have been anticipated at this stage and cannot be discounted as unforeseen confounding factors to this study.

In order to reflect on the success of the project we now look back at the objectives

- Research academic background to stakeholder involvement in business process production, alpha testing and error tracking/incident management

This has been covered within the academic research chapters 2 and 3. Of note, in view of the repeated changes in the testing timetable over the course of the project, equal emphasis was placed on exploring both business process analysis and user acceptance testing, to cover the event of testing postponements beyond the time set aside for this project. There was a good amount of material available on stakeholder involvement in business process analysis and design. There was less on alpha testing and a clear lack of academic material available on incident management which has already been noted. While this was a disappointment, the approach taken to build on available material seemed a pragmatic approach and the results fitted reasonably well with the related practical experience.

- Investigate "Model Community" operation
- Relate Model Community operation to academic background

This has been explored through Chapters 4 and 5. Of note the principles related to analysis and design learned during the academic research were highlighted as important issues in the practical experience of the analysis and design work. The lack of academic material available on incident management in testing raises this as an issue for further study.

- Facilitate implementation of user acceptance test site for business process and software testing (inc. incident management resolution).

Aside from the usual time management challenges involved in all project management, the key challenge in this project was the need to fit this project within the much larger programme of work that NPfIT involves. The programme had a direct impact on the scheduling of the project, it affected the focus of the project, access to the client, etc. While I was therefore not able to control of all aspects of the project as a result, it was both challenging and rewarding to build in the flexibility in the project so it fitted within such a vast programme. The initial approach taken to the academic research element of the project, in conjunction with the related practical work allowed me the flexibility to explore analysis, design and testing issues until the programme schedule allowed for a final focus on the testing issues explored (See Appendices 10 and 11).

- Research effectiveness of incident management resolution mechanism

This has been addressed with the study in Chapter 6. Of note the very limited time available to run the study must have limited the success of this element, however even in view of the limited time available I believe valuable lessons were learned.

- Recommend strategy for stakeholder involvement in business process production/review and Model Community testing.
- Recommend research-based strategy for stakeholder involvement in error tracking (incident management) resolution, to inform further iterations of business process/software development.

This work is to be found in Chapter 7. Of note the lack of academic material available on incident management has meant that recommendations have been based on practical experience of the process as much as any academic background.

Overall I feel that the project has been a success.

6.4 Client feedback

A preliminary report (including the conclusions and recommendations that follow) was submitted to the client, the Regional Programme Director of the North East Cluster NPfIT. The feedback from the client to this project work was positive, indicating that the project objectives had been successfully met;

"Initial client feedback on this the first ever NHS Model Community is that it has been a success. The Model Community has allowed the first release of software to be deployed in the Primary Care settings with more confidence, as it has been judged as fit for purpose in terms of supporting the core business processes found within Primary Care. This has been a learning curve for the NHS in terms of how to exploit the potential of a Model Community in an IT Programme. The academic approach taken to support this dissertation has ensured that the learning and development has been captured and is fed forward into the other similar new Model Communities across the NHS (there are 5 in total) and also into the future use of this Model Community for the future releases of software in the NPfIT Programme".

7 Conclusions and Recommendations

The business process lies at the heart of any business. The modern Information Technology (IT) revolution has highlighted the role of IT in facilitating business change.

If we examine the cycles of change, software development, quality and risk management in parallel we note that they share much in common. The initial phases of these cycles should involve key stakeholders taking an evolutionary approach to explore key core business processes across an organisation looking for those that might gain a quick win (e.g. improve quality or reduce risk) with the right IT support. Any technology that is designed to support a business process should support key best practice design principles.

Within any programme of change involving IT, user acceptance testing serves as a key quality assurance step, in allowing stakeholders test their business processes with the supporting technology.

On the basis of my exploration of the available academic literature, the North East Cluster NPfIT, its Model Community and the related incident management study, a number of recommendations are made.

7.1 Recommendations on Analysis and Design

7.1.1 Stakeholders

The NPfIT provides an ideal opportunity for stakeholders within the NHS to examine their current working practices, with a view to how these can be improved on, supported by modern IT. Any related changes will have a major impact on the NHS and so should be led by the key stakeholders i.e. the patients, the clinical, administrative and managerial staff, ensuring that all stakeholders who will be affected by this programme of change have input into the programme.

However much stakeholder involvement has occurred to date, there is an acknowledged need to improve on the process for stakeholder education and

participation in analysis, design and build phases. This is currently under development in the form of clinical network development across the cluster, in conjunction with related work at a national level by the CRDB.

The process of education can be improved by a robust communication system across the cluster to disseminate information about the programme of change ahead and the tremendous potential of the NPfIT. This work should be built on to facilitate stakeholder participation in the proposed clinical networks, which can contribute to the analysis, design, build and test phases of the change cycle. Adequate resource and support (including remuneration for clinical staff to contribute where appropriate) should be provided to ensure that stakeholders can be participate on a regular basis over the length of time required to support the change. At the same time efforts made at cluster level will need to be co-ordinated with clinical organisations at a national level through the CRDB to ensure the clusters work has a mandate for change from the top down and the bottom up. The proposed development of the clinical network needs a robust communications network from cluster to SHA to trust level, with adequate resource and support, to support the related education and participation required. Both the clinical network and the communication support required should become operational as soon as is reasonably possible.

7.1.2 Process

The evolutionary approach taken to this important work is laudable. It has begun by breaking this massive programme of work into manageable bundles and limiting the implementation to those who are deemed organisationally ready, i.e. early adopters.

Having explored best practice alongside the NPfIT approach, there is a lack of transparency between the ERDIP, the OBS and the rationale for the current release plans for implementation in the programme. It is unclear whether key core processes that offer quick wins horizontally across the NHS are the first targets in the early releases. A more transparent approach in the future would be welcomed.

At each stage in the evolutionary cycle, particular attention should be paid to those core processes that can be easily improved or supported by information technology with a high benefit/ cost ratio to enable a related early release. It is recommended that the cycles of business process exploration should begin with a look at the key core business processes along horizontal lines (e.g. Clinical Documentation, Decision Support, Orders and Results, Prescribing, Scheduling etc) ensuring that these explorations examine the role of IT support in these processes. As the P1R2 workshops have already begun work in this area, this work should be explored by the working groups as soon as possible.

Through a consistent means of process exploration (the best practice in process mapping has yet to be determined, but the NPfIT recommendations on UML seem reasonable) current practice should be documented as early as possible. Business process modelling should then allow a variety of viewpoints from several stakeholders to explore how changes in common core business processes could add value to the process (by either cost, time or risk reduction, or quality improvement) in successive phases of evolutionary change

7.1.3 Technology

It is recommended that key best practice principles of usability design such as those outlined in Section 2.3.1 are agreed with the LSP and should form part of the usability testing criteria.

7.2 Recommendations on testing

Having examined the literature on the subject of user testing it can be concluded that that Model Community testing element is a commendable part of the NPfIT effort to assist the change that is required by the NHS. Given robust and transparent business process analysis and design phases, the testing phase (of which the Model Community is a key part) provides a key quality assurance step. The Model Community clearly provides a unique opportunity for NHS staff to explore their business processes in a safe environment and ensure that IT designed to support them is fit for purpose.

A few recommendations to improve this process can be made.

7.2.1 Stakeholders

Through a more robust communications network an agreed system of stakeholder involvement in the testing process should be used. This should be tied in with the work of user led design, build and test groups to ensure continuity throughout the process. As the key stakeholder in these arrangements, the patient, will be particularly affected by these changes, efforts should be made to involve patient groups to take an active part in the evaluation process. Adequate notice (6 weeks) and support should be made available to testers to facilitate their attendance at testing.

The test team should be resourced to work with approximately 3 testers a day over the average 5-day test period expected per sub release. This should allow a manageable number of testers to provide an effective level of evaluation. Working with a "buddy" system, this will need 3 Model Community test team members per day to work with the testers, with additional staff available for incident reporting and support functions.

7.2.2 Process

A well organised clinical user group network should agree key scenarios at the start of the change cycle. These scenarios should inform the design, build and then be used in the test phase to ensure that requirements have been addressed. The outputs from that work which form the inputs to the Model Community testing process should ideally be best practice business/clinical processes, documented using industry standard, best practice process mapping methodology populated to sufficient detail with realistic data.

7.2.3 Technology

The technology presented to the Model Community test environment should have undergone rigorous testing before its arrival. Software incidents should be the exception, rather than the predominant feature of our study. The focus on Model Community testing should be on business process exploration and technology usability issues.

7.2.4 The evaluation of the incidents

The incidents raised should be categorised and rated by users, facilitated by the test team to ensure continuity between testers, as is the current arrangement. The buddy system adopted should be developed and it would seem logical that the buddies would facilitate the direct reporting of incidents electronically for further dissemination for action, rather than the current paper based approach. In addition, a concurrent digital video taped "think aloud" approach may be worth exploring in future. One advantage of a video record of the event is that is which would provide reasonably objective set of evidence of any problems encountered, which could be used for later analysis.

In order to get increasing "buy-in" from the clinical staff which is necessary to support this programme of change, a robust evaluation process which can demonstrate early quantifiable benefits to clinicians (e.g. reduced time to complete documentation) should be demonstrated as early as possible. While this study has illustrated the challenges in providing objective quantitative data during the testing process, it should be acknowledged that valuable information has been gathered from this qualitative study. While healthcare IT evaluations may have been lacking to date, the healthcare service has many years of experience with the process of evaluation (e.g. drug trials) and in this regard it may have something to teach the software industry. The gold standard evaluation in the medical sciences is the randomised-controlled trial (RCT). An exploration of the literature suggests that these are very rare in IT studies. At this point a user acceptance test in the form of the Model Community appears the ideal way to proceed and perhaps in time this may evolve to accommodate RCT based studies.

The output results from the tests should form two significant groups. Any concerns related to poor or ineffective business processes at the test should be fed back to the clinical network groups to explore whether agreed best practice needs to be re-examined. Any usability (or software) issues should be fed back to the LSP. Those incidents that demand an unacceptable workaround should receive particular attention

and should be fixed before deployment. In addition the number of moderate level usability issues should be brought to an absolute minimum before deployment. Ignoring significant numbers of moderate usability issues will mean that the technology is deemed to be unhelpful overall and end up unused.

This project has been just a very small part of a massive and complex programme of work that is the National Programme for Information Technology. The programme offers the potential to support clinical staff as they make improvements across the NHS with the help of modern IT. Through rigorous yet transparent analysis and design work, stakeholders will have the opportunity to explore some fundamental changes to the way they work. The Model Community offers the potential to ensure those changes are supported by the IT service and ensure that clinical staff are able to deliver the timely, high quality, low risk care they aspire to give patients across the NHS.

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9 Appendices

Appendix 1 Project Terms of Reference

Appendix 2 NPfIT Northeast Cluster Model Community Information Sheet

Appendix 3 NPfIT Incident Severity Rating recommendations

Appendix 4 NPfIT Northeast Cluster Incident Severity Rating

Appendix 5 Excerpt from list of business process scenarios run during P1R1a Model Community testing

Appendix 6 Sample business process scenario- inc. subprocess

Appendix 7 Sample Incident report

Appendix 8 excerpt from NPfIT Model Community acceptance criteria

Appendix 9 excerpt from LSP Model Community acceptance criteria recommendations

Appendix 10 Project Gantt Chart

Appendix 11 Project Schedule

Appendix 1 MSc Project Terms of Reference

Project Title
Testing business processes with information systems in an alpha test site setting

Overview
Within any business sector, few things remain constant apart from the need for change. Business change may involve the introduction of new people, new processes or new technology in an organisational system. The modern Information Technology (IT) revolution has highlighted the role of IT in facilitating organisational change. When using IT in this role it is important to ensure that business processes are supported by the technology and not forced to work around it. This should be facilitated by following an evolutionary software development approach, beginning with an effort to determine business processes to inform the requirements analysis, design and build phases and allow testing of the software before implementation.
The health sector is one business sector under pressure to change. To support the reform of the NHS in England, the National Programme for IT in the NHS was set-up to procure a Care Record Service (CRS) to enable an integrated electronic care record for each person in England by 2010. It has been described as the biggest civil Information Technology procurement programme anywhere in the world. The North East Cluster region of the NHS, covering a population of 7.5 million people, is one of five regions in England where the CRS will be implemented.
Within the North East Cluster, work has already begun on defining the business processes that need to be supported by the new CRS service. These have informed the design and build phase in the first release of the service. Business process scenarios will be tested against the pre-release software in the "Model Community", essentially an alpha test site for the cluster based programme. The Model Community will facilitate the validation of the fit between business process and software. The mechanism of identifying the source of potential errors ("incident management") is an area of particular importance. A systematic approach to this area is required, aiming to highlight problems related to business process and/or the supporting software.

Initial Client Wish list
The following requirements have been expressed by the client as desirable, but have not been finalised at this time

To raise awareness of the Model Community amongst clinical stakeholders
To engage stakeholder leads to explore mechanisms for agreeing new business processes
To provide clinical expertise on business process development.
To identify stakeholders to involve in testing business processes against pre-release software.
To ensure stakeholders are trained for their role in testing
To examine test results to further inform business process and software development.
To evaluate the testing process to identify how to improve on it.

Objectives
a) Investigate Model Community operation
b) Research academic background to stakeholder involvement in business process production, alpha testing and error tracking/incident management
c) Relate Model Community operation to academic background

d) Recommend strategy for stakeholder involvement in business process production/review and Model Community testing.
e) Recommend research-based strategy for stakeholder involvement in error tracking (incident management) resolution, to inform further iterations of business process/software development.
f) Facilitate implementation of alpha test site for business process and software testing (inc. incident management resolution).
g) Research effectiveness of error tracking resolution mechanism.
h) Evaluate overall project success (including client feedback)

Resources
Communication resources i.e. PC, phone, desk
Software: MS Office, MS Project, email, intranet, internet
Library (inc. University of Leeds) resources
Constraints
This project forms part of a complex programme of work and may be constrained by changes in the testing schedule outside of the author's control.

Reporting To
Mr. Martyn Forrest (Client) Mr. Norman Parrington (Supervisor)

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NHS

National Programme for Information Technology

North East Cluster

North East Cluster Model Community

The National Programme for IT (NPfIT) is essential if the NHS is to meet the needs of patients in the 21st Century - and improve the working lives of those delivering care.

We cannot modernise the health service and offer the seamless care that patients want without harnessing the potential of IT to join up the service. The National Programme will ensure the right information is available to the right people at the right time.

This is clearly a massive task given the complexity of the NHS and the radical change we intend to achieve.

To ease the implementation process England has been divided into five clusters. We in the North East cluster cover five strategic health authority areas:

- Northumberland and Tyne and Wear
- County Durham and Tees Valley
- North and East Yorkshire and Northern Lincolnshire
- West Yorkshire
- South Yorkshire

The design and roll-out of the programme has been organised into two parts. Services that are common to all users nationally will be the responsibility of the National Application Service Provider (NASP).

Services delivered at a more local level will be the responsibility of the Local Service Provider (LSP). The NASP and the LSP will work together to integrate existing local systems and implement new systems, if necessary.

After a rigorous and demanding procurement process, Accenture was chosen as the LSP for the North East cluster.

How are the National Programme's IT solutions being designed, built and tested?

As part of the North East Cluster's implementation plan for new IT solutions design workshops were held with clinicians to explore current clinical practice in several areas, including primary care and mental health.

As a result of this work, some clinical processes have been defined and these have informed the build of the first phase of the IT solution.

The same processes and related scenarios are now being used to ensure the solution goes through a comprehensive and rigorous testing procedure, which will include model community testing.

What is a model community?

The purpose of the model community is to ensure good clinical practice is supported by the new IT solutions. The model community testing process will involve NHS staff simulating the care scenarios in which the IT solutions will be used.

Using this safe environment to trial the solutions should ensure that they support day-to-day healthcare before they are introduced into real care settings.

Model community testing is also a contractual obligation, which is required if the LSP is to receive its milestone achievement certificate.

Appendix 2- NPfIT Northeast Cluster Model Community Information Sheet

How is the model community different to the Frontline Support Academy?

The NHS Front Line Support Academy will help NHS leaders to get to grips with the leadership, communications and change management aspects of managing the National Programme for IT. It will not be involved with testing the cluster- based IT solutions.

Where is the North East Cluster's model community?

Northern Lincolnshire and Goole Hospitals NHS Trust is hosting the North East Cluster's model community at Goole and District Hospital.

The facility, which occupies spare rooms in a ward at the hospital, is equipped to resemble a variety of care environments.

How can I get involved?

Contact your strategic health authority's chief information officer. When the clinical scenarios affecting your area of interest are tested we would be glad of your help.

How to find out more about NPfIT

Through the new NHS Care Records Service, the National Programme will revolutionise the way that information is accessed and shared, connecting more than 30,000 GPs and 270 acute community and mental health NHS trusts in a single, secure, national system - integrating with diverse systems currently in use across the NHS.

Over time, the NHS CRS will provide all 50 million NHS patients with an individual electronic NHS Care Record, which will include information on the care they receive through the NHS or social services.

More information is available on our website www.npfit.nhs.uk

Appendix 2- NPfIT Northeast Cluster Model Community Information Sheet

Appendix 3

National NPfIT Incident Severity Level recommendations

Incident Severity	
Severity Level	Interpretation
1	The incident prevents a critical element of the Services and/or the System from functioning or being performed
2	All elements of the Services and/or the System can still function with a workaround; however functionality or performance is severely impacted
3	All elements of the Services and/or the System can still function with a workaround; however required functionality or performance is materially impacted
4	All elements of Services and/or the System can still function, however there is a minor functionality/performance impact
5	All elements of Services and/or the System can still function, however there are minor cosmetic defects with no functional impact and with no impact on patients or clinical services

Appendix 4

North East Cluster NPfIT Incident Severity Levels

(adapted from National NPfIT documentation)

Incident Severity	
Severity Level	Interpretation
1 **CRITICAL**	The incident prevents a critical element of the Services and/or the System from functioning or being performed e.g. • Software crashes • Software hangs • Loss of Data
2 **HIGH**	All elements of the Services and/or the System can still function with a workaround; however functionality or performance is severely impacted eg • Major feature is broken or missing (significant to business process) • Any workaround causes unacceptable work processes
3 **MEDIUM**	All elements of the Services and/or the System can still function with a workaround; however required functionality or performance is materially impacted eg • Can live with it for now but has adverse impact with business processes • Workaround exists but requires timely resolution- timescale for fix agreed
4 **LOW**	All elements of Services and/or the System can still function, however there is a minor functionality/performance impact e.g. • Easy workaround • Unlikely to occur in normal use
5 **COSMETIC**	All elements of Services and/or the System can still function, however there are minor cosmetic defects with no functional impact and with no impact on patients or clinical services e.g. • Misaligned text • Spelling incorrect

Scenario Description	Roles required
Create a schedule, verify resource availability and publish the schedule	Practice Manager
A new patient phones to Register with the Surgery. The patient is not recorded on the PCS system. A record is found on the PDS system The Receptionist creates a new Registration	Patient, Receptionist
A patient calls to book an appointment with a GP. The receptionist searches the system using the patient's surname to check the patient is registered and books the appointment	Patient, Receptionist
A patient calls to change an appointment. The receptionist searches the system using the patients surname to change the appointment.	Patient, Receptionist
GP communicates with receptionist that session is to be cancelled, the Receptionist contacts patients to offer them an alternative appointment with another GP or Session. The Receptionist rebooks the appointments	GP, Receptionist, Patient
A patient phones regarding a change of address. The Receptionist locates the Record on the PCS using the patient's surname. The Receptionist changes the address. The address change is sent to the PDS and updated	Patient, Receptionist
A patient does not attend their appointment. The patient is marked as DNA (did not attend)	Receptionist
A patient arrives late for an appointment and is offered a new appointment	Patient, Receptionist
The Receptionist asks the patient's consent for sharing of their details for Secondary Usage. The patient grants their consent and the Receptionist updates this in PCS. The Consent Status is sent to PDS	Patient, Receptionist
The GP consults the patient and records the presenting complaints, patient history and patient examination. A prescription is printed and a leaflet is printed	GP, Patient
The GP consults the patient and records the presenting complaints, patient history and patient examination. An emergency admission into secondary care is needed and transport is booked	GP, Patient
The GP checks the pathology links to see details of test results received from Hospital. The results are manually uploaded to patient records	GP
A referral letter is completed after the Care Encounter is finished	GP, Receptionist
A letter is scanned (Referral or other Letter), saved as a .PDF file and attached to the patient's record by the receptionist. The GP then accesses the referral letter in .PDF reader application	GP, Receptionist
The GP is informed of the death of a patient. The GP updates the death notification information	GP or Practice Manager

Appendix 5
Excerpt from list of business process scenarios run during P1R1a Model Community testing

North East Cluster Model Community Test Scenarios

P1R1 Primary Care Scenario inc Sub Processes

PCS006.1

Test log for Dr Smith, a GP from Yorkshire, tested on: 01/09/2004

Step No	Scenario Step	Expected Outcome	Actual Outcome	Pass/Fail	Failure Severity	Failure Type	Comments
1	GP logs into the system	Log in successful					
2	GP selects Patient from appointment list	Patient found					
3	GP examines the patient	Patient examined					
4	GP records clinical diagnosis requiring prescription e.g. tonsillitis	Diagnosis recorded					
5	GP adds appropriate medication						
6	GP prints a prescription	Prescription printed					
7	GP prints a leaflet	Leaflet printed					
8	GP closes consultation and closes the appointment	Appointment closed					

Failure Type	S = Software B = Business Process U = Usability T = Training	Severity	1 = The incident prevents a critical element of the Service from working 2 = All elements of the Service can function with a work around - functionality severely impacted 3 = All elements of the Service can function with a work around - functionality materially impacted 4 = All elements of the Service can function with a work around - minor impact 5 = Minor cosmetic impact - no impact on patient or clinical service

Appendix 6- Sample Business Process Scenario- inc. sub processes

Appendix 7- Sample Incident Report

Model Community Incident Report Form

Environment Incident Occurred In	
PCS Synergy	
Supplier Name	Incident Reference Number / Issue
Accenture	PCS/IRN/016
Logged By	Email Address
KZB	
Department	Telephone Number
Date	Time
02/09/2004	

Incident Details

Incident Title	Supplier To Be Logged With
Consultation history	LSP
Incident Description	
History/examination data entry – free text. Have to enter each line under separate text entry. Then at the end link to problem. Can't enter data under problem until problem defined. Solution – allow free text entry to note/problem before read coded.. do not allow save until read coded Or add button for history and exam	
Business / Live Operations Impact	
Forces change in standard clinical process	

Scenario No/Step	Incident Type	Incident Severity	Software Release
PCS006/3	U	2	

Incident Type S = Software B = Business Process U = Usability T = Training D = Data

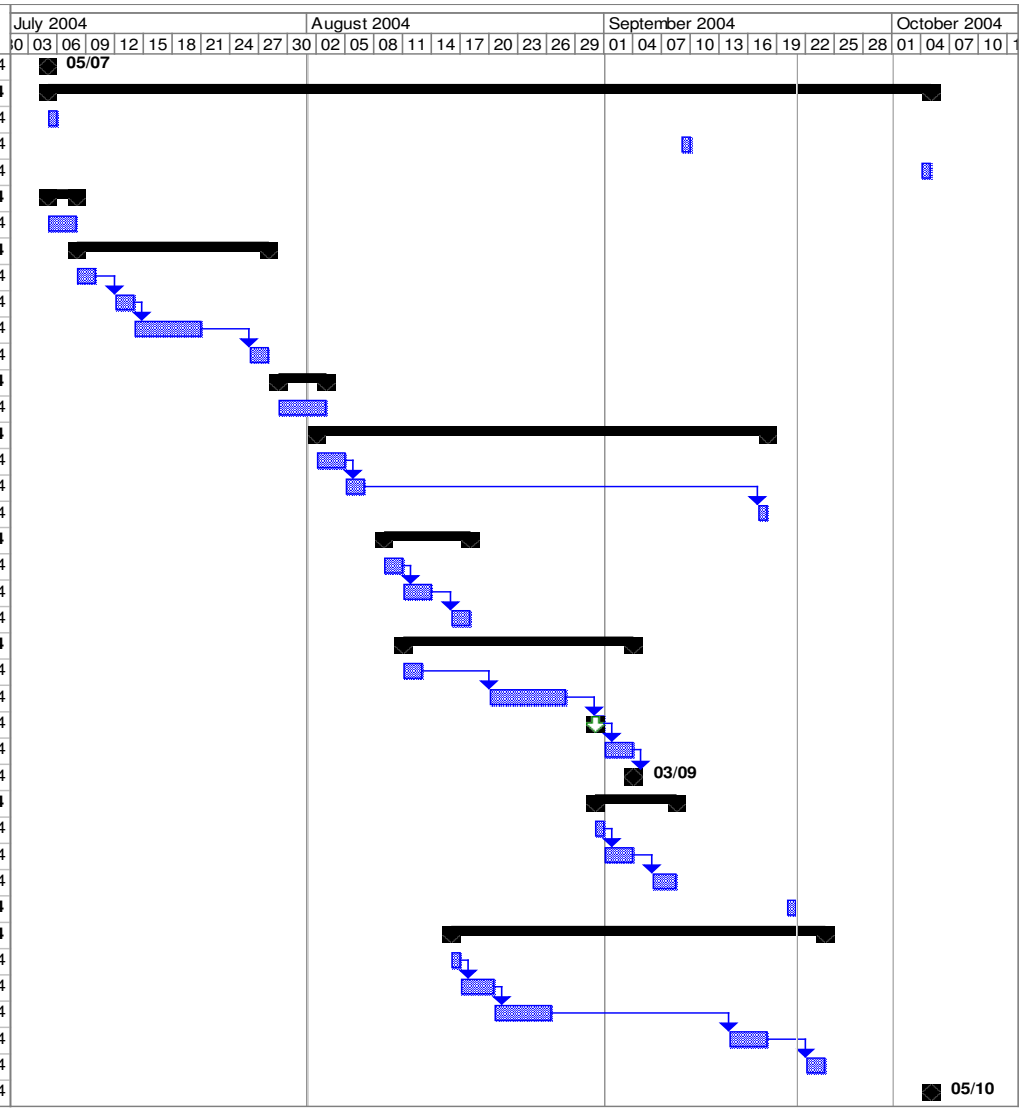
Appendix 8- excerpt from NPfIT Model Community acceptance criteria recommendations

Type of Exit criteria	Description of Criteria	Pass/Fail (✓/✗)
LSP Software	No severity 1 or 2 issues are outstanding	
	There will be no significant numbers of severity level 3 to 5 issues – as determined by the Model Community Test Management Team.	
Business Processes	Priority scenarios must all pass	
	No severity 1 or 2 issues are outstanding	
	There will be no significant numbers of severity level 3 to 5 issues - as determined by the Model Community Test Management Team..	
LSP Usability	No severity 1 or 2 issues are outstanding	
	There will be no significant numbers of severity level 3 to 5 issues - as determined by the Model Community Test Management Team..	
	User considers system to be easy to use and learn. The testing of the day to day use of the system and of the Services by users.	

Appendix 9- Excerpt from LSP Model Community acceptance criteria recommendations

Category	Criteria	Pass/ No outstanding critical issues
Business Processes	There must be end user involvement during the testing phase	
Business Processes	The Model Community test scenarios have been successfully validated for R1A by end users	
Business Processes	High priority scenarios must all pass or have an agreed work off plan	
Business Processes	The Model Community test has been conducted successfully once for both the East and North East Cluster from an Accenture location in Leeds	
Business Processes	All agreed scenarios will be executed once by each Cluster	
Business Processes	No critical problems, or their equivalents impacting business processes, should be open at the point of software deployment without a work off plan	

ID	Task Name	Work	Start
1	Start project	0 hrs	Mon 05/07/04
2	**Administer project**	**48 hrs**	**Mon 05/07/04**
3	prepare/attend first review	16 hrs	Mon 05/07/04
4	prepare/attend second review	24 hrs	Thu 09/09/04
5	prepare report for submission	8 hrs	Mon 04/10/04
6	**Investigate Model Community (MC)**	**24 hrs**	**Mon 05/07/04**
7	examine MC material	24 hrs	Mon 05/07/04
8	**Research academic background**	**104 hrs**	**Thu 08/07/04**
9	begin research with books	16 hrs	Thu 08/07/04
10	literature search of journals	24 hrs	Mon 12/07/04
11	read articles	40 hrs	Wed 14/07/04
12	collate articles	24 hrs	Mon 26/07/04
13	**Relate MC to academic material**	**24 hrs**	**Thu 29/07/04**
14	review MC and evidence	24 hrs	Thu 29/07/04
15	**Strategy for stakeholder involvement in BP review**	**56 hrs**	**Mon 02/08/04**
16	liase with stakeholders	24 hrs	Mon 02/08/04
17	suggest strategy for implementation	24 hrs	Thu 05/08/04
18	attend meeting to assess value of strategy	8 hrs	Fri 17/09/04
19	**Strategy for stakeholder involvement in incident mana**	**64 hrs**	**Mon 09/08/04**
20	examine incident management plans	16 hrs	Mon 09/08/04
21	relate to evidence	24 hrs	Wed 11/08/04
22	suggest strategy for incident management resolution	24 hrs	Mon 16/08/04
23	**Model Community testing**	**96 hrs**	**Wed 11/08/04**
24	business process scenario reviews	16 hrs	Wed 11/08/04
25	faciliate testing	48 hrs	Fri 20/08/04
26	pilot test scenarios	8 hrs	Tue 31/08/04
27	run test scenarios- Primary care	24 hrs	Wed 01/09/04
28	run test scenarios- Single Assessment	0 hrs	Fri 03/09/04
29	**Research effectiveness of incident management mech**	**44 hrs**	**Tue 31/08/04**
30	pilot study of effectiveness	8 hrs	Tue 31/08/04
31	study of effectiveness	12 hrs	Wed 01/09/04
32	review /report results	24 hrs	Mon 06/09/04
33	**Client feedback from strategies and study**	**8 hrs**	**Mon 20/09/04**
34	**Project report**	**124 hrs**	**Mon 16/08/04**
35	draft research outline	8 hrs	Mon 16/08/04
36	draft dissertation outline	28 hrs	Tue 17/08/04
37	first draft of dissertation	40 hrs	Fri 20/08/04
38	second draft of dissertation	32 hrs	Tue 14/09/04
39	final draft of dissertation	16 hrs	Wed 22/09/04
40	End project	0 hrs	Tue 05/10/04



Appendix 10- Project Gantt Chart

Task No	*Task Name*	*No of hours*	*Planned Start*	*Actual Start*	*Planned Finish*	*Actual Finish*	*Deliverable*
1	**Start project**	0 hrs	05/07/2004	05/07/2004	05/07/2004	05/07/2004	
2	**Administer project**	**48 hrs**	05/07/2004	05/07/2004	08/10/2004	01/10/2004	
3	prepare/attend first review	16 hrs	05/07/2004	05/07/2004	05/07/2004	15/07/2004	TOR, Gantt, Schedule
4	prepare/attend second review	24 hrs	06/09/2004	27/08/2004	06/09/2004	06/09/2004	TOR, Gantt, Schedule
5	prepare report for submission	8 hrs	08/10/2004	29/09/2004	08/10/2004	01/10/2004	Dissertation report
6	**Investigate Model Community (MC)**	**24 hrs**	05/07/2004	05/07/2004	07/07/2004	07/07/2004	Understanding of Model Community
7	examine MC material	24 hrs	05/07/2004	05/07/2004	07/07/2004	07/07/2004	
8	**Research academic background**	**104 hrs**	08/07/2004	08/07/2004	27/07/2004	27/07/2004	Academic background to subject
9	begin research with books	16 hrs	08/07/2004	08/07/2004	09/07/2004	09/07/2004	
10	literature search of journals	24 hrs	12/07/2004	12/07/2004	13/07/2004	13/07/2004	
11	read articles	40 hrs	14/07/2004	14/07/2004	20/07/2004	20/07/2004	
12	collate articles	24 hrs	26/07/2004	26/07/2004	27/07/2004	27/07/2004	
13	**Relate MC to academic material**	**24 hrs**	29/07/2004	29/07/2004	02/08/2004	02/08/2004	Understanding of MC in context of academic background
14	review MC and evidence	24 hrs	29/07/2004	29/07/2004	02/08/2004	02/08/2004	
15	**Strategy for stakeholder involvement in BP review**	**56 hrs**	05/07/2004	02/08/2004	17/09/2004	17/09/2004	Strategy document
16	liase with stakeholders	24 hrs	05/07/2004	02/08/2004	07/07/2004	04/08/2004	
17	suggest strategy for implementation	24 hrs	03/08/2004	05/08/2004	04/08/2004	06/08/2004	Recommendations
18	attend meeting to assess value of strategy	8 hrs	17/09/2004	17/09/2004	17/09/2004	17/09/2004	
19	**Strategy for stakeholder involvement in incident management**	**64 hrs**	05/07/2004	09/08/2004	09/08/2004	17/08/2004	Strategy document
20	examine incident management plans	16 hrs	05/07/2004	09/08/2004	06/07/2004	10/08/2004	
21	relate to evidence	24 hrs	03/08/2004	11/08/2004	05/08/2004	13/08/2004	
22	suggest strategy for incident management resolution	24 hrs	06/08/2004	16/08/2004	09/08/2004	17/08/2004	Recommendations

Appendix 11- Project Schedule- Page 1 of 2

23	**Model Community testing**	**96 hrs**	05/07/2004	11/08/2004	20/08/2004	03/09/2004	MC testing implementation
24	business process scenario reviews	16 hrs	05/07/2004	11/08/2004	06/07/2004	12/08/2004	
28	faciliate testing	48 hrs	18/08/2004	20/08/2004	20/08/2004	27/08/2004	
25	pilot test scenarios	8 hrs	02/08/2004	31/08/2004	04/08/2004	31/08/2004	
26	run test scenarios- Primary care	24 hrs	09/08/2004	01/09/2004	11/08/2004	03/09/2004	
27	run test scenarios- Single Assessment Process	0 hrs	12/08/2004	na	16/08/2004	na	
29	**Research effectiveness of incident management mechanism**	**52 hrs**	23/08/2004	31/08/2004	30/08/2004	10/09/2004	Analysis of effectiveness of incident management mechanism
30	pilot study of effectiveness	8 hrs	23/08/2004	31/08/2004	23/08/2004	31/08/2004	
31	study of effectiveness	12 hrs	24/08/2004	01/09/2004	26/08/2004	03/09/2004	
32	review/report results	24 hrs	27/08/2004	06/09/2004	27/08/2004	10/09/2004	
33	**Client feedback**	**8 hrs**	30/08/2004	20/09/2004	30/08/2004	30/09/2004	
34	**Project report**	**124 hrs**	30/08/2004	16/08/2004	17/09/2004	01/10/2004	Project dissertation
35	draft research outline	8 hrs	30/08/2004	16/08/2004	30/08/2004	16/08/2004	
36	draft dissertation outline	28 hrs	31/08/2004	17/08/2004	03/09/2004	20/08/2004	
37	first draft of dissertation	40 hrs	03/09/2004	20/08/2004	09/09/2004	26/08/2004	
38	second draft of dissertation	32 hrs	09/09/2004	14/09/2004	15/09/2004	20/09/2004	
39	final draft of dissertation	16 hrs	15/09/2004	28/10/2004	17/09/2004	30/10/2004	
40	**End project**	0 hrs	11/10/2004	04/10/2004	11/10/2004	04/10/2004	Submit report

10 Glossary

CRDB	Care Record Development Board
ERDIP	Electronic Record Development Implementation Programme
GP	General Practitioner
IT	Information Technology
LSP	Local Service Provider
MC	Model Community
NASP	National Service Provider
NEC	Northeast Cluster
NHS	National Health Service
NPfIT	National Programme for Information Technology
OBS	Output Based Specification
P1R1a	Phase 1, Release 1, sub-release a
PCS	Primary Care System
PDS	Patient Demographic Service

Word Count 14725