AN EVALUATION OF THE DEVELOPMENT AND IMPLEMENTATION OF THE INFORMATION SYSTEM AT A REGIONAL HOSPITAL IN THE FREE STATE PROVINCE

Seponono John Molifi
Graduate of the Regent Business School, Durban, Republic of South Africa
Richard Cowden
Academic and Dissertation Supervisor Associated with the Regent Business School and the University of KwaZulu – Natal, Durban, Republic of South Africa
Anis Mahomed Karodia (PhD)
akarodia@regent.ac.za
Professor, Senior Academic and Researcher, Regent Business School, Durban, Republic of South Africa

Abstract

This study aimed to evaluate the development and implementation of the information system (IS) at the Regional Hospital in the Free State (FS) province. The IS appears not to have been developed and implemented as originally intended, and, subsequently, has resulted in the inadequate functioning of the IS. A quantitative methodological approach was utilised to ascertain doctor's (N = 62) and nurse's (N = 186) perceptions, as IS end-users, of the development, maintenance, usability, and the performance of the IS system at the hospital. The doctors and nurses (as IS end-users) reported insufficient involvement in the process of the development and implementation of the Shared-Laboratory-Report-Tool (SLRT) system at the Regional Hospital in the FS province. Resultantly, the IS end-users were not involved in the general non-stage-specific involvement (e.g., inability to access and change passwords on the SLRT system), there is an absence of IS end-user support services (e.g., an absence IS end-user help-desk line, an absence of SLRT system manual or documentation, an absence of EUT, and so on) and IS end-users were not involved in the overall developmental stages of System Development Life Cycle (SDLC). For example, the doctors and nurses were not involved in feasibility studies such as determining IS end-user requirements and specifications and pre- and post-implementation preparatory processes). As a result, SLRT system is inadequate in delivering the intended objective of facilitating more effective and efficient healthcare service provision. Based on the results, it is recommended that formal evaluation procedures for determining the adequacy and efficacy of the IS are conducted and that end-users are consulted and included in the design and developmental process of the IS. Future research should focus on examining whether the required procedures were followed in implementing the IS and conducting failure analysis to objectively determine the current status of the IS.

Key Words: Evaluation, Information Systems, Hospital, Healthcare, Efficacy, Life Cycle, Doctors, Nurses

Introduction

Information system/s (IS) are relied upon more frequently as a means of communication between people using a variety of physical devices (hardware), information processing instructions and procedures (software), communications channels (networks), and stored data (data resources; O'Brien

and Marakas, 2006: 06). Both IS managers and academic researchers continue to devote considerable attention to IS Development (ISD), due to its role in the ultimate success of the functioning of IS (Boateng and Hinson, 2008: 18). It appears as though the development and the implementation of a Shared-Laboratory-Report-Tool (SLRT) system at the Regional Hospital in the Free State (FS) province has been unsuccessful, as IS end-users (doctors and nurses) are not utilising the IS as intended. It is crucial that the implementers of the IS at Regional Hospital in FS province conform to the logical principles of ISD and project management in order to implement a reliable, usable, functional and maintainable IS (SLRT system) as intended by the organisation. As a result, this study seeks to evaluate IS end-user engagement with the IS and ascertain the reasons for inadequate implementation of IS end-user engagement or involvement during System Development Life Cycle (SDLC) of an IS (SLRT system) at the Regional Hospital in the FS province.

Globally, IS or IT is used as a tool of change promoting long-term prosperity. Organisational long-term prosperity largely depends on successful implementation of feasible and reliable IS that merges appropriately with business processes. Despite the apparent benefits of IS, an IS may not enhance business processes. Often, an IS has been developed and implemented without taking necessary sequential steps or phases, as well as necessary management measures (e.g., feasibility studies such as economic or operational) towards successfully implementing IS projects. In such instances, the end-users are not equipped with knowledge and skills to optimally utilise the IS. Apparently, implementing the IS within the Regional Hospital in the FS province has been problematic. It appears as though the IS (SLRT) was developed and implemented without taking methodological approaches and necessary steps for successful implementation of the IS. In particular, the end-users (e.g., administrative staff, nurses) may have not been involved in the process of developing and implementing of IS.

In order to ensure successful and effective system development and implementation is achieved by IS project managers, all the necessary key elements in the project should be integrated at the bottom or foundation of the project (e.g. Human Resource Function; HRF, to conduct Training Need Analysis (TNA) and to facilitate training and development programmes in order to be integrated in the overall business strategy). In order to be successful, organisations must closely align Human Resource (HR) strategies and programmes with environmental opportunities, business strategies and the organisations unique characteristics and distinctive competence (HR study guide, 2007:40). In the Management Information Systems (MIS) study guide (2007: 52) it is stated that issues with IS inherent in organisations will not automatically be resolved through implementing an IS. Although the IS was developed at the Regional Hospital in the FS province to enhance healthcare service delivery and to reduce high Turn-Around-Time (TAT) in diagnostic medical laboratory services to comply with the requirements by the Department Of Health (DOH), it is apparent that this IS has not been implemented successfully and the necessary actions have not been employed to rectify the current issues (e.g. the IS appears to be inaccessible to IS end-users). Segismundo and Miguel (2008: 899) suggest that during periods of increasing global competition, the success of projects becomes more integral to an organization's business performance. However, it was proposed by Segismundo et al. (2008: 899) that many projects still present delays, aims and objectives often fail, and may be removed or cancelled. In some instances, problems may occur due to ineffective management of project risk (Segismundo et al., 2008: 899).

In South African (SA) organisations, insufficient Research and Development (R&D) facilities or institutes attribute to organisations unsuccessfully utilising IT techniques and tools because employees do not receive adequate IS training and may lack the appropriate computer skills, knowledge, and

experience to adequately utilise an IS. Additionally, when implementing IS to a group of people who are not computer literate or the nature of their work does not incorporate computer systems utilities and applications (e.g. Doctors and Nurses as IS end-users), this may stimulate fear and a complete resistance to change and possible failure of the IS project. In hospital settings, failure of ISD, to deliver the organisational needs and objectives intended may result in inadequate or insufficient provision of healthcare services to patients due to failure to use the IS. It was proposed by Beynon-Davies, Owens and Williams (2004: 278), that IS use failure typically occurs as a result of IS end-user stakeholders feeling that the IS does not match their expectations. According to O'Brien et al. (2006: 387), one of the keys to solving problems of IS end-user resistance to new technologies is proper education and training. Additionally, IS end-user involvement in organisational change is essential for successful development of new IS (O'Brien et al., 2006: 388). As a result, exacerbated project risks may ensue and hinder or hamper the effectiveness of an IS project as well as the efficient use of organisational resources. A deficit in IS end-user involvement in the development and implementation of the IS (SLRT system) at the Regional Hospital in the FS province may be considered an IS project risk; an aspect this study aims to investigate.

LITERATURE REVIEW

Introduction

Defining SDLC

According to Stair, Reynolds and Chesney (2008: 21), ISD involves creating or modifying business processes (e.g., transfer of medical data between healthcare workers by means of SLRT system). The ISD process is also called the SDLC because the activities involved are ongoing (Stair and Reynolds, 2012: 505). The SDLC consists of a set of different stages or phases, with each phase, heavily dependent on the results of the previous one (a step-by-step procedure). Thus, if phase one is not adequately addressed, issues will continue to the following phase, which may result in undesirable costs and further issues.

According to Sekhar (2007: 191), SDLC include a feasibility study about the IS requirements, gathering, analysis, design, prototyping, implementation, validation, testing and operation. Nevertheless, there are also several critical factors in SDLC, which may impact the selection of an appropriate approach when developing and implementing IS. It is quite vital to understand the business environment that the organisation is involved and engaging. Thus, knowing your stakeholders (for example, IS end-users and so on) exactly and adherence to organisational vision, mission, objectives as Key Performance Areas (KPAs) and the current business performance in line to its overall business strategy as Key Performance Indicators (KPIs).

The five phases or steps in the SDLC

Systems investigation

Systems investigation phase is the same as preliminary investigation phase (see Figure 2.1), as the top management and IT team manoeuvre the business problems, opportunities and priorities, conduct feasibility studies, and decide on IS project management plan and approval on the IS proposal. Because the ISD process is very expensive, the systems investigation stage typically requires a preliminary study called a feasibility study (O'Brien et al., 2006: 406). A feasibility study is a

preliminary study where the IS requirements and specifications of prospective IS end-users and other resource requirements, costs, benefits, and feasibility of proposed IS project are determined (O'Brien et al., 2006: 406). According to Sekhar (2007: 221) the IS has been tested for feasibility in the following ways:

1. Technical feasibility: Technical feasibility involves the demonstration the reliability of hardware and software capabilities to meet the IS end-user requirements of a proposed IS to be developed within the desired period (Stair et al., 2012: 406). This involves both hardware selection and the software selection.

- Hardware selection involves the selection of hardware (e.g., personnel computer with specified specifications and an 80-column printer) required to satisfy IS end-user requirements in ISD. According to Laudon et al., (2010: 516), among the duties of the systems analysts, the most important duty is to determine the information requirements that must be met by the system solution selected, and briefly, this involves identification of who needs what information, where, when, and how. IS requirements analysis carefully defines the objectives of the new or modified IS and develops a detailed description of the functions that the new IS must perform (Laudon et al., 2010: 516). For example, doctors and nurses at the Regional Hospital may specify either they want a telemedicine such as SLRT system in the form of notebook or pocket device depending on the nature of their work. However, if IS requirements analysis is conducted ineffectively and inefficiently, this is the main cause of IS failure and high ISD costs (Laudon et al., 2010: 516). Consequently, a system designed with inappropriate set of requirements will either have to be discarded because of poor performance and functioning or will need major modifications (Laudon et al., 2010: 516). If the IS end-user requirements are met, then the IS project is technically feasible.
- Software selection involves the selection of software that can possibly facilitate the exact and desired outcome of the IS. For example, the telemedicine (SLRT system) development project does not require Active Server Pages (ASP) though it is developed in ASP. We can make exe file or some Dynamic Link Libraries (DLL's) and Object Linking and Embedding (OLE) Control Extension (OCX) files may be needed to run this IS project, and whether these files are on a sharing mode, thus, between LIS and HIS.

2. Operational feasibility: Operational feasibility means that the IS end-users (e.g., doctors and nurses) should support the IS (e.g., telemedicine such as SLRT system) project.
   - The IS should not pose any problems to IS end-users after implementation. It appears that with support from IS end-users (doctors and nurses), the development and implementation of the telemedicine (SLRT system) at the Regional Hospital in the FS province could have been successful in the pre- and post-implementation phase.
3. Economical feasibility: Economical feasibility is the most important aspect of the overall feasibility study.

For example, the IS package being developed must be financially feasible. As a result, if the IS implementers can afford the IS components based on IS end-user's (doctors and nurses) requirements and specifications as well as the compensation for ISD team, then the IS project is economically feasible.

According to Cervone (2007: 349), the preliminary investigation phase initiates the IS project and answers the question "should this project even be performed?" During this phase a strategic evaluation may be conducted to ensure that IS end-user requirements and specifications are been identified and considered. Therefore, if the IS implementers decide to continue with the IS project plan, based on strategic evaluation, it will have to proceed to the next phase called systems analysis. The primary result of systems investigation phase is a defined and structured ISD project plan for which business

problems or opportunities and priority statements have been made; to which some organisational resources have been committed, and for which systems analysis is recommended (Stair et al., 2008: 395). Sequentially, the next phase is systems analysis.

According to O'Brien et al. (2006: 421), an important part of testing is the review of prototypes of displays, reports, and other outputs. It appears that prototypes should be reviewed by IS end-users of the proposed system for possible errors and of course, testing should not occur only during systems implementation stage, but throughout the system's development process. The ISD team collaborate with IS end-users to devise a systematic test plan, which comprises of preparatory schedule for a set or series of tests (Laudon *et al.*, 2010: 520). Laudon et al. (2010: 518) mention that IS testing can be divided into three types of activities: unit testing, system testing, and acceptance test:

1. Unit testing

Unit testing (e.g., prototype) or program testing includes testing each program separately in the system to ensure that the programs are flawless or defect-free. This type of IS testing should aim at locating defects in programs and to focus on identifying causes that may lead to a program failure.

2. System testing

System testing (e.g., the entire SLRT system) involves testing the functionality of the entire IS, to determine whether discrete modules will function together as planned and to determine any discrepancies between the ways in the actual work of IS and how the IS was conceived. The evaluation in systems testing involve several activities, such as performance time, capacity for file storage and handling peak loads, recovery and restart or reboot capabilities, and manual SOPs.

3. IS acceptance testing?

This type of testing facilitates IS end-users involvement in SDLC, Acceptance testing provides the final indication (e.g., IS end-users agreement license on SLRT system) that the IS is ready to be utilised in a production settings (e.g., in a hospital settings). According to Olson (2004: 13) the first three Critical Success Factors (CSFs) in ISD are clear objectives, top management support, and IS end-user involvement (Client consultation) in the overall SDLC. IS end-user involvement reappears in the form of client acceptance (Olson, 2004: 13).

In order for the IS end-users to feel as part of the IS, the IS managers need to make sure that the IS end-users formally acknowledge to utilise and accept the IS. For example, the IS implementers should conduct IS end-user acceptance testing prior to implementation of the IS, and provide IS End-User Licence Agreement (EULA) and other related documentation with clear acceptance policy. An acceptance use policy defines acceptable uses of the organisational resources and IS device component, including desktop and laptop computers, wireless devices and internet, and therefore, the policy should clarify organisational policy regarding privacy, and the IS end-user responsibility; thus, accepted and unaccepted actions for every IS end-user and specifies consequences for non-compliance (Laudon et al., 2010: 340). According to O'Brien et al. (2006: 422) a rapid IS end-user testing is one of the benefits of a prototyping process. It appears that, by conducting IS end-users acceptance testing, the organisation is indirectly determining and measuring the acceptance behaviours and attitudes of the IS end-users towards the IS. However, this may be done through the deployment of Technology Acceptance Model (TAM). It was proposed by Eriksson, Kerem and Nilsson (2004: 201) that TAM identifies the perceived usefulness and the perceived ease of use of a technology as determining IS end-user behaviour, and many MIS researchers have found that trust influences consumer behaviour (see Figure 2.4).

Systems maintenance and review

The purpose of systems maintenance and review is to ensure that the IS operates as intended and to modify the IS so that it continues to meet changing business needs (Stair et al., 2008: 396). During this stage, the IS will be reviewed by top management, IS end-users and technical specialists or analysts to determine how well it has met its original objectives and to decide whether any revisions or modifications are needed or in order (Stair et al., 2008: 396). As a result, IS end-users have to be able to perform daily, weekly and monthly maintenance on the IS in order to maintain a constant and optimum functioning and availability of the IS. Consequently, the notion of maintenance and review phase may be considered in light of assessing the likelihood of the IS to be able to function normally, and to be available when needed by IS end-users. This phase appears to be considered as a corrective action or measure phase, where mistakes, problems and other dysfunctional are been identified and corrected. Changes in hardware, software, documentation, or procedures to the IS in order to correct errors, meet new requirements, or improve processing efficiency are termed maintenance (Laudon et al., 2010: 522).

System maintenance

In practice, many IS maintenance reflect changing IS requirements, and the corrective action to be done to rectify these IS problems is so far unknown (Brooke, 2009: 122). According to Wu et al. (2006: 136-137), the IS is developed and implemented to support the required business functions (e.g., in hospital settings) so it is essential that they can be operated and used without interruption in meeting the IS end-user's needs, through reliability resulting in cost effectiveness during the entire SDLC. It is very crucial to design the IS that will be less costly to maintain. There is no way that the IS performance or functionality can be attained, retained and sustained, if the IS maintenance is too high or surpasses the IS benefits.

System review

Brooke (2009: 121) mentioned that the issues of accessibility to data and information currency need to be evaluated and reviewed in future studies of the post-implementation IS environment. There is a need to determine whether IS is capable, in practice, to meet the IS end-user's information requirements of accessibility, flexibility, accuracy, reliability and completeness claimed for them, and as well as to ascertain if they are able to adapt to radically changed information needs in a way that older IS were not (Brooke, 2009: 121). In case of the IS (SLRT system) at the Regional Hospital in the FS province, it appears that the doctors and nurses (as IS end-users) are not able to access the IS and the need for IS (SLRT system) have not been achieved so far. Apparently the IS (SLRT system) may have been developed and implemented without the involvement of the IS end-users in the overall SDLC.

Nevertheless, the system review as a sub-phase may be employed to monitor or review the accessibility, flexibility, accuracy, reliability and completeness of the IS. But, in addition, it appears that the implementers of the IS (SLRT system) at the Regional Hospital in the FS province were too reluctant to maintain and review the IS (SLRT system). Hence, even now the IS (SLRT system) is claimed, by the doctors and nurses (as IS end-users), to be a 'White Elephant' with no apparent accessibility and with no optimal functionality to provide the intended output of information requirements.

Causes of unsuccessful IS development and implementation

Capaldo and Rippa (2009: 642) suggest that the recent literature has highlighted numerous cases of IS failure amongst companies that implemented a system. In addition, Capaldo et al. (2009: 642) proposed that the problems underlying the disappointing results of IS implementation are diverse, as these problems (as causes) are not only associated with technical implementation (e.g., inadequate definition of functional requirements, underestimating the difficulties related to legacy closing, errors in the choice of IS software, and so on), but are also associated with organizational implementation (e.g., lack of commitment on the part of top management, lack of involvement of IS end-users and their possible resistance to change). However, this study focuses on the lack of IS end-user involvement in SDLC as one of the factors or causes that may have led to IS project failure at the Regional Hospital in the FS province.

Primary causes of unsuccessful IS or IT projects

It was proposed by Soja and Paliwoda-Pekosz (2009: 612) that prior literatures postulate six main causes of IS or IT project failure:

(1) The utilisation of an inappropriate project method of implementation, which may also apply to the ISD and implementation at the Regional Hospital. The IS implementers at the Regional Hospital had no specific ISD method, and it appears as though the implementer of IS (SLRT system) placed the IS within the hospital without facilitating the appropriate use of the IS.
(2) A lack of IS end-user involvement in the ISD of a new IS, which is reflected in the IS development and implementation at the Regional Hospital in the FS province. It appears as doctors and nurses (as IS end-users) are ill-informed about the IS (SLRT system) and some complained that they have not received or undergone proper training to ensure that they are fully equipped to use the IS.
(3) There may be dissimilarity between previous IS projects and the current IS project; thus resources, equipment, expertise and knowledge about IS projects may not be easily transferable from one IS project to another due to dissimilarity to previously conducted IS projects, and consequently, the dissimilarity in IS projects may pose difficulties or challenges to IS project managers.
(4) It appears that developing the IS in the hospital settings may be complex and complicated, as it requires the involvement of stakeholders and facilitating communication between members of the ISD team.
(5) The IS project requirements volatility may impose challenges to IS analysts, as a results of rapidly and radically changing needs of IS end-users. Inevitably, this may also apply to the ISD and implementation at the Regional Hospital in the FS province, were IS end-user requirements and specification were neglected by the implementers of the IS (SLRT system).

Lack of sufficient and appropriate IS end-user training (EUT)

According to O'Brien et al. (2006: 423), training is a vital and an integral portion to an implementing an IS. Apparently, the IS end-users (doctors and nurses) of the telemedicine (SLRT system) at the Regional Hospital in the FS province have not received efficient and sufficient training to enable them to operate and utilise the SLRT system more efficiently to aid in the provision of healthcare services. It also appear that the newly appointed doctors and nurses (with no one to train them) are unable to utilise the SLRT system, as the IS top management is not willing to maintain, review, or evaluate the IS in the post-implementation process. According to Wessels et al. (2010: 131), the post-implementation stage consists of deploying and evaluating the IS after it has been installed and

operational (e.g., to assess the IS end-users regarding the usability and availability of IS). However, training should not be directed only to IS end-users. Those who implement and manage the development and implementation of the IS (SLRT system) at the Regional Hospital in the FS province should also receive training, so that they can be the masters of the IS.
According to O'Brien et al. (2006: 423), IS personnel (e.g., IS end-user consultants or LIS implementation consultants) must be sure that IS end-users are trained to operate a new business IS, otherwise implementation of the IS is unlikely to succeed. It appears that the lack of proper, appropriate, extensive and sufficient IS EUT may be one of the causes of the development and implementation failure at the Regional Hospital in the FS province. Training and development should not be confused, because both are neither the same nor similar.

Table 2.1: Illustration of the distinctions between training and development

	TRAINING	DEVELOPMENT
Focus	Current	Future
Use of Work Experiences	Low	High
Goal: Preparation for	Existing job	Changes
Participation	Required	Voluntary

Source: Adapted from Anonymous (2007a: 138).

From the holistic point of view, organisations have to focus on training the IS end-users on how to utilise the new SLRT system, which automatically changes the current business processes. Training is important when the use of work experience is low, for example, new IS means low work experience of such IS. Consequently, the goal and objective of EUT is mostly directed to the existing job (e.g., doctors and nurses as IS end-users, for the current job enhancement or betterment). Lastly but important, the IS end-user participation in training programmes is highly required in the implementation phase of the IS (SLRT system). As mentioned by Kaplan-Mor et al. (2011: 27), defining training as a controlled change of behaviour and the most popular training evaluation model (e.g., TNA) in use nowadays, and is based on a sequence of four interdependent steps intended to achieve the organisational goals and objectives:

(1) Objective reaction of learner (e.g., IS end-users).
(2) The resulting increase in knowledge or capability;
(3) The extent of behaviour and capability improvement; and
(4) Implementation or application results– the effects on the business or environment resulting from the trainee's performance.

As mentioned by Kaplan-Mor et al. (2011: 26) one of the most pervasive means of reducing IS project failure, is by training of the IS end-users. Kaplan-Mor et al. (2011: 26) further mentioned that the likelihood is that training enhances the productivity of the IS stakeholders and improve communication of organisational goals and objectives to new personnel (e.g., new appointed doctors and nurses have to be trained to be able to operate and utilise the SLRT system). According to O'Brien et al. (2006: 423), training involves activities like data entry, or it may also involve all aspects of the proper use of new IS.

Kaplan-Mor et al. (2011: 26) mention that of all types of corporate training, EUT takes the largest portion of approximately 38.4 percent. It was proposed by Kaplan-Mor et al. (2011: 26) that EUT

deals with the teaching of skills to effectively use computer applications to IS end-users. For example, it is not always ease to give medical or clinical professionals an IS and expect them to operate IS effectively and efficiently without a proper or a formal EUT, troubleshooting methods, a 24 hour help-desk and/ or system's end-user manual and so on. Besides, IS may need to be communicated in the form of training, as lot of people are too reliant on traditional offering of services with too much negligence on the contemporary and modernised offering of services. Kaplan-Mor et al. (2011: 26) indicate that many studies have reached the conclusion that training has a crucial role in the process of assimilating a new technology. In addition, according to O'Brien et al. (2006: 423), IS managers and IS end-users must be educated in how the new technology impacts the company's business operations and management. The knowledge about the IS must be supplemented by training programs, when implementing a new IS, and the use of IS for specific work activities (O'Brien et al., 2006: 423).

Emerging Information and Communication Technology (ICT) and its benefits for the healthcare industry

Mayoka et al. (2012: 201) suggest, that in recent years, R&D activities have led to the increased penetration and diffusion of the ICT in all the disciplines and professions including banking, communication, education, health and other businesses in both the developed and developing countries (e.g., SA). Ffurthermore, Mayoka et al. (2012: 201) indicate that the provision of services such as e-banking, e-learning, e-health, e-commerce, has become popular in all aspects of humankind. According to Mayoka et al. (2012: 201), the healthcare system is not excluded in these emerging industries, as many hospitals are engaging towards implementing telemedicine. Telemedicine is described as "the practice of medical care using interactive audiovisual and data communications including medical care delivery, diagnosis, consultation and treatment, as well as education and the transfer of medical data" (Mayoka et al., 2012: 201). In fact, ICT has altered global practices performed (e.g., from traditionally and historically performed business practices to technological and modernised business practices); as an IS can create, store, maintain, and manipulate information. For example, people formerly stored and shared information through filing methods; accumulating large magnitudes of paper requiring storage. As a result, obtaining specific information is difficult and time consuming, as individuals are required to survey storage facilities to locate documents. Consequently, quick-service provision in healthcare industries may be ineffective and impeded due to the length of time required to obtain relevant information. Looking holistically at the capability of the telemedicine as a tool to transfer medical data among healthcare workers, by using contemporary ICT or IS (e.g., such as SLRT system), healthcare professionals may swiftly provide information to other professionals and clients.

Contemporarily, it appears that IS such as telemedicine (e.g., SLRT system) may be useful to change and enhance healthcare business processes to be much faster and convenient, as compared to historical business processes, particularly in hospital settings. According to Laudon et al. (2010: 73), "business processes are concrete workflows of material, information, and knowledge- sets of activities". In addition, business processes refer to the unique ways in which organisations coordinate work, information, and knowledge, and the ways in which management chooses to coordinate work (Laudon et al., 2010: 73). According to Sekhar (2007: 212), information processing for management decision-making is acquiring more acceptance in various sectors in the country (e.g., SA), so the scope and the context of IS is very broad and wide in hospital settings (Sekhar, 2007: 212). In recent years, the penetration, sophistication, and diversity of IS has increased dramatically, and nowadays, IS actively supports all core business processes of organisations and increases operational and organisational efficiency and effectiveness (Kaplan-Mor et al., 2011: 25). Nowadays, business managers and

employees in all functional areas (e.g. from operational to senior management) work together and use business IS (Stair et al., 2008: 388). According to Laudon et al. (2010: 48), the field of MIS strive to achieve the wider IS literacy, which deals with the behavioural issues as technical issues surrounding the development, usability, and the impact of IS deployed by the managers and employees in the organisation. The three principal levels of the organisational hierarchy that can be supported by IS in the hospital settings are outlined below (see Figure 2.5). According to Laudon et al. (2010: 49) organisations have a structure that is composed of various levels and specialities or professions, and the organisational structure reveals a distinct division of labour. According to Laudon et al. (2010: 49), the upper levels of the hierarchy include top management (e.g., IT executive), professional (e.g., MIS manager), and technical employees (e.g., IS implementers, IS implementation consultants, IS analysts, IS programmers, IS testers), whereas the lower levels includes operational or functional personnel (e.g., operational ward managers, doctors and nurses in the hospital settings) to which the IS can be beneficial.

Figure 2.5: Three principal levels of the organisational hierarchy

Source: Adapted from Alba (2013).

Sekhar (2007: 212) mention that the implementation of IS is required in all operational or functional areas of the hospital, to ensure accurate reporting of all duties being executed. For example, the functional areas requiring implementation of IS in a hospital are patients details, doctors details, pharmacy and surgical stores, clinical and x-rays laboratories, finance and accounting section, employees, administration and maintenance, infrastructure, and surgeries and operations information (Sekhar, 2007: 212). According to Mayoka et al. (2012: 201), a study shows that telemedicine is increasingly being employed for purposes of communication and performing remote medical procedures. For instance, with the development and implementation of a telemedicine (e.g. SLRT system) at the Regional Hospital in the FS province, doctors and nurses can swiftly, readily and easily access laboratory reports much faster than the traditional method of collecting documents directly

from the laboratory. As a result, a number of applications are being developed and deployed in hospitals to support clinical medicine and medical information sharing via telecommunication links (e.g. link between LIS and HIS networks via SLRT system) and the internet (Makoya et al., 2012: 201).

Makoya et al. (2012: 201) proposed that despite the benefits of telemedicine (e.g. SLRT system) as a technology that is selected method for delivering cost-effective quality healthcare services (with the potential to significantly impact healthcare services in developing countries where there are persistent shortages of medical personnel such as doctors and nurses), there have been a vast number of challenges with systems design and sustainability during ISD in the developed and in the developing countries (e.g., SA with poor R&D facilities). For example, the development and implementation of the IS (SLRT system) at the Regional Hospital in the FS province appears to be problematic and has encountered challenges, with poor system design and implementation, and a lack of sustainability procedures prior to, during and after SDLC. However, as this study is focusing on the lack of IS end-users involvement and engagement in the overall SDLC as the main source, among others, of IS project failure, so according to Stair et al. (2008: 388) IS end-users are central to project success, as IS end-users assist with the ISD and, in many cases, leading the way (e.g. specifying the features and requirements of the IS) in SDLC. So it appears that the negligence of IS end-user involvement in SDLC by IS implementers may result in an IS that is not user-friendly, which give rise to failure (e.g., failure of IS to meet IS end-user's expectations and requirements) to complete ISD process and subsequently giving birth to what the doctors and nurses at the Regional Hospital in the FS province call White Elephant (SLRT system). According to Beynon-Davies et al. (2004: 278), the definition of failure depends on the position and perspective of the definer and it is an intersubjective concept, hence, the concept of expectation failure is critical. Expectation failure refers to the inability of an IS to meet a specific stakeholder group's expectations (Beynon et al., 2004: 278). Beynon et al. (2004: 278) further mentioned that as a consequence of the definition of expectation failure, the identification of stakeholders (e.g., IS end-users) and their likely impact on the trajectory of an IS project is extremely important. It appears that the IS end-user involvement is crucial in the identification of certain IS requirements and specifications, facilitate training and increase usability, to facilitate the use of the systems as well as to maintain, review and evaluate the system. As a result, lack of IS end-user involvement in the overall implementation SDLC appears to have influenced the malfunction of the IS project at a Regional Hospital in the FS province.

However, Makoya et al. (2012: 201) mentioned that the World Health Organisation (WHO) opted and urges countries to develop strategies for proper design and implementation of e-health technologies (e.g. SLRT system), as it is a cost-effective method of healthcare service delivery. In doing so, governments would benefit from services such as medical education, health surveillance, knowledge sharing and research (Makoya et al., 2012: 201). This study focuses on pertinent end-users of the SLRT system (i.e., doctors and nurses), to evaluate the reasons for inadequate IS end-users involvement in the SDLC at the Regional Hospital in the FS province.

RESEARCH METHODOLOGY

Target population

According to Anderson, Sweeney and Williams (2003: 791), the target population is the population we want to make inferences about. The target population for this particular study depended heavily on the

research questions, which attempted to determine the causes and reasons (e.g., lack of end-user involvement in SDLC) that have led to IS (SLRT system) project failure by evaluating the development and implementation of the IS (SLRT system) at the Regional Hospital in the FS province. Consequently, these targeted IS (SLRT system) end-users are doctors and nurses at the Regional Hospital in the FS province.

According to Anderson et al. (2003: 14) a population is a set of all elements of interest in a particular study. The population of this study includes all the wards and clinics staff at the Regional Hospital in the FS province. In particular, the participants will be Doctors and Nurses. It was advisable to conduct the study with sample of the targeted participants and obtain the participation from all participants in the target.

Table 3.1: Table for determining sample size from a given population

Population (N)	Sample (S)	Population (N)	Sample (S)	Population (N)	Sample (S)
10	10	220	140	1200	291
15	14	230	144	1300	297
20	19	240	148	1400	302
25	24	250	152	1500	306
30	28	260	155	1600	310
35	32	270	159	1700	313
40	36	280	162	1800	317
45	40	290	165	1900	320
50	44	300	169	2000	322
55	48	320	175	2200	327
60	52	340	181	2400	331
65	56	360	186	2600	335
70	59	380	191	2800	338
75	63	400	196	3000	341
80	66	420	201	3500	346
85	70	440	205	4000	351
90	73	460	210	4500	354
95	76	480	214	5000	357
100	80	500	217	6000	361
110	86	550	226	7000	364
120	92	600	234	8000	367
130	97	650	242	9000	368
140	103	700	248	10 000	370
150	108	750	254	15 000	375
160	113	800	260	20 000	377
170	118	850	265	30 000	379
180	123	900	269	40 000	380
190	127	950	274	50 000	381
200	132	1000	278	75 000	382
210	136	1100	285	1 000 000	384

N is population size
S is sample size
Source: Adapted from Anonymous (2008: 34).

Table 3.2: Purposive or Judgemental sampling at the Regional Hospital in the FS province

Number of Doctors				Number of Nurses			
Population (N)	Sample (S)	Number of Clinics	Number of Wards	Population (N)	Sample (S)	Number of Clinics	Number of Wards
82	66	11	20	423	201	11	20
Total sample of doctors (in clinics plus wards) = 66/31 = 2 doctors per hospital unit. Therefore, 62 doctors in 31 hospital units.				Total sample of nurses (in clinics plus wards) = 201/31 = 6 nurses per hospital unit. Therefore, 186 nurses in 31 hospital units.			

N is population size
S is sample size

The sample for this study was determined using the predetermined statistical data (see Table 3.1). The Regional Hospital in the FS province is made up of 11 clinics and 20 wards, a sample of 6 Nurses and 2 Doctors per hospital unit formed part of the sample for
disadvantages of deploying questionnaire are as following:

- It can takes a considerable amount to construct;
- It may require to be piloted;
- It may require some refinement prior to deployment;
- It may provide data that fails to capture an accurate or a precise picture of the contingent or a situation because of the limited and narrowed flexibility of response (Lowe, 2007: 39).

Nevertheless, it was acknowledged that the use of questionnaires may be hampered by certain demerits, but the merits of using questionnaire are of the outmost important when undertaking a research survey. The researcher mitigated and reduced some of these demerits that may be present when using a questionnaire, by undertaking the pilot study in order to refine the questionnaire items prior use, so as to provide information that captured an accurate picture of the overall study.

Limitations of the research

This particular research study had one main aim; thus, evaluating the importance of involving the IS end-users in the development and implementation of IS. However, there were some financial constraints, limited budget and limited time to spend in conducting this research study. The study could have been extended by evaluating the following areas:

- The methodology or models that was used by IS implementers in SDLC, thus, the merits and demerits of using several SDLC models in the development and implementation of the

who do not? According to Reddy et al. (2011: 161) most researchers view non-response bias as a continuum, ranging from fast responders to slow responders (with non-responders defining the end of the continuum). Others have found that late responders answer differently than early responders, and that the differences may be due to the different levels of interest in the subject matter (Reddy et al., 2011: 161). As a result, the researcher engaged all the doctors and nurses at the Regional Hospitals prior conducting sampling on the overall population (i.e., all the doctors and nurses were aware of the

study). All participants from the target population had the same views and experiences regarding the development and implementation of the SLRT system at the Regional Hospital in the FS province. Therefore, the researcher mitigated and eliminated such response and non-response bias by explaining the research subject matter and by distributing questionnaires simultaneously in all Regional Hospital medical units.

In addition, the researcher eliminated the use of race or ethnic group, as this study did not mention the IS project failure in terms of distinguishing the IS end-users (as participants) by race. The researcher also used gender neutral words such as male and female, and did not distinguish participants by rank, as this could have led to people at a lower rank or younger medical professionals to feel useless in this study. Lastly, the use ambiguous language (e.g., use of strong MIS terms) was avoided, so that all medical professionals involved, can understand the questions in the questionnaire.

RESULTS, DISCUSSION AND INTERPRETATION OF FINDINGS

Results for participant demographics (Section A)

The descriptive statistics for the demographic variables of the participants are outlined below (see Table 4.1). This table indicates that 186 nurses and 62 doctors completed the questionnaires. The participants included a greater proportion of nurses (75%) as compared to doctors (25%). However, the hospital employs fewer doctors, suggesting that, coupled with the sampling technique utilised, that the sample is representative of the general population of nurses and doctors at the hospital. In addition, the sample included more female doctors and nurses (58.9%) compared to males (41.1%), which corresponds with the superior female employee population at the hospital. The age, educational level, and years employed at the hospital descriptive suggests that a broad age-ranging nurse and doctor population work at the hospital, that the doctors and nurses have received extensive education (which may extend from the educational requirements for nursing and medicine), and have been employed by the hospital for a lengthy duration. The latter may be particularly encouraging to younger nursing and doctor staff with interest in constructing careers. It may also suggest that the hospital is implementing the correct strategies or techniques to retain its doctors and nurses. Approximately half of the doctors and nurses (44.4%) indicated that they had received a formal or informal computer based qualification, which may be an important aspect to consider in conjunction with the information that follows. That is, perhaps the SLRT system is being underutilised as a result of inadequate employee computer skills.

Table 4.1: Demographic information of doctors and nurses in percentages

Descriptive statistics for demographic variables				
Variable	*N*	*M*	*S*	Percentage
Occupation				
Total	248	1.25	0.43	100
Nurse (1)	186	-	-	75
Doctor (2)	62	-	-	25
Gender				
Total	248	1.59	0.49	100
Male (1)	102	-	-	41.10
Female (2)	146	-	-	58.90

Age				
Total	248	3.58	0.90	100
< 20 years (1)	0	-	-	0
20 – 29 years (2)	28	-	-	11.3
30 – 39 years (3)	85	-	-	34.3
40 – 49 years (4)	100	-	-	40.3
50 – 59 years (5)	32	-	-	12.9
> 60 years (6)	3	-	-	1.2
Education				
Total	248	4.00	1.13	100
Below Matric (1)	4	-	-	1.6
Matric (2)	17	-	-	6.9
Certificate (3)	56	-	-	22.6
Diploma (4)	90	-	-	36.3
Undergraduate Degree (5)	66	-	-	26.6
Honours/BTech (6)	11	-	-	4.4
Masters (7)	3	-	-	1.2
PhD (8)	1	-	-	0.4
Years Working at Hospital				
Total	248	3.18	1.11	100
0 – 1 year (1)	18	-	-	7.3
1 – 5 years (2)	48	-	-	19.4
5 – 10 years (3)	86	-	-	34.7
10 – 15 years (4)	64	-	-	25.8
15 or more years (5)	32	-	-	12.9
Computer Based Qualification				
Total	248	1.56	0.49	100
Yes (1)	110	-	-	44.4
No (2)	138	-	-	55.6

Note. Means (M) and standard deviations (S) are based on parenthetic numerical grouping categories assigned to each variable (e.g., 1, 2).

Results for IS related items: Sections B, C, and D.

The following provides the number of counts (N), means (M), standard deviations (S), and the frequency and percentage responses across each item (see Table 4.2). The table indicates individual item analyses and interpretation of the response patterns are outlined below.

Table 4.2: Means, standard deviations, response frequencies and percentages of IS related items (i.e., B: general, non-stage-specific involvement, C: end-user support services, and D: end-user involvement in SDLC)

IS related items: Response frequencies and percentages						
	Response option					
Item	1	2	3	4	5	Total

number												
	N	%	*N*	%	*N*	%	*N*	%	*N*	%	*N*	%
6	**215**	**86.7**	30	12.1	0	0	1	0.4	2	0.8	248	100
7	5	2	13	5.2	52	21	**106**	**42.7**	72	29	248	100
8	5	2	26	10.5	57	23	**111**	**44.8**	49	19.8	248	100
9	**173**	**69.8**	65	26.2	3	1.2	3	1.2	4	1.6	248	100
10	**150**	**60.5**	75	30.2	15	6	4	1.6	4	1.6	248	100
11	19	7.7	18	7.3	**87**	**35.1**	68	27.4	56	22.6	248	100
12	2	0.8	13	5.2	29	11.7	97	39.1	**107**	**43.1**	248	100
13	15	6	20	8.1	58	23.4	48	19.4	**107**	**43.1**	248	100
14	7	2.8	17	6.9	25	10.1	86	34.7	**113**	**45.6**	248	100
15	5	2	10	4	34	13.7	54	21.8	**145**	**58.5**	248	100
16	1	0.4	9	3.6	47	19	54	21.8	**137**	**55.2**	248	100
17	2	0.8	5	2	26	10.5	65	26.2	**150**	**60.5**	248	100
18	0	0	11	4.4	4	1.6	36	14.5	**197**	**79.4**	248	100
19	0	0	2	0.8	13	5.2	37	14.9	**196**	**79**	248	100
20	0	0	5	2.0	19	7.7	33	13.3	**191**	**77**	248	100
21	1	0.4	5	2	12	4.8	40	16.1	**190**	**76.6**	248	100
22	2	0.8	12	4.8	28	11.3	61	24.6	**145**	**58.5**	248	100
23	0	0	8	3.2	16	6.5	40	16.1	**184**	**74.2**	248	100
24	0	0	3	1.2	13	5.2	40	16.1	**192**	**77.4**	248	100
25	40	16.1	48	19.4	56	22.6	27	10.9	**77**	**31**	248	100
26	1	0.4	8	3.2	22	8.9	50	20.2	**167**	**67.3**	248	100
27	1	0.4	8	3.2	10	4.0	41	16.5	**188**	**75.8**	248	100
28	0	0	3	1.2	15	6	30	12.	**200**	**80.**	248	100

								1		**6**		
29	1	0.4	2	0.8	9	3.6	29	11.7	**207**	**83.5**	248	100
30	1	0.4	8	3.2	84	33.9	58	23.4	**97**	**39.1**	248	100
31	2	0.8	1	0.4	8	3.2	27	10.9	**210**	**84.7**	248	100
32	**106**	**42.7**	88	35.5	11	4.4	15	6	28	11.3	248	100
33	**153**	**61.7**	35	14.1	34	13.7	13	5.2	13	5.2	248	100

Note. Item numbers correspond with questionnaire (see Appendix E). Response options correspond with item 6 to 33 questionnaire options: 1 = strongly agree, 2 = agree, 3 = neutral, 4 = disagree, 5 = strongly disagree.

Results for Section B: General, non-stage-specific involvement.

Participant's responses for the IS related items are outlined in Table 4.2. Item 6 responses suggest that the majority (98.8%) of the participants would like to provide swifter and faster healthcare services to patients. Perhaps, the established IS system (partly developed to improve the speed of service delivery) is not functioning as originally intended and requires redress in order to obtain thorough healthcare service delivery benefits. Item 7 responses also suggest that the majority (71.7%) of participants also denote that laboratory reports are typically not received in the timeous manner anticipated (i.e., within the expected TAT specified in the laboratory guidelines). Conceivably, the IS system may not be utilised as intended and, as a result, reports are being distributed using more historical methods (i.e., hand-to-hand delivery or over the phone). Conceivably, this may have mounted more costs to the company due to repetitive requests of the hard copy of the laboratory reports and/or an increased telephone bills to the Regional Hospital or the company, as a result of repetitive requests of the laboratory results over the phone. This supposition is supported, in part, by majority (64.6%) of the participant's recognition that the traditional messenger or tinker service is inadequate in distributing reports (item 8). By more successfully implementing the IS system, the messenger service could be completely eradicated and receipt of laboratory reports could be improved. The majority (96%) of the doctors and nurses agree that technology can improve healthcare service delivery (item 9). And in addition to that, since there is a high percentage (90.7%) of doctors and nurses, who agree, that the SLRT system portray the most important tool for and can achieve this (item 10). This implies that majority of them agree that the SLRT system is needed to harness the distribution of the laboratory reports within "a brick and a click". However, the participants are mixed in their views of whether the SLRT system is user-friendly (item 11) and the majority (82.2%) of them consider the SLRT system inflexible and difficulty to utilise and access (item 12), and in general, not currently useful to them in performing their functions (item 13). This implies that during post-implementation phase or stage, the SLRT system had never worked as intended due to several reasons, which may have needed a prompt response of IS implementers. For example, post-implementation training, encouragement to use IS and a thorough IS maintenance, evaluation and review from IS implementers (e.g., LIS implementation consultants) to increase the rate of usability, and ultimately, accomplishing the intended objective. Considering the importance the participants have placed on the SLRT system as an enhancer of operations and service delivery at the hospital, there appear to be factors inhibiting the successful implementation of the IS to obtain comprehensive benefits from the

system. Unfortunately item 14 shows that the majority (80.3%) of the participants, who disagree, may have never used this particular IS before. Or they may have used it before, and this may indicate that the SLRT system was not significant in its contributions to superior service delivery at other hospitals, which may suggest that the SLRT system is not a useful tool to improving service delivery in hospitals or that an alternative system is required to obtain the desired or anticipated service delivery improvements. However, negative influential factors that exist at the Regional Hospital in the FS province may have also existed at other hospitals, and may have hindered or hampered its usage (which is an area that requires further studies).

Results for Section C: End-user support services.

Cogitating the participant perceptions regarding support services, there is an absence of end-user support from the IS developers (item 15), there is no apparent help-desk line for communication or the participants are currently unaware of the line (item 16), and they are not knowledgeable about end-user support documents or manuals (item 17). These findings indicate either: (1) support for end users are currently unavailable or (2) the end-users are unaware or have not been informed about the support services available. If support services are in fact available, perhaps the indicated lack of and insufficient pre and post implementation EUT (items 18, 19, and 31) may be a plausible reason for participant indications that support services are generally absent. Participants denoted lack of knowledge relating to various SLRT system functions (e.g., password changes), slow resolution of interface issues, and inability to perform maintenance functions (items 20 and 21) indicate that participants have either not received adequate EUT, or they are presently not receiving the appropriate support services required, or a combination of the two issues are co-occurring.

Results for Section D: End-user involvement in SDLC.

Examining items pertaining to participant involvement in the development life cycle of the SLRT system, the findings indicate that participants were typically not involved in the process (item 22), have not received basic computer training relating to the SLRT system to enable them to teach (e.g., Super-users) others (item 23), and were generally not involved in specifying or developing particular SLRT system's specifications or requirements (items 24 and 26). These findings correspond with the inadequate EUT that participants report, indicating that doctors and nurses, as required operators of the SLRT system, were neither involved in developing the system nor received the training required to efficiently utilise the system. In fact, it appears as though the participants should have been consulted in developing the system, as many consider the system does not meet all mandatory requirements or specifications (item 25). In fact, the participants denoted that they were not involved in the preparatory process (i.e., pre-implementation training) and were not included in the testing of the system following initial implementation (item 27 and 28), indicating that they were not even consulted and their perceptions or suggestions were not considered prior to final implementation. A formal procedure for authorised and documented access has not been provided to participants (item 29), which implies the absence of formal procedures and control (e.g., use of IS agreement policy) of IS end-users. In addition to a lack of consultation in the development, testing, and implementation of the SLRT system, the system did not undergo practical pilot testing (e.g., prototyping) within the hospital prior to implementation in the overall hospital units (item 30). Perhaps, this may provide reasoning for the lack of IS end-user consultation in designing and developing the SLRT system, as the participants were unable to test the product and determine areas for improvement, modification or adaptation. In addition, the majority (84.7%) of participants, who disagree, have never received post-implementation training and the support from the implementers of the SLRT system. These imply that the top

management of the company that have implemented SLRT system, failed to maintain, evaluate and review the system after it has been implemented. The participants also noted that receiving appropriate resources (e.g., training and support services) would improve their engagement and willingness to employ the SLRT system for use (item 32). Perhaps, providing such resources would improve the current inefficient and ineffective implementation of the SLRT system and subsequently rendering faster provision of healthcare service delivery (as they have indicated). In addition, the doctors and nurses suggested that they would have been able to add substantial value to the development and implementation of the SLRT system, if they were initially involved in the overall SDLC (item 33). Clearly, future IS system development and implementation in healthcare domains should involve direct consultation and collaboration with the doctors, nurses, and other appropriate IS end-users.

Inferential statistics

The following outlines the inferential statistics conducted and an interpretation of the findings. In particular, this section discusses the relationship between computed variables (B, C, and D) and differences between specified groups along these variables.

Table 4.3: Means, standard deviations and Pearson's correlations for variables B, C, and D.

Means, Standard deviations and Pearson correlations: Variables B, C, and D.			
Variable	B	C	D
B	-	.49**	.42**
C	-	-	.58**
D	-	-	-
Mean (*M*)	27.38	31.75	48.13
Standard Deviation (*S*)	4.37	4.20	5.79

Note. Variables B, C, and D denote general non-stage-specific involvement, end-user support services, and end-user involvement in SDLC, respectively.
* p< .01
** p< .001

Pearson's correlations

Considering the results in Table 4.3, the Pearson's correlations between IS variables B, C, and D were all statistically significant. The findings reveal that the greater end-user support that is received, the higher the IS end-user involvement is (C and D variables). Additionally, the involvement and engagement in the SLRT system relates strongly to the degree of involvement participants have in the SDLC (B and D variables). Thus, the more individuals are involved in the SDLC of the SLRT system, the more involved the IS end-user will be in utilising the system. Considering that the doctors and nurses were not consulted or involved in the development and implementation of the SLRT system and have not received sufficient support services (Table 4.2), provide plausible explanation for the current underutilisation and inadequate implementation of the SLRT system among the doctors and nurses. The relevant individuals (e.g., the developers and the managers of the SLRT system at the hospital) should seek to provide superior SLRT system support services to doctors and nurses and attempt to involve them in the continuous life cycle of the SLRT system, which may improve the extent to which the doctors and nurses currently use the SLRT system.

Group differences: Student's *t*-tests

Student's *t*-tests were computed to determine whether the degree to which participant's involvement in utilising the SLRT system (variable B) differs according to whether or not they possess a computer based qualification (Yes: $M = 27.5$, $S = 4.12$; No: $M = 27.28$, $S = 4.57$), the gender of the participants (Male: $M = 27.25$, $S = 4.49$; Female: $M = 27.47$, $S = 4.29$), and the occupation of the participants (Nurse: $M = 27.47$, $S = 4.37$; Doctor: $M = 27.10$, $S = 4.39$). The results were not statistically significant, $t_{(246)} = 0.402$, $p = .688$; $t_{(246)} = -.391$, $p = .696$; $t_{(246)} = 0.578$, $p = .564$, in each case, respectively. The findings suggest that, even if computer skills have been obtained, it does not ensure that the SLRT system will be implemented and utilised as intended. That is, training, involvement in SDLC, and support services are required in order to improve or guarantee doctors and nurses will employ the SLRT system appropriately and effectively. In addition, involvement in utilising the SLRT system does not differ according to gender and occupation. Though nurses are more likely to utilise the IS system for communication purposes, it appears as though this is not occurring at the hospital. Thus, even the employees that more likely required engaging and using the SLRT system exhibit an unexpected lower degree of involvement in using the system.
The IS end-user will be in utilising the system. The following chapter provides the conclusions and the recommendations for this particular study, which may be used by the hospital or the company for future IS development and implementation and alternative organisations when developing and implementing an IS similar to the SLRT system.

CONCLUSIONS AND RECOMMENDATIONS

Introduction

Lack of IS end-user involvement in the overall SDLC has manifested as a prevalent issue or factor in SA organisations, and perhaps, this requires a prompt response for improving R&D facilities or institutes. Invariably, the lack of end-user interface with IS and the SDLC of systems has led to many IS project failures in the last few years in SA (e.g., the development and implementation of the IS at the Regional Hospital in the FS province, the FS provincial government website design, and so on). Consequently, lack of IS end-user involvement suggests that IS end-users are not engaging in the development and implementation of the IS. As a result, this study was urged and undertaken to evaluate the development and implementation of the IS at the Regional Hospital in the FS province. This chapter provides the conclusions and recommendation for this particular study.

Findings from the study

In this section, the overall conclusions of this particular study are provided. It outlines the association between findings of the study and the literature review in chapter two. It also provides the linkage between the findings of the study and the primary research objectives as well as research questions outlined in chapter one. Then, following delineation of these elements, this section provides the conclusions to satisfy the research aims and objectives outlined in this study.

Findings from the literature review

In this subsection, the major findings emanating from the literature review of this study are outlined. The literature review in chapter two indicated several main causes that may lead to IS project failure. Some (if not all) are reflected and highlighted in the development and implementation of IS at the Regional Hospital in the FS province. Nevertheless, in order to overcome these causes, the literature review in chapter two indicated that there are several CSFs that can be implemented in order to ensure the successful development and implementation of multiple IS projects.

According to Laudon et al. (2010: 48), the field of MIS strives to achieve the wider IS literacy, which deals with the behavioural issues as technical issues surrounding the development, usability, and the impact of IS employed by the managers and employees in the organisation. For example, looking holistically at TAM indicated in chapter two, clearly this model stresses the issues of the IS end-users towards IS as external variables; such as perceived usefulness and perceived ease of use, which determine IS end-user's attitude towards using the system, behavioural intention to use the system and the actual system use. The findings of this study revealed these external variables as the most prominent factors that have led to IS use failure, and ultimately leading to IS project failure. For example, the doctors and nurses (as IS end-users) perceive SLRT system as useless (i.e., not user-friendly) and find it difficult to use. And therefore, all these IS end-user's perceptions give rise to the negative attitude towards the use of the SLRT system and the lack of actual system use. Nevertheless, the doctors and nurses have positive behavioural intentions to utilise the SLRT system, merely if they can be provided with necessary resources to enable them to utilise the SLRT system.

The MIS study guide (2007: 224) indicates that when IS end-users begin to feel that they have little input into the ISD process during SDLC, it may lead to IS resentment and ignorance of its benefits by IS end-users. IS end-user involvement in the overall SDLC is one way to eliminate these negative external variables (e.g., IS end-user's behaviour or attitude towards the system).

Findings from the primary research

In this subsection, the linkage between the findings and the primary research for this particular study is provided. In particular, it presents a series of statements evaluating the degree to which the research objectives have been fulfilled and it also presents the findings as per the research questions.

The relationship between the findings and the research objectives

Here the findings and the research objectives, which ultimately provides possible conclusions to the research objectives, are discussed. The findings, as they relate to each objective, are outlined below.

Objective 1:

- To examine the extent of IS end-user engagement and implementation of the SLRT system in the Regional Hospital in the FS province.

Examining the extent to which the IS end-users (doctors and nurses) engaged and implemented the SLRT system at the hospital; the findings of this study revealed that participants were typically not

involved in the process of SDLC. In particular, based on these findings, the lack of IS end-user engagement or involvement in the development and implementation of the SLRT system at the hospital implies that;

1. Doctors and nurses (as IS end-users) have not specified necessary IS end-user requirements and specifications, and as a result, the SLRT system does not meets all mandatory end-user requirements and specifications,
2. IS end-users have not engaged in the design of user interface, as the majority of the doctors and nurses feel that they had no control over the design process of the SLRT system to ensure that the system reflects their priorities (specifications) and needs (requirements).
3. And IS end-users were not involved in the initial and the final testing (e.g. alpha or beta testing) of the SLRT prototype.

According to Laudon et al. (2010: 517), IS end-users must have sufficient control over the design process to ensure that the system reflects their business priorities and information requirements, not the biases of the technical staff (e.g., IS analysts or IS designers). Furthermore, the MIS study guide (2007: 224) mentions that keeping the IS end-users involved and engaged in the overall SDLC will produce an effective and efficient IS. Indeed, keeping IS end-users involved will increase usability and reduce resentment or ignorance of the IS. The findings of this study revealed that there was a lack of IS end-user engagement or involvement in the development and implementation of the SLRT system at the Regional Hospital in the FS province.

Objective 2:

- To determine the reasons for ineffective implementation or inadequate use of the SLRT system at the Regional Hospital in the FS province.

From objective 1, it can be depicted that the IS end-users were not included amid the IS stakeholders in the development and implementation of the SLRT system at the Regional Hospital in the FS province. Perhaps, this provides the fundamental reasoning for improper use of SLRT system, which subsequently leads to ineffective implementation of the SLRT system. In retrospect, the doctors and nurses have a negative feeling towards the SLRT system because their perceptions (regarding the development and implementation of the SLRT system) illustrate that there is no apparent SLRT system support services and that they are unable to utilise the SLRT system, and thus:

1. The top management support towards IS end-users appears to be lacking, as the system support services appear to be missing or IS end-users are unaware of the support services available (e.g., 24 hour help-desk line for communication during downtimes),
2. IS end-users were not provided with system's manual to enable them to utilise the SLRT system (e.g., IS utilities) and legal documentation (e.g., EULA),
3. IS end-users are not familiar with the functional features (e.g., password changes, maintenance instructions or schedule and so on) of the SLRT system, because they were never provided with any basic working knowledge of computer applications relating to the SLRT system. In essence, the SLRT system is not currently useful to them in performing their functions and duties relating to healthcare services,
4. IS end-users have not received appropriate or efficient training (e.g., pre- and post-implementation EUT), so they are not knowledgeable about the SLRT utilities.
5. IS end-users were not involved in the pre- and post-implementation processes (e.g., preparatory processes), and it appears as if the implementers of the SLRT system failed to maintain, evaluate and review the SLRT system at the Regional Hospital in the FS province.

Presumptively, these provide reasons for ineffective implementation or inadequate use of the SLRT system at the Regional Hospital in the FS province.

Objective 3:

- To explore the potential healthcare provision consequences associated with inadequate implementation of the SLRT system at the Regional Hospital in the FS province.

Considering high mortality rates being experienced in many regions of SA, the probability may be high that; it is either the doctors and nurses are reluctant and sluggish to execute their tasks or they may be the potential factors leading to this (e.g., improper use of new healthcare technologies or telemedicine, lack of knowledge regarding new healthcare technologies or really people are very ill). Nevertheless, in accordance with the findings of this study (i.e., particularly relating to the development and implementation of the SLRT system at the Regional Hospital in the FS province), the majority of the doctors and nurses would like to provide swifter and faster healthcare services to patients. This implies that the participants may not have been too reluctant or sluggish to perform their duties, and maybe there have been certain influential factors disturbing them to perform their duties. Perhaps, the developed and implemented SLRT system is not functioning as originally intended and simply not fulfilling its objective, and certainly requires evaluation and review in order to obtain thorough healthcare service delivery benefits. In certain instance, this system will however improve the provision of healthcare service and may acts as a vehicle that will drive doctors and nurses to perform their duties in timeous manner. Subsequently, the act of conducting faster healthcare services, as a good healthcare practice, may (or may not) reduce high mortality rate in hospitals in SA.

The findings of this study revealed that the majority of participants denote that laboratory reports have not been received within the expected TAT specified in the laboratory guidelines. Considering this issue, the doctors and nurses are not presently providing faster healthcare service delivery as intended. And therefore, this indicates that the SLRT system may have not been utilised as intended. As a result, this creates the potential healthcare provision consequences associated with inadequate implementation of the SLRT system at the Regional Hospital in the FS province:

1. Laboratory or medical reports are being distributed using more historical methods (i.e., hand-to-hand delivery or over the phone),
2. Additional costs to the company due to repetitive requests of the hard copy of the laboratory reports and/or an increased telephone bills to the Regional Hospital or the company, as a result of repetitive requests of the laboratory results over the phone, and
3. Doctors and nurses claim that the traditional messenger or tinker service is inadequate in distributing laboratory or medical reports thoroughly within the hospital units (wards or clinics).

Nevertheless, as far as the NHS context is concerned, the WHO also urges all the national governments to implement telemedicine successfully as a cost effective tool and a means for providing faster healthcare service delivery. In addition, the majority of the doctors and nurses agree that technology can improve or enhance the provision of healthcare services to patients, and ideally, the majority of the doctors and nurses believe that the SLRT system is needed to harness the distribution of the laboratory reports within “a brick and a click”. In any case, this implies that the laboratory reports can either be available online (a click) or offline (a brick) whenever they are needed. Considering the importance the participants have placed on the SLRT system as an enhancer of operations and service delivery at the hospital, there appear to be factors inhibiting the successful implementation of the IS to obtain comprehensive benefits from the system. Unfortunately, the findings indicated that the majority of the doctors and nurses may have never used and interacted with

this particular IS before. Alternatively, they may have used it before, and this may indicate that the SLRT system was not significant in its contributions towards superior healthcare service delivery at other hospitals. Sceptically, this suggests that the SLRT system is not a useful key tool in terms of enhancing healthcare service delivery in hospitals. Therefore, the SLRT system implementers either evaluate or review an existing IS or a new system is required to obtain the desired or anticipated service delivery improvements. However, negative influential factors that exist at the Regional Hospital in the FS province may have also existed at other hospitals, which may have hindered or hampered its usage.

Conclusions

From the findings of this study, guided by the MIS literature review, it can be concluded that the doctors and nurses were not engaged in the overall SDLC. Consequently, lack of IS end-users involvement in SDLC implies that IS end-users do not engage in the systems specifications and requirements activities. Thus, IS end-users may have not received an appropriate EUT, may have not presented with legal acceptance documentations and other related documentations (e.g., IS end-user manuals), and may have not been supported by the top management in maintaining and sustaining thorough utilisation of the SLRT system. Therefore, it can be concluded that the doctors and nurses (as IS end-users) were not engaged in the overall SDLC and were not involved in the design and implementation of the SLRT system because the SLRT system is not functioning appropriately. Clearly, future IS system development and implementation in healthcare domains should involve direct consultation and collaboration with the doctors, nurses, and other appropriate IS end-users.

The SLRT system is currently underutilised by the doctors and nurses and the specified employees possess inadequate knowledge about the SLRT system. In addition, the employees have received insufficient training, were largely absent from the consultation process when developing and implementing the SLRT system, and continue to receive inadequate end-users support from the developers of the system. Therefore, this study suggests that the main reasons for ineffective implementation or inadequate use of the IS are lack of IS end-user support services, a lack of proper and sufficient EUT, a lack of IS end-users resources, and lack of top management support from the side of the IS developers or implementers.

In addition, even though the doctors and nurses are willing to provide faster healthcare services for the patients, the laboratory results take too long before they reach the appropriate parties. Evidently, the SLRT system is not achieving one of its objectives. Therefore, considering the fact that the doctors and nurses would like to provide faster and swifter healthcare service delivery to the patients, these findings reveal that the potential healthcare provision consequences associated with inadequate implementation of the SLRT system may include the impact of the health and well-being of the patients as doctors and nurses do not receive laboratory reports timeously (in contrast to when the SLRT system function at optimum levels).

Recommendations

Based on the primary findings and the fulfilment of the objectives of the study, the following recommendations are suggested:

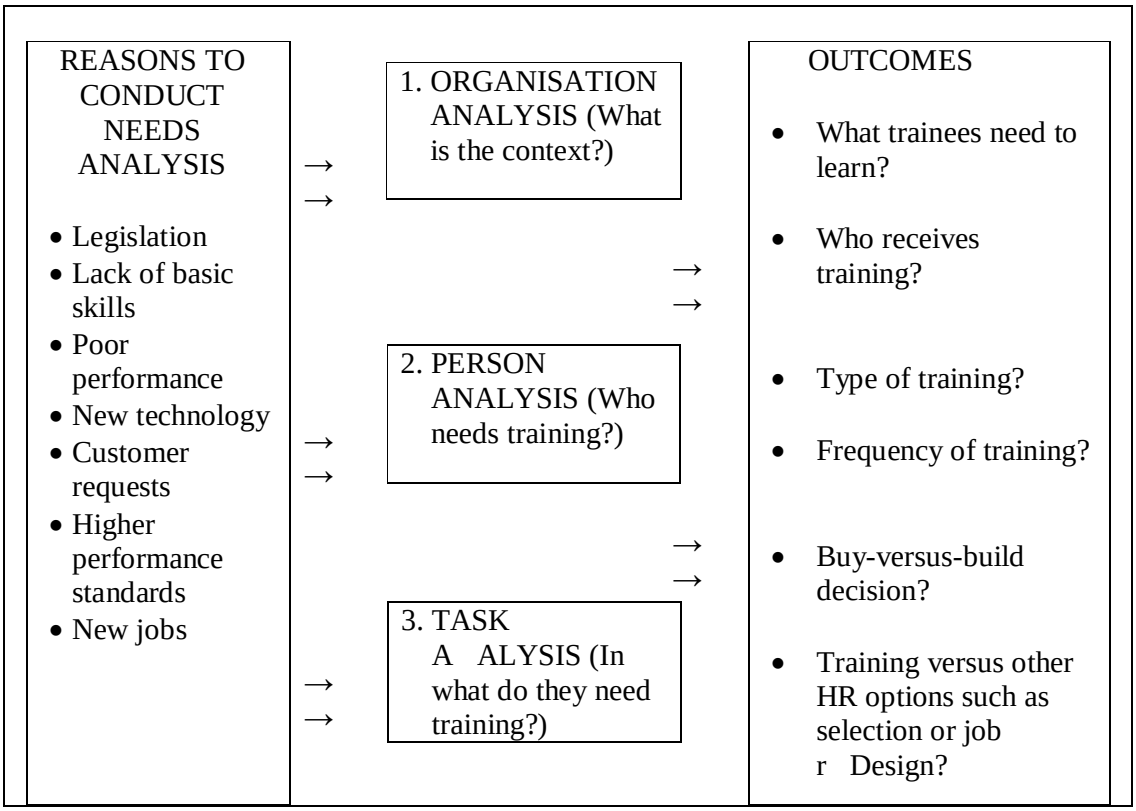
Typically, once an IS has been implemented, IT management requires an evaluation of the success of the IS in attaining the goals. However, it may be difficult to conduct, and many businesses do not

attempt to take anything more than an informal approach to evaluation. However, from the doctors and nurses perceptions, it can be seen that the SLRT system is not working properly or according to specifications. As a result, it is recommended that the top management of the company that have developed and implemented the SLRT system to:

1. Encourage all the relevant stakeholders (e.g., IS end-users, IS analysts, IS developers, IS managers, and so on) to participate and engage all parties in the SDLC. In addition, if possible, incentives such as performance-based management system can be introduced (e.g., Management-By-Objectives approach) to ensure that all stakeholders receive sources of extrinsic motivation. On top of this, they should provide all necessary resources needed for successful development and implementation of the SLRT system.

2. A Training Need Analysis (TNA) may be appropriate to conduct, together with the integration of the HRF in the overall IT SBU. In fact, in order for the company to successfully implement the SLRT system; they should integrate the HRF into the overall business strategy in order to facilitate an effective TNA. TNA is the first stage in the training process and it includes a procedure to determine whether training will indeed address the problem which has been identified. The TNA process begins with the identification of the pressure points (i.e., poor performance, new technology, job redesign and so on), which triggers and prompts the conduction of TNA (see Figure 5.1).

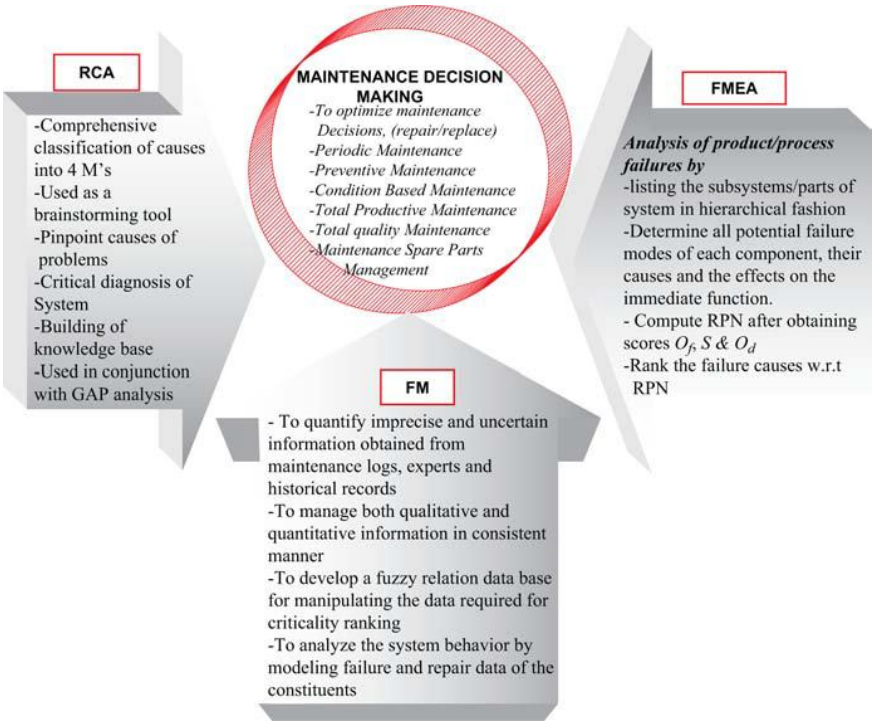
Figure 5.1: The Training Need Analysis process



Source: Adapted from Anonymous (2007a: 143).

3. The use of generic techniques may be useful to evaluate the success or failure of an IS, so a framework for failure analysis and maintenance decisions should be developed (see Figure 5.2). For example, the most widely used methods for failure analysis include RCA, Reliability Block Diagrams, Monte Carlo simulation, Markov modelling, Failure Mode and Effects Analysis (FMEA), Fault Tree Analysis, Six Sigma and Petrinets.

Figure 5.2: Framework for failure analysis and maintenance decisions



Source: Adapted from Sharma, R.K. and Sharma, P. (2010: 66).

3. The IS implementers are encouraged to utilise one of the widely used SDLC models such as Waterfall model, Prototyping, Rapid Application Development model, and Spiral Model during the development and implementation of the SLRT system.

Areas for further research

Considering the findings from the study and some of the delineated limitations, there are number of areas warranting future research:

1. In-depth research on the overall methodology or approach that was utilised in SDLC of the SLRT system (incorporating all the hospitals where the SLRT system was implemented). This may give a holistic overview of the overall strategy that has been implemented to develop this particular system in all the SA public hospitals where this type of IS is installed by the company.
2. Examine whether necessary steps in SDLC were followed efficiently and effectively (e.g., by the IS implementers, IS analysts, IS mangers and so on) in the development and implementation of the SLRT system across national public hospitals.

3. Conduct Failure Analysis (e.g., use of various failure techniques) on the development and implementation of the SLRT system across all the national public hospitals where this type of IS was installed by the company. This may provide specific causes of the IS project failure for the overall IS project (provided that the SLRT system is not functional in all the national public hospitals). For example, use RCA method as a problem solving technique, which is also known as a cause-and-effect analysis. RCA provides comprehensive classification of causes related to 4 M's; that is man (e.g. IS end-user), machine (SLRT system), materials (e.g. IS end-user manual) and methods (e.g. prototyping, training methods) and thus helps in establishing a knowledge base to mitigate the problems associated to ISD process or product (IS) reliability, availability and maintainability. According to Sharma *et al*. (2010: 67), RCA is a common terminology found in the IS reliability literature to eliminate future occurrence of IS failures by pinpointing the causes of problems (e.g. lack of end-user involvement or lack of top management support during stages of SDLC).

Conclusion

The study evaluated the development and the implementation of the IS at the Regional Hospital in the FS province. The SLRT systems have vast number of benefits in the provision of healthcare services, such as reduced paper work and storage costs, reduced malpractice insurance, swifter distribution of laboratory or medical reports, and enables doctors and nurses to manage their workflow more effectively and ultimately improving patient's well-being. However, the development and implementation of the SLRT system at the Regional Hospital in the FS province has been problematic. The findings of this study revealed that doctors and nurses (as IS end-users) were not involved in the process of the development and implementation of the SLRT system at the Regional Hospital in the FS province; thus the IS end-users were not involved in the general non-stage-specific involvement (e.g., inability to access and change passwords on the SLRT system), an absence of IS end-user support services (e.g., an absence IS end-user help-desk line, an absence of SLRT system manual or documentation, an absence of EUT and so on) and IS end-users were not involved in the overall stages of SDLC (e.g., not involved in feasibility studies such as determining IS end-users requirements and specifications, not involved in pre- and post-implementation preparatory processes, not involved in special testing of the SLRT system, not involved in legal procedures of the SLRT system, etc.). As a result, SLRT system fails to deliver the intended objective, as a planned change by the top management of the company.

In addition to the recommendations of this study, it is also recommended that if the IT services are outsourced, the company should evaluate the outsourced development and the implementation of the IS to ensure that IS end-users are involved in the ISD and received necessary resources to enable them to utilise the IS. Additionally to the areas for further research, the roles of the stakeholders that form the IT team, during the development and the implementation of the IS, may be researched. This will provide each and every stakeholder (e.g., IS analysts, IS developers, IS testers, IS client consultant or IS implementation consultant, and so on) with relevant roles and duties (which need to be performed during the stages of SDLC), and how these roles can contribute to the success or failure of IS projects.

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