Investigation of the Requirements (Specification) for an Intellectual Disability Information System for a Child Service of St. John of God Hospitaller Services.

by

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Author's Declaration

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

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ABSTRACT

The need for a more functional Intellectual Disability Information System to facilitate the delivery and efficiency of the Intellectual Disability (ID) Services provided by the St. John of God Hospitaller Services was identified through a recent user survey carried out by the researcher in April 2009.

The lack of adequate, if any, requirements specification and modelling was identified in the current ID system (IDIS), which led to the dissatisfaction experienced by its users. Software Requirements Analyses within the organisation has up till now been predominantly narrative and therefore difficult to validate by the system users, which has given rise to legacy systems with functional deficiencies.

This project aims to capture the user requirements and identify the core information data elements appropriate to the clinical and social management of intellectually disabled persons receiving service from the St. John of God Hospitaller Services. In order to ensure that an effective methodology was employed, a detailed review of the relevant literature was undertaken. Of all the methods identified, interviews, focus groups, document and form analysis and use cases were used extensively by the researcher and the requirements were modelled using UML tools. Information models were developed and functional requirements were expressed using UML's use case models and class diagrams while non functional requirements were re-used from a similar requirements project as recommended by experts in the literature review since these are fairly standard.

A Software Requirement Specification (SRS) document was produced as the main deliverable of the project. A review of the business process across the business units of the organization also resulted from this exercise and this triggered the decision to undertake Business Process Re-engineering. This is presently underway and beyond the scope of this project.

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CHAPTER 1: INTRODUCTION

1.1. Purpose:

The aim of this project is to produce a Software Requirement Specification (SRS) document which thoroughly outlines the functional and non-functional features of the proposed Intellectual Disability Service User Information System (IDSUIS) for one of the St. John of God (SJOG) Intellectual Disability Services for Children (namely Carmona Early Services). This will involve liaison with the system users and other stakeholders to produce a requirements specification document.

1.2. Background and Motivation:

The St. John of God Hospitaller Services is a private not-for-profit healthcare organisation providing both Mental Health and Intellectual Disability (ID) Services for both children and adults. The ID services within Ireland provide support for people with intellectual disability in different parts of Dublin (Carmona Services, Menni Services, STEP and Citygate and St. Augustines School), other parts of the country, (Wicklow, Kildare, The North-East and Kerry), and outside the country (Northern Ireland and New Jersey). In Dublin, the Carmona Services is located in Dun Laoghaire and provides service to those who reside within its South Dublin catchment area to enable them achieve their personal goals and outcomes in accordance with the values and ethos of the Hospitaller Order of St John of God. Carmona Services provides supports to about 350 children & adults. It provides community & residential programs to aid inclusion of children in their local communities.

The organisation has 2 main business-critical legacy systems which are the Mental Health Information System (MHIS) and the Intellectual Disability Information System (IDIS). To facilitate the delivery and efficiency of the Mental Health Service and to achieve the mission of modern personalised healthcare to the highest professional

standards, the organisation recognised the need for an Electronic Patient Record. The Mental Health Information System, MHIS was developed in-house as a result by the development team of the IT Department in 1995. This proved to be successful, meeting most of the requirements of the user groups, from the clinicians to the administrative staff. MHIS was developed as a Patient Administration System and an Electronic Patient Record, capturing both patient demographic data and clinical information.

Following the success of the MHIS, the Intellectual Disability Information System (IDIS) was later developed in 2005 as an electronic system for the ID services carried out by the organisation. The system was adapted as an off-shoot or modification of the MHIS. The work flow of the Mental Health Service however differs significantly from that of the ID Services, although both are health-related services provided by the same organisation. Different data sets are captured by both services manually and electronically with the ID service capturing social data in addition to demographic and clinical data (i.e. from the clinical team as well as the social support staff supporting the service users in their daily activities). Also, while the life cycle of patients within Mental Health may be periodic, lasting the duration of their contact with the service, the ID service typically persists throughout the lifetime of the service user. The reporting function of the current ID Information system as a result, did not meet the statutory reporting requirements of the Health Service Executive (HSE) and the overall functionality of the system did not adequately suit ID services and therefore was not satisfactory to the system users.

The IDIS has been in use since its inception, primarily within the administrative areas of the ID service only to satisfy statutory reporting requirements – it uploads service information to the National Intellectual Disability Database (NIDD) on a daily and annual basis. The clinical areas of the system were not championed and therefore their usage amongst the clinical staff was patchy. In 2008 a pilot was run in one of the SJOG services to extend the use of IDIS into the clinical areas in a more targeted fashion. A group of clients were selected and all of the details normally recorded on paper files were entered in the IDIS. At the end of the pilot stage, the pilot users found that while there was some

very useful functionality within the system, there were a number of weaknesses identified.

So, after 4 years of its implementation, it became necessary to evaluate the outcomes of the ID system and to measure its success. A project was carried out by the researcher in April 2009 to evaluate the effectiveness of the IDIS. A user survey was conducted to evaluate the users' satisfaction with the current system, as it was considered to be a very efficient, effective and the most cost-effective way to get user feedback.

An online questionnaire was designed on surveymonkey.com using the Likert-scale and open-ended questions. The survey aimed to determine why IDIS was underutilized and not well adopted by its users. The survey revealed an overall dissatisfaction with the system's functionality with a positive feedback for usability and support. The users reported that the system did not reflect their work practise and did not capture most of the information they needed to record, as most of the relevant data were left out, making them also keep manual records. Also, much of the functionality and terminology were not relevant to ID services.

The major issues identified were outlined to the development team and used to develop strategies to serve as reference for future system development and design. Recommendations were made following the survey to build a brand new ID system from scratch or buy a system off the shelf and adapt it to suit the users' needs.

To facilitate this recommendation, and because Information Systems require a high level of investment to implement, a Software Requirement Specification was deemed vital to capture the users' requirements and ensure its successful adoption and use. This is the main focus of this research.

1.3. Benefits of an Electronic System:

Based on the benefits realised from the MHIS and other clinical systems in the industry to date, it is proposed that the new IDSU system will have enormous benefits for both the primary system users within the organization as well as external stakeholders. The proposed benefits include:

1. Accuracy and centralization of data.
2. Lack of duplication of data.
3. Real time and secure communication between providers.
4. Online shared diary which supports effective appointment scheduling and planning among team members.
5. Online collaboration.
6. Ease of use with structured drop-down lists.
7. Improved quality and safety ensured through alerts and reminders.
8. Generation of useful and high quality reports.
9. Automatic upload of information to the NIDD database and HSE templates which supports statutory reporting to external stakeholders.

1.4. Objectives of this Study:

Following the identification of the need for a new or upgraded IDSU system, this dissertation is an attempt to identify the "core" information data elements considered appropriate to the clinical and social management of an ID service user receiving service from the St. John of God Hospitaller Services. Because of the large scope of the ID services covering adult and children, it was necessary to narrow the scope of the project to focus mainly on the Early Intervention Services of the Children Services of the organization.

1.5. Research Question:

Following the objectives and purpose of the project, the research question is:

> What are the functional and non-functional requirements of an Intellectual Disability Information System as seen by the system users and other stake holders (using System Analysis Methods)?

1.6. Overview of the Research:

The research question addresses the issue of quality user requirements, which was one of the major problems experienced during the software crisis and which has failed and continues to plague many software projects today. In order to address this question, it was necessary to first identify all the stakeholders (including the system users) and their goals to get a detailed analysis of their goals, particularly the high priority ones. The technologies used for eliciting requirements were also examined from the literature in order to identify the methodology most suited for this research. Some of the techniques learned were then applied to obtain a detailed record of the functional requirements. These requirements were then modelled using object-oriented modelling tools identified by past studies. To avoid re-inventing the wheel, the non-functional requirements, which are fairly standard, were re-used from a similar project with some modification.

This case study explored a modern approach to system development, applying use cases and UML models.

1.7. Overview of the Dissertation:

The following sections of this dissertation are described in more detail within each chapter. Chapter 2 of the dissertation reviews the literature on Software Systems Development. It provides an overview of its history, reflecting on the Software crisis which highlights the need for Software Requirement Specification and reviews the tools

and techniques used within the industry. Chapter 3 details some of the methodologies employed from the literature review to elicit and model the requirements. In Chapter 4 of this dissertation which is the result chapter, the business overview, the stakeholders and their goals, one example use case, some UML diagrams and other artefacts generated during the exercise were presented. Chapter 5 which combines the discussion and conclusion elaborates on the project experience, it's achievement, the lessons learned and the limitations experienced by the researcher during the course of the project.

CHAPTER 2: LITERATURE REVIEW

Standing on the shoulders of giants…

2.1. Introduction:

To effectively undertake any project on Software Requirements Specification, it is essential to understand the history behind the Software Development Process, its context and the Software crises. This chapter explores the concept of Software Systems Development, the stages involved and hones in on Requirements Analysis, which is a part of the Analysis phase of the Systems Development Life Cycle (SDLC). It also outlines the most widely used methods proposed by Software Engineering authors for eliciting and validating Software Requirements from system users with their benefits. It illustrates the modelling tools available to define the requirements, placing emphasis on UML, a modern object-oriented approach, which is the method of choice for this dissertation.

It is also important to state here that not much literature was found on Intellectual Disability Information Systems.

2.2. Basic Function of an Intellectual Disability System:

The purpose of an IDSU Information System is to provide important functions which include data capture, searching and sorting tools, re-assembly of data into new structures, presentation of data in logical form to the viewer and also providing robust statistical analysis functions and a secure means of communication between the providers of ID services (the service user's key workers and multi-disciplinary team (MDT)) (Hamilton et al., 1998). It should not just be an information storage media where transaction events are recorded. The main requirements for the ID system would be client records available to multiple users in multiple locations in real time with a secure messaging system, and this has to be achieved with minimal keyboard entry.

An IDSU system should encapsulate the best professional principles and also harness the advantages of modern information technology to implement a better service. Given that older procedures or systems do not necessarily ruin organisations, any new system to be introduced should bring quantifiable benefits and advantages to an organisation. It should also first and foremost support the users of the system and empower them, especially in requirements not adequately met by flat database files or older methods.

2.3. Software Systems Development

The typical stages of any system development cycle (like the Waterfall-type model) are: Problem Definition and Requirement Specification, Feasibility Study, System Analysis, System Design, Detailed Physical Design, Implementation and Maintenance. Each stage produces an output called a product or deliverable, which forms the input of the next stage. Spiral models have been proposed as they accommodate additional requirements which are uncovered as the system development process gets underway.

2.3.1. Definition:

Software Systems Development is one of the most complex processes ever attempted. It has been divided into several stages by different authors and the progression through these stages has been termed the *System Development Life Cycle* (SDLC) or *Methodology*. The SDLC has been defined in simple terms as the process of understanding the business goals of an organization, designing and building a system to support these goals and then successfully delivering the system to its users. It is a process used by Systems Analysts to cope with the increasing demands for large, complex Information Systems. SDLC is a framework for the sequence of tasks necessary to develop a system with tools and techniques for accomplishing these tasks (Roberts, 1999). Several SDLC models exist, the oldest being the "waterfall model" which is a sequence of stages where the output of each stage becomes the input for the next. Different methodologies give different names to the different steps and the number of steps varies between four and seven. Britton and Doake (1996) and Langer (2008) state

that while there is no single generally accepted Life Cycle, various methodologies have evolved through the years which have defined the stages of the development process into these typical stages:

1. Problem Definition: determines the need for a system to support a business function.
2. Feasibility Study: Initial investigation and analysis.
3. Analysis: Define business goals and gather system requirements.
4. System Design: Conversion of business requirements to system requirements.
5. Detailed Design: Design the database and accompanying applications.
6. Implementation: Building and Testing the database and applications.
7. Maintainance: Training and Support.

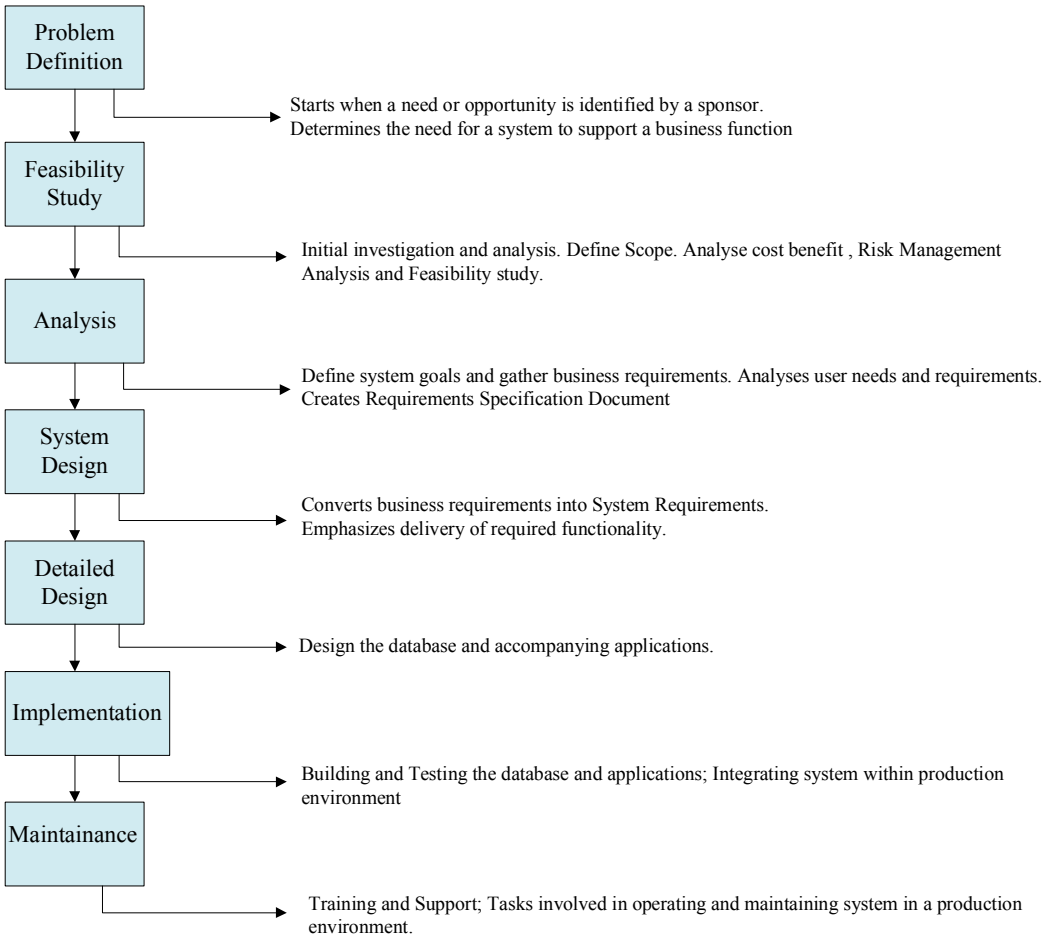

Fig. 2.1.: 7-phase System Development Life Cycle Diagram

Dennis et al (2002) grouped these stages into a broader fundamental four-phase model, which they claim is common to all system development projects even though the focus of each phase may differ. Although most authors have generally adopted the 7-stage life cycle, most life cycles can be broadly categorized into these 4 stages. These stages are:

1. Planning: Involves identifying the system's business value to the organization, feasibility analysis and developing work plan.
2. Analysis: Involves analysing the problem, gathering information and modelling data and process. This stage answers the question of who will use the system (identifying stakeholders), what the system will do, and where and when the system will be used. Also, any current system is investigated, improvement opportunities identified and a concept for the new system is developed. The strategy for analysis includes the analysis of the current system (the As-Is system) with it's problems, followed by the analysis of the new system (the To-Be system). This is then followed by Information Gathering employing techniques like questionnaires or interviews.
3. Design: Involves System, Network architecture, Database and File design
4. Implementation: Involves the construction (programming, testing, installation and support)

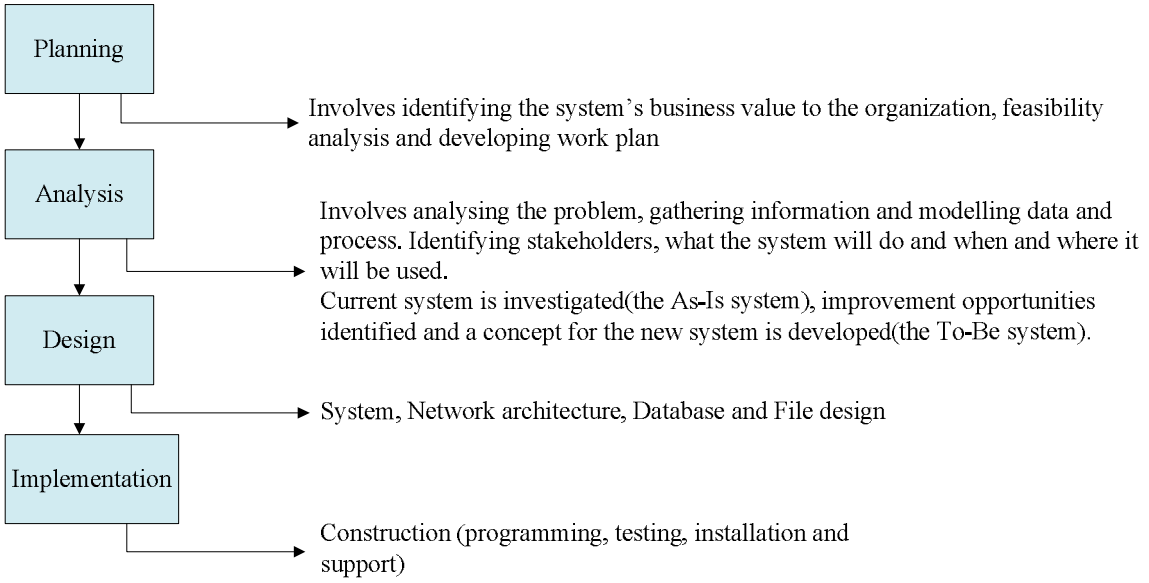

Fig. 2.2.: 4-phase System Development Life Cycle Diagram

For some projects, the steps or phases proceed in a logical pattern from start to finish while for many others the project teams run through the steps in a consecutive, incremental, iterative or other pattern. No methodology on it's own can guarantee 100% Information Systems (IS) development success but several fundamental concepts and practical techniques exists that can improve the probability of success.

2.3.2. Software Systems Methodologies

In response to the problems facing the software industries in the 1960s, the Structured Analysis methods were developed. Some of the major structured methods include the Soft Systems Methodology (by Peter Checklands), Structured Design (by Larry Constantine), Yourdon's Structured methods (by Edward Yourdon), Jacksons Structured Programming (by Michael A. Jackson), Structured Analysis in 1978 (by Tom DeMarco), Structured Analysis and Design Technique (SADT by Douglas Ross), Structured Analysis and System Specification published in 1979 (by Tom DeMarco) and Structured Systems Analysis and Design Method (SSADM) by the UK Office of Government Commerce. (Wikipaedia). Of all the structured approaches, the SSADM received wider

adoption (Duncan et al, 1995). It was devised in the early 1980s by the UK Civil Service in conjunction with Learmonth & Burchett Management Services (LBMS) to aid systems analysts in their development tasks. It was adopted as a mandatory standard by the Civil Service in 1983, version 2 released in 1984, version 3 in 1986 and version 4 was launched in 1990 and promoted as an open standard. (Duncan et al, 1995).

Other methodologies worthy of mention include in-house methodologies, the more contemporary Rapid Application Development (RAD), Object-Oriented (OO) approaches (like OMT, Booch method, Objectory and UML), "lightweight" Agile Software Development and Information Engineering. The knowledge-based system development Life Cycle (KBSDLC), a prototyping methodology was presented by Weitzel and Kerschberg in 1989 to suit knowledge-based systems as they argued that older (linear) methodologies worked poorly on knowledge-based systems.

Table 2.1.: Main Software Systems Methodologies.

Methodology	Date	Method	Methodologist
Soft Systems Methodology	1960s	Structured	Peter Checklands
Structured Design		Structured	Larry Constantine
Yourdon's Structured methods		Structured	Edward Yourdon
Jacksons Structured Programming		Structured	Michael A. Jackson
Structured Analysis	1978	Structured	Tom DeMarco
Structured Analysis and Design Technique (SADT)		Structured	Douglas Ross
Structured Analysis and System Specification	1979	Structured	Tom DeMarco
Structured Systems Analysis and Design Method (SSADM)		Structured	UK Office of Government Commerce
Rapid Application Development			
OMT, Booch method, Objectory and UML		OO	
Agile Software Development and Information Engineering		Agile	

Although many methodologies exist, there doesn't seem to be much adoption by system developers in Ireland. Barry and Lang in 2003 carried out a survey on multimedia developers in Galway, Ireland to determine the methodology used to develop their Information Systems. They found most practitioners used their own in-house methods rather than the traditional methodologies although they generally agreed that a systematic approach is desirable to give beneficial structure to the development process.

Table 2.2: Incidence of method usage in traditional IS development. (Survey by Barry & Lang 2003 in Galway, Ireland.)

Method	Respondents who have used this method *n*=65		Respondents for whom this is the principal method in use *n*=45	
In-house method	37	56.9%	34	75.6%
Do not use any method	16	24.6%	N/A	N/A
SSADM	11	16.9%	4	8.9%
Rapid Application Development (RAD)	9	13.8%	3	6.7%
UML	4	6.2%	1	2.2%
Information Engineering	3	4.6%	1	2.2%
Yourdon/STRADIS	2	3.1%	1	2.2%
LBMS System development method	2	3.1%	0	–
Jackson Systems Development	1	1.5%	1	2.2%
OMT	1	1.5%	0	–
Booch	0	0%	0	–
Overall	–	–	45	100.0%

They cited that 61% of practitioners felt the methodologies were too cumbersome while 19.2% claim that it wasn't difficulty in using or understanding the methodologies that inhibited their usage of these traditional methods. They suggest that the reason for low adoption of these formalized methodologies is their perceived technical limitations rather than objections. A significant number (30.8%) reported these methods to be too costly, while others cited the methods were not suited for the real world and lengthy training was required. (Barry & Lang, 2003).

2.3.3. The Software Crises: System Development Success & Failure Report.

Requirements Analysis task cannot be undertaken without mentioning the software crises. Survey carried out by the Standish group revealed that 37% of failed projects were due to factors relating to problems with requirements, making it the largest single contributor to software failure (Larman, 2002).

The Systems Development Life Cycle stages have been well defined through the years to reduce the rate of system failure which has occurred in over half of all Information Systems (IS) development projects. This development process is critical to the success of any system and if not well planned and well thought of, a system may bring no overall benefits. As systems cost so much to implement, it is always best to maximise the return on their investment. The success of a system can be measured by: user acceptance and actual use of the system, how well the system fulfills the project's task of supporting the user, benefits to the organization and personnel, ease of use, cost of maintenance and flexibility.

On the other hand, some of the most cited reasons for systems failure are failure to meet its requirements, poor performance, poor reliability and poor usability. This comprises: the system not (or only partially) fulfilling it's projected requirements, inflexible solutions, overloading the users, disproportional costs and failing to integrate the existing components. Failure criteria also include cancellation of the project before the system is completed and lack of use or adoption by the users of the system (Dennis et al, 2002). Failure has also been viewed in terms of significantly late delivery of the system (compared to deadlines), significantly higher costs (than budgeted), technical advent, lack of specialized personnel and high-level support, and mismanagement of the project. Research carried out by KPMG between 1989 and 1995 revealed some factors behind system failure, some of which include Shifting Requirements, unclear requirement capture, poor management, poor estimation and a few times, the use of new technology within the design, which is not always appropriate.

Research, surveys and government reports have shown that a lot of IT projects have gone wrong and that system developers and project managers still underestimate the risk (Fielding, 2002). Robertson & Robertson (2006) reported that 60% of the system development errors are related to the requirement specification. They further maintain that the cost of gathering good requirements is very insignificant to the cost of poor requirements. An example of a failed project that comes to mind in Ireland is the PPARS (The Personnel, Payroll and Related Systems) project abandoned by the HSE in 2005 as it was unable to meet the major functional requirements and cost an excess of €220m (compared to it's initial estimate of €9m) (Irish Independent website). The KPMG research cited above which was conducted among 134 companies in the US, UK, Australia, Europe and Africa showed that over 50% of them admitted to having a failed IT project in the last 12 months which cost as much as £8M. The survey also suggested that poor communication between the project owners and the developers was the reason such projects failed; only 23% of the organizations' staff were Project Management Institute certified and 81% used a "home-grown" methodology (Fielding, 2002).

2.4. Software Requirement Specification (SRS):

2.4.1. Definition:

A Software Requirement Specification (SRS) as defined by Wikipaedia is "a document with a complete description of the behavior of the system to be developed from a user's point of view. It includes a set of use cases that describe all the interactions the users will have with the system". Whitten et al (2004) also defined it as "the process used by system analysts, to identify or extract system problems and solution requirements from the user community". Requirements analysis encompasses all the tasks involved in determining the needs or conditions to be met by a new or altered system, taking into account the possibly conflicting requirements of the various stakeholders, such as beneficiaries or users.

Robertson & Robertson (2006) on the other hand define the Requirements as "what the product does for it's users and which constraints it must satisfy".

The Systems Analyst is the role responsible for this stage of the development process and most authors acknowledge this role as key to the success of any IS development as they are responsible for analysing the business situation, identifying needs, and designing an IS to meet business needs. Systems Analysts work closely with and liaise between the programmers and the stakeholders of the system to develop systems that make significant impact.

2.4.2. Requirements Analysis:

Information systems have been developed for decades but have met with little success generally due to late delivery, over-shot budget, unreliability and failure to meet requirements; the most recurring problem being that of misunderstood requirements (Robertson and Robertson, 2006). The amount of time, energy and money spent on maintenance is a good indication of this; therefore, a systematic approach is necessary for the specification, design, and development of information systems to ensure success.

Whitten et al (2004) emphasized the importance of this phase by stating how critical it was to the success of any development project as information systems are evaluated against this phase. Requirements specified must therefore be actionable, measurable, testable and related to identified business needs or opportunities. (Wikipaedia).

Requirement Analysis aims to identify all the system stakeholders, identify their wants and needs and ensures that they clearly understand the implications of the new system. DeMarco (1979) and Robertson and Robertson (2006) both highlighted the significance of the system users, stating that no system will succeed without the active and willing participation of its users. Also, users and other stakeholders have to be involved and central to the system development process. They further state that the most useful software products are those where the developers as well as the clients have a clear understanding of what the software is meant to accomplish and how it is meant to do this, while stressing the point that apart from a few accidents, no product has ever succeeded

without prior understanding of its requirements. Dieste et al (2008) agreed stating that understanding the customer requirements is one of the most important of all the activities associated with software development.

2.4.2.1 Stakeholder Analysis and Identification:

Stakeholders are all the people with vested interest in the system to be developed. They include end users, functional managers, IS managers, systems personnel, and external consultants and each of these have a different view of the system. (Roberts, 1999)

2.4.2.2 Requirement Specification Activities:

Requirement Analysis usually involves three main activities:

1. Requirement Gathering or Acquisition: involves liaising with users and other stakeholders to determine their requirements.
2. Analyzing Requirements: clarifies requirements
3. Modeling Requirements (System Modeling): involves using natural language or other modeling tools.

Some overlapping occurs between requirement gathering and system modeling. Models are used to discover requirements by the requirements gatherer and can therefore be useful requirements gathering tools. On the other hand, the modeler models the functionality and data from the requirements.

A Software Requirement Specification (SRS) document is the product of the Requirement Analysis phase of the Systems Development Lifecycle and this usually forms a part of the contract document. Some of the benefits of having a SRS document include:

1. Providing a checklist of Requirements
2. Provide a contract between the project sponsor(s) and developers.

3. Providing a high level description for complex systems.

2.4.2.3 Requirements Acquisition Techniques: Methods and Sequence

Requirements Gathering involves all the activities involved in generating or specifying the requirements from the stakeholders. The techniques are very important as they provide a useful means of facilitating communication. Some authors advocate the combination of several methods to elicit the most accurate requirements while Coughlan (2003) stressed that some techniques are more effective in eliciting requirements than others depending on the context under study. Maiden and Rugg (1996) cited an example of a requirement gathering project where one method of acquisition would have compromised the user's safety and using an additional method revealed more to the engineers. They argued the need to employ more than one acquisition method to capture the full range of complex requirements for most complex systems. Some analysts however, do not see much benefit in using several methods for gathering complete and accurate requirements. This has been due to deficiencies in guidelines for selecting methods, ordering the chosen methods or even planning a systematic, well grounded requirements gathering project. The ACRE (ACquisition of REquirements) framework designed by Maiden and Rugg in 1996 set out to overcome these limitations.

Techniques which offer face-to-face contact and give multiple cues serve to enrich communication and reduce ambiguity which is common in a requirements capture situation. Different techniques are available for requirements acquisition for software-intensive systems but requirements analysts are faced with the problem of choosing what methods are suitable and in what sequence to order them. Generally, the requirements of the system data and functionality are derived from analysing the current system and interaction with users and clients. A wide range of methods exist from the ethnographic to the constructivist but each of these methods is not sufficient to capture complete requirements when used in isolation.

Table 2.3.: ACquisition of REquirements (ACRE) Framework designed by Maiden and Rugg in 1996. Minimum conditions for method of use. Manpower constraints indicate the minimum number of people needed to use the method.

Constraints	observation	u. interviews	s. interviews	protocols	card sorting	laddering	rep. grid analysis	brainstorming	rapid prototyping	scenario analysis	RAD	ethnographic
Meeting is needed	x	--	--	--	--	--	--	--	--	--	--	x
Time to prepare session	==	==	-	-	-	==	-	==	-	-	-	==
Time for acquisition session	-	==	==	==	==	==	==	==	==	==	x	x
Time to obtain requirements	-	-	-	-	-	-	-	-	==	-	x	x
Number of requirements engineers	1	1	1	1	1	1	1	1	1	1	1	1
Number of stakeholders	1	1	1	1	1	1	1	1	1	1	6	2
Friendliness to stakeholders	-	==	-	-	==	==	==	-	-	-	x	x
No technological overheads	-	==	==	-	==	==	==	==	x	==	x	-

Software Requirement Specification involves requirements elicitation and requirements modelling. Common techniques employed by system analysts to gather requirements include:

1. Questionnaires.
2. Interviews (structured and semi-structured)
3. Surveys
4. Focus groups (requirements workshops)
5. Creating requirements lists
6. Observation
7. Brainstorming
8. Analysis of existing documentation and forms
9. Ethnographic

Modern techniques include:

10. Rapid Prototyping
11. Use cases.

Other techniques rarely used are:

12. Protocols
13. Card Sorting
14. Laddering
15. Scenario Analysis

the most common elicitation methods being Questionnaires, Surveys, Interviews, focus groups, Observation, Brain storming and Document and Form analysis.

Coughlan, 2003 further categorized the elicitation techniques into classes:

1. *Traditional*: Questionnaires, Interviews, and Analysis of existing documentation.
2. *Group*: Brainstorming, Focus groups, Consensus-building workshops.

Of all the requirement elicitation techniques available, **Interviews** and **Prototypes** are the 2 most commonly advocated by most authors. Weitzel and Kerschberg (1989) who developed a prototyping methodology stated that prototypes are very useful techniques for specifying correct, complete and unambiguous requirements. This was supported by Dieste et al (2008) and Graham (1991) who chose it as the method of choice for specifying requirements in expert systems and conventional IT projects. A combination of these methods can be employed where necessary to establish the exact requirements of the stakeholders to produce a system that meets the business needs.

Although DeMarco (1979) places value on Requirement analysis, he argues that system success cannot be ensured by any one of these techniques, and the purpose of analysis is not to achieve success but to avoid failure. Dennis et al. (2002) agrees with DeMarco (1979) stating that no technique is guaranteed to ensure success but proper use of some fundamental concepts and practical techniques can improve the probability of success. On the other hand, Robertson and Robertson (2006) state that system success can be

ensured and is highly dependent on the product of the Requirement Specification process. They insist that it is the only way to ensure that the essence of the requirement has been captured and communicated and it is against this that the required product can be tested.

2.4.2.4 System Analysis Modelling Techniques:

A technique is simply an operation with one or more inputs and one or more outputs, while a method is a sequence of techniques or methods. There has been an increasing need to develop standards for software development, including modeling standards. Liaw et al raised the issue of a lack of accepted and implemented modeling standards, which has hampered developers from ensuring compatibility and interoperability. The IEEE standard does not endorse any model but draws the benefits from each modeling technique.

Requirements have been specified in these formats:

a. Natural Language
b. Requirements Specification Languages
c. Representation Tools

2.4.2.4.1 Natural Language:

Also termed the traditional or classical approach, this was the earlier approach to SRS and is still very much in use today. Written in natural language (e.g., English) and text-based, this method has proved to be inherently ambiguous, as it produces large and bulky documents that stakeholders were unable to read or understand. Careful review of a natural language SRS is necessary to identify and clarify any ambiguous use of language and for correction. Even with the use of other approaches, the IEEE recommends retaining the natural language descriptions to cater for customers unfamiliar with the notations.

2.4.2.4.2 Requirement Specification Languages:

The Structured Analysis method overcomes the inherent problem of ambiguity characterized by natural language SRS. Unlike the natural language, the Requirement Specification language processors automatically detected many semantic, lexical and syntactic errors the Natural language was prone to. The major disadvantage to the use of these modeling languages is the learning curve involved for both analyst and customer. Many non-technical users find them incomprehensible. An important point worthy of note is that these languages tend to be better at modeling certain types of requirements and designing some particular types of systems which may influence the requirements in subtle ways.

2.4.2.4.3 Representation tools:

Generally, requirement methods and languages are categorized into 3 groups: Object, Process and Behavior. Object-oriented approaches have the advantage of being able to organize requirements into real-world objects with attributes and the operations performed by the objects. Process-based approaches have requirements organized into functions that communicate through data flows while behavioral approaches describe the external behavior of the system in terms of some mathematical functions, abstract notion or state machines. The usefulness of any particular tool is dependent on the size and complexity of the program.

2.4.2.5 Structured vs Object-Oriented Tools:

Since the introduction of traditional Structured Analysis in 1978, it has been an industry standard method for Software Requirements Analysis and has been supported by numerous CASE tools (Firesmith, 1991, Booch et al, 2005). Various forms of the Object-

Oriented (OO) approach introduced since the early 1980s have also become the preferred approach and have been widely used for the design and coding of certain programs.

There are varying views on the different modeling techniques with DeMarco as far back as 1979 advocating the data flow diagram (bubble chat) as a documenting technique. Lejk and Deeks (2002) strongly agreed with him stating that the DFDs are an extremely useful interface between users and computing practitioners. Shen et al (2004) also agreeing, pointed out that even though OO seems to be regarded as the leading technique, structured methodologies still play an important role in system analysis and design. They viewed UML as a relatively new modeling technique compared to its structured counterparts.

More recent debates from the software development community have however advocated the Object-Oriented approach as the preferred technique for certain Software development projects. Gabbert (2001) strongly advocated this approach emphasizing its support for the more popular OO languages during system implementation and highlighting the importance of acquiring the skill set for software designers. She reported an increase in projects using Object-Oriented technology from 3.8% to 12% between 1991 and 1996.

Interestingly, some methodologists have attempted merging both approaches, arguing the effectiveness of combining both methods together (Shumate, 1991); others have refuted the usefulness of combining both methods, pointing out significant disadvantages of their combination (Firesmith, 1991). This has generated much controversy in the software development community. Some hybrid approaches combining both methods exist and have been advocated, like staged delivery cycle, where analysis and design are first done in waterfall style, then coding and testing are divided into iterations (Fowler, 2004).

Table 2.4.: Major Differences between Structured and Object-Oriented Analysis and Design

	Structured Approach	**Object-Oriented Approach**
Methodology	System Development Life Cycle	Incremental and Iterative
Focus / Based on	On Process	Objects
Process & Data	Treats Processes and data as separate components	Combines data and processes that act on the data into Objects
Risk	High	Low
Reuse	Low reuse	High Reuse of Code (Inheritance)
Maturity	Mature, widespread and well established analysis techniques	Emerging
Suitable for	Well-defined projects with stable user requirements	Risky large projects with changing user requirements
Transition		Easier transition from analysis to implementation.

Analysis Phase	**Requirements:**
	• DFDs
	• Structured English
	• Decision Table / Tree
	• ER Analysis
		Requirements:
		• **Use Case Model** (Uses Cases, Flow of Events, Activity Diagram)
		• **Object Model**
		  • Classes & class relations
		  • Object Interaction: Sequence & collaboration Diagram, State Machine Diagram,
		  • Object to ER Mapping

In the survey carried out in Galway, Ireland by Barry and Lang in 2003, many respondents used two of the three most widely adopted techniques (Data Flow Diagrams and Systems Flowcharts) from the pre-structured and structured era for IS development. OO techniques wasn't as widely used surprisingly maybe due to the resilience of the older techniques. Their findings paint a picture of a profession that does not readily adopt up-to-date techniques in development practice confirming the contention that the software industry is very reluctant and slow in accepting new techniques.

Table 2.5.: Technique usage in traditional IS development. (Survey by Barry & Lang 2003 in Galway.)

Technique	Respondents who have used this technique *n*=70	
System Flowcharts	49	70.0%
Project Management Techniques	42	60.0%
Data Flow Diagrams	37	52.9%
Workflow Diagrams	27	38.6%
Entity Relationship Diagrams	24	34.3%
Normalization	20	28.6%
Structure Charts	18	25.7%
Pseudocode/Structured English	18	25.7%
Decision Trees/Tables	14	20.0%
JAD	9	12.9%
Entity Life Histories	5	7.1%
Use Case Diagrams	4	5.7%
Functional Decomposition Diagrams	4	5.7%
Class Diagrams	3	4.3%
State Transition Diagrams	1	1.4%

2.4.2.6 Structured Systems Analysis Tools:

The structured analysis techniques were devised as a result of the problems and failures characterized by the natural language approach. SSADM, one of the standard structured approach uses three important modeling tools namely: Logical Data Modeling, Data Flow Modeling and Entity Behavior Modeling which places emphasis on three fundamental views: processes, data and events that are modeled by the Data Flow Diagrams, Entity

models and Entity Life Histories respectively (Lejk and Deeks, 2002). Although these all cross-reference each other, they still are separate diagrams and concepts. One major limitation of the structured approach is the separation of data stored from the processes which act upon the data. The three most widely used Structured modeling methods are: the IDEF0 which establishes functional models, the IDEF3 which captures process descriptions, and the Data Flow Diagram which describes information / data flow.

2.4.2.7 Unified Modeling Language (UML) – An Object-Oriented Approach

Wieringa (2003) described UML as a collection of diagram techniques initially defined by Booch, Rumbaugh & Jacobson and adopted by the Object Management Group (OMG) in 1997; and a standard Notation for Object-Oriented Software Design.

Object-Oriented analysis aims to model a system as a group of interacting objects. Introduced in the early 1980s, various forms of Object-Oriented approaches exist. The UML is one of the Object-Oriented modeling notations available and is a graphical language for visualizing, specifying, constructing, and documenting the artefacts of an object-oriented software-intensive system. It is a standard way to write a system's blue-prints (Wikipaedia) and standard for modeling the architecture and behavior of an object-oriented software system (Fries, 2006). It was earlier conceived as a general-purpose language used for modelling object-oriented software applications but is now considered the lingua franca of software engineering (Knape et al, 2003). They further state that it is very effective in modelling processes in software applications using activity and class diagrams. UML is a set of modelling notation adopted by the Software industry, which has been considerably extended in recent versions (v 1.4 and 2.0) to be capable of representing more complex and process-oriented problems (Hederman et al, 2002). They cited previous attempts made to represent clinical guidelines using IT representational techniques such as flowcharts, sequence diagrams, or high level petri nets. Otero and Dolado (2003) argue that although it has evolved as the dominant and standard modelling language in the software industry, it has been criticised for it's complexity, inconsistent semantics and ambiguous constructs.

UML combines best techniques from object modeling, data modelling (entity relationship diagrams) business modeling (work flows) and component modeling. It can be used throughout the software development life cycle, with all processes, and across different implementation technologies. It combines the notations of the Object-modeling technique (OMT), the Booch method and Object-Oriented software engineering by merging them into a single, widely usable and common modeling language. The UML standard was created by a response from industry leaders when the OMG called on OO methodologists to create a rigorous modeling language.

UML is an evolving standard which includes a set of graphical notation techniques created by the Object Management Group. It is the method of choice for this project since it overcomes the limitations of the Classical System Analysis method and Structured Approach, which though successful and widely adopted has its limitations. It combines best techniques from the structured approach as well as the OO approach and it can be used throughout the SDLC. It is a very flexible tool and supports software re-use (Lejk and Deeks, 2002). Some advantages of the UML approach are that it combines data and process into objects, creates better Structured Programs and allows for easier transition from analysis to implementation.

Fries in 2006 stated that UML diagrams have been shown to be an effective aid in program understanding and he went on to design a framework for transforming structured analysis and design artifacts to UML. He claimed that legacy systems written in an out-of-date programming language may require numerous modifications.

2.5. Summary of Literature Review

This chapter has discussed the definition and history of Software Systems Development, its Methodologies and its stages. It has also discussed Software Requirement Specification, its Tools and Techniques and honed in on the UML, the OO methodology of choice for this project. It has also briefly discussed the purpose of an IDSUIS.

CHAPTER 3: METHODOLOGY

In preparing for battle, plans are useless, but planning indispensable. (General Eisenhower).

3.1. Introduction:

This chapter outlines some of the methods proposed by authors in the literature review for eliciting and validating software requirements from system users. It illustrates the systematic approach and rigour taken by the researcher to accurately specify the user's needs to generate an optimum Software Requirement Specification. It then elaborates on the requirements modelling tools and techniques analysed from the extensive literature fit for the purpose of this project.

3.2. Setting:

The research was conducted within the Early Children Services of the Carmona Services of St. John of God Hospitaller Services in Dublin, Republic of Ireland, which is representative of the ID services rendered by the organisation.

3.3. Procedure:

3.3.1. Ethics Approval:

The research commenced after ethics approval was granted by the Provincial Ethics Committee of St. John of God Hospitaller Services (Appendix 2) and the Research Unit of the School of Computer Sciences at Trinity College, Dublin (Appendix 3).

3.3.2. Overview of Business Area:

It was first of all necessary to establish the business area in order to identify what areas required automation. Experts have advised first partitioning the work into manageable sizes and business events before studying each part to find the requirements (Robertson & Robertson (2006), Cockburn (2008)).

It was in light of this and for time constraints that the researcher narrowed the study area to the Early Children Services of one of the organisation's service unit, namely the Carmona Services.

3.3.3. Gathering the Requirements - The Process:

Following the Unified Process for categorising requirements, the researcher used the FURPS model (Functionality, Usability, Reliability, Performance and Supportability) developed by Grady in 1992 as a checklist. Requirements are generally classed as functional (behavioural) or non-functional (everything else). This placed requirements into the following categories:

Functional

Non-Functional:

- Functionality - Capabilities, Security, Feature set, Generality
- Usability - Aesthetics, Human Factors, Documentation, Consistency
- Reliability - Predictability, Recoverability, Frequency / Severity of Failure, Accuracy
- Performance - Response time, Speed, Efficiency, Resource Consumption, Throughput.
- Supportability - Maintainability, Testability, Adaptability, Extensibility, Compatibility, Installability, Configurability, Serviceability, Portability.

(Larman, 2002)

3.3.4. Non-Functional Requirements - Reuse:

Requirements experts, Robertson and Robertson (2006) and other authors have proposed the reuse of requirements (no need re-inventing the wheel), particularly non-functional requirements, which are fairly standard. They claim that requirements for any product built are never completely unique, therefore specification for previous projects can be used if relevant to project in progress.

The non-functional requirements generated by the organisation for a similar project, MHIS was therefore modified to fit ID services and re-used, while this project will focus on building the functional requirements from scratch for the new IDSUIS.

3.3.5. Functional Require ments :

Requirements Analysis usually includes a description of related domain processes which can be written as use cases. Once feasibility was determined, the researcher trawled for requirements by studying the work carried out by the business area, which was then partitioned into business use cases. The business use case is the functionality required by the work to make the correct response to a business process.

From the literature, it is strongly recommended that software requirements be generated from the domain experts, potential system users and a consensus of all primary stakeholders. The high priority goals of all the stakeholders must be in foresight and addressed to achieve any accurate or useful requirement. To achieve this, all the stakeholders of the current system were first identified with all the goals they aimed to achieve. The systems supplying or receiving data from the current system were also identified at this stage as failure to do so would jeopardize the requirements elicitation.

Techniques such as scenario interviews were conducted to discover the true nature of the work in details. The researcher worked closely with the stakeholders to capture the requirements and to decide the best product to help with the work i.e. how much of the work can be automated and the effect on the work. Once these were decided, the requirements were written in natural language.

The “Use Case Writing” model proposed by Alistair Cockburn in his book “Writing Effective Use Cases” was employed to gather as much functional requirements as possible. The use case template designed by Dennis et al (2002) was used to document use cases (Appendix 7).

The summary of this model is:

1. Identify the Stake Holders and the primary actors of the system.
2. Draw the Scope of the project or system under design – services the system offers
3. Write the stakeholders and all their interests and ensure all interests are catered for.
4. Make an Actor-Goal list for all the actors who have goals the system is supposed to meet.
5. Select some use cases to expand, capturing stakeholders and their interests, preconditions system must ensure and guarantees.
6. Write the main Success Scenario.
7. Write an exhaustive list of extension conditions that the system must handle.

(Cockburn, 2001)

Stakeholders exclusive to the Children's services were first identified with input from the IDIS systems administrator, the children services manager and the Early Services childcare supervisor. The stakeholders are displayed in Figure 4.3, while Table 4.1 outlines their goals at a high level.

3.3.5.1 Gathering Functional Requirements:

Larman (2002) defined requirements as capabilities and conditions to which the system must conform. The primary aim of requirements analysis is to systematically find, communicate, record (document), organise and track the changing system needs in a clear manner to the client and the development team. This activity involved the process of discovering what the users and customers of the software want the system to do for them. It also involved the employment of skilful elicitation techniques such as use cases and scenario interviews.

Although the Object Oriented analysis techniques were employed in this project and it's methodology highly recommended by most modern authors, the requirements were written with a waterfall bias of thoroughly defining and fully freezing all the requirements upfront before design in line with the scope of the project.

3.3.5.2 Selecting the Appropriate Techniques:

The five most commonly used requirements gathering techniques identified in the literature review are interviews, joint application design sessions (JAD – a special type of group meeting), document analysis, observation and questionnaires (Dennis et al, 2002).

No one technique is better than the other when used in isolation - each technique comes with its own strength and weaknesses which are harnessed by their combination as is the case in most projects. Most projects combine some of these techniques to provide a depth of richness and detailed information. Observation and Document Analysis are very useful fact-finding tools and therefore good with understanding the As-Is system. Questionnaires and Document analyses discover information from a wide range of sources while interviews and observation gets information from a source at any given time. While all techniques have the disadvantage of integrating information from different sources, the Focus Group improves integration as all information is combined during the session. Focus Groups require the most user involvement while the others require the least (apart from interviews) (Dennis et al, 2002).

The researcher, after carefully analysing these techniques and considering the constraints of the project, identified 3 of these techniques which fit the purpose of this project namely: interviews, Focus Groups and document analysis with the results from the open-ended questions obtained from a previous survey.

The techniques chosen were:

- Interviews – semi-structured
- Document Analysis
- Focus groups

Although observation is a very useful technique for exploring and discovering hidden requirements, it was not selected due to ethical consideration and lack of evidence of it's value.

3.3.5.2.1 The Interview Methodology:

It was decided to use semi-structured interviews and this was based on the premise that the system users could provide invaluable insight to their work flow. The value of semi-structured interviews in requirements gathering lies in its flexibility and the opportunity it presents to probe further based on the interviewees answers. This is a useful tool for exploring requirements which have been overlooked or not anticipated.

To ensure some consistency with the interviews, an agenda to be covered was prepared to explore the areas of work flow and data requirements. These questions were not asked in a specific order to allow some flexibility and to give room for more information that may emerge during the interview.

A pilot interview was conducted with a colleague and my manager, both of whom had been involved with the system since its inception, to verify if the questions would elicit the desired information. The questions were then modified with the feedback from the pilot. Audio or video recording of the interviews were not used even though they are very useful in capturing all the information exchanged. The researcher believed these may jeopardise the research as some participants may find it uncomfortable.

3.3.5.2.2 Selecting Interviewees

While a concerted effort was made to interview more users and user groups, the researcher was only able to interview one user representative per job role, and in few cases, two. Participants were selected on the basis of the information they were able to contribute.

Healthcare providers involved in the care and treatment of people with intellectual disabilities were invited via email to participate in a one-to-one interview. The user groups targeted included the healthcare workers, multidisciplinary clinical staff, care-givers, admin managers, directors and other stake-holders involved in the care and treatment of children with intellectual disabilities. On a number of occasions, an in-depth interview was conducted in the user's office or service centres, and over the phone in

some cases, most interviews being conducted on a one-to-one basis. The duration of the interviews were typically between 30 minutes and 1 hour at most over a period of 4 months. Notes were taken on an interview report template (Appendix 6) and this was transcribed onto a use case template (Appendix 7) immediately after the interview to ensure accuracy.

3.3.5.2.3 Document Analysis

Printed documents and forms were collected from the Early services childcare supervisor and the children services manager. Blank samples of forms held in service users' manual records and departmental folders were collected for further analysis. In some cases the clinical team held manual templates designed internally.

3.3.5.2.4 Focus Groups

On 3 occasions, a focus group of domain experts and the systems administrator met with the researcher to brainstorm. These meetings included most stakeholders from the clinical staff to the admin staff. The focus group meetings lasted between 1 to 2 hours.

3.3.5.3 Unified Modelling Language (UML)

The Unified Modelling Language (UML) is a graphical language for visualizing, specifying, constructing, and documenting the artefacts of an object-oriented software-intensive system (Wikipedia). UML is a set of modelling notation adopted by the Software industry, which has been considerably extended in recent versions (v 1.4 and 2.0) to be capable of representing more complex and process-oriented problems (Hederman et al). Whatever the tools used for specification, they must be implementation-independent and must be applicable to any design and implementation (Gabbert, 2001).

3.3.5.4 Requirements Modelling using UML:

UML was the chosen technique employed by the researcher for analysing and modelling the requirements as it was earlier conceived as a general-purpose language used for modelling object-oriented software applications and is now considered the lingua franca

of software engineering. (Knape et al, 2003). They recognised it as an effective tool for processes modelling while many other authors like Larman (2002) and Fowler (2004) found it a useful tool for even analyzing requirements.

The UML techniques that aid the requirements specification activity are:

1. The **use case diagram**, which describes how people interact with the system and also summarises all the use cases for the part of the system being modelled together in one picture;
2. The **class diagram**, which builds up the domain model and is drawn from a conceptual model;
3. The **Activity Diagram**, which models the work flow of the organization, showing how software and human activities interact. This shows the use case context and shows details of how a complicated use case works;
4. The **state diagram**, which is useful for emphasizing an interesting concept.

For the purpose of this dissertation, modelling was restricted to only the use case, the class and the activity diagram.

3.3.5.5 Use Cases and the Use Case Diagram

"Use cases" were first invented in the late 1960s and was introduced to the OO programming community by Ivar Jacobson in 1986. They were recognised as filling a significant gap in the requirements process and were therefore used to describe functional requirements (Cockburn, 2001, Fowler, 2004). They are stories of using a system to meet goals and are a widely used mechanism for discovering and recording requirements. The Unified Process defines the use case model within the requirements phase.

They proved to be a very useful communication tool and kept the analysis simple and understandable for all stakeholders. Communication was kept paramount and notations were kept to a minimum, adhering to the KISS (keep it simple stupid) principle; the

researcher abstained from drawing diagrams that appeared complex and incomprehensible to the domain experts to avoid confusing them.

Larman (2002) and Fowler (2004) argued that use cases are not an object oriented artefact and are not part of the UML notation, although the use case diagram is. However, they found it to be a very useful and popular tool for specifying requirements and play a major part of the Unified Process. The Use cases being the building block for the use case diagram was properly designed to give better understanding of the functionality of the system at a very high level. It also encouraged the users to provide additional requirements or correct errors in the written requirements.

3.4. Summary of the Methodology:

In summary, this project employed a qualitative research approach; justified by the fact that it involved exploration, human perception and experience. After the appropriate approvals and consents were received to undertake the project, the requirements were categorized following the FURPS model and the re-use and modification of the non-functional requirements was then proposed. The functional requirements were then elicited through an in depth study of the business area and a selection of the appropriate gathering and modelling techniques. The main gathering techniques employed were interviews, document analysis and focus groups while the UML modelling technique used was mainly the use case diagram with a class and activity diagram.

CHAPTER 4: RESULTS

4.1. Introduction:

This chapter presents the artefacts produced by the research undertaken using the methods stipulated in the previous chapter. It presents an overview of the organisation's business area, detailing the activities of one of its functional unit, Carmona Services, and then systematically outlines each artefact leading to the final Software Requirement Specification document. The organization's business area was first reviewed with the main business activities carried out within the functional unit of choice.

4.2. Overview of the SJOG ID Services Business Activities

The organization's business area was established first in order to understand the organisation's business activities and identify what areas required automation. SJOG's ID services spans across different parts of Dublin (Carmona Services, Menni Services, STEP and Citygate and St. Augustines School), other parts of the country (Counties Wicklow, Kildare, The North-East and Kerry), and outside Ireland (Northern Ireland and New Jersey). The ID Services given by SJOG can be categorized into children and adult services, which receive multidisciplinary support and respite services represented in Figure 4.1 created by Sarah Reade.

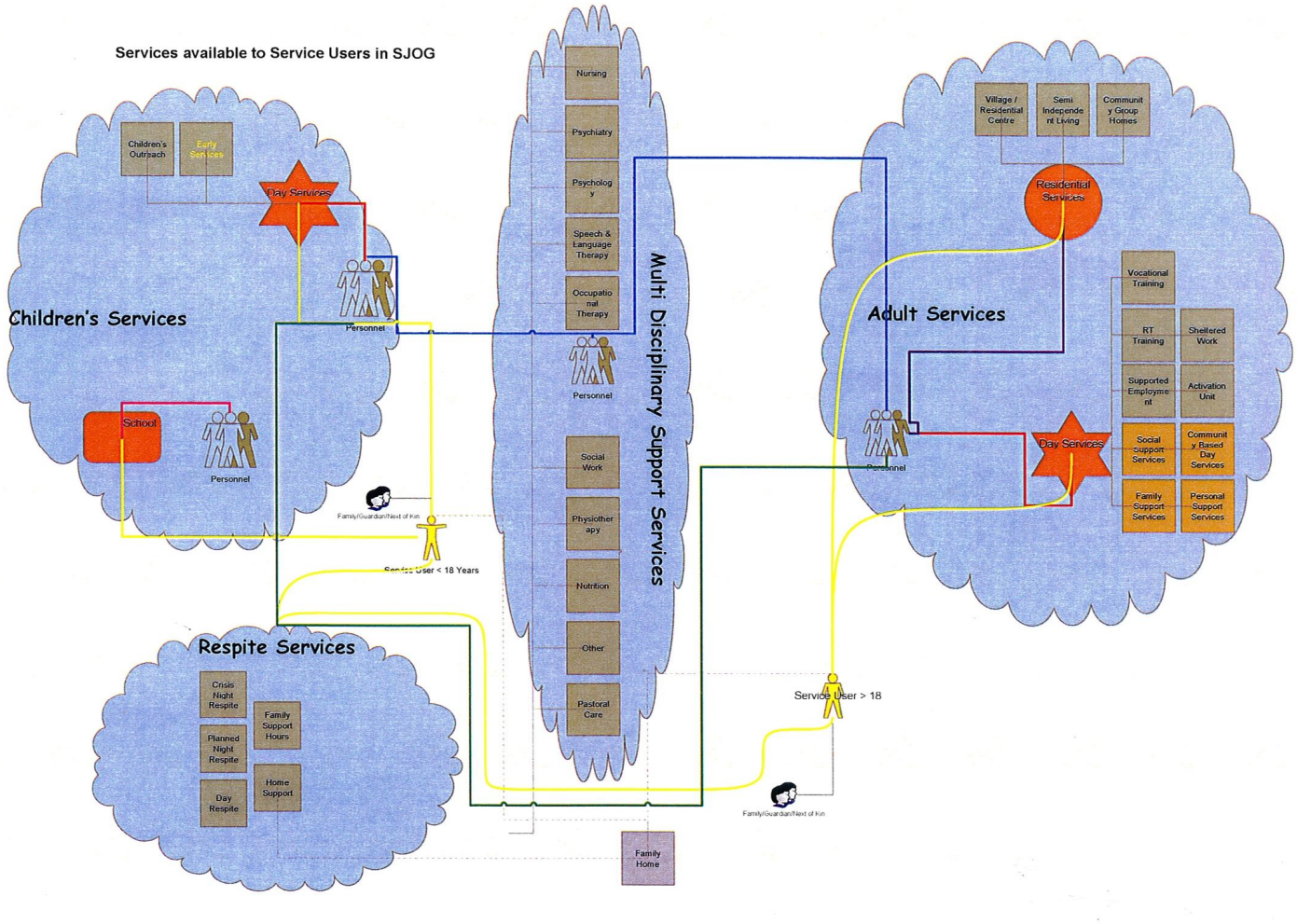

Fig. 4.1.: Overview of ID Services Available to Service Users of SJOG

4.2.1. Defining the Business Area (The Project Scope)

In order to capture the optimum requirements, it was first decided to narrow the project scope to the organization's **adult** services following advice from Robertson & Robertson (2006), who advocated first partitioning the work into manageable sizes and business events before studying each part. Adult services range from day programmes like education, training, lifelong learning and supported employment to residential and respite services, including multidisciplinary support. All SJOG business units with the exception of STEP and Citygate generally cover all these adult services. STEP and Citygate only

deals with sheltered and supported employment and supported living for people with mild disabilities and has no multidisciplinary support service.

Focus group meetings involving the service director, admin manager, service-based IT coordinator, MDT members, the service IDIS administrator, together with the IDIS systems administrator and the researcher were held across all business units to list all the stakeholders for each Service and document their high level requirements. These meetings revealed a significant difference in business activities and processes across all SJOG services (therefore having different data requirements), even for the same service type (having the exact NIDD service code).

It was then decided to standardize the business activities across the organization in order to have the same data requirements across the board. This triggered a Business Process Re-engineering, which is presently underway and beyond the scope of this project.

4.2.2. Defining the Business Unit

As a result of this wide variation across SJOG units, the researcher was faced with choosing another parameter to scope the project. The only option available was to narrow the research scope to one business unit which should reflect all the business activities carried out within a typical ID service. All the SJOG ID services were reviewed individually in terms of their business activities with input from the system's administrator and the ICT director. The options available were then narrowed down to Carmona Services and The North East Services (in Drumcar) which were the two Services that most reflected all the ID services given by SJOG and also had a clinical aspect to it (as well as social). After careful analysis, taking into consideration the previous experience with the pilot study, it was felt that Carmona Services best represented the SJOG ID services. The justification was that Carmona Services had championed the pilot study carried out in 2008 to extend the use of IDIS into the clinical areas and it was the only service presently using the clinical area of the IDIS.

4.2.3. Overview of Carmona Services

Carmona Services is one of SJOG's business units located primarily within the Dun Laoghaire area and provides service to those who reside within its South Dublin catchment area. Supporting about 350 children & adults, it provides community & residential programs to aid inclusion of children in their local communities, extending its services up to the Wicklow area.

Carmona Services business activities can be grouped into adult and children's day and residential services which are represented in Figure 4.2.

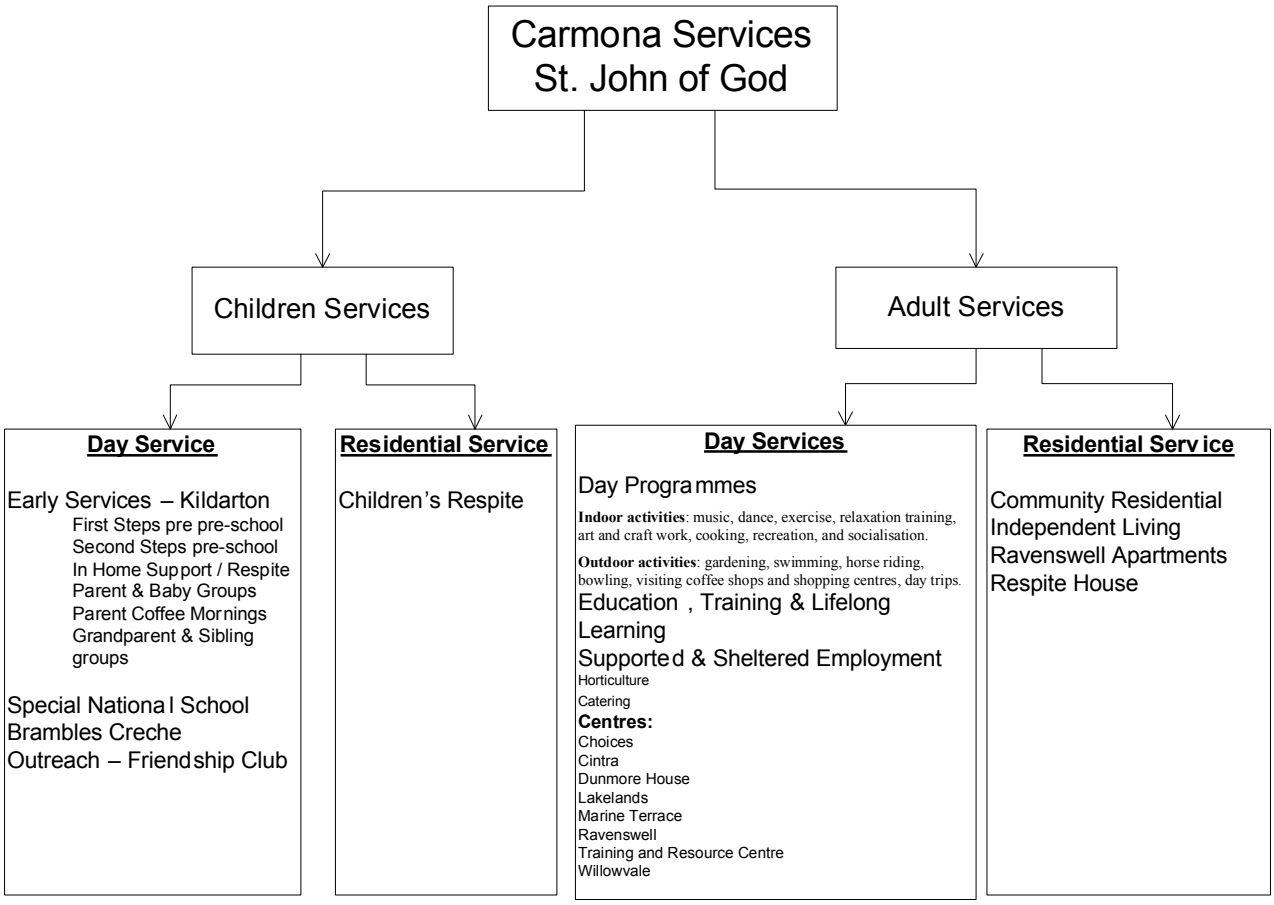

Fig. 4.2.: Carmona Services Business Activity Overview.

4.2.4. Early Children Services

Having narrowed the search to Carmona Services, 2 choices were available to the researcher: gathering requirements from both the children and adult services or from one. Choosing both services was way beyond the scope of this dissertation considering the time constraints. Liaising with the systems administrator revealed that some work had been done within the adult services during the pilot in 2008 and no requirements analysis exercise had been carried out within the Early Services. It was then agreed that a requirements analysis for the Early Services would be most useful to the organisation as there was none carried out till date.

Carmona Early Services provides support, guidance and information to parents and families during the early development of their child. Parents work closely with staff members to achieve their child's potential from birth to age five. This service is provided both in the family home and in Kildarton, which is situated in Glenageary Road.

Children under 2½ years and assessed as being in the moderate, severe to profound range of intellectual disability are placed in First Steps. They are then offered a place in the Second Step programme, which is a specialised playgroup that takes place in Kildarton, when they reach 2½ years. The Outreach service is given to some families who do not take up the offer but opt for mainstream playgroups for their children and this includes multidisciplinary support, coffee mornings, Friendship Clubs and information evenings.

4.3. Requirements Analysis - The Use Case Approach

The use case approach was the method of choice for analysis of the behavioural requirements of the business processes and ID system as justified in the literature review. Although it has been argued not to be object-oriented (Larman, 2002 and Fowler, 2004), it forms the basis for the object-oriented use case model. Alistair Cockburn devised a Use Case writing model which was adapted by the researcher and this process is summarized by the following steps:

1. Identify the Stakeholders and the primary actors of the system.
2. Write down the stakeholders and all their interests and ensure all interests are catered for.
3. Make an Actor-Goal list for all the actors who have goals the system is supposed to meet.
4. Select the major use cases to expand based on priority, capturing stakeholders and their interests, preconditions system must ensure and guarantees.
5. Write the main Success Scenario.
6. Write an exhaustive list of extension conditions that the system must handle.

4.3.1. Stakeholder Identification and Analysis:

The first step to the requirements gathering exercise involved listing all persons or systems with an interest in the system or business activity under investigation, including those who input and receive data from it. During the first set of focus group meetings held in each service prior to the change in scope, a brainstorming exercise was carried out to clearly identify all possible stakeholders for the ID services. A stakeholder diagram (Figure 4.3) displaying known stakeholders as seen by the systems administrator was distributed to all participants and this list was modified to reflect stakeholders relevant to each Service. The stakeholder list derived from the first set of meetings held in Carmona Services was then modified by the Early Services childcare supervisor to reflect Early Services.

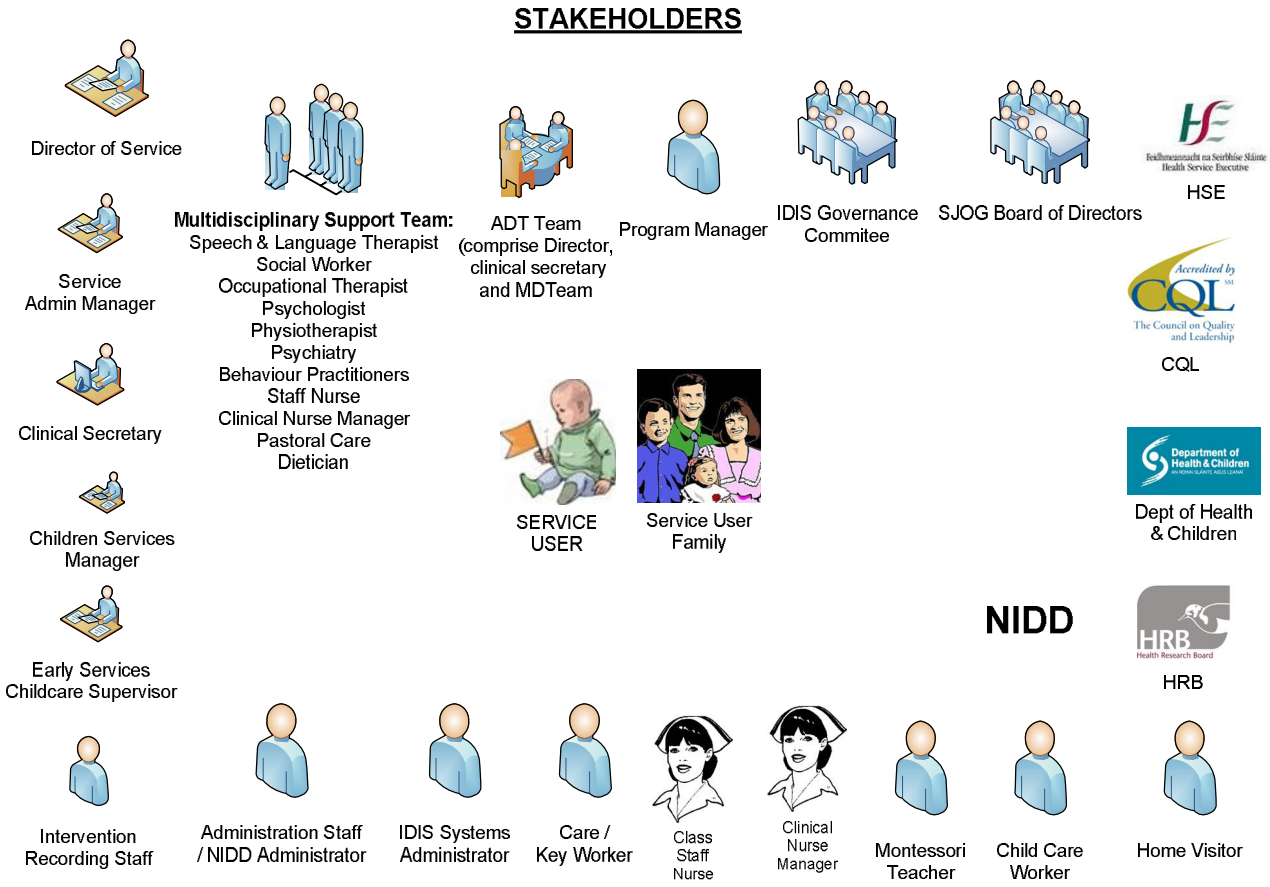

Fig. 4.3.: Identified Stakeholders for Carmona Early Children Services.

4.3.2. Internal Stakeholders and their interest

The stakeholders within the organisation and a brief description of their interests are listed below:

- Clinical Secretary

  Manages appointment diary for MDT / clinicians. Update assessment reports.

- Administration Staff / NIDD Administrator

  Updates service user demographic information onto the IDIS and ensures no discrepancy in information between the NIDD and the IDIS. Service User Daily Recording.

- Home Visitor

  Assigned to each family to visit the home fortnightly, should they wish. Works closely with family through the early stages of the child's development and is the

link to all other supports and professionals that the child may need. In most cases, may be the care worker.

- Care / Key Workers

  Assigned to all service users (SU), both adults and children, as the SJOG contact person to assist SU to realise their goals as specified in their Personal Outcome Measures (POMS). Gives day-to-day care and responsible for service user's care plan.

- Montessori Teacher

  Teaches in the pre-school program for First and Second steps.

- Early Services childcare Supervisor

  Co-ordinates all activities for the First and Second Steps.

- Multidisciplinary Support Staff

  Comprises Psychiatrist, Social Worker, Speech & Language Therapist, Occupational Therapist, Physiotherapist, Behaviour Practitioners, Staff Nurse, Clinical Nurse Manager, Pastoral Care and Dietician.

  Give professional services based on the need and care plan of the service user.

- Intervention Recording Staff

  Records all incidents and accidents which occur to service users.

- Program Manager

  Responsible for coordinating all programs and organising all activities given.

- Service Administrative Managers

  Coordinates all business activities carried out within the service.

- Directors of Service

  Head of the business unit.

- IDIS Governance Committee

  Committee responsible for the management of IDIS; policies and decisions.

- SJOG Board of Directors

  Responsible for governing the organization; Reports to the organization's external stakeholders, mainly the HSE.

Stakeholders exclusive to adult Services:

- Personal Outcome Measures (POMS) Administrators

External Stakeholders include:

- The Health Service Executive (HSE)
- The National Intellectual Disability Database (NIDD): database receiving service information from IDIS
- Department of Health & Children (DOHC): supports and reinforces equal participation for people with disabilities
- Health Research Board (HRB): Administers NIDD
- The Council of Quality & Leadership (CQL)

4.3.3. External Stakeholders and their Interests – Statutory Reporting.

The main external stakeholders include the NIDD system administered by the HRB (and indirectly by the HSE) on behalf of the DOHC and CQL.

4.3.3.1 National Intellectual Disability Database - NIDD

The NIDD was established in 1995 and is managed by the HRB on behalf of the Department of Health and Children. It has an excess of 25,500 registrations. The NIDD is a set of information that outlines the specialized health services currently used or needed by people with intellectual disability. The database informs the regional and national planning of these services by providing information on trends in demographics, current service use and future service need. (The HRB Website)

Within the Republic of Ireland, The HSE areas administer the NIDD, although the responsibility for providing the information to the HSE areas primarily lies with the service providers, HSE personnel and school principals. Access to this information at regional level helps to ensure more sophisticated service planning at HSE area level and promotes effective coordination of local services. Data collected includes personal details, current service provision and future service needs

Objectives:

- To provide an accurate minimum dataset of essential information on all people with an intellectual disability
- To enable current needs to be assessed more accurately
- To support planning for the future development of services
- facilitate research
- To monitor trends in service use, need for services, and demographic change

Benefits include:

- Enhances service planning
- Recognises needs of individuals, their families and service providers
- Evidence-based prioritisation of service requirements
- Commitment of funding to meet identified need
- Puts Ireland to the forefront of international developments in this field

Fig 4.3 shows a screenshot of an NIDD form displaying the type of information the NIDD collects from each service provider. This information is uploaded from the current IDIS onto the NIDD at the close of business each day.

55. If multidisciplinary support services are received or required, please indicate type(s):

Multidisciplinary Service	Current		Future		
	Currently Receiving √	Agency Providing Current Service	Not Receiving but Requiring √	Receiving but needing an enhancement √	Reason for Duplication between Received and Enhanced
Medical services	o	|__|__|__|__|__|__|	o	o	|__|__|
Nursing	o	|__|__|__|__|__|__|	o	o	|__|__|
Nutrition	o	|__|__|__|__|__|__|	o	o	|__|__|
Occupational therapy	o	|__|__|__|__|__|__|	o	o	|__|__|
Physiotherapy	o	|__|__|__|__|__|__|	o	o	|__|__|
Psychiatry	o	|__|__|__|__|__|__|	o	o	|__|__|
Psychology	o	|__|__|__|__|__|__|	o	o	|__|__|
Social work	o	|__|__|__|__|__|__|	o	o	|__|__|
Speech & language therapy	o	|__|__|__|__|__|__|	o	o	|__|__|
Other	o	|__|__|__|__|__|__|	o	o	|__|__|
Specify	_____		_____		

56. Are current services provided by an early intervention team?
|__| 1=yes 2=no 3=n/a

57. Year in which future services are required
|__|__|__|__|

58. Will future services be provided by an early intervention team?
|__| 1=yes 2=no 3=n/a

Fig. 4.3.: Screenshot of NIDD Data Form

All Intellectual Disability Service Providers have a statutory obligation to furnish the NIDD with data they collect for government service planning. To satisfy these statutory reporting requirements of the NIDD as seen above, the IDIS uploads service information held in its database onto the NIDD on a daily and annual basis.

4.3.3.2 Dept of Health & Children:

The Department of Health and Children's primary role is the formulation and evaluation of policies and the strategic planning of health services. They work in conjunction with the HSE, Government Departments, voluntary service providers and other interested bodies.

The government launched the National Disability Strategy in 2004 to support the participation of people with disabilities. The Education for Special Educational Needs Act, 2004 and the Disability Act, 2005 formed an integral part of their strategic planning. In 2007, Part 2 of the Disability Act gave children with disabilities under 5 years of age an entitlement to an independent assessment of health and education needs, independent of the costs of the provision of service. This was to be followed by a statement of the services identifying and outlining the services to be provided to the person by the HSE (DOHC website).

Service information from the IDIS in form of reports is generated and this is administered through the HSE on behalf of the DOHC.

4.3.3.3 THE Health Service Executive (HSE)

The HSE in response to the Disability Act, 2005 make provision for a range of health services provided by themselves in conjunction with other voluntary organizations funded by them. They recognize the importance of early intervention services for children under five; therefore make these services available to children with disabilities.

These services include:

• Multi-disciplinary teams,

• Home supports and

• Community nursing.

. The key disciplines involved in providing these services are;

• Psychology,

• Speech and Language Therapy,

• Occupational Therapy and

• Physiotherapy

The HSE's Early Intervention staff respond to all children with disabilities and identify which agency is best suited to respond to each child's needs according to the type of presentation or geographical location. Referrals are often made from the maternity hospitals and forwarded to the service providers.

To satisfy the HSE's reporting requirements, the IDIS generates service information held within its database onto HSE templates.

4.3.3.4 The Council on Quality & Leadership Accreditation Service:

CQL is an international not-for-profit organization that co-ordinates organizations and leaders in the disability field with a vision of dignity, community inclusion and quality of life for people with intellectual disabilities and mental illnesses. It began working in collaboration with many Irish organizations in the disability sector since 1997. Its main focus is on the Quality of Service given and the measure of the service user's personal outcomes.

CQL conducts accreditation every 4 years where it measures Shared Values, Basic Assurances and Personal Outcome Measures for service users and this data is generated in form of reports from the IDIS during the accreditation exercise.

4.3.4. Stakeholder Matri x

The interests of the stakeholders were analyzed in order to prioritize them in the order of their relevance. Different methodologies propose different ways of analyzing the stakeholders, the most common approach being to map the interest and influence of each stakeholder group on a quadrant. Figure 4.4 shows a model of the stakeholder matrix diagram and Figure 4.5 shows the stakeholder matrix for Carmona Early services.

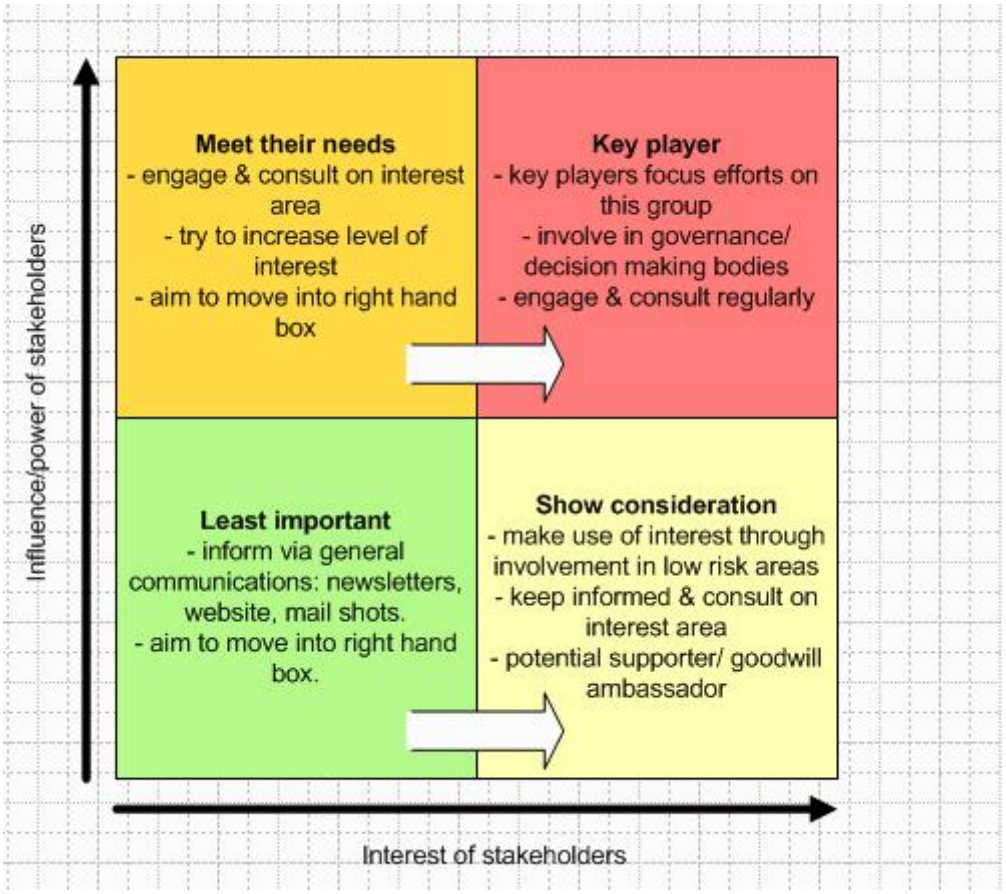

Fig. 4.4.: The Stakeholder Matrix Diagram adapted from www.stakeholdermap.com

Meet their Needs	**Key Player**
Clinical Secretary Administrative Staff / NIDD Administrator Care / Key Workers Multidisciplinary Support Staff: Psychiatrist, Social Worker, Speech & Language Therapist, Occupational Therapist, Physiotherapist, Behaviour Practitioners, Staff Nurse, Clinical Nurse Manager, Pastoral Care and Dietician Intervention Recording Staff Home Visitor Care / Key Workers Early Services childcare supervisor	Children Services Manager Service Administrative Manager Director of Service IDIS Governance Committee SJOG Board of Directors
Least Important	**Show Consideration**
Service User and Family Montessori Teacher Program Manager	The Health Service Executive (HSE) The National Intellectual Disability Database (NIDD) Health Research Board (HRB) The Council of Quality & Leadership -CQL Department of Health & Children

Interest of Stakeholders

Fig. 4.5.: The Stakeholder Matrix Diagram for the IDSUIS

4.3.5. Defining the Actors

The actors of a system are the stakeholders that use the system directly by adding data and changing it's state. With input from the systems administrator and the Early Services childcare supervisor, the researcher determined the actors for the system. The supervisor seemed adamant about certain stakeholders being actors as she was unable to see the value their data would bring to the system. Like in the case of the Montessori teacher, the manager insisted there wasn't a need to record the class activities carried out each day and attendance, although manual records were kept for these.

In order to derive functional requirements, these actors and their primary goals were outlined. These goals were then expanded to derive use cases, which would form the basis of the UML's use case diagram.

4.3.6. The Actor–Goal List

The Actor-Goal list shows the business or system's functional content by naming all the user goals that the system will support. To generate the high priority goals for the system, meetings were arranged firstly with the childcare supervisor, where some actors and their goals were identified. It was recommended at this stage to meet with the Children Services manager, who methodically went through an exhaustive list of all the job roles and the functionality they carried out. The combined Actor-Goal list for the main business processes and for the system is displayed in Table 4.1 and the expanded use cases documented within the SRS in Appendix 9.

Table 4.1.: Actor-Goal list.

Use Case No.	Scope	Primary Actor	Task / Goals	Priority
1	Business	Clinical Secretary / ADT Team	Admit Service User	1
2	System	Clinical Secretary	Register Service User	1
3	System	Clinical Secretary	Edit Service User Details	1
4	System	Clinical Secretary	Set up appointment	1
5	Business / **System**	Principal Social Worker	Visit Service User Family Obtain consent **Record Consent**	1
6	Business	Systems Administrator	Add System user	1
7	Business	Systems Administrator	Manage Security Access	1

8	System	Service Provider (All)	Set up appointments / Update Diary	1
9	Business / System	Service Provider (All)	Visits Service User Family / Record visit report	1
10	System	Service Provider (Clinical Team)	Record Developmental Assessment / Clinical Notes	1
11	System	Early Services childcare supervisor	View Service User Details	3
12	System	Respite Supervisor	Book Respite / Update Diary	2
13	Business	Management Team (Admin Manager / Director of Service)	Run Reports	2

4.3.7. The Use Case Model

The use case model detailing all the interactions the primary stakeholders have with the system is displayed in Figure 4.6. This is also documented within the SRS in Appendix 9.

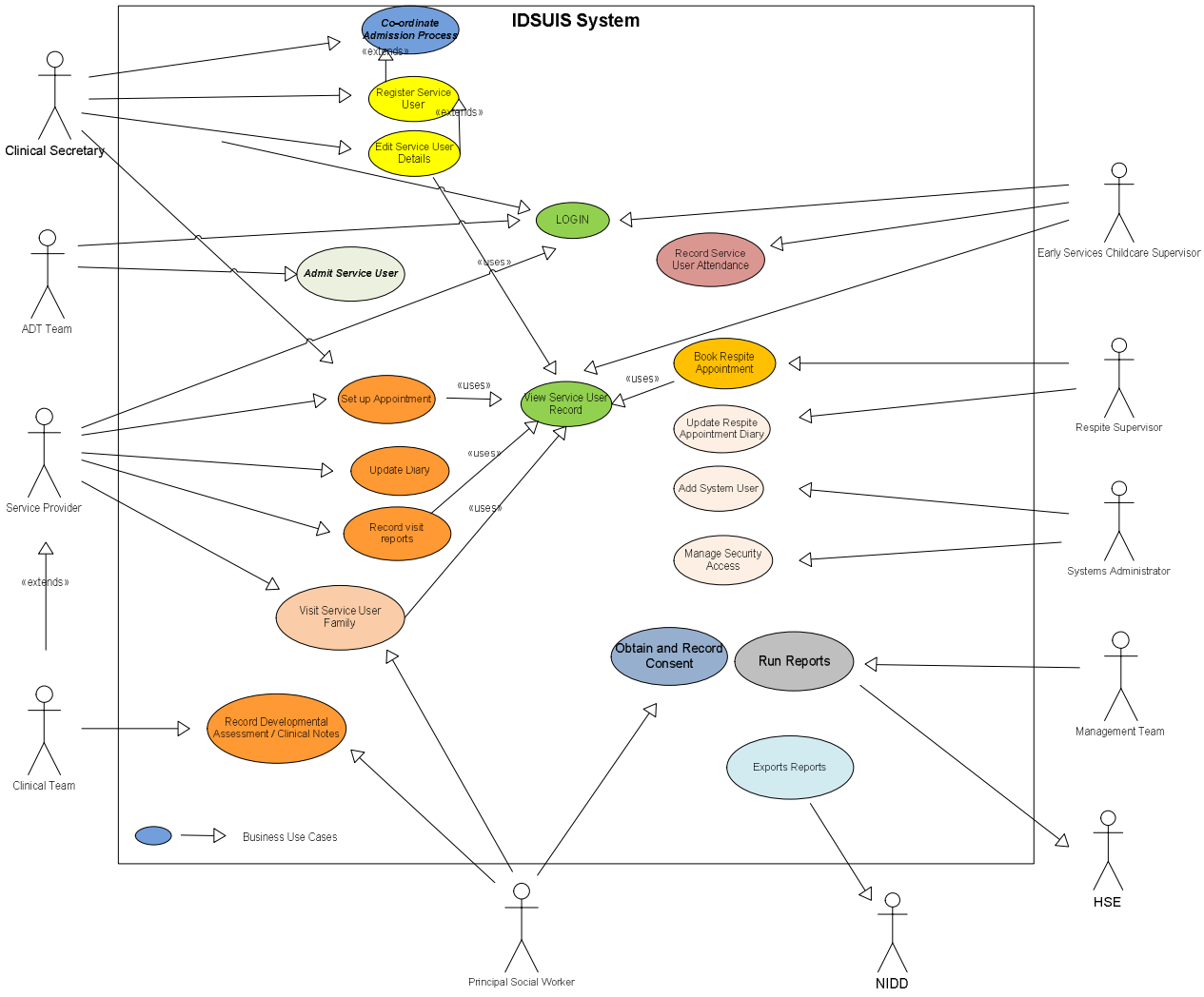

Fig. 4.6.: The Use Case Model for the IDSUIS

4.3.8. The Class Diagram

The class diagram displaying the objects of the system and their relationships is displayed in Figure 4.7 (and within the SRS in Appendix 9). These classes are composed of the class name, attributes and operations.

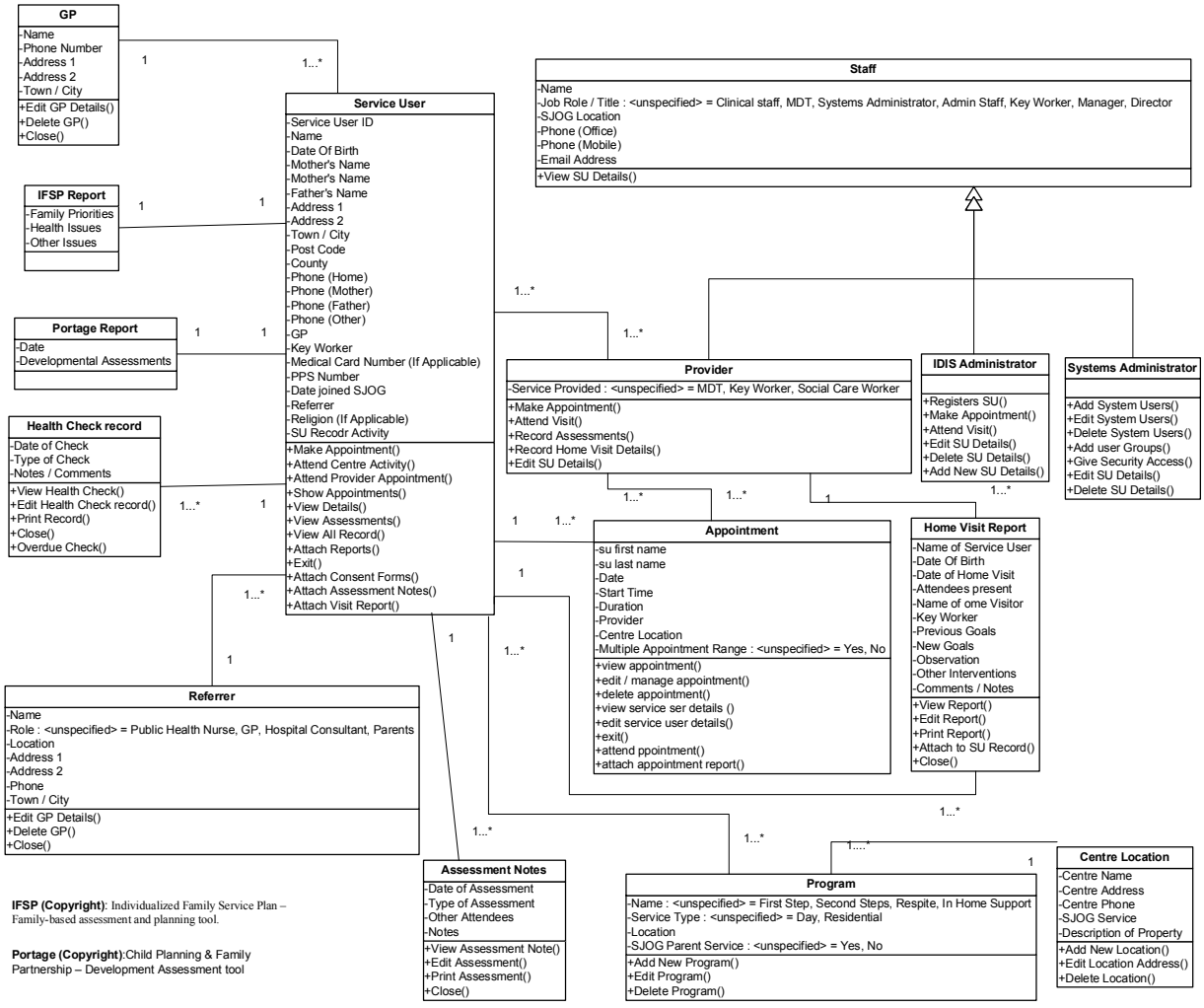

Fig. 4.7.: The Class Diagram for the IDSUIS

4.3.9. The Activity Diagram

The activity diagram detailing all the interactions the primary stakeholders have with the system is displayed in Figure 4.8. This is also documented within the SRS in Appendix 9.

Fig. 4.8.: The Activity Diagram for the Admission Process (To Be system)

4.3.10. The Software Requirements Specification

The SRS document resulting from this dissertation is a complete and thorough description of the behaviour of the system to be developed. This document explains the requirements of the desired IDSUIS from the user's point of view. It includes a set of use cases and a use case diagram that describe the interactions the users will have with the system and an activity diagram for the admission, discharge and transfer process. It also includes a class diagram detailing the objects within the system, their properties and how they interact within the system.

4.3.11. Writing the Use Cases

Use cases are a description of the flow of events within a business process or system detailing the main success and failure scenarios and these were written strictly from the user's perspective using the template designed by Dennis et al (2002) (Appendix 7). Meetings were arranged with the identified users with permission from the service director and the children services manager, who selected the participants to be interviewed.

With an approval mail from the project sponsor attached, a mail was sent to each participant requesting participation in an interview (Appendix 4). The mail outlined the details of the proposed study stating participation was completely optional. Emails were sent back and forth to confirm suitable dates and the interview questions (Appendix 5) were sent prior to the meetings. The replies constituted consent to participate in the study.

The interview report template (Appendix 6) was used to document as much of the participants response during the interview and once the meetings were over, the main scenarios were transcribed immediately onto the use case template to avoid errors. A sample business use case for coordinating the admission process is outlined in Fig. 4.7 and all the other use cases are within the SRS document in Appendix 9. Follow up emails were sent for further clarification (Appendix 8) and in two cases, a second visit was made to verify the use cases.

Use Case Name: Admit Service User	ID: 1	Importance level: High
Primary Actor: ADT Team	Scope: Business Use Case	

Stakeholders and Interests:

ADT TEAM: (Consist of **Director, Children Services Manager, Principal Social Worker, Clinical Secretary, MDT staff**). Wants to ensure admission of only suitable children to ensure the services offered are best suited to the child's needs according to the level of disability; Wants a record of all applications including unsuccessful.

Service User Family: Wants to receive service from organization based on medical and psychological needs; wants adequate support to ensure development to enable independence and full potential is achieved.

REFERRER: (May be **Consultant Paediatrician, GP, Public Health Nurse or Parent/s**). Wants to ensure child receives appropriate and adequate support to enable child reach full potential.

Brief Description: The process of admission into SJOG ID service from application stage.

Preconditions: Service user must meet admission criteria; must be within the moderate, severe to profound range of Intellectual Disability and must live within the Carmona catchment area.

Success Guarantee: Admission outcome is reached and family is informed. Letter stating outcome is received by all applicants.

Trigger: Child with ID Referred for Admission by Referrer.

Relationships:
- Association: Clinical Secretary, ADT Team
- Include:
- Extend: Register Service User
- Generalization:

Normal Flow of Events / Main Success Scenario:

1. ADT Team receives application / referral from Referrer
2. Clinical Secretary acknowledges receipt of referral within 2 weeks of receipt.
3. ADT team reviews application and carries out initial screening and assessment.

4. Provisional offer of admission into service is made and letter sent to applicant / referrer.
5. Social Worker carries out home visit (to support family; offers advise & entitlements)
6. Social Worker feeds back to ADT team.
7. ADT members carry out final assessment to see if criteria are met and parents want the service. Admission decision is reached.
8. Director sends offer of Enrolment into Service to family.
9. Principal Social Worker and Children Services Supervisor carry out home visit to family to assess needs and introduce Carmona Services team to family.
10. Children Services Supervisor give parents IDIS Consent form and Service Agreements to sign
11. Children Services Supervisor allocates / advise them of their key worker.

Alternate / Exceptional Flows:

2a. If detailed psychological assessment is missing,
1. Clinical Secretary requests more information from referral source
2. Application is kept on hold until assessment received.

3a. If more information is still required,
1. ADT team places application on hold till next meeting.
2. ADT team sends letter to referrer to supply additional information.

3b. If child is within the mild range,
1. ADT team discharges the child to another service or the community health nurse.
2. ADT team sends letter of regret to referrer.

3c. If child lives outside the Carmona catchment area,
1. ADT team recommends alternate service provider to family.
2. ADT team sends letter of regret to referrer.

7a. If service is still not suitable for child;

1. Final offer not made.
2. Letter of regrets sent with recommendations made for appropriate service.

7b. If parents do not require service;
1. Final offer of admission is not made.
2. ADT team sends letter of regret.

Fig. 4.9.: Use Case for the Admission Process

4.4. Summary of the Results

In summary, an overview of the business activity for Carmona Children Services was given and the stakeholders and their interests were identified and presented in a diagram. A description of the external stakeholders and their interest in the system was also illustrated, a stakeholder matrix was drawn up and an actor-goal list showing the primary stakeholders and their goals was produced. A use case model, class diagram and activity diagram were drawn and use cases were written to expand this model with an SRS being the final artifact produced for this dissertation.

CHAPTER 5: DISCUSSION

5.1. Introduction

This chapter reviews the research question, discussing the knowledge gained and the main findings of the research and puts them in context with the existing knowledge. It discusses how information, expressed as system requirements, was used to model business processes using UML. It highlights the contribution of this research to the existing requirements gathering practices carried out within the software development industry, while identifying the constraints and limitations that influenced the research.

5.2. Review of the Research

For decades, IS development have met with little success due to late delivery, over-shot budget, unreliability and unfulfilled requirements, therefore it has become necessary to adopt a systematic approach for their specification, design, and development. For this project, a qualitative research approach was used since it involved exploration and human perception. The Object-Oriented techniques were chosen, because of their overall benefits compared to the structured approach and their popularity amongst modern authors (Gabbert, 2001).

The OO approach is an incremental and iterative process which focuses on developing software systems in small steps, adding more functionality to the system as well as addressing problems arising from previous iterations. The benefit of this is the management and reduction of risk at earlier stages in the development process. The structured approach on the other hand assumes a waterfall approach which captures all the system requirements upfront, before testing and evaluating the software at the end of the process.

Within the St. John of God Hospitaller Services, the need for a more functional ID Information System was identified. To successfully implement the new system, an SRS

project was proposed to capture the user requirements and identify the "core" data elements appropriate for the management of ID services given by the organisation.

Having justified the method of choice, the first step was to actively involve the users in the specification of the proposed software system. This decision was informed by one of the main findings in a recent evaluation survey carried out by the researcher in April 2009. User involvement was one of the primary reasons given for a lack of adoption. Involving the users during the requirements gathering stage gave them a sense of ownership and this has been known to promote user acceptance and adoption which is very vital for successful implementation of information systems (Lee et al, 2005).

Interviews, document analysis and focus group meetings were the main data collection strategies used to elicit requirements from the system users while UML's use case model, class and activity diagrams were the analysis strategies employed to model the requirements. The major use cases were selected and expanded using the priority levels as guide. Use cases expressing the users' work flow were written out resulting in the functional requirements of the SRS document. The non-functional requirements were re-used from a similar project, saving development time and effort.

5.3. Discussion

Reviewing the research question;

> *"What are the functional and non-functional requirements of an Intellectual Disability Information System as seen by the system users and other stake holders* ***(using System Analysis Methods)****?"*

this was answered by producing a comprehensive SRS document, not without generating some interesting observations.

Although the Object-Oriented analysis techniques were employed for this project, justified by the reasons stated above, the requirements were still written with a waterfall bias of thoroughly defining and fully freezing all the requirements upfront before design.

This was done in accordance with the project objective as a complete description of all the business processes was first necessary to get a detailed description of the requirements before design, to inform the decision to buy an off-the-shelf product, develop externally or develop in-house. This possibility of effectively combining methodologies confirms the argument made by Shumate (1991) who proposed the effectiveness of combining methodologies when necessary to get the best of both worlds. This emphasizes the point that one method does not fit all and it is important to mix and match when necessary to derive the best.

Similarly, a combination of elicitation methods was also employed during the research which was the only way to derive a better understanding of the domain area. This resulted in better quality requirements as interviews could never replace documents and forms and vice versa. This confirms the arguments made by Coughlan (2003) and Maiden and Rugg (1996) that the use of multiple methods was necessary to establish the exact requirements to produce a system that meets the business needs.

Another significant finding which agrees with existing knowledge was the value of re-using non-functional requirements advocated by Robertson and Robertson (2006), as these were fairly standard. They stated that there was no need re-inventing the wheel and advocated re-use as this is a significant benefit of OO methods. The re-use of non-functional requirements from a similar clinical project saved the researcher time and effort.

During the focus group meetings, the researcher identified "adequate conflict management" as an indispensable requirement for the success of the project, thus agreeing with Cockburn (2008). Different stakeholders held radically conflicting views about the priorities and purpose of the system and had extremely high expectations of what the system should do for them. Cockburn stated that if stakeholders' conflict was not properly addressed and managed, the project would fail even before it started as these types of disagreements result in inconsistent or missing requirements. The researcher employed her people skills to define priorities (based on the input from the sponsors) and

alleviate conflict between stakeholders and was honest about the capabilities of technology upfront.

Fears and concerns of stakeholders or implications of the system were also a huge factor that could affect the project if not well addressed. Security and confidentiality concerns expressed by members of the social work team affected the project as from the onset they expressed unwillingness to use the system (and to be part of the project) as they couldn't share certain SU information with other members of the MDT. This concern was prevalent across the organisation during the focus group meetings as social workers insisted they didn't use the present system because all the MDT had access to all their notes. Their concern was alleviated by assuring them that they would be given a different level of access to the other MDT.

5.4. Achievements

The main achievement of this project was the production of a comprehensive SRS document which will inform the development team and the ICT manager of the core information needs of the ID system to be developed. This will inform the decision to buy or develop in-house. This will also set a precedence in the organisation for future software development to include an SRS, employing modern techniques.

Another off-shoot of this project was the identification of a need to review the business processes within the organisation. This project sparked off a business process re-engineering for all ID services as these were not standard across the organisation. Carmona Services was chosen as best practicing unit and it's requirements would be replicated across the other services.

The most valuable achievement made from this project was the SRS skills and experience gained as a result. The researcher being a member of an ICT Infrastructure support team had no project management skill or experience prior to this project. All the UML and use case writing skills were learned on-the-job while carrying out the project. This project

increased the researcher's communication and negotiation skills while opening up more opportunities within the organisation for future projects.

The researcher was able to deduce and point out some hidden value and benefits the system could bring to the organization. In the course of the interview with the childcare supervisor, it was discovered that attendance recording was sometimes erratic. The researcher advised that recording this on the system could present interesting trends that could inform their decision to make changes to particular programs having very low attendance. Also recording of the application process which shows an upsurge in rejected applications could buy a case with the HSE for the organization to extend its services to ID persons in the mild range.

5.5. Limitations and Difficulties

Problems with standardization of services rendered across the organization interrupted the project significantly. The early stages of this project revealed so much variation between services and their data requirements. This led to a review of the work processes, following which recommendations were made for a business process re-engineering to standardize the services. This resulted in the suspension of a project running simultaneously.

This seriously impacted the project as some users lost interest and the original enthusiasm they had for the project. The researcher was unable to get enough focus group meetings and face-to-face interview sessions as planned since participants were unable to see its immediate benefit to the organization. The researcher however made up for this by making much effort to elicit requirements via the use of telephone interviews and email, (Appendix 8) missing out on some of the benefits of face-to-face interviews.

The organization's annual review and CQL's 4-yearly accreditation were taking place during the same period as the research and this proved very difficult for the researcher to get interviews underway as this was a very busy time for the service. The researcher

slightly adjusted the research schedule and made the most of it by working on other elements of the project and sending diagrams by email for verification until the participants were free. This was very useful as some users agreed since they had no time to read a large volume of text.

A common limitation which affected the research methodology was the inability to use the most appropriate elicitation technique. Even though certain techniques may have generated richer results, because of ethical concerns, those techniques were not used. For example, having identified observation of the work process to be a very useful technique for exploring and discovering hidden requirements, the researcher could not employ this technique due to issues with ethics surrounding observing service users or live records on the current system (as the test system was under-developed). The researcher couldn't provide sufficient proof of its value outweighing the ethical concerns. While acknowledging this limitation, every effort was made to ensure adequate elicitation using other available methods which helped to overcome this limitation.

Audio or video recording of the interviews, which can further give validity to the research, were not used as the researcher believed these may jeopardise the interview results as some participants may feel uncomfortable.

5.6. Summary

This chapter reviewed the aim of the project, which was developing an SRS for an ID system using analysis techniques. It also discussed the challenges faced by the author and how they were overcome, while applauding the work for its achievements, which included the SRS and a recommendation for a business re-engineering.

CHAPTER 6: CONCLUSION & FUTURE WORK

6.1. Introduction

This chapter gives an overview of this research highlighting the most important lessons learned from the research, bringing the entire project to a close. It also suggests recommendations for future work in the problem domain and highlights the main points of the research.

6.2. Conclusion

The development of any Information System must take a lot of factors into consideration to ensure successful implementation. Factors hugely important include the understanding of user's requirements and workflow practices, amongst others.

Although many authors cited in the literature review referring to the software crisis have argued that the lack of, or poor, requirements specification is to blame for the high number of failed software projects, the researcher agrees with Cockburn (2008) that gathering and modelling requirements on its own does not guarantee success drawing from the observation and experience gained from this project. Cockburn also disagrees that requirements are fully to blame for the high volume of failed projects. Many other factors (foreseen and unforeseen) come into play and can hinder a project success, if not adequately managed. Project governance and leadership, effective stakeholder engagement, communication and planning are most critical to any project and key to the elicitation of any useful requirements in the first place. The value of communication and effective stakeholder engagement was greatly highlighted by the research as lack of engagement with stakeholders at some stage in the project almost resulted in insufficient requirements.

Cockburn cited Capers Jones' (2000) argument that "the root causes of software failure can be traced back to faulty management and quality control practices rather than to the requirements processes". He demonstrated how easy but incorrect it was to blame

requirements when the root cause laid elsewhere in the work. He also argued that software failures were mostly defined in terms of deviation from the requirements specification whereas most accidents resulted from errors in the requirements specification. This further indicates the value of accurate and comprehensive requirements specification.

The use of modern modelling techniques like UML's use case and activity diagrams are highly recommended as they were very useful and made for excellent elicitation and verification tools when compared to other narrative or bulky methods previously used. These tools made for easier verification of the gathered requirements, especially when the participants were very busy, and are becoming invaluable for clear and complete requirements elicitation because of their structural and graphical outlook (Lejk and Deeks, 2002).

The research also revealed some of the benefits automation could bring to the ID service like tracking the application process which could make a business case for the expansion of the organization to include the mild ID range. Attendance rates for centre activities can be used to spot interest or trends, which can aid planning and resource management. Unsuitable trends can also be spotted via automation.

In conclusion, the researcher in agreement with Eva (2001) advocates the discipline and rigor of using proven systems analysis methods to identify and respond to user's requirements rather than resort to the undisciplined style of development. Much attention should be given to requirements analysis and user participation and these should be consistent with principles of requirements engineering and as in life's principle, as every project is unique, no one method or size fits all.

6.3. Recommendations and Future Work

Further investigation is necessary in the following areas:

- This research revealed a need for literature on clinical systems analysis and design as not much literature exists on this topic. The researcher searched journals and articles and did not find much published work in this area which is becoming highly significant.

- More work is needed in the area of identifying information needs for ID information systems as this continues to pose a huge problem for organizations giving ID services within Ireland. Not one system available till date within Ireland seems to satisfactorily meet the needs of this service. This should be investigated and an information model developed by the HSE or HRB.

- More requirements needed for the other areas and services of SJOG

- Research into the development of test software systems directly from real-world "live" systems by extracting or masking sensitive identifiable information to aid researchers and system developers getting a better feel of the system is recommended.

CHAPTER 7: REFERENCES

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CHAPTER 8: APPENDICES

Appendix 1: Abbreviations

CQL - The Council on Quality and Leadership

DOHC - Dept of Health and Children

HRB - Health Research Board

HSE - Health Service Executive

ID - Intellectual Disability

IDIS - Intellectual Disability Information System

IDSU - Intellectual Disability Service User

IDSUIS - Intellectual Disability Service User Information System

IS - Information System

MDT - Multidisciplinary Team

MHIS - Mental Health Information System

NIDD - National Intellectual Disability Database

OO - Object Oriented

POMS - Personal Outcome Measures

SDLC - Systems Development Life Cycle (SDLC)

SJOG - St. John of God

SRS - Software Requirement Specification

SU - Service user

Appendix 2: St. John of God Provincial Ethical Committee Approval

Saint John of God *Hospitaller* Services
Programme Development Department

18th November 2009

Ms Patience Mabadeje
IT Support
St John of God Hospitaller Services
Provincial Administration
Hospitaller House
Stillorgan
Co Dublin

Dear Patience,

Re Proposal: *"Requirement Analysis for Intellectual Disability Information System" ID No. 348*

Thank you for the above research proposal submitted to the Provincial Ethics Committee.

The Provincial Ethics Committee have pleasure in formally approving the above research proposal and take this opportunity to wish you well with the study and look forward to receiving a copy of your findings.

Kind regards

Yours sincerely

Eadbhard O'Callaghan
Acting Chair
Provincial Ethics Committee

Hospitaller House, Stillorgan, County Dublin, Ireland. | **Tel:** 01 2771500 | **Fax:** 01 2783024
Email: brigid.butler @sjog.ie | **www.sjog.ie**
Reg Charity No: CHY3822

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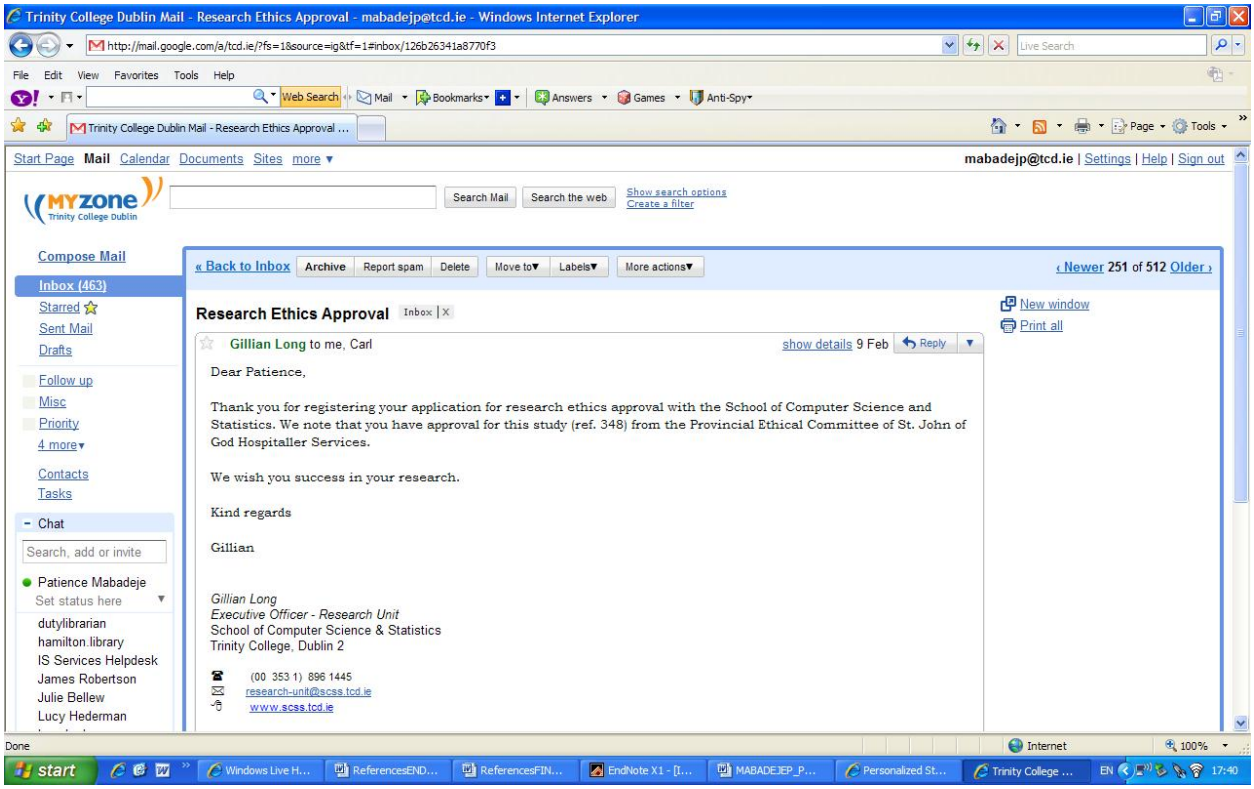
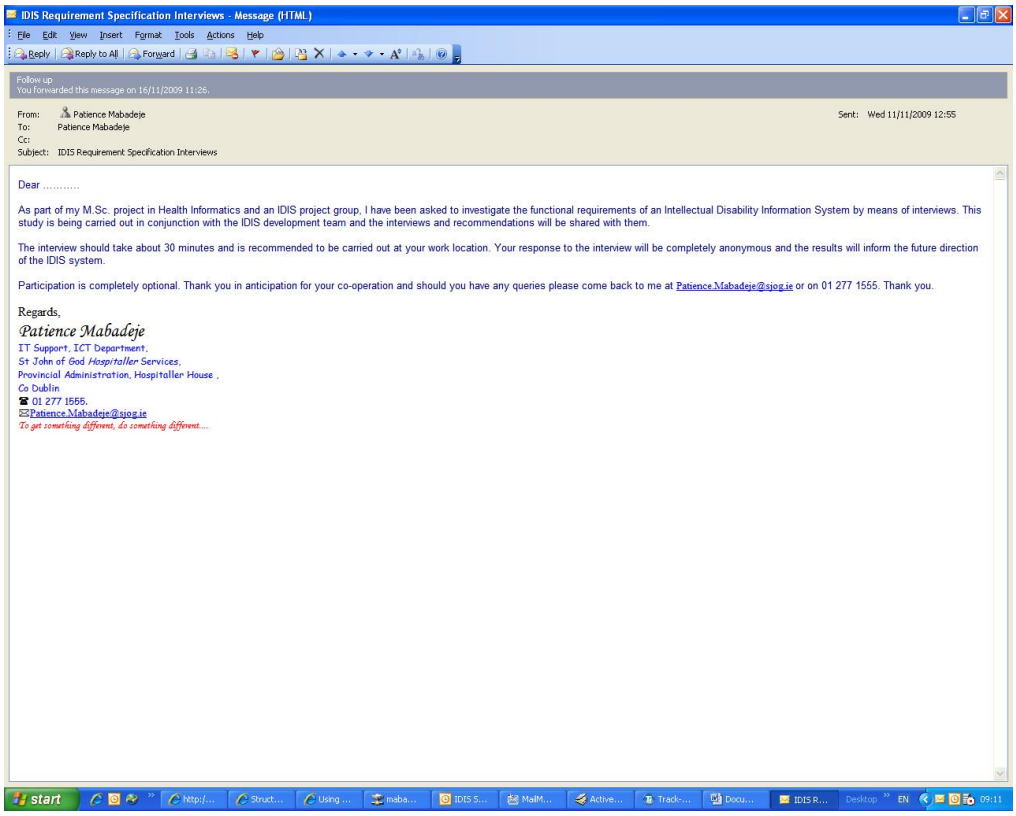
Appendix 3: Trinity College Ethics Approval



Appendix 4: Interview Request from Researcher and Project Sponsor



IDIS Requirement Specification Interviews - Message (HTML)

File Edit View Insert Format Tools Actions Help

Reply | Reply to All | Forward

Follow up
You forwarded this message on 16/11/2009 11:26.

From: Patience Mabadeje
To: Patience Mabadeje
Cc:
Subject: IDIS Requirement Specification Interviews
Sent: Wed 11/11/2009 12:55

Dear .....

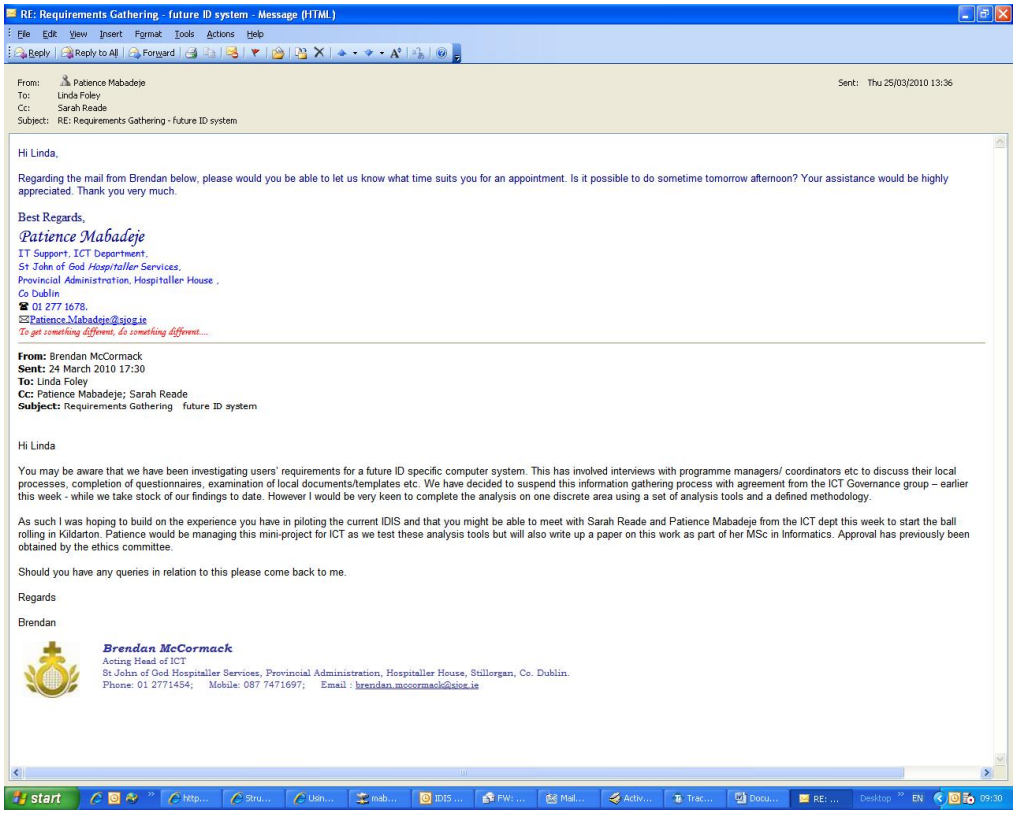
As part of my M.Sc. project in Health Informatics and an IDIS project group, I have been asked to investigate the functional requirements of an Intellectual Disability Information System by means of interviews. This study is being carried out in conjunction with the IDIS development team and the interviews and recommendations will be shared with them.

The interview should take about 30 minutes and is recommended to be carried out at your work location. Your response to the interview will be completely anonymous and the results will inform the future direction of the IDIS system.

Participation is completely optional. Thank you in anticipation for your co-operation and should you have any queries please come back to me at Patience.Mabadeje@sjog.ie or on 01 277 1555. Thank you.

Regards,

Patience Mabadeje
IT Support, ICT Department,
St John of God *Hospitaller* Services,
Provincial Administration, Hospitaller House ,
Co Dublin
☎ 01 277 1555.
✉Patience.Mabadeje@sjog.ie
To get something different, do something different....



RE: Requirements Gathering - future ID system - Message (HTML)

File Edit View Insert Format Tools Actions Help

Reply | Reply to All | Forward

From: Patience Mabadeje
To: Linda Foley
Cc: Sarah Reade
Subject: RE: Requirements Gathering - future ID system
Sent: Thu 25/03/2010 13:36

Hi Linda,

Regarding the mail from Brendan below, please would you be able to let us know what time suits you for an appointment. Is it possible to do sometime tomorrow afternoon? Your assistance would be highly appreciated. Thank you very much.

Best Regards,

Patience Mabadeje
IT Support, ICT Department,
St John of God *Hospitaller* Services,
Provincial Administration, Hospitaller House ,
Co Dublin
☎ 01 277 1678.
✉Patience.Mabadeje@sjog.ie
To get something different, do something different....

From: Brendan McCormack
Sent: 24 March 2010 17:30
To: Linda Foley
Cc: Patience Mabadeje; Sarah Reade
Subject: Requirements Gathering future ID system

Hi Linda

You may be aware that we have been investigating users' requirements for a future ID specific computer system. This has involved interviews with programme managers/ coordinators etc to discuss their local processes, completion of questionnaires, examination of local documents/templates etc. We have decided to suspend this information gathering process with agreement from the ICT Governance group – earlier this week - while we take stock of our findings to date. However I would be very keen to complete the analysis on one discrete area using a set of analysis tools and a defined methodology.

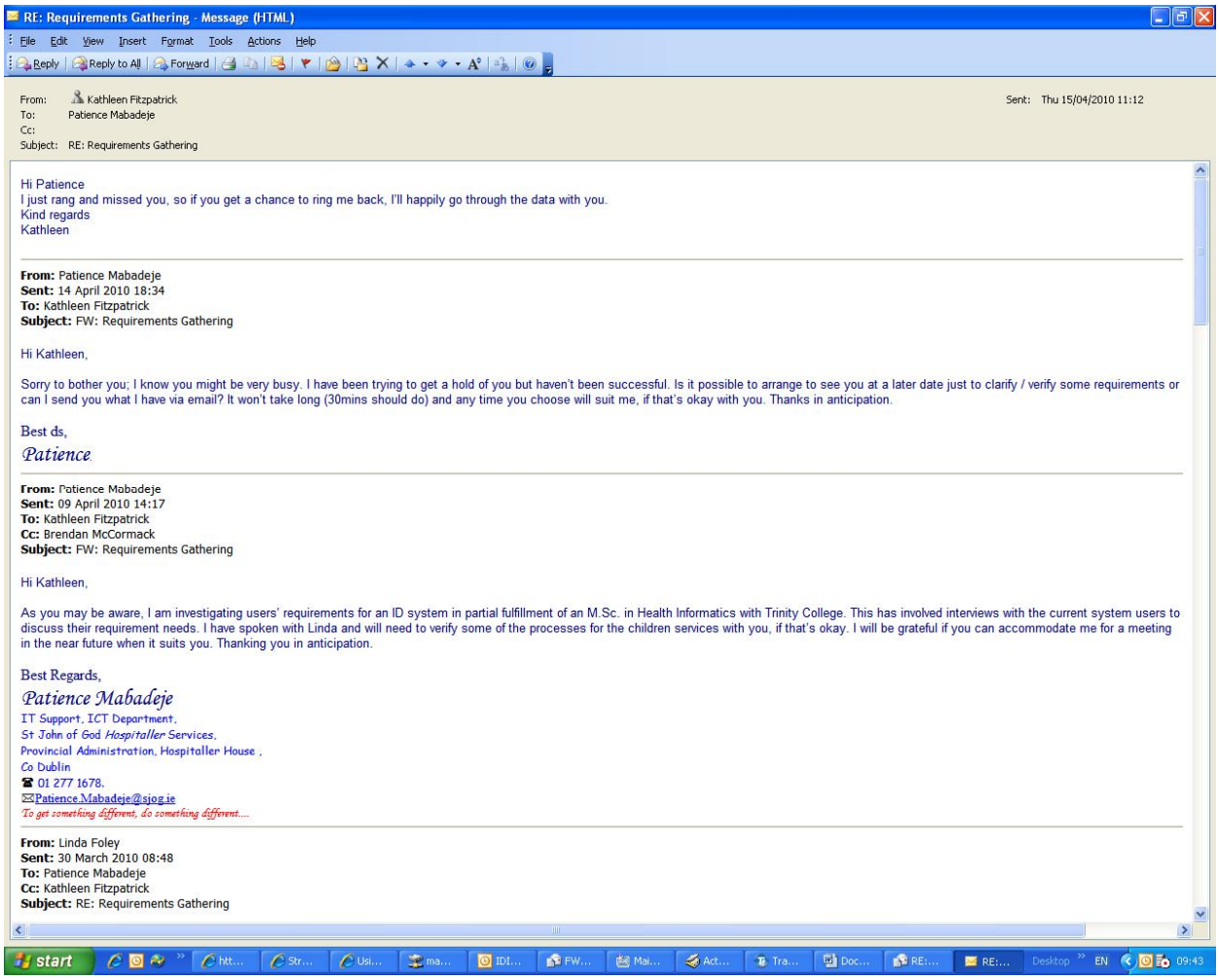
As such I was hoping to build on the experience you have in piloting the current IDIS and that you might be able to meet with Sarah Reade and Patience Mabadeje from the ICT dept this week to start the ball rolling in Kildarton. Patience would be managing this mini-project for ICT as we test these analysis tools but will also write up a paper on this work as part of her MSc in Informatics. Approval has previously been obtained by the ethics committee.

Should you have any queries in relation to this please come back to me.

Regards

Brendan

Brendan McCormack
Acting Head of ICT
St John of God Hospitaller Services, Provincial Administration, Hospitaller House, Stillorgan, Co. Dublin.
Phone: 01 2771454; Mobile: 087 7471697; Email : brendan.mccormack@sjog.ie



RE: Requirements Gathering - Message (HTML)

File Edit View Insert Format Tools Actions Help

Reply | Reply to All | Forward

From: Kathleen Fitzpatrick
To: Patience Mabadeje
Cc:
Subject: RE: Requirements Gathering
Sent: Thu 15/04/2010 11:12

Hi Patience
I just rang and missed you, so if you get a chance to ring me back, I'll happily go through the data with you.
Kind regards
Kathleen

From: Patience Mabadeje
Sent: 14 April 2010 18:34
To: Kathleen Fitzpatrick
Subject: FW: Requirements Gathering

Hi Kathleen,

Sorry to bother you; I know you might be very busy. I have been trying to get a hold of you but haven't been successful. Is it possible to arrange to see you at a later date just to clarify / verify some requirements or can I send you what I have via email? It won't take long (30mins should do) and any time you choose will suit me, if that's okay with you. Thanks in anticipation.

Best ds,
Patience

From: Patience Mabadeje
Sent: 09 April 2010 14:17
To: Kathleen Fitzpatrick
Cc: Brendan McCormack
Subject: FW: Requirements Gathering

Hi Kathleen,

As you may be aware, I am investigating users' requirements for an ID system in partial fulfillment of an M.Sc. in Health Informatics with Trinity College. This has involved interviews with the current system users to discuss their requirement needs. I have spoken with Linda and will need to verify some of the processes for the children services with you, if that's okay. I will be grateful if you can accommodate me for a meeting in the near future when it suits you. Thanking you in anticipation.

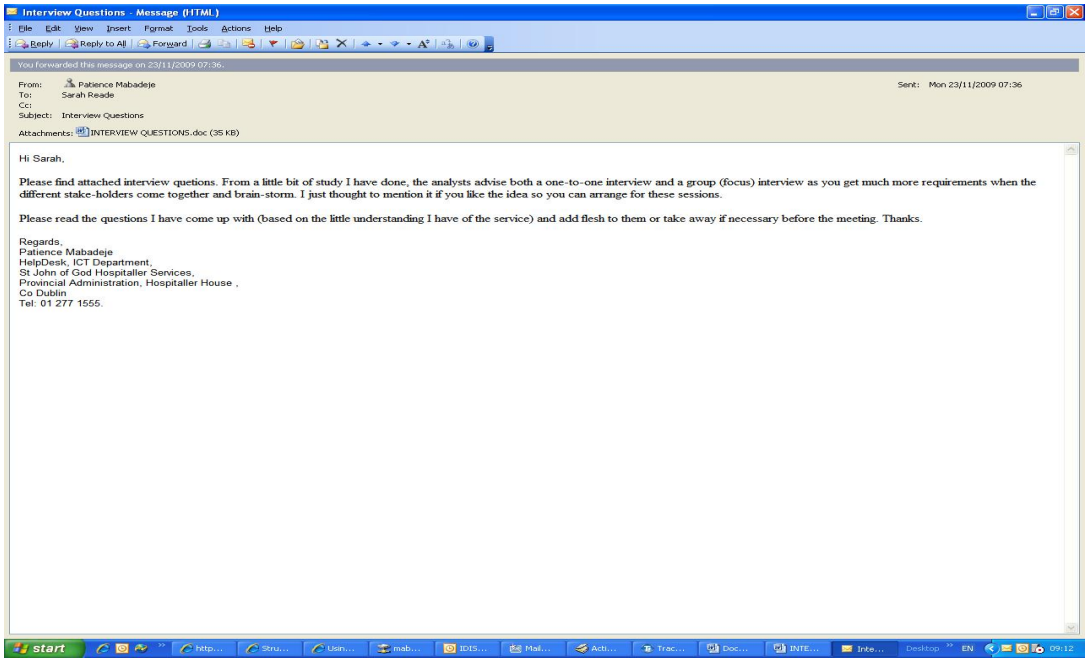
Best Regards,
Patience Mabadeje
IT Support, ICT Department,
St John of God Hospitaller Services,
Provincial Administration, Hospitaller House ,
Co Dublin
☎ 01 277 1678.
✉Patience.Mabadeje@sjog.ie
To get something different, do something different....

From: Linda Foley
Sent: 30 March 2010 08:48
To: Patience Mabadeje
Cc: Kathleen Fitzpatrick
Subject: RE: Requirements Gathering

start htt... Str... Usi... ma... IDI... FW... Mai... Act... Tra... Doc... RE:... RE:... Desktop EN 09:43

Appendix 5: Interview Questions

INTERVIEW QUESTIONS.



Interview Questions - Message (HTML)

File Edit View Insert Format Tools Actions Help

Reply | Reply to All | Forward

You forwarded this message on 23/11/2009 07:36.

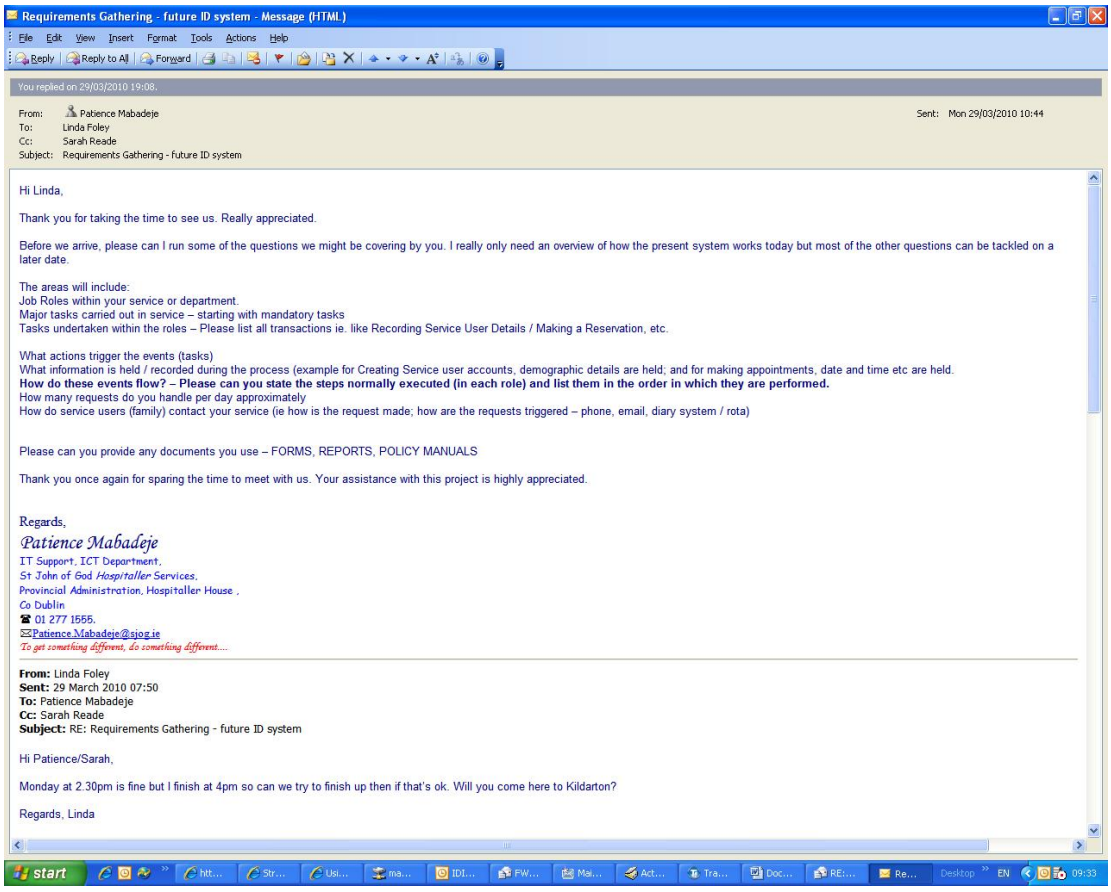
From: Patience Mabadeje
To: Sarah Reade
Cc:
Subject: Interview Questions
Sent: Mon 23/11/2009 07:36
Attachments: INTERVIEW QUESTIONS.doc (35 KB)

Hi Sarah,

Please find attached interview quetions. From a little bit of study I have done, the analysts advise both a one-to-one interview and a group (focus) interview as you get much more requirements when the different stake-holders come together and brain-storm. I just thought to mention it if you like the idea so you can arrange for these sessions.

Please read the questions I have come up with (based on the little understanding I have of the service) and add flesh to them or take away if necessary before the meeting. Thanks.

Regards,
Patience Mabadeje
HelpDesk, ICT Department,
St John of God Hospitaller Services,
Provincial Administration, Hospitaller House ,
Co Dublin
Tel: 01 277 1555.



Requirements Gathering - future ID system - Message (HTML)

File Edit View Insert Format Tools Actions Help

Reply | Reply to All | Forward

You replied on 29/03/2010 19:08.

From: Patience Mabadeje
To: Linda Foley
Cc: Sarah Reade
Subject: Requirements Gathering - future ID system
Sent: Mon 29/03/2010 10:44

Hi Linda,

Thank you for taking the time to see us. Really appreciated.

Before we arrive, please can I run some of the questions we might be covering by you. I really only need an overview of how the present system works today but most of the other questions can be tackled on a later date.

The areas will include:
Job Roles within your service or department.
Major tasks carried out in service – starting with mandatory tasks
Tasks undertaken within the roles – Please list all transactions ie. like Recording Service User Details / Making a Reservation, etc.

What actions trigger the events (tasks)
What information is held / recorded during the process (example for Creating Service user accounts, demographic details are held; and for making appointments, date and time etc are held.
How do these events flow? – Please can you state the steps normally executed (in each role) and list them in the order in which they are performed.
How many requests do you handle per day approximately
How do service users (family) contact your service (ie how is the request made; how are the requests triggered – phone, email, diary system / rota)

Please can you provide any documents you use – FORMS, REPORTS, POLICY MANUALS

Thank you once again for sparing the time to meet with us. Your assistance with this project is highly appreciated.

Regards,
Patience Mabadeje
IT Support, ICT Department,
St John of God *Hospitaller* Services,
Provincial Administration, Hospitaller House ,
Co Dublin
☎ 01 277 1555.
✉Patience.Mabadeje@sjog.ie
To get something different, do something different....

From: Linda Foley
Sent: 29 March 2010 07:50
To: Patience Mabadeje
Cc: Sarah Reade
Subject: RE: Requirements Gathering - future ID system

Hi Patience/Sarah,

Monday at 2.30pm is fine but I finish at 4pm so can we try to finish up then if that's ok. Will you come here to Kildarton?

Regards, Linda

QUESTIONS

Clinical Secretary:

What are the TOP 5 regular tasks you perform daily?
What other CORE task do you perform occasionally / weekly / monthly / yearly?
What are the **mandatory** details you record about each service users: Offer Response: Accept / Reject, demographic details?
What **optional** details do you also record: Nutritional Needs? Appointments with clinical / MDT / Pastoral Care? Medication details? Level of disability? Main or Secondary Service? Method of Referral to service, Date of (last) Assessment..
What level/s of disability does service cater for? Moderate? Severe? Profound? Physical or Sensory?
How do you uniquely identify SU?
What do demographic details you capture?
Information Source: What is the source of your information?
Who requires access to the information you record: within or outside SJOG?
Please list all current programs service runs AND all activities carried out within each program: Day & Residential? Specialised & Non-Specialised? Support for parents/SU?
Will service users require access to this system?
Please state reason for removal of SU from system– Transferred, Deceased, Deleted
Please list ALL reports you presently generate from the current system and reports required.
Are there any manual tasks you perform?

Care Workers / Givers

What service do you give? Home visitor/Class assistant/ Key worker?
Do you use the current system?
Please list all activities carried out for SU.
What are the top 5 tasks you perform?
What details do you record for each SU while carrying out your task–Dietary Requirements, medications?
Daily Activities carried out (Residential)
What support do you give family?
Please list ALL the Care Goals/plans you record presently.

Clinical / Multidisciplinary Staff

Top 5 tasks performed for SUs?
Details recorded against each SU?
How do you record all information: IDIS or Word Processing system?
Is Scanning required? What information is scanned onto system?
Does any other team/role require access to the information you record?
Are templates required for repetitive tasks: mails to GP, assessment notes?
Do you require built-in messaging facility?

Management Staff

Please list reports you currently generate and would like to generate from the system
What SEARCHES do you make regularly?
What information is required for service planning?
What information is sent out to external stakeholders.

Other General Questions (System Administrator):

1. Job Roles within service.
2. What data is captured by the current ID system?
3. What data is missing from current ID system?
4. What fields in the current system are not relevant to ID services? (Dormant or Irrelevant).
5. What information is manually recorded/computed/calculated?
6. What other non-functional (usability/security) requirements are required for the user's task?
7. Are alerts required to reduce errors?
8. HCI Issues (Usability / User Friendliness of system)
9. What high priority features must the system have to be successful

Observe Work Flow.
Observe how user enters data (usability issues)
See Forms, Manual Files, Electronic Documents, Diaries / Schedules
Features / Functions / Characteristics of the system
Collect as much documents used–forms, data sheets, information leaflets, reports.
What actions trigger the events.
How do events flow? –State the steps normally executed and list them in the order in which they are performed.
What is the average number of requests handled per day
How do SU's family contact service (how are requests made–phone, email, web portal)

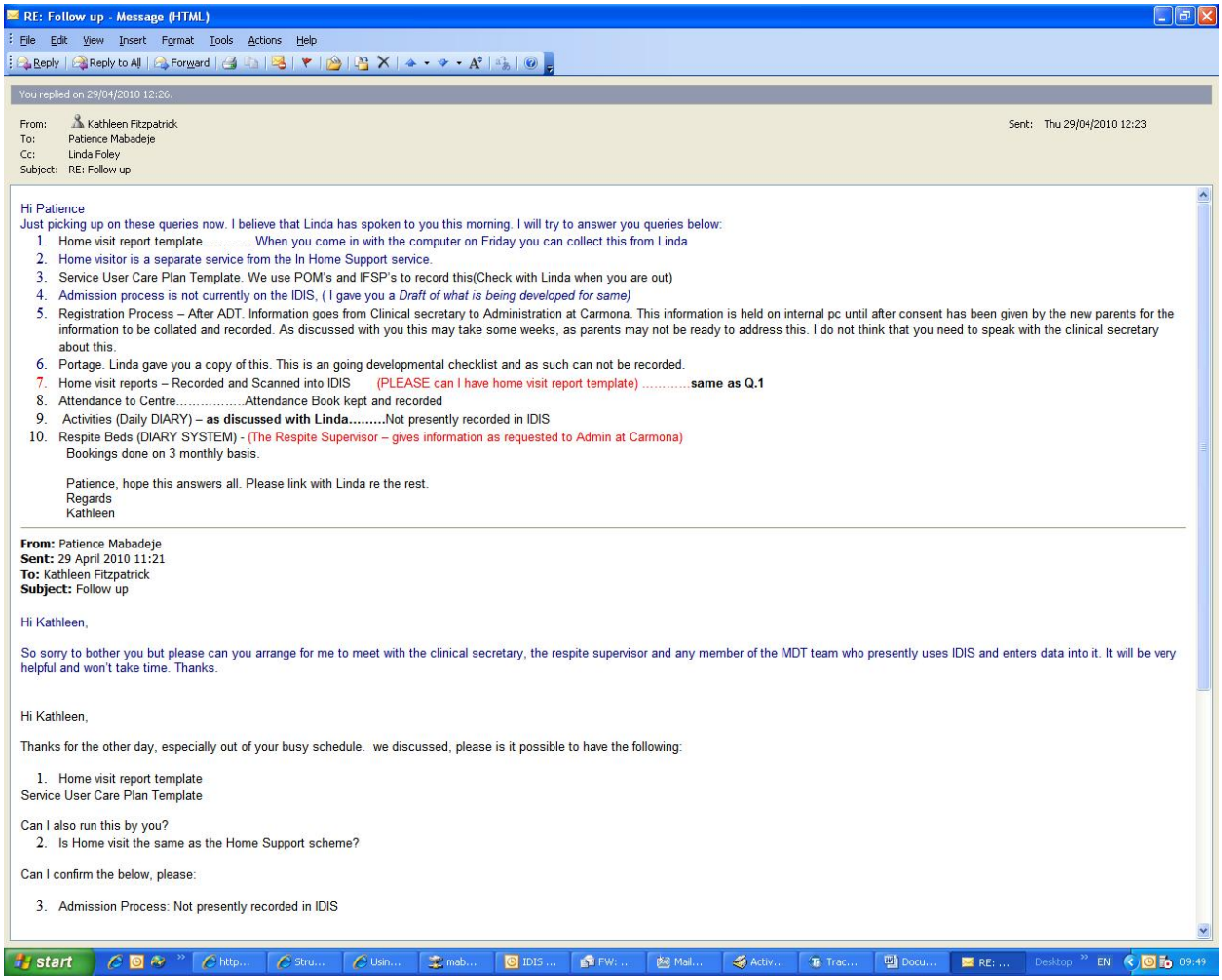
Appendix 6: Interview Report Template

INTERVIEW REPORT
Person Interviewed: Interviewer: **PATIENCE MABADEJE** Date of Interview: Primary Purpose: Summary of Interview: Detailed Notes:

Appendix 7: Use Case Template

Use Case Name:	**ID:**	**Importance level:**
Primary Actor:	**Use Case Type:**	
Stakeholders and Interests:		
Brief Description:		
Trigger:		
Relationships: **Association:** **Include:** **Extend:** **Generalization:**		
Normal Flow of Events:		
Subflows:		
Alternate / Exceptional Flows:		

Appendix 8: Verification of Use Cases



RE: Follow up - Message (HTML)

File Edit View Insert Format Tools Actions Help

Reply | Reply to All | Forward

You replied on 29/04/2010 12:26.

From: Kathleen Fitzpatrick
To: Patience Mabadeje
Cc: Linda Foley
Subject: RE: Follow up
Sent: Thu 29/04/2010 12:23

Hi Patience
Just picking up on these queries now. I believe that Linda has spoken to you this morning. I will try to answer you queries below:

1. Home visit report template..... When you come in with the computer on Friday you can collect this from Linda
2. Home visitor is a separate service from the In Home Support service.
3. Service User Care Plan Template. We use POM's and IFSP's to record this(Check with Linda when you are out)
4. Admission process is not currently on the IDIS, (I gave you a *Draft of what is being developed for same)*
5. Registration Process – After ADT. Information goes from Clinical secretary to Administration at Carmona. This information is held on internal pc until after consent has been given by the new parents for the information to be collated and recorded. As discussed with you this may take some weeks, as parents may not be ready to address this. I do not think that you need to speak with the clinical secretary about this.
6. Portage. Linda gave you a copy of this. This is an going developmental checklist and as such can not be recorded.
7. Home visit reports – Recorded and Scanned into IDIS (PLEASE can I have home visit report template) ..... **same as Q.1**
8. Attendance to Centre.....Attendance Book kept and recorded
9. Activities (Daily DIARY) – **as discussed with Linda.....**Not presently recorded in IDIS
10. Respite Beds (DIARY SYSTEM) - (The Respite Supervisor – gives information as requested to Admin at Carmona)
    Bookings done on 3 monthly basis.

Patience, hope this answers all. Please link with Linda re the rest.
Regards
Kathleen

From: Patience Mabadeje
Sent: 29 April 2010 11:21
To: Kathleen Fitzpatrick
Subject: Follow up

Hi Kathleen,

So sorry to bother you but please can you arrange for me to meet with the clinical secretary, the respite supervisor and any member of the MDT team who presently uses IDIS and enters data into it. It will be very helpful and won't take time. Thanks.

Hi Kathleen,

Thanks for the other day, especially out of your busy schedule. we discussed, please is it possible to have the following:

1. Home visit report template

Service User Care Plan Template

Can I also run this by you?

2. Is Home visit the same as the Home Support scheme?

Can I confirm the below, please:

3. Admission Process: Not presently recorded in IDIS

start http... Stru... Usin... mab... IDIS ... FW: ... Mail... Activ... Trac... Docu... RE: ... Desktop EN 09:49

Appendix 9: The Software Requirement Specification (SRS)

St John of God

Software Requirements Specification

Intellectual Disability Service User Information System

Version: 1.0
Date: June, 2010
Prepared by: Patience MABADEJE

Version Control

Version Number	Date	Author	Purpose
1.0	June 2010	*Patience MABADEJE*	Feedback from current IDIS user group showing significant dissatisfaction with functionality.

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1. Introduction

The need for a more functional Intellectual Disability Information System to facilitate the delivery and efficiency of the Intellectual Disability Services provided by the St. John of God Hospitaller Services was identified.

The aim of this Software Requirement Specification (SRS) document is to capture the user requirements and identify the "core" data elements appropriate for the clinical and social management of intellectually disabled persons receiving service from the St. John of God Hospitaller Services.

1.1 Purpose

The aim of this SRS document is to thoroughly outline the functional and non-functional features of the proposed Intellectual Disability Service User Information System (IDSUIS) for one of the Children Intellectual Disability (ID) Services of St. John of God Hospitaller Services (namely Carmona Early Services). This will involve liaison with the system users and other stakeholders to produce a requirements specification document.

1.2 Scope

This document covers the high level descriptions of all the functional and non-functional requirements from the Intellectual Disability Service User Information System project. Because of the large scope of the ID services covering adult and children, it was necessary to narrow the scope of this SRS project to focus mainly on the Early Intervention Services of the Children Services of the organization.

1.3 Overview

The current Intellectual Disability Information System (IDIS) was developed in 2005 as an electronic system for the ID services. It was modified from a mental health clinical system whose work flow significantly differs from that of the ID Services. The ID service currently captures social data in addition to demographic and clinical data manually and electronically. The reporting function of the current ID Information system as a result, did not meet the statutory reporting requirements of the HSE and the overall functionality of the system did not adequately suit ID services and therefore was not satisfactory to the system users.

2. Requirements

2.1 Functional Requirements

2.1.1 Status of Data Capture

Table 1.1.: Status of Data capture for Data Elements Held by Service

Data Elements	Status of Data Capture
IDSU Number	
Service User Demographic Details	Presently captured
GP Details	Presently captured
Referrer Details	Presently captured
Consent Form	Scanned into record
Assessments (MDT)	Presently captured
Home Visit Record	Scanned into record
Initial Individual Family Service Plan	Scanned into record
Weekly Activities timetable	Manually captured
Children Services Checklist	Manually held in paper file
Early Services Personal Profile	Manually held in paper file
Protage Early Education Programme	Manually held in paper file
Guide to Early Movement Skills	Manually held in paper file

2.1.2 Use Case Model for Intellectual Disability IS

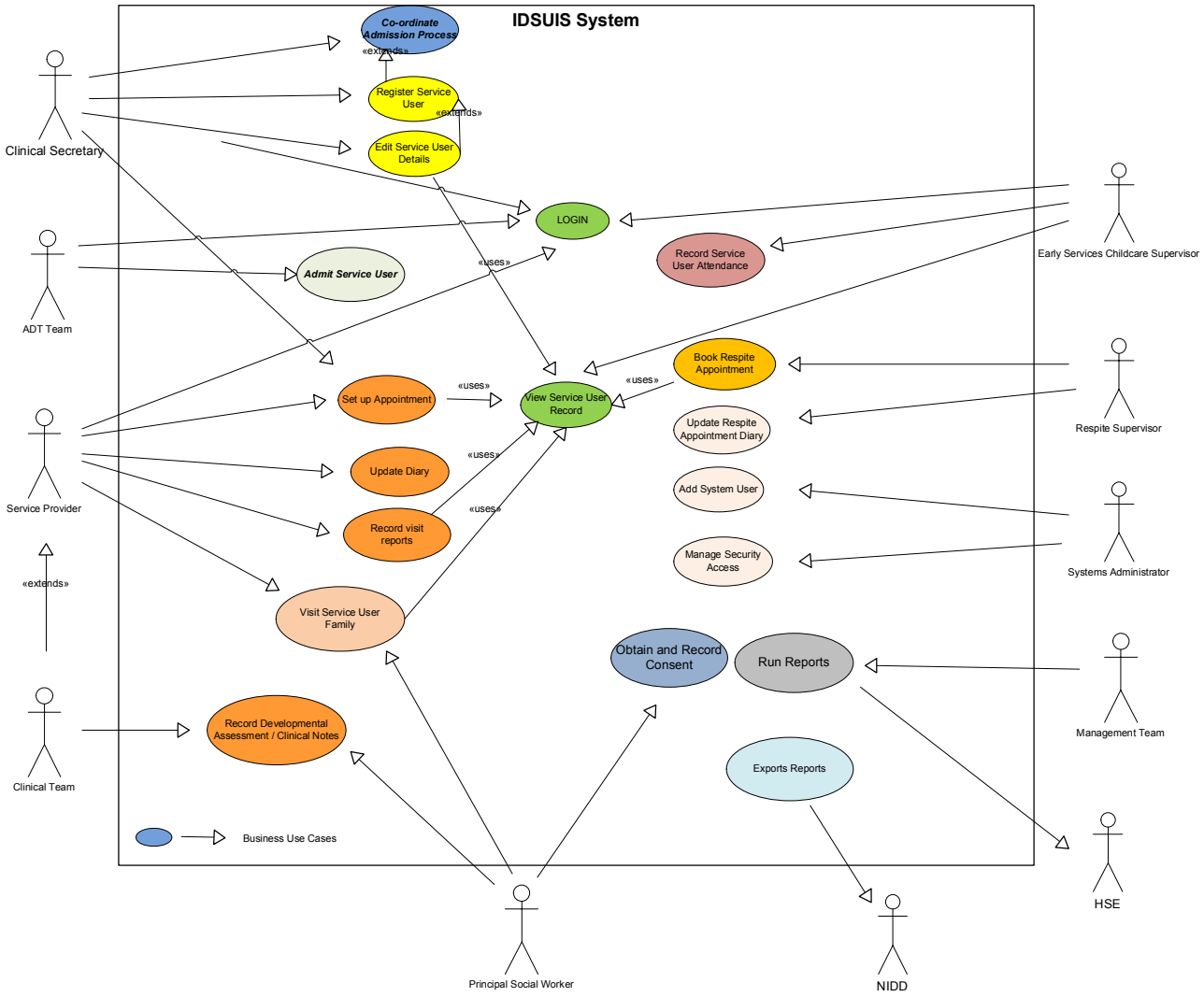

Fig. 1.1.: Use Case Model showing IDSUIS

2.1.3 Activity Diagram for Admission Process

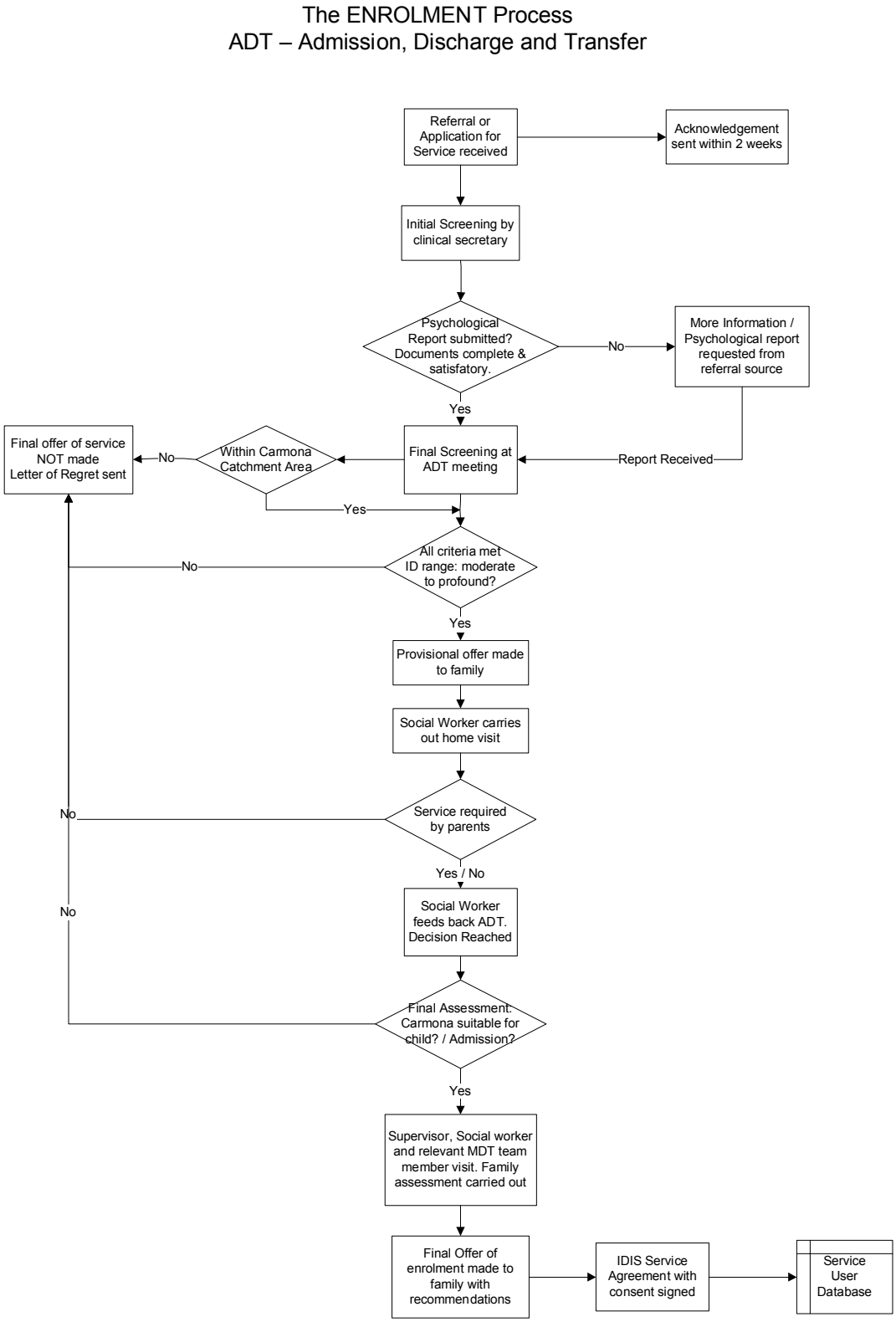

Fig. 1.2.: Activity diagram for Admission process

2.1.4 Class Diagram for ID Children Service

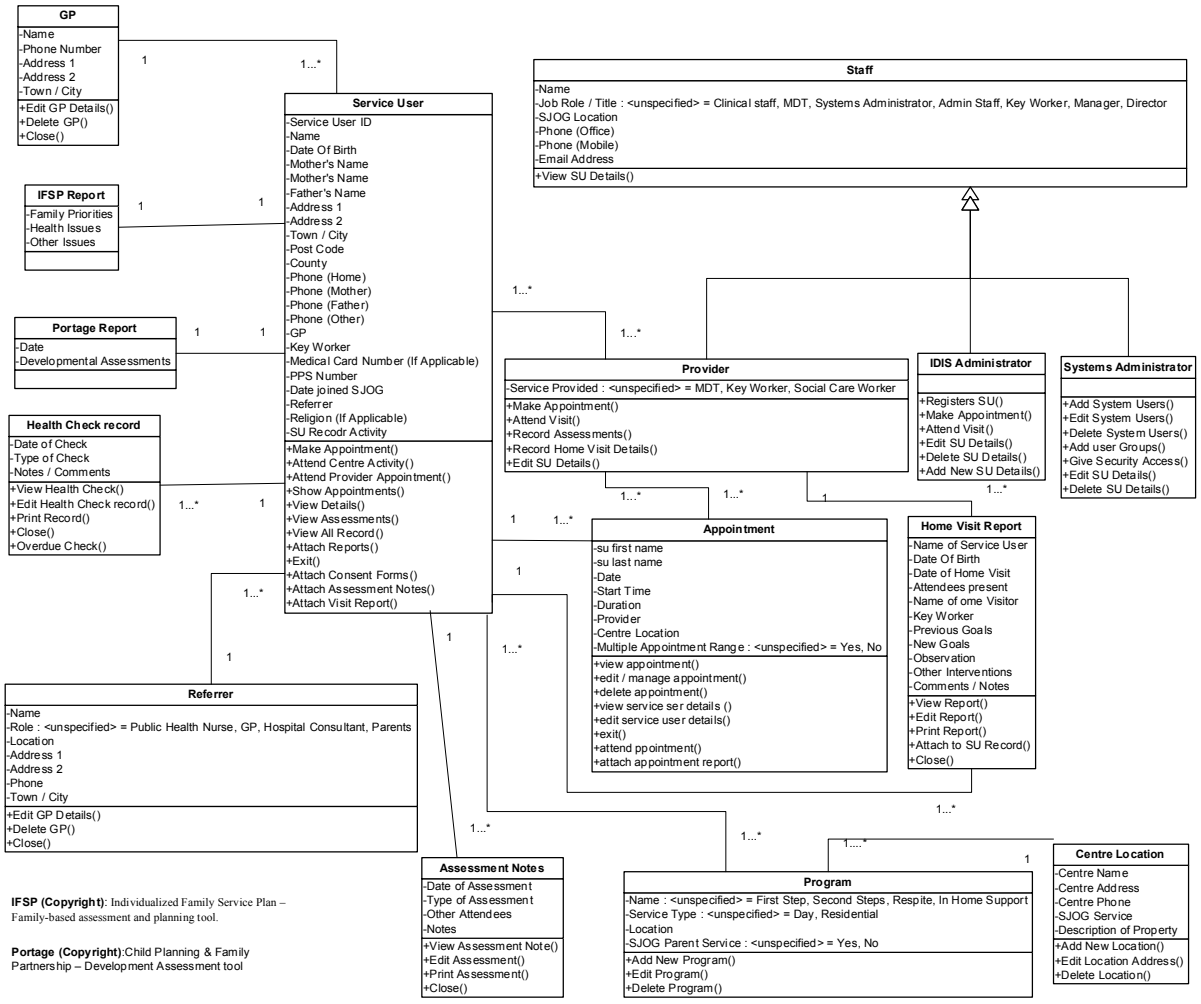

Fig. 1.3.: Class Diagram

2.1.5 Use Case 1: Admit Service User

Use Case Name: Admit Service user	**ID**: 1	**Importance level**: High
Primary Actor: ADT Team	**Scope**: Business Use Case	

Stakeholders and Interests:

ADT TEAM: (Consist of **Director, Children Services Manager, Principal Social Worker, Clinical Secretary, MDT staff**). Wants to ensure admission of only suitable children to ensure the services offered are best suited to the child's needs according to the level of disability; Wants a record of all applications including unsuccessful.

Service User Family: Wants to receive service from organization based on medical and psychological needs; wants adequate support to ensure development to enable independence and full potential is achieved.

REFERRER: (May be **Consultant Paediatrician, GP, Public Health Nurse or Parent/s**). Wants to ensure child receives appropriate and adequate support to enable child reach full potential.

Brief Description: The process of admission into SJOG ID service from application stage.

Preconditions: Service user must meet admission criteria; must be within the moderate, severe to profound range of Intellectual Disability and must live within the Carmona catchment area.

Success Guarantee: Admission outcome is reached and family is informed. Letter stating outcome is received by all applicants.

Trigger: Child with ID Referred for Admission by Referrer.

Relationships:
Association: Clinical Secretary, ADT Team
Extend: Register Service User

Normal Flow / Main Success Scenario:

1. ADT Team receives application / referral from Referrer
2. Clinical Secretary acknowledges receipt of referral within 2 weeks of receipt.
3. ADT team reviews application and carries out initial screening and assessment.
4. Provisional offer of admission into service is made and letter sent to applicant / referrer.
5. Social Worker carries out home visit (to support family; offers advise & entitlements)

6. Social Worker feeds back to ADT team.

7. ADT members carry out final assessment to see if criteria are met and parents want the service. Admission decision is reached.

8. Director sends offer of Enrolment into Service to family.

9. Principal Social Worker and Early Services Supervisor carry out home visit to family to assess needs and introduce Carmona Services team to family.

10. Early Supervisor give parents IDIS Consent form and Service Agreements to sign

11. Childcare Supervisor assigns a key worker to family.

Alternate / Exceptional Flows:

2a. If detailed psychological assessment is missing,
1. Clinical Secretary requests more information from referral source
2. Application is kept on hold until assessment received.

3a. If more information is still required,
1. ADT team places application on hold till next meeting.
2. ADT team sends letter to referrer to supply additional information.

3b. If child is within the mild range,
1. ADT team discharges the child to another service or the community health nurse.
2. ADT team sends letter of regret to referrer.

3c. If child lives outside the Carmona catchment area,
1. ADT team recommends alternate service provider to family.
2. ADT team sends letter of regret to referrer.

7a. If service is still not suitable for child;
1. Final offer not made.
2. Letter of regrets sent with recommendations made for appropriate service.

7b. If parents do not require service;
1. Final offer of admission is not made.
2. ADT team sends letter of regret.

Figure 1.4.: Business Use Case 1 – Admit Service User

2.1.6 Use Case 2: Register Service User

Use Case Name: Register Service User	**ID**: 2	**Importance level**: High
Primary Actor: Clinical Secretary	**Use Case Type**: System use case	

Stakeholders and Interests:

Clinical Secretary: Wants Fast, Accurate, Easy and Robust data entry with various ways of accessing information and easy to use GUI.

Service User and Family: Wants to receive adequate support and best possible service from organization based on medical and psychological needs to ensure development, independence and full potential is achieved.

SJOG Organization: Wants to ensure accurate information is recorded to ensure top class service delivery, satisfy service user requirements and receive adequate funding from the HSE; Wants automatic update of service levels; Wants to record all admissions. Wants reduced downtime from system and some fault tolerance;

HRB / HSE / NIDD Database:
Want demographic profile of people with ID in the Republic of Ireland recorded accurately: age, gender and level of ID. Wants to know how many people with ID are receiving specialized health services and what services they receive. Wants to know how many people are waiting for specialized health services, what service they are waiting for and when, in the next five years they need these services.

Department of Health & Children:
Wants to ensure the support and participation of people with Special Educational Needs. Wants independent assessment of health and education needs.

Brief Description: Use case for registration of SU on system

Preconditions: Clinical Secretary is identified and authenticated by system. All SU Demographic details, Disability Level, GP Information, Referral information are received by secretary. All entry is date and time stamped; Deletion of record is not supported.

Success Guarantee: Service User details are recorded correctly and accurately and stored on system to the highest relevant detail. Consent from Parents is saved. Disability Level, Demographics and GP Information accurately recorded. Group Allocation updated (eg. Baby group, crèche).

Trigger: Service User Approved for Admission to service and Consent Form from Parents Received

Relationships:
Association: Clinical Secretary
Extend: Admit SU.

Normal Flow / Main Success Scenario:

1. Clinical Secretary receives Approval for service and Consent Form from Parents
2. Clinical Secretary starts a new record
3. Clinical Secretary enters SU Demographic details, Disability Level, GP Information, Referral and Other medical conditions provided by parents.
4. Clinical Secretary saves entry or record.
5. System records information; displays a summary of details recorded and requests confirmation, giving options to Edit, Start again, Delete or Save.
6. Clinical Secretary reviews details, confirms and saves summary
7. System saves record and Generates a unique Service User Number.
8. System generates summary report that can be printed, filed or given to parents, if needed.

Exceptional Flows:

a. If system fails at any time, to ensure as much transaction state and events can be recovered from any step of the scenario:

    1. Clinical Secretary restarts System, logs in and requests recovery of prior state.
    2. System reconstructs prior state

        2a. System unable to recover from prior state and detects anomalies.
            1. System signals error to Secretary, records error in logs, and enters clean state.
            2. Clinical Secretary starts new record.

3a. If invalid identifier (incorrect or wrong format eg. date, email details not matching):
1. System signals error to Secretary and rejects entry
2. Administrator updates record with valid entry

4a. If mandatory field missing:
1. System signals error to Administrator and does not execute save.

2. Administrator updates mandatory field.

6a. If any information is missing or incorrect on review;
1. Administrator edits displayed system information – change or fill in missing information

2. Administrator saves summary

6b. If any information is wrong or no more needed;
1. Administrator deletes displayed record

2. System requests delete confirmation

3. Administrator confirms delete

6c. If any information is no more needed and new record is required;
1. Administrator requests system to start new record

2. System alerts record not saved and requests delete confirmation

3. Administrator confirms delete

4. System starts new record.

Figure 1.5.: System Use Case 2 – Register Service User

2.1.7 Use Case 3: Edit Service User Details

Use Case Name: Update Service User Details	**ID**: 3	**Importance level**: High
Primary Actor: Clinical Secretary	**Use Case Type**: System	
Stakeholders and Interests: **Administrator / Clinical Secretary**: Wants Fast and Easy way to update data. **SJOG Organization**: Wants to ensure up-to-date information is held at all times to ensure optimal participation. **HRB / HSE / NIDD Database**: Wants up to date information on demographic profile and development assessment of ID persons and how these have changed over time.		
Brief Description: Use case for updating changes in SU's record **Preconditions**: Clinical Secretary identified and authenticated by system. All edits date and time stamped. Deletion of record not supported.		

Success Guarantee: Service User details are updated and stored.

Trigger: Change in any demographic or other relevant information of Service User.

Relationships:
Association: Clinical Secretary
Extend: Register SU

Normal Flow:

1. Administrator receives Change of Address, Phone Number or GP details from Parents
2. Administrator searches for SU record.
3. Administrator enters new details.
4. Administrator saves details onto record.
5. System records information; displays a summary of details updated and requests confirmation, giving options to Edit, Start again, Delete or Save.
6. Administrator reviews details, confirms and saves summary.
7. System saves new details onto SU record.
8. System generates summary report.

Figure 1.6.: Use Case 3 – Edit SU details

2.1.8 Use Case 4: Set up Appointment

Use Case Name: Set up Appointment	**ID**: 4	**Importance Level**: Medium
Primary Actor: Service Provider	**Use Case Type**: System	

Stakeholders and Interests:

Service Provider (Key Worker and MDT): Wants to be able to see all appointments made for service user centrally to avoid overwhelming family with too many appointments within the same period. Wants to co-ordinate appointments and share visits with other colleagues for same reason. Wants to see other colleague's diary to book joint appointments to avoid double-booking.

Service User and Family: Wants well co-ordinated visit schedule to avoid being overloaded with too many appointments. Wants to avoid double-booking.

Brief Description: Use Case for the process of setting up appointments for Service Users both in the Centre (Group appointments) and at Home (Individual Appointments). Update Diary.

Preconditions: Provider logged on securely and launches application; Authenticated.

Success Guarantee (Post Conditions): Appointment recorded correctly on the date agreed by both Service Provider and user. Appointment visible to all service providers. No double-booking of provider or service user.

Trigger:
SU routine assessment due;
SU referred to provider for assessment;
SU family requests appointment.

Relationships:
Association: Service Provider
Extend: Register Service User

Normal Flow:
SU is referred to provider for appointment or SU is due for routine appointment or SU family requests an appointment.

1. Provider clicks on the diary tab
2. Provider clicks on "Make New Appointment"
3. Provider selects Appointment type: Individual or Group
4. Provider Selects Centre Location
5. Provider selects appointment date and time
6. System automatically selects authenticated provider

7. Provider SAVES appointment
8. System saves appointment in diary
9. System records date and time Appointment made

Subflows:
If Individual Appointment is selected,

- System displays SU key worker

If Group Appointment is selected,

- System displays a dropdown list of all providers

Alternate Flow:
6a. If other providers in the appointment,

1. Provider clicks Add Provider
2. Provider selects all providers in appointment and clicks Add
3. Provider's diary is updated.

6b. If recurring or multiple appointments to be created,

1. Provider selects multiple appointment button
2. Provider selects recurrence or duration of multiple appointment

7a. If time slot already taken or provider has coinciding appointment,

1. System alerts provider of current appointment
2. Provider selects new appointment slot

Figure 1.7.: Use Case 4 – Set up Appointment

2.1.9 Use Case 5: Record Home Visit Report

Use Case Name: Record Home Visit Report	ID: 5	Importance level: Medium
Primary Actor: MDT / Key Worker	Use Case Type: System	
Stakeholders and Interests: **Key Worker / MDT**: Wants record of signed visit report scanned onto system, saved on SU record and stored by date of visit not date scanned.		
Brief Description: Use case for saving signed report onto SU record. **Preconditions**: Same as above. **Success Guarantee**: All home visit reports are scanned and saved onto SU record and sorted by date of visit, not date scanned.		
Trigger: Home visit carried out.		
Relationships: Extend: Register Service User		
Normal Flow / Main Success Scenario: 1. Provider places signed report onto scanner 2. Provider searches for SU record. 3. Provider opens record and clicks “home visit” button 4. Provider selects date of visit from calendar 5. System displays authenticated provider 6. Provider clicks the “scan report” button 7. System triggers scanning and displays scanned document 8. Provider reviews and saves document. 9. System saves report onto SU record by date of visit.		

Figure 1.8.: System Use Case 5 - Record Home visit

2.1.10 Use Case 6: Record Developmental Assessment /Clinical Notes

Use Case Name: Record Developmental Assessment / Clinical Notes	**ID**: 6	**Importance level**: High
Primary Actor: MDT (Clinical)	**Use Case Type**: System	
Stakeholders and Interests: **MDT**: Wants record of assessments or notes stored by date of assessment and provider identifier; Wants more templates with already populated fields-internal reports by clinician. Wants to be able to filter records by clinician and home visit reports from clinical notes.		
Brief Description: Assessments recording. **Preconditions**: Same as above **Success Guarantee**: Assessments and notes successfully saved against SU record.		
Trigger: Clinical assessment carried out.		
Normal Flow: 1. MDT completes assessment of SU 2. MDT searches for SU record on system. 3. MDT clicks on "clinical notes". 4. System generates note template with demographic fields filled in 5. MDT reviews displayed information and types in assessment notes 6. MDT saves notes onto record. 7. System requests "save" confirmation. 8. Administrator reviews notes and confirms save. 9. System saves notes under SU record by date of assessment.		

Figure 1.9.: System Use Case 6 - Record Developmental Assessment

2.2 Non-Functional Requirements

2.2.1 Usability Requirements

- Interface elements (e.g. menus) should be easy to understand
- The user documentation and help should be complete
- The system should be easy to use and learn
- Smooth and Easy navigation between windows around the system
- 3 Clicks maximum to achieve most function task
- Fast and Easy data entry with drop down menus and check boxes
- Error messages should explain how to recover from the error
- Undo should be available for most actions
- Actions which cannot be undone should ask for confirmation
- The screen layout, menus and colour should be clear and easy to understand

2.2.2 Reliability/Availability Requirements

- The module must be available to users 24/7/365
- The system must be stable and online 99.9% of time

2.2.3 Security Requirements

- All user groups must have different levels of access to SU files. Example Social Workers reports cannot be seen by another clinical team.

2.2.4 Performance Requirements

- Initial screen load must take less than 10 seconds
- Screen refresh must take less than 5 seconds when moving from screen to screen

2.2.5 Interface Requirements

- Must be capable of uploading to the NIDD

2.2.6 Reporting Requirements

- Must generate useful and accurate reports for NIDD, HSE, Dept. of Education and CQL

2.2.7 User Documentation and Help Requirements

- Training Manual
- Training coursework
- User manual updated to include new module
- On-Line user manual to include new module

2.2.8 Constraints

- *Budget*
- *Available Resources*
- *Legal restrictions*
- *Statutory reports*
- *Data protection*
- *Freedom of Information*

3. Project Stakeholders

Project Role	Name
Project Sponsor	*Brendan McCormack*
Project Manager	*Patience Mabadeje*
Project Team	*Carmona Services Early Intervention Service team*
Clinical	*Carmona Services MDT*
Project Partner	*Centre for Health Informatics, Trinity College.*

4. Success Criteria

Project Goal	Project Success Criteria
Register All Service Users irrespective of service type received	➢ *All service users to be recorded on system regardless of whether primary service is received from SJOG or not.*
Accuracy of Reports	➢ *Reporting must match the current data / information held within the service; no*

	manual tweaking of reports.
All services received recorded	➢ *Regardless of the complexity, all activities captured presently in manual records to be recorded electronically – except where ethically impossible*
Availability of System	➢ *No customer downtime during regular business hours.*
Access to system	➢ *All primary stakeholders, particularly care workers must have access to the system*
Data Upload	➢ *Data must be uploaded to NIDD every night and at the end of the calendar year.*
Records	➢ *No manual records kept*

Specification Sign Off

Functional Requirements Agreed ☐

Non-Functional Requirements Agreed ☐

Success Criteria Agreed ☐

Software Requirements Specification Accepted ☐

MDT	Name:	_____
	Approved By:	_____
	Title:	_____
	Date:	_____
Project Manager	Approved By:	_____
	Name:	PATIENCE MABADEJE_____
	Date:	3RD SEPTEMBER, 2010_____
ICT	Name:	_____
	Approved By:	_____
	Date:	_____

Project Sponsor	Name:	_____
	Approved By:	_____
	Title:	_____
	Date:	_____

Project Acceptance

Deliverables in place	☐
Project Accepted	☐
Success Criteria Met	☐

MDT	Name:	_____
	Approved By:	_____
	Title:	_____
	Date:	_____
Project Manager	Approved By:	_____
	Name:	PATIENCE MABADEJE_____
	Date:	3RD SEPTEMBER, 2010_____
ICT	Name:	_____
	Approved By:	_____
	Date:	_____
Project Sponsor	Name:	_____
	Approved By:	_____
	Title:	_____
	Date:	_____

Post Implementation Review

Current Situation Documented	☐
Benefits Identified	☐
Future Improvements Identified	☐

MDT	Name:	_____
	Approved By:	_____
	Title:	_____
	Date:	_____
Project Manager	Name:	PATIENCE MABADEJE_____
	Approved By:	_____
	Date:	3RD SEPTEMBER, 2010_____
ICT	Name:	_____
	Approved By:	_____
	Date:	_____
Project Sponsor	Name:	_____
	Approved By:	_____
	Title:	_____
	Date:	_____