

A Decision Support System for Investigating the Critical Success Factors of ICT Project Implementation in the Health Sector: A Case Study of the UK National Health Service (NHS)

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Abstract: Despite numerous previous studies on critical success factors (CSFs) on projects, the rate at which Information and Communication Technologies (ICT) projects still fail is very alarming and most especially with respect to their implementations in the health sector. Many authors have alluded the reasons for these to the complexity and difficulties in deciding the factors inherent in implementing even smaller-scale systems in this sector. Therefore, this research develops a decision scheme for investigating the critical factors that are responsible for the successful implementation of ICT projects in the health sector using the UK National Health Service (NHS) as a case study. Empirical data were collected through mixed method research techniques which included semi-structured interviews and survey questionnaires. The collected data were analysed using SPSS descriptive, inferential and analytical statistics. The CSFs were identified and then ranked in order of importance. Furthermore, the barriers to successful ICT project implementation in the healthcare sector were identified and examined. Based on the research findings, solutions were also proffered to these barriers. Finally, an integrated decision model was developed to provide a holistic framework for successful implementation of ICT projects in the health sector.

Keywords: Critical success factors, Healthcare project, ICT Projects, project success decision system

1. Introduction

The health sector is changing dramatically because of rapid technological developments and it is believed that future technological innovation will continue to transform the industry (Thimbleby, 2013). Healthcare is becoming progressively technology dependent and there is an increasing need to meet meaningful requirements in order to work with Health Information and Decision Exchanges (HIDEs) (Hijazi, 2014). It has therefore become imperative for healthcare organisations to have effective IT solutions in order to be able to meet the increasing pressure, demands of the sector and make effective and efficient healthcare decisions (Banova, 2019). However, building and implementing these ICT projects successfully is particularly challenging (Sullivan, 2018) and many authors have attributed the reasons for these to the complexity and difficulties of the factors for implementing even smaller-scale systems in this sector (Kaplan and Harris-Salamone, 2009). The role of technology in healthcare has expanded exponentially over the last decades and Skinner (2017) discussed that the potential to store, share and analyse health information is directly tied to improved technology. The author further stresses that technology usage in the health sector increases the capabilities of the healthcare provider, as well as improving the quality of life of some patients and even saving the lives of others. This

is because the health sector is gradually moving into an age where decision about patients can be attended to remotely and there are many items of evidence that showed that accurate and precise diagnostic decisions have been made through telehealth and telemedicine, even in rural areas (Oderanti and Li, 2018). Therefore, the technological impact in healthcare has moved from just improving patient care to impacting the whole of society (Skinner, 2017).

CSFs are described by Alias et. al (2014) as managed decision factors which have vital and crucial influence on project success. Healthcare ICT, according to Gomes and Romão (2016) are decision tools or structure that amplifies the processing, communication or transmission of information electronically with the aim of improving human health. The authors suggest that ICT is a major instrument in delivering healthcare in public sector. Even though several previous studies have been carried out on theories around CSFs, the context regarding ICT implementation in healthcare remains unclear. Whitney and Daniels (2013) suggest that more studies should be carried out to ascertain the reason why there are varying views on CSFs.

Therefore, this research examines the success of healthcare ICT project implementation based on some identified CSFs which include: Top Management Support (TMS); project management/planning; team (work); user involvement; clear goals; scope; effective communication; risk management; project team and manager's experience; adequate funding; teamwork; project understanding; realistic expectations and talent. It further explores how well these CSFs impact ICT projects, examines whether these CSFs alone could solely affect the successful implementation of healthcare ICT projects, and explores the likely barriers to the implementation of these projects. In addition, the research identifies, ranks and investigates the CSFs that are responsible for the implementation of ICT projects in the health sector using the UK's National Health Service (NHS) as a case study. The purpose of the study is to gain further understanding of "if" and "how" well these critical decision factors could determine the success of projects in the sector.

Covid 19 and ICT Revolution

This research is considered timely at this critical period of Covid-19 in which many healthcare organisations (including the NHS) are being overwhelmed in every area of operations and decisions. The prospect of many economies and the fabric of society have been reshaped by the recent COVID-19 pandemics. As a result of this overwhelming situation, some healthcare organisations embarked on emergency implementation of ICT projects such as Eko Telemed described in Adejoro (2020) and the NHS Virtual consultations in Cavendish (2020) in order to help cope with the challenges. Covid-19 has revolutionised the healthcare sector (including the NHS) and the World Health Organisation suggested that countries should unleash information technology projects for effective decision making to defeat the pandemic (WHO, 2020). It has been predicted, that after the pandemic has subsided, the Covid-19 experience would force many healthcare organisations into looking for rapid implementation of ICT projects in order to revolutionise the sector, fast-track healthcare decision processes and cope in case similar situation arises in future (Cavendish, 2020). The pandemic has highlighted the essential role of information and communications technology (ICT) in connecting people, trading and working – whether working from home or onsite.

1.1 Research Questions

This study will look to answer the following questions:

- What are the most important CSFs responsible for ICT project implementation in the healthcare sector?
- In what ways are the CSFs responsible for deciding the success of ICT project implementation?
- What are the challenges and barriers to making effective decisions for successful implementation of ICT projects in the health sector?
- What strategies do project managers employ to overcome the challenges and barriers to successful project implementation in the sector?

The aim of this research is to investigate those decision factors that are responsible for the successful implementation of ICT projects in the healthcare sector using the NHS as a case study. To achieve this aim, the specific objectives to consider include the following:

- ## 2. Literature Review

The successful implementation of ICT projects in healthcare appears to be a complex decision task and based on review of previous literature, it has been discovered that many studies about the critical success factors of ICT project implementation in the health sector come with different factors (Garousi et. al, 2019). Different lists of CSFs have been identified and some of which have changed over years. Notable contributions were provided by Todorovic et.al (2015) and they include factors such as top management support, project schedule, client consultation, personnel, technical tasks, client-acceptance, project mission and troubleshooting. However, researchers such as Pinto and Slevin in their work on the 'critical success factors in Research and Development (R&D) projects' have different opinions. They stress that it is vital to create key performance indicators (KPIs) as a requisite for project success measurement (Nyandongo, 2018). A varying view by different researchers on the concept of CSFs is highlighted in Table 1. It also reveals the level of inconsistency as different studies are being compared. According to Berg (2011), success can be determined in many ways: employee satisfaction, effectiveness, organisational attitudes, commitments and patient satisfaction. The author therefore suggests that what constitutes CSFs can be challenging.

Table 1: Critical Success Factors Identified in Some Literature

[illegible]

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Troubleshooting	√								√		√
Problem Solving	√								√		
Abilities											
Competent and Motivated project Team	√			√		√	√	√			
Skilled Managers and Designers											√
Time Management	√			√							
Personnel	√										
Monitoring performance and providing Feedback	√	√	√	√	√	√	√	√	√		
Project Performance and Quality		√			√						
Project Ownership	√				√	√	√	√		√	
Planning /Controlling	√		√	√	√	√	√	√	√	√	

Source: (Nyandongo, 2018)

Table 2: Related Work on CSFs for IT/IS Implementation in the Health Sector

Author(s)	Year	Methodology	Research topic	Focused country(ies)
Abouzahra	2011	4-year study	“Causes of failure in healthcare IT Projects”	Saudi Arabia
Axelsson et al.	2011	Literature review, semi-structured interviews and case study	“Best practices and critical success factors for IT implementation”	Sweden
Ghazvini and Shukur	2013	Literature review	“Security challenges and success factors of electronic healthcare systems”	Malaysia
Gomes et al.	2016	Questionnaire and guided interview	“Maturity models and project success in healthcare”	Portugal
Vagelatos and Sarivougioukas	2001	Implementation project	“Critical success factors for IT implementation”	Greece
Hung et al.	2014	Literature review, online survey and regression analysis	“Critical success factors for the implementation of integrated healthcare information systems”	Taiwan
Kaplan and Harris-Salamone	2009	Literature review and workshop	“Success and failure of health IT”	United States
Koumaditis et al.	2013	Literature review and case study	“Critical success factors for the implementation of service-oriented architecture”	Greece and Portugal
Santos et al.	2014	Literature review	“Model for success factors for public health projects”	Portugal

Source: (Schönberger and Čirjevskis, 2017)

The aim of the research by Abouzahra (2011) was to examine the causes of ICT project failures in the healthcare sector by evaluating and assessing the project documentations. The study concluded that the causes of project failures include unidentified risks and stakeholders, unclear scope and communication (Schönberger and Čirjevskis, 2017). On the other hand, the work of Axelsson et. al (2011) analysed the best practice of CSFs in regard to healthcare sector ICT implementation; the results of the research showed that the implementation of an IT/IS system that is based on healthcare best practices solutions is not necessarily successful as a result of some CSFs. The conclusion of the research is that the result is not only peculiar to the Health Information Systems (HIS) but to some other projects in ICT in different business environments (Axelsson et. al, 2011).

Furthermore, the work of Ghazvini and Shukur (2013) was aimed at investigating and analysing the condition of e-health systems security and patient's records privacy at the time (Schönberger and Čirjevskis, 2017). The outcome of the study indicates that the most challenging factor in e-health systems implementation is human error (Ghazvini and Shukur, 2013). On the contrary, the focal point of the research by Gomes et. al (2016) was to develop a structure for various approaches to management that will make ICT investments in the health sector stronger. The study concluded that the use of project management techniques and proper allocation of technology are crucial in achieving successful project results. In addition, the findings of Hung et. al (2014)'s work showed that hospitals should capitalise on organisational fit and the CSFs for a successful IT/IS project implementation. Moreover, the result of the research work of Kaplan and Harris-Salamone (2009) suggests that challenges in implementing ICT projects occur because of sociological, cultural and financial problems. Another related research was conducted by Koumaditis et. al (2013) and was designed to identify the CSFs for implementing service-oriented architectures in the health sector. These CSFs were examined and merged into a conceptual model of the CSFs for implementing service-oriented architecture solutions. The framework was assessed, and the study concluded that the conceptual model could assist researchers in implementing ICT projects that are like it (Koumaditis et. al, 2013). In contrast, Santos et. al (2014) study's focus was on project management success and the need for the development of success factors model for the public health projects. The authors recommended that further research is required to increase the awareness of CSFs in projects implemented in the public health sector (Santos et. al, 2014). Furthermore, Vagelatos and Sarivougioukas (2001)'s research work was about CSFs and the problems identified during the implementation of the systems in a Greek hospital; the project's success factors were also evaluated. The conclusion of the study was that factors that are critical in the implementation of ICT projects are not purely technical but are social and organisational. Lastly, in their study, Doherty et al (2012) argued that the success of ICT projects should be determined by the relevant and significant benefits delivered instead of focusing on the factors that contributed to the success of the projects.

2.3 Research Hypotheses

Based on the identified factors and the interrelationships between each other, the following hypotheses were formulated for further quantitative studies/testing and to provide answers to the research questions:

Fayaza et al, (2017) identified 15 CSFs that are critical for IT projects' success. The result of the study suggested that leadership qualities play an important part in securing top management support in accessing necessary resources. The authors further argued that while effective communication is critical to the success of IT projects in Pakistan, top management support as a whole was not significant in IT project success.

- H1: There is a positive relationship between Top Management Support (TMS) and successful ICT project implementation in the health sector.

Many studies describe TMS as a necessary ingredient when implementing ICT projects (Imtiaz et.al, 2013). The authors suggest that the lack of this factor can lead to project failures. Also, Zhang et al (2003), point out that TMS is very vital in solving disputes, in providing clear directions and in ensuring that critical resources for the project are available. Therefore, when it comes to ICT project success, TMS should be considered a factor on the list of CSFs (Brm, 2020). Thus, hypothesis H1 will answer the question of whether TMS is important in the successful implementation of ICT projects in the health sector.

- H2: Effective Project Management/Planning is positively related to successful ICT project implementation in the health sector.

Project management is defined as the application of methods, processes, knowledge, skills and experience to successfully attain the objectives of specific project according to the acceptance

criteria of the project within agreed specification and guidelines (APM, 2019). On the other hand, project planning establishes what is to be delivered, when it will be delivered, the cost, how it will be delivered and the human resources required (APM, 2020). Several authors have suggested that effective project management and planning are important in successful ICT project implementation (Schönberger and Čirjevskis, 2017). Hence, this hypothesis, H2, is formulated to validate this assumption.

- H3: Clear scope and objectives are positively related to successful ICT project implementation in the health sector.

A project scope is defined as the work required to output a project's deliverables (PMI, 2020). It is described by Jamaledine (2017) as the first step in setting the project's goals and objectives. Project managers plan scope, estimate, schedule, resource, and control activities as a single set of work tasks in managing ICT projects. Thus, the scope is difficult to manage (PMI, 2020). A clear and well-defined project scope and realistic objectives are vital for implementing a successful ICT project and it is among the three most cited CSFs (Imtiaz et.al, 2013). Therefore, hypothesis H3, is created to test this assertion.

- H4: An effective communication strategy by project managers is positively related to successful ICT project implementation in the health sector.

Effective communication is considered as an important factor for the successful implementation of ICT projects (Imtiaz et.al, 2013). It is believed that it helps the stakeholders in understanding the objectives of the project and that this will increase their interest and also make them show more responsibility towards the work (McLeod et.al, 2011). According to Sudhakar (2012), communication is one of the CSFs for project implementation, especially ICT projects. Therefore, Hypothesis H4 is formulated to verify this assumption.

- H5: User Involvement (UI) is positively related to successful ICT project implementation in the health sector.

Successful projects take the user's needs into consideration as the system is being developed; the end users will normally be involved in the development process (Imtiaz et.al, 2013). The authors also suggest that user's interaction helps in understanding the systems better as well as improve user's acceptance. Imtiaz et.al (2013) in their research highlighted that UI is a critical success factor for successful ICT projects. Thus, Hypothesis H5 will test whether this factor is a significant determinant of ICT project success in the health sector.

2.4 Theoretical Framework

A useful perspective to frame the issues at stake is that of the integration of two IS theories; Technology-Organization-Environment framework (T-O-E) (Baker, 2011) and the Delone and McLean information systems (IS) success theory (Delone and Mclean 2003). Based on the results of this research and research evidence from previous studies, these two theories are considered as complements rather than substitutes (Oderanti et.al, 2021). Therefore, their integration has been employed to theoretically underpinned this research.

2.4.1 Technology-Organisation-Environment Framework (T-O-E)

The T-O-E is an organisation-level theory that describes the factors influencing the adoption of technology and also explains that the technique organisations employ in implementing technologies is influenced by three different elements: technological context, the organisational context and the environmental context (Baker, 2011). The T-O-E concepts and constructs underpin this research because they assist in establishing and investigating the factors that impact the implementation of new technology by organisations. They also help in ascertaining the effect of organisational policy and environmental context on the successful implementation of ICT projects in the UK National Health Service (NHS). T-O-E framework was used as a guide

for creating the research questionnaire used for carrying out the survey and for the formulation of the hypothesis. T-O-E constructs' choice was also informed by the framework's explicit relevance to ICT solution as well as their hypothetical rationale. The framework was also adopted because of its vital relationship with technology and organization (Thong, 1999). Furthermore, the T-O-E context is more concerned about people rather than their roles; the theory postulates that people cannot be replaced (Baker, 2011).

2.4.2 Delone and Mclean IS Theory

Delone and Mclean (2003) evaluated the existing definitions of IS success and their proportionate measures and categorised them into 6 groups. A model involving several dimensions was created and the different success categories depend on each other. This was done to produce a more detailed and general definition of IS success that will cover a wide range of viewpoint of information systems evaluation (Delone and Mclean, 2003). The authors further assert that technology use and user satisfaction is influenced by the system quality, information quality, and service quality, in return, individuals and organisation derive net benefits from the use of technology by users (Oderanti et.al, 2021).

2.4.3 Integrated Model of DeLone-McLean and T-O-E Framework

After in-depth studies and an extensive literature review, an integrated framework was derived from DeLone-McLean and T-O-E models and this became a useful tool for underpinning this study and to explore the research questions. The integrated model provides a holistic decision framework for investigating the factors that impact the success or failure of ICT project both during the implementation process as well as at the live (or post-deployment) environment. The T-O-E model has also been studied and adopted by various IS researchers (Mardiana et.al, 2015). In addition, it offers a more holistic perception into the technology adoption factors, challenges, processes, implementation and capacity development (Wen and Chen, 2010). The Delone-McLean IS theory was integrated because it assists in investigating the relationship between the identified factors in the study and the perceptions of user satisfaction and organisational performance while the TOE framework is used because it widely represents the facets that aligns with the factors identified in the research.

The integrated model of DeLone-McLean and T-O-E framework is proposed to address the previous research deficiencies identified above. It is anticipated that the integration of the variables in the Delone-McLean IS theory with the environment and other variables in the T-O-E would produce a robust theoretically meaningful decision framework which could be used effectively by relevant practitioners for ICT project implementation in the health sector. Also, it is expected that the incorporation of service quality into the revised DeLone-McLean model would strengthen the model; this inclusion is because of the development in IS/IT which have shown that it is not just about a product but also about the people that provides the services (Mardiana et.al, 2015).

The proposed decision model is presented in Figure 1 and it consists of both observable and unobservable variables. It is based partly on Delone-McLean Model constructs which comprise of system quality, information quality and service quality variables. It is projected that these features will influence an individual's present and future adoption of technology (infrastructure) or intention to use and user satisfaction (Delone and Mclean, 2003).

System quality in the model refers to the features that an organisation is looking for in its information system. This could include system flexibility, system reliability and ease of use (Petter et al, 2008). Information quality is the characteristics of the system outputs that an organisation desire while service quality talks about the support the systems receives from the IT department (Petter et.al, 2008). System use means how the users (staff and customers) use the system while user satisfaction refers to how satisfied the users of the system are with the end result of the system provided by the IS and ICT department (Petter, 2020). Net benefit on

the other hand is described as the extent to which IS/IT is contributing to the success of organisations, individuals, industries, groups and nations (Petter, 2020).

The research model posits some predictors for technology adoption within the TOE framework. Some of the factors identified in the research within the technological context are ease of use, reliability and flexibility. The organisational context includes top management support and adequate funding while training, external pressures from government and industry were identified within the environmental context. These factors were put together with user satisfaction and perceived benefits for the hypotheses testing.

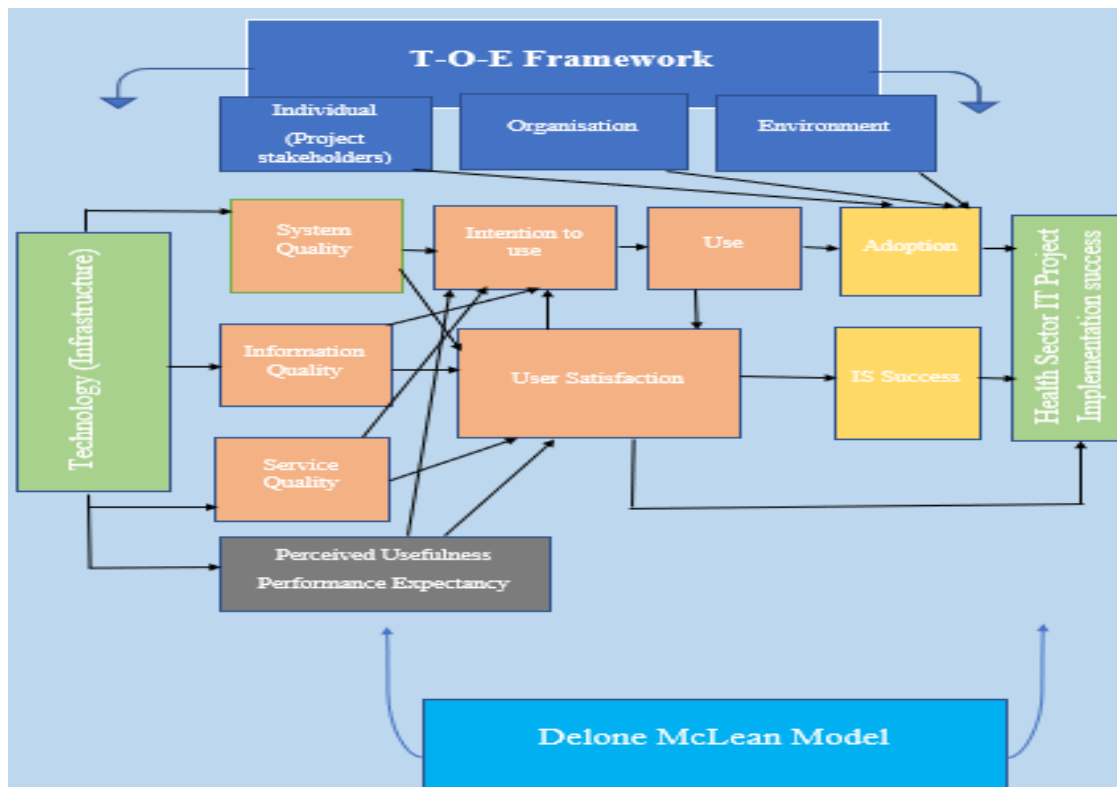


Figure 1: Theoretical Framework for the Research. An integration of T-O-E and DeLone-McLean Frameworks

The adapted integrated decision framework in Figure 1 suggests that successful ICT project implementation in the health sector depends on the technology (infrastructure), individual (project stakeholders), organisation and the system environment. The model also illustrates that the adoption of technology by users is dependent on the system, information and service qualities which are informed by the stakeholder's intention to use the system and eventually the use of the system. Furthermore, it proposes that user satisfaction is derived from the quality of the system, information and service. Users are also satisfied with the use of a system if it is perceived as useful and the performance expectancy is high. It can therefore be opined that IS success/IT project implementation success is dependent on the adoption of technology by stakeholders and the organisation in a user-friendly environment with quality system, information and service which will bring about user satisfaction based on the perceived usefulness and performance expectancy of the project's stakeholders/individuals.

3. Methodology

3.1. Research Design and Procedures

This study adopts mixed method research design. Using exploratory data analysis, both quantitative and qualitative data analysis techniques were employed in analysing the raw

primary data collected using inferential and descriptive statistics. This was used to exploratively perform initial investigations on the collected data so as to discover patterns, to spot anomalies and to test the study's hypotheses. SPSS 27 software was used in analysing the quantitative data collected. Thematic analysis was used to present and interpret the qualitative data from the interviews conducted. Common patterns within the data set were identified, grouped, ranked and hypotheses tested in order to find out if the research objectives were met.

The quantitative technique was adopted in quantifying behaviours, opinions and other defined variables; they are also commonly used for surveys, polls and so on (Saunders et. al, 2012). The technique was considered suitable for this research because the study involved carrying out surveys. The qualitative methods are typically employed in gathering non-numerical data which can be done in a structured, unstructured or semi structured manner (Saunders et. al, 2012). This method was adopted because of its flexibility. It is also a conversational technique that will provide more in-depth information about the problem to be solved (Saunders et. al, 2012).

3.2 Independent and Dependent Variables

The independent variable is the variable that is manipulated or changed by the researcher (Saunders et. al, 2012). The independent variable is the cause while the dependent is the effect. The 12 CSFs identified in this research (see Table 4) are the independent variables while the dependent variable is the ICT project implementation in the health sector. Any change in the independent variables (i.e. the 12 CSFs) is expected to affect the implementation of ICT projects in the health sector.

3.3 Case Study Organisation

The organisation for this study is a large general hospital in the South of England with a large ICT Department. Fifteen top management staff (i.e. $n = 15$) of the ICT department of the General Hospital were interviewed at the premises of the hospital using the semi-structured interview method. Some of the collected data from these interviews were later adopted and further explored in designing the survey questionnaire. Purposive sampling was adopted for the interviews to select only the senior members of staff (i.e. $n = 15$) in the ICT Department of the General Hospital while random sampling was used for the questionnaire application to collect a range of answers from the relevant staff at the ICT Department. The survey questionnaire was designed in a way that it will assist in providing answers to the research questions and test the research hypotheses and it was based on the twelve CSFs identified from the literature review. This research method was considered suitable as the topic requires the examination of causative variables between different types of data (Lowe, 2019).

3.4 Participants

Fifty-eight members of staff (i.e. $n = 58$) of the ICT department of the UK General Hospital participated in the survey which was conducted with the aid of questionnaires (the maximum respondents target, and sampling frame was 65). The participants comprise of ten system analysts, two software developers, three ICT consultants, 19 project managers and the twenty-four unspecified ICT roles. The response rate which was calculated as 89% is categorised as high considering the sample size ($n=58$) used for the study. The analysis of the role breakdown shows that the staff with unspecified roles has the highest percentage (41.4%), 32.8% were project managers, 17.2% were systems analysts, 5.2% were ICT consultants and the software developers were (3.4%). The questionnaires were distributed via emails that contained the link to the questionnaire.

3.5 Measures

The questionnaire consists of 20 questions about the CSFs identified and chosen for the research; all attitudinal questions were ranked using the Likert scale methodology. The raw data was simplified and adapted into the Statistical Package for Social Sciences 27 (SPSS 27) software. The validity and reliability of the raw data was 100% as shown in Table 3 below.

Table 3: Case Summary of Questionnaire

Valid		Cases Missing		Total	
N	Percent	N	Percent	N	Percent
58	100.0%	0	0.0%	58	100.0%
Statistics					
N	Valid				58
	Missing				0

The 12 research variables are effective communication, adequate funding and resources, effective project management, client involvement, competent project team and manager, risk management, top management support, teamwork, project understanding, the project team and the manager's experience, realistic expectation and talent. These variables were rated on a 5-point Likert scale.

4. Methodology and Empirical Analysis

The identified and chosen CSFs for this research were ranked and presented in the frequency distribution Table 4. This ranking validates the second research objectives and the research question on whether these factors could be considered as being equally vital in ICT project implementation success or if some are more important than the others. Results in Table 4 suggest that some CSFs are, indeed, more important than the others. As shown in the table, it was discovered that effective communication is the most critical factor with the highest percentage ranking of 10.6% while talent was the least ranked factor (2.7%).

Table 4: CSFs Ranking

Critical Success Factors	Percent	Ranking
Effective communication	10.6%	1
Adequate funding and resources	9.8%	2
Effective project management	9.7%	3
Client involvement	9.3%	4
A competent project team and manager	9.1%	5
Risk management	8.9%	6
Top management support	8.9%	7
Teamwork	8.8%	9
Project understanding	8.4%	9
The project team and the manager's experience	7.3%	10
Realistic expectations	6.6%	11
Talent	2.7%	12
Total	100%	

Table 4 portrays how the respondents ranked the identified CSFs. They opined that effective communication is the most critical factor with the highest percentage of 10.6%, followed by adequate funding and resources (9.8%). Effective project management is ranked 3rd with 9.7%, client involvement and a competent project team and manager were ranked 4th and 5th with 9.3% and 9.1% respectively. However, talent (2.7%) was ranked as the least factor (12th), realistic expectations is in 11th position (6.6%), the project team and the manager's experience is 10th, (7.3%), project understanding is 9th, (8.4%) and ranked 8th is teamwork (8.8%). TMS and risk management were both ranked 6th with 8.9%.

The research findings suggest that all the identified CSFs would impact ICT project success at the hospital. However, apart from the factors which they were asked to rank, the participants also identified other factors that they believe could affect ICT project implementation at the General hospital that was surveyed in the UK. These are presented in Table 5.

Table 5: Other Identified Factors

Valid	Other Factors	Frequency	Percent	Valid Percent	Cumulative Percent
	Timeliness	2	3.4	3.4	5.2

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Trust policies	1	1.7	1.7	6.9
Research and Development	1	1.7	1.7	8.6
Traceability matrix	1	1.7	1.7	10.3
Lessons learned	2	3.4	3.4	13.8
Accountability	1	1.7	1.7	15.5
Correct selection of suppliers	1	1.7	1.7	17.2
Fraudulent and corrupt practices	2	3.4	3.4	20.7
Change management	3	5.2	5.2	25.9
Systems' reliability	1	1.7	1.7	27.6
Business ownership	1	1.7	1.7	29.3
Effective live data sharing	1	1.7	1.7	31.0
Proper financial costing	2	3.4	3.4	34.5
Clearly defined deliverables	3	5.2	5.2	39.7
ICT support roles and service desk involvement	1	1.7	1.7	41.4
Effective team management	1	1.7	1.7	43.1
Technology update	3	5.2	5.2	48.3
Effective project monitoring	5	8.6	8.6	56.9
Project environment and organisational culture	1	1.7	1.7	58.6
Adequate awareness	1	1.7	1.7	60.3
Understanding patient's/user's needs	1	1.7	1.7	62.1
Client's willingness to explore the projects	1	1.7	1.7	63.8
Clear project schedule	2	3.4	3.4	67.2
Effective project funds management	2	3.4	3.4	70.7
Managers' skills	2	3.4	3.4	74.1
Staff attitude to work and motivation	2	3.4	3.4	77.6
Adequate funds and comprehensive business case	4	6.9	6.9	84.5
Understanding of departmental needs	1	1.7	1.7	86.2
ICT outsourcing	3	5.2	5.2	91.4
Great governance and leadership	2	3.4	3.4	94.8
Clear priorities	2	3.4	3.4	98.3
Consistent team membership	1	1.7	1.7	100.0
Total	58	100.0	100.0	

Table 5 indicates that effective project monitoring (8.6%) and adequate funds and comprehensive business case (6.9%) are the other two most important factors that are responsible for successful ICT project success at the hospital

Some of the possible barriers or challenges to ICT project success as identified by the respondents are as summarised in Table 6.

Table 6: Barriers to ICT Project Success

Valid	Factors	Frequency	Percent	Valid Percent	Cumulative Percent
	Inadequate financial Resources	19	32.8	32.8	34.5
	Changes in government policies and legislations	1	1.7	1.7	36.2
	Work overloads and lack of motivation/Incentives	1	1.7	1.7	37.9
	Not engaging with clinical staff	2	3.4	3.4	41.4
	Lack of technology support	2	3.4	3.4	44.8
	Poor project planning	1	1.7	1.7	46.6
	Maturity of the hospital ICT infrastructure	1	1.7	1.7	48.3

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Project delays	3	5.2	5.2	53.4
User engagement	1	1.7	1.7	55.2
Unrealistic expectations	1	1.7	1.7	56.9
Poor infrastructure and network	1	1.7	1.7	58.6
Lack of effective communication	1	1.7	1.7	60.3
Lack of prioritisation of projects within the Trust	1	1.7	1.7	62.1
Scope creep	2	3.4	3.4	65.5
Third party suppliers	1	1.7	1.7	67.2
Technological updates	1	1.7	1.7	69.0
Frequent changes within ICT projects	1	1.7	1.7	70.7
Unforeseeable political issues	1	1.7	1.7	72.4
Increasing population	1	1.7	1.7	74.1
Unclear project scope	2	3.4	3.4	77.6
Fear of change	1	1.7	1.7	79.3
Misappropriation of project funds	2	3.4	3.4	82.8
Lack of dedicated resource to projects	1	1.7	1.7	84.5
ICT outsourcing	1	1.7	1.7	86.2
Lack of managers' support and involvement	1	1.7	1.7	87.9
High staff turnover	1	1.7	1.7	89.7
Shortage of human resources	6	10.3	10.3	100.0
Total	58	100.0	100.0	

Table 6 reveals that 32.8% (the highest percentage) of the respondents opined that inadequate financial resource is one of possible barriers to ICT project success at the hospital while 10.3% suggests that the shortage of human resources is a challenge to ICT project implementation. Also, 5.2% believes that project delay is a barrier. These are the top three barriers according to the survey conducted.

The participants were also asked to suggest possible solutions to the challenges identified and some of the responses are thematically and statistically summarised in Table 7.

Table 7: Solutions to Barriers

Valid	Suggested Solutions	Frequency	Percent	Valid Percent	Cumulative Percent
	Risk assessment before projects starts	1	1.7	1.7	3.4
	Good communication	2	3.4	3.4	6.9
	Reduction of staff turnover	4	6.9	6.9	13.8
	Reduction of project duration	2	3.4	3.4	17.2
	Adequate planning and progress tracking	2	3.4	3.4	20.7
	More senior management involvement	5	8.6	8.6	29.3
	Good teamwork	1	1.7	1.7	31.0
	Availability of necessary tools for projects	2	3.4	3.4	34.5
	Solving of corruption in the NHS	2	3.4	3.4	37.9
	Employment of skilled and qualified staff	2	3.4	3.4	41.4
	Better buy in	1	1.7	1.7	43.1
	Through scrutinisation of business cases before approval	2	3.4	3.4	46.6
	More investments in projects	2	3.4	3.4	50.0
	Setting realistic timelines and expectations	1	1.7	1.7	51.7
	Proper accountability	1	1.7	1.7	53.4
	More managers' support	1	1.7	1.7	55.2
	Use of Agile management methods	1	1.7	1.7	56.9
	More stakeholders' involvement	1	1.7	1.7	58.6
	Advance preparations for sudden political changes	2	3.4	3.4	62.1
	Updating ICT infrastructure	2	3.4	3.4	65.5
	Effective change management	2	3.4	3.4	69.0
	Adequate staff training	3	5.2	5.2	74.1
	Avoiding scope creep	1	1.7	1.7	75.9
	Approval of realistic projects	1	1.7	1.7	77.6
	Proper budget and forecast	2	3.4	3.4	81.0
	Dedicated ring-fenced time	1	1.7	1.7	82.8

Efficiency	1	1.7	1.7	84.5
Sufficient financial and human resources	5	8.6	8.6	93.1
More engagement from the team	1	1.7	1.7	94.8
Clearly defined objectives and scope	2	3.4	3.4	98.3
Risks monitoring	1	1.7	1.7	100.0
Total	58	100.0	100.0	

Table 7 shows some of the possible solutions to the challenges to ICT project success. 8.6% of the respondents suggests that more senior management involvement and the availability of sufficient financial and human resources will assist in overcoming the barriers. Also, 6.9% opined that the staff turnover should be reduced while 5.2% of the respondents believes that adequate staff training will provide solutions to the identified challenges.

Five of the survey questions were about the influence of some of the identified CSFs on ICT project success at the hospital; their responses to these questions were used to answer the second research question and also help in achieving the third objective of this research. The results are analysed and presented below.

4.1 Top Management Support and ICT Project Success

Analysis of this research findings indicates that 89.5% of the respondents believes that ICT project success is dependent on TMS, 1.7% says it has no influence, while 8.8% were neutral. Based on these results, it can be concluded that TMS has a great influence on the success of ICT projects at the hospital.

4.2 Effective Project Management/Planning and Project Success

68.4% of the respondents believe that this factor is extremely likely to impact ICT project success, 24.6% suggests that it is likely to influence it, 5.3% said it is unlikely to impact project success while 1.7% took a neutral stand. This result suggests that majority of the respondents are of the opinion that this factor will influence ICT project success. Hence, it can be deduced that this factor has a huge impact on project success in the healthcare sector.

4.3 Influence of Clear Scope on ICT Project Success

52.6% of the respondents agree that clear scope and objectives will extremely influence ICT project success, 45.6% believe that it is very influential while only 1.8% says this factor is slightly influential. This reveals that clear scope and objective will impact ICT project success immensely as most of the respondents opined that the influence on ICT project implementation is enormous.

4.4 Impact of Effective Communication on ICT Project Success

57 (98.3%) out of the 58 respondents believe that effective communication has a great impact on the successful implementation of ICT projects at the hospital while one person (1.7%) suggests that it has no influence. The conclusion therefore is that this factor has a significant effect on ICT project success.

4.5 User Involvement's Impact on ICT Project Success

The result reveals that 87.7% of the respondents agree that user involvement impacts ICT project success at the hospital while 12.3% say otherwise. However, since most of the people surveyed believe that this factor is very critical, we can infer that it is very important in ICT project success.

4.6 Other Findings and Analysis

The survey participants were required to rate the hospital's most recent ICT project in relation to the variables in the Delone-McLean (D&M) IS model. Overall, the respondents rated and declared the project as successful when they satisfied the success criteria of D&M IS model. Below is the summary of their responses.

4.6.1 Rating of ICT System's Quality

The findings reveal that 15.8% of the participants believe that the system's quality is excellent, 38.6% rated the system as good while 21.1% believe that it is very good. On the other hand, 12.3% of the respondents opined that the system quality is poor and 12.2% suggests that it is fair. This shows that most of the respondents are happy with the quality of the ICT system and they therefore declared that the ICT system was a success from DeLone and McLean (D&S) IS Model perspective.

4.6.2 Rating of ICT System Information Quality

8.8% of the respondents rated the system's information quality as excellent, 35.1% suggested that the information quality is good while 25.6% believes that it is very good. On the other hand, 7% of the participants suggests that the quality is poor while 23.5% says it is fair. This survey indicates that about 70% of the respondents were satisfied with the system's information quality and therefore rated the project as successful.

4.6.3 Rating of ICT System Service Quality

The research result shows that 18.3% of the respondents rated the system's service quality as poor, 22.8% says it is fair, 21.1% rated the system as good, 22% as very good while 15.8% believe it is excellent. A total of 41.1% of the participants were not happy with the system's service quality while 58.9% are satisfied with it. This depicts that the respondents' opinions are very mixed, therefore the result is not conclusive. Further research might be needed to come to a definite conclusion about this subject.

4.6.4 Rating of ICT System User Satisfaction

19.3% of the participants rated the system's user satisfaction as poor, 22.8% as fair while 19.3% of the respondents rated it as good, 22.8% posits that it is very good while 15.8% are of the opinion that the system is excellent. This result portrays that the opinions of the participants are mixed. A total of 57.9% are satisfied with the IT system while 42.1% are not too happy with it. Hence, the result is inconclusive.

4.6.5 Rating of ICT System Ease of Use

Most of the respondents (54.4%) are indifferent to the question. 29.8% believe it is easy to use, 5.3% suggests that it is difficult to use while 10.5% of the participants opined that it is very easy to use, therefore, this result is inconclusive. This demonstrates the indecisiveness of the respondents; hence, more research is needed to investigate this topic further.

4.6.6 Rating of ICT System's Flexibility

More than half of the respondents (50.9%) were indifferent to the system's flexibility while 28.1% opined that the system is very flexible to use. 5.3% of the respondents believes that the system is not flexible to use, 7% says it is slightly flexible and 8.7% thinks it is extremely flexible. The result indicates that most of the participants are not concerned about the system's flexibility while about 43.8% of the people surveyed thinks the system is flexible. Thus, further research is recommended to explore this subject more as the result is very ambiguous.

4.6.7 Rating of ICT System Reliability

The survey result depicts that 36.9% of the participants were neutral about this subject, 42.1% rated it as reliable while 12.3% believe it is very reliable. On the other hand, only 1.7% of the staff suggests that the system is not reliable and 7% suggests that it is unreliable. This result shows that more than half of the hospital staff (54.4%) thinks that the system is reliable while a minority (8.7%) believes that it is not.

4.6.8 Cronbach's Alpha (α)

The reliability statistics depict that the number of items involved is 17 and the value of Cronbach's alpha is 0.844 which indicates a high level of internal consistency for the scale used in the survey.

Table 8: Cronbach's Alpha

Case Processing Summary			
		N	%
Cases	Valid	57	98.3
	Excluded	1	1.7
	Total	58	100.0
Reliability Statistics			
Cronbach's		N of	
Alpha		Items	
.844		17	

4.7 Hypotheses Testing and Analysis

Five hypotheses were formulated based on the identified CSFs and their interrelationship. These hypotheses were statistically tested, analysed and validated in order to draw inference and conclusion.

H1: There is a positive relationship between TMS and successful ICT project implementation in the health sector.

It is evident from Table 9 that the research findings validate H1. It indicates that TMS influences ICT project success in the health sector.

Table 9: TMS Influence

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No influence	1	1.7	1.8	1.8
	Neutral	5	8.6	8.8	10.5
	Very well	51	87.9	89.5	100.0
	Total	57	98.3	100.0	
	No answer	1	1.7		
Total		58	100.0		

Table 9 indicates that 89.5% of the respondents believes that ICT project success is dependent on TMS, 1.7% says it has no influence.

The Mean value is 2.88, the Standard Deviation is 0.381; this value is low in comparison to the mean value, and it indicates that the individual data values are close to the mean value. Also, the Standard Error Mean is 0.050; this is low, and it implies that it is relatively close to the true mean of the overall population.

Table 10: H1 One-Sample Statistics

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	N	Mean = μ	Std. Deviation	Std. Error Mean
TMS influence on IT project Implementation	57	2.88	.381	.050
No answer	1			
Total	58			

Decision rule for assessing if the test is significant (for $\alpha = .05$)

- If $p \leq .05$, the test is significant (the sample is significantly different than $\mu = 2$) $H_0: \mu \leq .05$ (null hypothesis)
- If $p > .05$, the test is not significant (the sample is not significantly different than $\mu = 2$)

$H_a: \mu > .05$ (alternative hypothesis)

where μ = Mean ranking for the CSF, N = sample size, p = P value, df = degrees of freedom (sample size – 1), t = t-score

Hypothesis 1 testing result

The result of the hypothesis 1 testing reveals that at 95% confidence interval and when the test value = 2, the Mean Difference is 0.8777.

Testing the response of the people who were surveyed against $\mu = 2$ (neutral) using a two-tailed test and $\alpha = .05$, $p \leq .05$

$t(56) = 17.370$, $p = .00$

Table 11: H1 One-Sample Test

	Test Value = 2					
	t	df	Sig. (2-tailed) = p	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
TMS influence on IT project implementation	17.370	56	.000	.877	.78	.98

The p value is .00, this shows that the test is significant, and the null hypothesis is accepted. Therefore, it could be concluded that there is a positive relationship between TMS and successful ICT project implementation in the health sector.

H2: Effective Project Management/Planning is positively related to successful ICT project implementation in the health sector.

This hypothesis is validated by the research findings as evident in Table 12.

Table 12: Effective Project Management/Planning Impact

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Extremely Unlikely	3	5.2	5.3	5.3
	Neutral	1	1.7	1.8	7.0
	Likely	14	24.1	24.6	31.6
	Extremely likely	39	67.2	68.4	100.0
	Total	57	98.3	100.0	
	No answer	1	1.7		
Total		58	100.0		

68.4% of the respondents believes that this factor is extremely likely to impact ICT project success, 24.6% opined that it is likely to influence it while just 5.3% says it is unlikely to impact project success.

The Mean value is 4.51 while the Standard Deviation is 0.966; this value is low, and it shows that the data values are clustered around the mean value. Also, the Standard Error Mean is 0.128; since this value is less than 1, it is acceptable.

Table 13: H2 One-Sample Statistics

	N	Mean = μ	Std. Deviation	Std. Error Mean
Effective project management and planning impact on project success	57	4.51	.966	.128

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No answer	1			
Total	58			

Hypothesis 2 testing result

The result of hypothesis 2 indicates that at 95% confidence interval and when the test value = 3, the Mean Difference is 1.509. $t(56) = 11.793$ and $p = .00$

Table 14: H2 One-Sample Test

	Test Value = 3					
	t	df	Sig. (2-tailed) = p	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Effective project and planning impact on project success	11.793	56	.000	1.509	1.25	1.77

The p value is .00 which means that the test is significant, and the null hypothesis is accepted; effective project management/planning is positively related to successful ICT project implementation in the health sector.

H3: Clear scope and objectives are positively related to successful ICT project implementation in the health sector.

The research findings validate H3 as shown and evident in Table 15. It suggests that clear scope and objectives crucial to ICT project success in the health sector.

Table 15: Clear Scope and Objective Influence

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Slightly Influential	1	1.7	1.8	1.8
	Very influential	26	44.8	45.6	47.4
	Extremely Influential	30	51.7	52.6	100.0

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	Total	57	98.3	100.0	
	No answer	1	1.7		
	Total	58	100.0		

The table depicts that 52.6% of the respondents agree that clear scope and objectives will extremely influence ICT project success, 45.6% believes that is very influential while only 1.8% says this factor is slightly influential.

The Mean value is 3.51 and the Standard Deviation is 0.539; this value is low, and it demonstrates that the data values are close to the mean value. In addition, the Standard Error Mean is 0.071; this value is less than 1, hence, it is acceptable.

Table 16: H3 One-Sample Statistics

	N	Mean	Std. Deviation	Std. Error Mean
Influence of clear scope And objectives on IT project Success	57	3.51	.539	.071
No answer	1			
Total	58			

Hypothesis 3 testing result

The testing result depicts that 95% confidence interval and when the test value = 2.5, the Mean Difference is 1.009.

$t(56) = 14.140$, $p = .00$

Table 17: H3 One-Sample Test

	Test Value = 2.5					
	t	df	Sig. (2-tailed) = p	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Influence of clear	14.14	56	.000	1.009	.87	1.15

scope and	0				
objectives on IT					
project success					

The p value is .00, this shows that the test is significant, and the null hypothesis is accepted; clear scope and objectives are positively related to successful ICT project implementation in the health sector.

H4: An effective communication strategy by project managers is positively related to successful ICT project implementation in the health sector.

The survey result indicates that all the participants are of the opinion that effective communication strategies by the project managers will influence ICT project implementation success in the health sector. These responses validate this hypothesis as indicated in Table 18.

Table 18: Effective Communication Impact

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	57	98.3	100.0	100.0
	No	1	1.7		
	answer				
Total		58	100.0		

Table 18 shows that 98.3% believe that effective communication has a great impact on the successful implementation of IT projects at the hospital.

H5: User involvement is positively related to successful ICT project implementation in the health sector.

This hypothesis was validated by the research findings as evident and illustrated in Table 19. The result suggests that user involvement is critical to ICT project success.

Table 19: User Involvement Impact

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	50	86.2	87.7	87.7
	No	7	12.1	12.3	100.0
	Total	57	98.3	100.0	
	No	1	1.7		

	answer				
Total		58	100.0		

Table 19 reveals that 87.7% of the respondents agree that user involvement impacts ICT project success at the hospital while 12.3% says otherwise

4.8 Summary of Hypotheses Testing and Analysis

Table 20 shows the p-values and t-score for three of the CSFs that were tested in the research hypotheses.

Table 20: p Values for 3 of the Tested CSFs

CSFs	Mean	Std. Deviation	t-score	p-value
Top management support	2.88	.381	17.370	.000
Effective Project Management/Planning	4.51	.966	11.793	.000
Clear scope and objectives	3.51	.539	14.140	.000

The findings in Table 20 indicates that at 95% confidence level, all these CSFs have positive impact on IT project success at the hospital.

- To accept the hypotheses, p must be $\leq .05$. The decision on the hypotheses testing at 95% (.05) confidence level is presented in Table 21.

Table 21: Decision on Hypotheses Testing

	CSFs	p-value	Result	Reject or accept hypotheses
H1	Top management support	.000	$\leq .05$	Accepted
H2	Effective Project Management/Planning	.000	$\leq .05$	Accepted
H3	Clear scope and objectives	.000	$\leq .05$	Accepted

Table 21 reveals the decision on the three hypotheses tested. The p-value for the hypotheses is .000 which is $\leq .05$, therefore all the hypotheses are accepted; the CSFs are positively related to IT project success.

4.9 Correlation Analysis for CSF Rankings

Baccarini and Collins (2003) and Nasir and Sahibuddin (2011) also ranked the CSFs identified in their studies and compared their findings to other rankings obtained from literature review. To further investigate the CSFs responsible for the successful implementation of IT projects in the health sector, it is imperative to compare the CSFs rankings established in this study to the findings of other studies.

Table 22: Comparison of Survey Findings with other CSFs's Rankings

Critical success factors	Current study	(Baccarini & Collins, 2003) – based on 15 CSFs	(Nasir & Sahibuddin, 2011) – based on 26 CSFs
Effective communication	1	3	7 (5*)
Adequate Funding and Resources	2	8	16 (8*)
Effective project management	3	5	4 (2*)
Client involvement	4	6	6 (4*)
A Competent Project Team and Manager	5	13 (10*)	9 (7*)
Risk management	6	6	18 (9*)
Top management support	7	11	5 (3*)
Teamwork	8	9	22 (10*)
Project understanding	9	1	1
The Project Team and the manager's Experience	10	2	22 (10*)
Realistic expectations	11	4	8 (6*)
Talent	12	12	12

Table 22 represents the comparison of this research's CSFs's ranking with the rankings established in the works of Baccarini and Collins (2003) and Nasir and Sahibuddin (2011). It shows the discrepancies in the rankings in the three research.

4.10 Spearman RHO Correlation Coefficient

The Spearman's rank-order correlation evaluates the direction and strength of the relationship between two ranked variables. This was employed in comparing the CSFs' rankings in this research with two other studies. The decision rule for analysing the Spearman's rho correlation coefficient is as follows:

- If the correlation coefficient value is from 0.10 – 0.29 = small relationship
- If the correlation coefficient value is from 0.30 – 0.49 = medium relationship
- If the correlation coefficient value is 0.50 and above = large relationship

Table 23: Spearman's rho correlations analysis using SPSS 27Correlations

			Current study's ranking	Baccarini and Collins (2003)	Nasir and Sahibuddin (2011)
Spearman's	Current study's	Correlation	1.000	.056	.378

Rho	Ranking	Coefficient			
		Sig. (2-tailed)	.	.863	.225
		N	12	12	12
	Baccarini and Collins (2003)	Correlation	.056	1.000	.379
		Coefficient			
		Sig. (2-tailed)	.863	.	.224
		N	12	12	12
	Nasir and Sahibuddin (2011)	Correlation	.378	.379	1.000
		Coefficient			
		Sig. (2-tailed)	.225	.224	.
		N	12	12	12

It can be established from Table 23 that the current study has a small correlation with the research of Baccarini and Collins (2003) because the correlation coefficient is 0.056 (less than 0.30); it is not statistically significant. It has a medium correlation with the work of Nasir and Sahibuddin (2011) as the value is more than 0.30 (0.378). Furthermore, there is a medium relationship between Baccarini and Collins (2003) and Nasir and Sahibuddin (2011); the value is 0.379.

4.11 Kendall's Tau Rank Correlation Coefficient

The comparison between the rankings in these three studies was explored further by using Kendall's Tau rank correlation coefficient. Table 24 reveals the results of the comparison of the three studies analysed previously and the findings using the Kendall's Tau's technique.

Table 24: Spearman's rho and Kendall's Tau-b correlations analysis using SPSS 27

			Current study's ranking	(Baccarini and Collins, 2003)	(Nasir and Sahibuddin, 2011)
Kendall's Tau-b	Current study's ranking	Correlation	1.000	.107	.290
		Coefficient			
		Sig. (2-tailed)	.	.630	.192
		N	12	12	12
	(Baccarini and Collins, 2003)	Correlation	.107	1.000	.277
		Coefficient			

		Sig. (2-tailed)	.630	.	.215
		N	12	12	12
	(Nasir and Sahibuddin, 2011)	Correlation Coefficient	.290	.277	1.000
		Sig. (2-tailed)	.192	.215	.
		N	12	12	12
Spearman's rho	Current study's ranking	Correlation Coefficient	1.000	.056	.378
		Sig. (2-tailed)	.	.863	.225
		N	12	12	12
	(Baccarini and Collins, 2003)	Correlation Coefficient	.056	1.000	.379

Table 24 indicates that the Kendall's Tau technique tends to be more conservative as almost all the different relationships are not statistically significant (they are mostly less than 0.30). The significant difference in this study and the other studies might be due to the selection of sample population and area of research. Baccarini and Collins (2003) opted to use project managers in Australia in their study while Nasir and Sahibuddin (2011)'s work was on the CSFs for software projects and it is also country specific. Even though the analysis shows that some statistical differences exist between the studies, Table 24 illustrates that there were some clear similarities between the findings.

4.12 Interview Data Analysis

Fifteen participants were selected for the interview which took place at the premises of the UK General Hospital chosen for the research. The questions asked were tailored towards achieving the research's aim and objectives. The collected data were thematically analysed, and emerging themes were grouped together. The interview data were extracted from the answers to the questions the interviewees were asked. These responses were transcribed, and some themes were identified as responsible for the critical success factor of ICT Projects in the healthcare sector. The process involves reducing and breaking the data into smaller units whereby salient components, patterns and characteristics were revealed and explored.

Theme 1: CSFs responsible for IT project implementation in the health sector

The interviewees were asked about the factors responsible for the success of the hospital's projects. Majority of the interviewees agree with those CSFs already identified in Table 4. Furthermore, all of them unanimously agreed that user involvement is key to achieving IT project success. For instance, a Project Manager elaborated that:

".... Having good buy in and clinical input is key; we gain the users trust by involving them in the system's testing...."

Other CSFs mentioned include the use of PRINCE2 and/or PMI-PMP methodology and documentation.

Theme 2: Barriers to implementing IT projects at the hospital

The people interviewed gave varying answers to this question; but the major barrier in their view is resources (human and financial). In one of the managers' words:

"... The main thing is getting people to work with you on the project team; clinicians are extremely busy doing their day jobs..."

Another senior project manager said:

".... Even though the business cases are approved, funding is still a constraint. There are too many approved projects going on at the same time but inadequate resources"

Theme 3: How the barriers/challenges are handled at the hospital

The key responses to this question are: putting a good and skilled project team together and getting to know the clinicians that will work on a project before the commencement of the project in order to gain their trusts. One of the senior managers' explanation is:

".... We try and put a good project team together with a good communication plan; we also employ project managers with great interpersonal skills and try to do some background work upfront to buy in the clinicians and other stakeholders...."

Another external contractor emphasized that the barriers are overcome by managing the challenges on a daily basis, being consistent and persistent and by effectively managing the staff.

Theme 4: Reasons for IT project failure in the health sector

All the interviewees are of the opinion that the concept of IT project failure or success is subjective. One of the project managers said that:

".... The NHS is not so good at evaluating IT project success; most of the success stories are not talked about, so the success rate might be difficult to measure...."

Another interviewee who is a senior project manager explained that:

"...IT project success or failure in the NHS or the health sector as a whole cannot be generalised..."

The view of one of the senior managers when asked why IT projects fail in the health sector is as follows:

".... I would imagine it might be the clinical buy in and maybe at times it may be due to the inadequacy of both human and financial resources as well as new technology springing up frequently...."

Theme 5: How projects are referenced in the NHS

This theme was developed as a follow up to one of the interview questions which is about reasons for IT project failures. One of the managers opined that:

"...The NHS is good at sharing information; this helps the different Trusts in implementing their IT projects. Asking for reference sites from people that have implemented the same projects before assist in achieving a good success rate...."

One of the senior project managers agreed to this by saying:

".... The people in the NHS are honest and good at sharing information with each other if asked...."

Theme 6: Importance of lessons learned in IT project implementation

When asked what the interviewee will do differently if they were to implement their recent project again, all of them suggest that they would have to go back to the lessons learned log and take note of all the issues raised in it in order to prevent or avoid the mistakes made going forward. In their view, the lessons learned log is one of the most important logs in any project implementation. A senior manager said:

".... As part of the projects, we have issues, risk and lessons learned logs; these are extremely important for project success..."

Another manager elaborated by saying that:

".... We try and learn lessons from what we did not do well and what we have done well..."

4.13 Summary of Qualitative Research Findings

Table 25: Qualitative research findings' summary

Themes	Summary of findings	Frequency
Theme 1: CSFs responsible for IT project Implementation	The key factor suggested by all the people interviewed is user involvement	15
Theme 2: Barriers to implementing IT projects	The major barrier is resources (human and financial)	15
Theme 3: How the barriers/challenges are handled	By putting a good team together and effective communication	14
Theme 4: Reasons for IT project failure	The majority of the interviewees believes that the concept of ICT project failure or success is subjective	13
Theme 5: How projects are referenced in the NHS	Information about successful IT projects is shared honestly amongst project teams if requested	12
Theme 6: Importance of lessons learned in IT project implementation	The majority of the people interviewed agrees that the lessons learned log helps them in learning from the mistakes made when implementing a project in order to prevent the same issue happening in the future.	14

Table 25 summarises the interview themes and the interviewees' responses. The findings are consistent with the results of the quantitative research. Most of the CSFs identified (such as user involvement and clear scope) by the people interviewed were also recognised by respondents in the survey. Also, the barriers (such as inadequate resources and scope creep) identified in both techniques are coherent with each other. The frequency column in the table represents the number of respondents (out of the total interviewed n=15) that agreed with each theme.

4.14 Research Discussion

Based on the research findings, it is apparent that project managers need to focus on some critical factors in order to successfully manage their projects. The 12 CSFs identified and discussed in this research are project team, the manager's experience and competency, adequate funding and resources, client involvement, project understanding, risk management, teamwork, effective communication, top management support, realistic expectations, effective project management and talent. These CSFs were ranked by the 58 staff that participated in the survey and the five top-ranked ones are effective communication, adequate funding and resources, effective project management, client involvement and a competent project team and manager. The management staff interviewed also agree that these factors are the topmost factors responsible for the successful implementation of ICT projects at the UK General hospital

surveyed. The ranking of these factors confirmed that some CSFs are more critical than the others.

The barriers to ICT project success in the health sector were also identified using both the qualitative and the quantitative methods. Furthermore, the participants in both the survey and the interview were requested to suggest solutions to these identified challenges and the solutions proffered by the staff under both techniques were coherent with each other; these include provision of adequate resources and avoidance of scope creep. The five hypotheses formulated at the beginning of the research were tested and validated using different techniques such as Spearman rho correlation coefficient and Kendall's Tau technique.

The survey participants identified technology, project stakeholders, organisational structure and the project environment as some of the other factors that could affect the successful ICT project implementation at the hospital surveyed. This finding agrees with the adapted integrated decision framework (i.e. Figure 1) which demonstrates that technology adoption by users is dependent on the system, information and service qualities which are informed by individual's intention to use the system and eventually the use of the system.

The research finding reveals that 75.5% of the respondents agree that the system quality will play a major part in their decision to use it, about 70% of them opined that the ICT system information quality is a determining factor in the adoption while about 58% suggest that ICT system service quality will inform their decision to use it. These results validate the conceptual model for this research as adapted from T-O-E and DeLone-McLean frameworks.

In addition, the research findings depict that 57.9% of the respondents suggest that user satisfaction will impact the successful implementation of ICT project in the health sector, 54% believe that the system's reliability is very key to ICT project success, 54.4% opined that the ICT system ease of use will inform the adoption while about 50.9% believe that the flexibility of the system will determine the use.

Finally, to achieve the last objective of this research, a holistic decision framework was developed based on the empirical research results that could assist project managers in implementing successful ICT projects in the healthcare sector as shown in Figure 2.

The top three barriers to ICT project success as suggested by the participants in Table 6 are inadequate financial resources (32.8%), shortage of human resources (10.3%) and project delay (5.2%). Also, effective project monitoring (8.6%) and adequate funds/comprehensive business case (6.9%) were identified as the other two most important factors that are responsible for successful ICT project success at the hospital as illustrated in Table 5. In addition, Table 7 illustrates that more senior management involvement (8.6%), the availability of sufficient financial and human resources (8.6%) are the two topmost solutions identified by the respondents. These variables are represented in the integrated conceptual decision model shown in Figure 2.

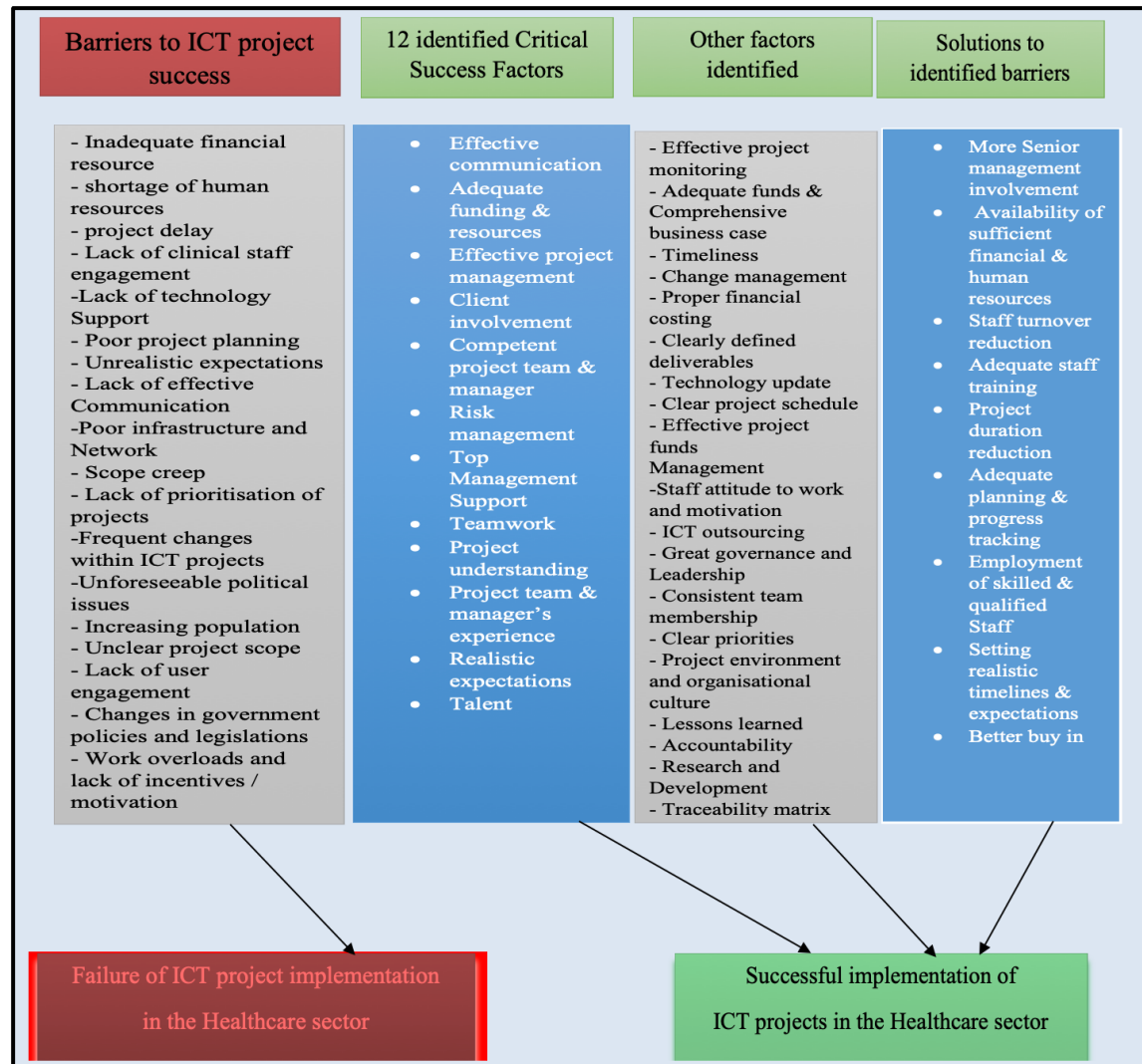


Figure 2: Integrated Conceptual Decision Model for Successful ICT Project

Implementation: This model was created based on the research findings. It posits that the identified barriers in the study could lead to ICT project failures in the healthcare sector while the 12 CSFs, the other factors identified in the study as well as the adhering to the solutions proffered to the barriers identified could lead to ICT project success in the healthcare sector.

4.15 Implication for Practice and Recommendations

This study is expected to stimulate healthcare sector project managers and other stakeholders' interest in understanding the impact of some factors in ICT project success. It is anticipated that the research's integrated decision model developed in this study (shown in Figure 2) would assist the project managers in the healthcare sector in managing and executing their projects with greater success.

The successful implementation of ICT projects in healthcare appears to be a challenging task. Based on the review of the literature, many studies about the critical success factors of ICT project implementation in the health sector have come with different factors. It can also be noted that the implementation of comprehensive information systems in health care practices are very risky and dangerous. Since it has been established that ICT projects are often complex, there is need for excellent management of the different phases throughout the project life cycle. The project planning will involve the determination of duration, milestones, requirements, resources and so on. All these are particularly important in a complex environment, such as the ICT project environment (Dezdar and Ainin, 2011).

The practical significance of this research finding is that it could assist in improving on the techniques for the adoption of CSFs for ICT implementations in the UK NHS and other nations with similar healthcare systems.

5. Conclusions

This research has investigated the CSFs of ICT project implementation and with specific focus on the health sector using the UK NHS as a case study. The theoretical framework for this study was developed from the integration of T-O-E and DeLone- McLean IS theories (Figure 1). The framework proposes that the successful ICT projects in the health sector is dependent on technology, individual, organisation and the environment. It also demonstrates that healthcare technology adoption by users is dependent on the quality of the system information and service. It further suggests that the users' satisfaction is obtained from the quality of the healthcare system, information and service and that users derive satisfaction from the use of the system if it is perceived as useful and has a high-performance expectancy. The developed model supports this study as it assists in investigating the research questions, analysing the survey questionnaires and in achieving the aim and objectives of the research.

In ranking the CSFs according to their criticality, the survey findings revealed that effective communication and adequate funding were ranked as 1st and 2nd respectively while others follow. It was also established that other factors such as clear priorities and consistent team membership are equally important for the successful implementation of ICT projects in the health sector.

Moreover, the possible barriers to ICT project implementation success were identified in both the survey and the interview results; these include unrealistic expectations and scope creep. In addition, possible solutions to these challenges, such as effective risk monitoring and the use of Agile management were suggested.

The research findings are consistent with some previous studies in other project areas; for example, the work of Baccarini and Collins (2003) and Nasir and Sahibuddin (2011). It also reveals the effect of the independent variables (that is, the 12 CSFs) on the dependent variable (ICT project implementation in the health sector). All the participants agree that the identified factors in the study will have a direct effect on ICT project implementation in the case organisation.

Moreover, the research hypotheses formulated based on the identified factors and the interrelationships between them were tested and validated which indicates that these CSFs are positively related to ICT project success.

This research is considered timely because it has been projected that the on-going COVID-19 pandemic will have a massive impact on ICT and ICT project implementation especially in the healthcare sector (WHO, 2020). It is anticipated that new information and communication technology projects will be deployed which will assist in connecting people that are either working from home or are onsite (Oderanti et.al 2021).

The difference between this research and the previous studies is that while previous studies investigated project success and the CSFs during project implementation (i.e. project life cycle) only, this study provides a holistic decision framework for investigating the factors that impact the success or failure of ICT projects both during the implementation processes as well as at the live (or post-deployment or use) environments. Furthermore, unlike previous studies which focused on success and CSFs in general project environment, this study is more specific to the healthcare context due to the inherent nature of the sector which distinguishes it from other general project environments.

Further Studies

Further studies could be carried out using a larger sample size from multiple project teams. This could provide a richer data source and a more definitive conclusion could be reached. In addition, with respect to evaluating the interrelationships between the CSFs, only twelve factors identified from literature were considered. The inclusion of more CSFs could possibly lead to further findings and insights. More research could also be carried out using the success factors identified in this study in ICT projects in other industries. Different data collection methods could also be employed to investigate more or alternative CSFs. Furthermore, the possibilities of using different data analysis techniques such as exploring the relationship among the CSFs using fuzzy-set qualitative comparative analysis (fsQCA) could possibly provide new useful insights in this research area.

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