Evaluating the quality of Electronic Health System at Helene Franz Hospital in Limpopo Province

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Plagiarism Declaration

Declaration

Hereby I, Ngoasheng Choene Agnes, declare that Evaluating the quality factors affecting the Electronic Health System at Helene Fran Hospital is my own original work and that all sources have been accurately reported and acknowledged, and that this document has not previously in its entirety or in part been submitted at any university to obtain an academic qualification.

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Signature _____

Approved by

Supervisor name   Supervisor name

Main Supervisor   Co Supervisor

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Abstract

The healthcare facilities are faced with the challenge of promoting, maintaining, restoring, and improving the quality of healthcare services for the citizens of South Africa and neighbouring states which result in a healthy society. This is as a result of changing patterns of diseases, and high demand resulting from free services as well as high mortality and morbidity. This requires the Electronic Health System that is effective and efficient in providing healthcare service. The systems should be able to provide decision-makers with real time information for planning, budgeting, resources allocation, development of programmes etc.

The goal of this study is to evaluate the quality of the electronic system utilized in Helene Franz Hospital, looking at its effectiveness and efficiency in providing services in terms of system quality, information quality, and service quality. The purpose of evaluating the electronic health system is to ensure that problems are monitored efficiently and effectively and that recommendations are included to improve the quality.

A quantitative research method in this study adopted to address the objectives of the study. It deems relevant because of the significant amount of data and feedback it provides, and the fact that it easily accessible to the participants and it is not costly as well. A questionnaire was designed for data collection.

A descriptive analysis of the data was carried out and was used to produce the summary of the data. Analysis of variance was done through ANOVA to relate and determine the relationships between the data. In this study Cronbach's Alpha was used to measure the reliability, that is, how closely related a set of items are as a group. The T-testing was used to determine if there is a significant difference between the means of two categories and in this study the two categories here is referring to female and male to which may be related in certain features.

The results were grouped into three main categories namely, Service Quality, System Quality and Information Quality. It was discovered in the study that there are factors affecting the electronic health system on Service Quality, Service Quality and Information Quality in Helene Franz Hospital. The next chapter presents the research findings and discussion of the study.

Keywords: Service Quality, System Quality, Information Quality.

work possible, and for his significant support, patience, and enthusiasm. I have gained priceless knowledge and experience through him. It was an honour for me to work under his professional supervision.

My heartfelt gratitude also goes to the Management of Helene Franz Hospital and staff at large for providing me with the necessary information required for the completion of this study.

I would also like to give special thanks to my family for their continuous support and understanding when undertaking my research project.

Above all, I would like to thank the Sovereign God for the protection, wisdom, understanding and strength to face all conditions.

Dedications

I dedicate my thesis work to my beloved family and a special feeling of appreciation to my loving mother, Maria Ngoasheng who urged me to pursue my studies. My sister, Pheladi; my brothers, Hlagala, Mathabatha, and Moraswi; and my sister – in-laws, Mokgaetjie, Phuti, and Kwena for the support they offered to me throughout my study life.

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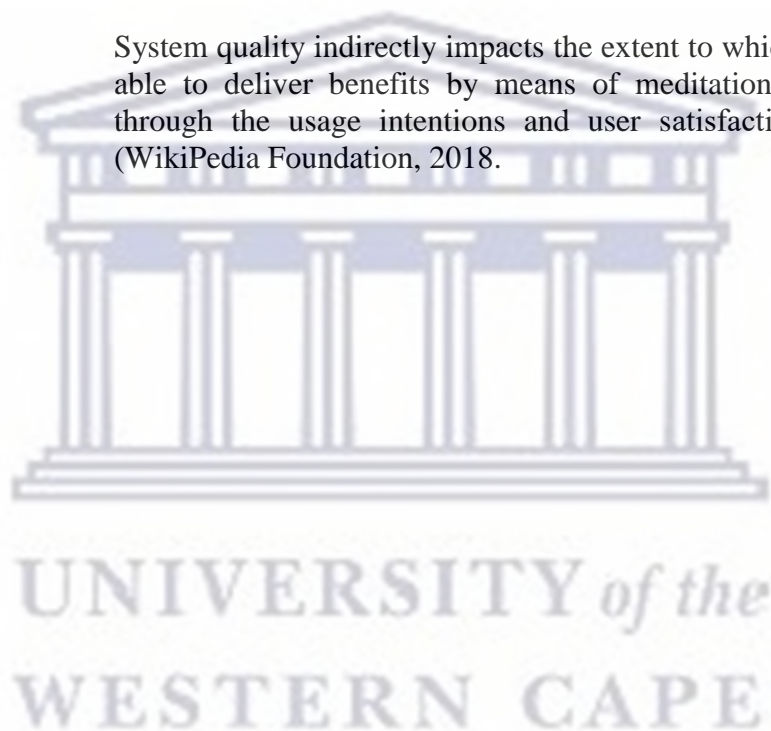| Electronic Health Systems	The digital information systems of Clinical and Administrative data. It enhances the safety, quality, and efficiency of hospital care provision, but realising these benefits is heavily dependent on system optimization (Creswell, KM. and Sheikh A., 2017).
Information Quality	Information quality refers to the quality of the information that the system is able to store, deliver, or produce, and is one of the most common dimensions along which information systems are evaluated." WikiPedia Foundation (2018).
Service Quality	"Service Quality (SVQ) is concerned with the overall support delivered by the service provider of technology" (Almrashdeh, 2011).
System Quality	System quality indirectly impacts the extent to which the system is able to deliver benefits by means of meditational relationships through the usage intentions and user satisfaction constructs". (WikiPedia Foundation, 2018.

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1. CHAPTER 1: INTRODUCTION AND BACKGROUND OF THE STUDY

1.1 Introduction

Information technologies play a vital role in healthcare delivery and help address the health problems and challenges faced by clinicians and other health professionals (Campanella, et al., 2015). I also acknowledged what Middleton et al. (2013) mentioning that in US there is a Federal Public Policy encouraging the adoption of the use of health information technology (health IT) in order to address health issues. For example, HITECH regulations 1 within the American Recovery and Reinvestment Act 2 aiming to provide incentives for both public and private health facilities to the use health IT. Another initiative in the US, which is the Health Insurance Portability and Accountability Act of 1996 (HIPAA) making ensuring that all the healthcare institutions adopt the national uniform standards for electronic transactions related to health insurance enrolment and eligibility, health-care encounters, and health insurance claims; for identifiers for health-care providers, payers and individuals, as well as code sets and classification systems used in these transactions; and for security of these transactions (German, et al, 2001)

In South Africa, the eHealth strategy was established in 2012 which requires health information system be used in order to strengthen the public health care system in the country. The current situation in South African public health facilities is that patient data (that is vital signs, temperatures, progress reports, history, etc.) is still manually recorded in the patient's file, while data required for monitoring and evaluation purposes is hand written by the nurses in registers e.g. demographic data, diagnosis etc.

The aggregated data is the one that is captured into electronic health information systems for analysis (Wright, O'Mahony, and Cilliers, 2017). In 2011 the Department of Health developed a policy; the District Health Management Information System (DHMIS), which guides the collection and analysis of the routine data from all hospitals, health centres and clinics nationally. This function is achieved by the use of District Health Information System (webDHIS) whereby the aggregated data is captured into on the monthly basis, which is used for planning, decision- making, budgeting, resource allocation as well as monitoring and evaluation of the development programmes.

The National Department of Health (NDOH) established a National Committee to develop a strategy towards a National Health Information System for South Africa (NHIS/SA) in 1995;

with the aim of developing and monitoring national health information system strategy which would guide the development of a national health information system countrywide. Its objective was to provide information for health managers and health workers. The committee identified patient care and financial information systems as crucial for health care management in the country.

In response to the national strategy and in recognition of provincial need, in 1998 the Northern Province started to implement an integrated computerised Hospital Information System (HIS) in its 42 hospitals. As for the clinics, the HPRS (Health Patient Record System) was introduced which is an electronic register of patients through which the gathered information enables the health sector to track patients at all levels. Hospital Information System (HIS) was one of the restructuring strategies in the Northern Province (Mbananga, Madale, and Becker, 2002). The objective of the paper is evaluating the quality of an electronic health system at Helene Franz Hospital in Limpopo Province.

1.2 **Background of the study**

This study is anchored in the context of Helene Franz Hospital, one of the 45 hospitals in Limpopo Province. Helene Franz Hospital is situated in Capricorn rural District under Blouberg Local Municipality, and provides health services to approximately 194435 patients, the previously disadvantaged population in Limpopo Province. It also covers Molemole, Vhembe and Waterberg Municipalities, including the neighboring states namely, Zimbabwe and Botswana. The hospital has 149 approved and 133 active beds to render health services to its patients. It also provides community outreach programs and distributes medications to 23 Clinics and 1 Community Health Center. Furthermore, Helene Franz Hospital has in total 425 employees comprising of Clinicians and Administrative staff.

Currently, the hospital using both paper-based and different Electronic Health Information Systems to capture and recording the necessary information from patients which overlap into each other. The manual system has been there ever since the existence of the hospital and the electronic system was introduced in 2000, in order to capture the patient visits, demographic data, admission, discharge, diagnosis and transfer out and so on.

The patients at Helene Franz hospital get registered in eHIS (Electronic Health Information systems) by the Clerks and once they are provided with their own folders, they go to the Nurses for vital signs and the Medical Doctors for examinations; it is that the patients either get

admitted or referred to other clinics (e.g. Physiotherapy, Speech and Audio, Optometry etc.) or Pharmacy for collection of medications.

On the other side, admitted patients go to the wards whereby they are recorded in the registers by the Nurses. Information was captured in the system (eHIS) by the Ward Clerks with addition of bed allocation and ICD10 codes which are not captured in the registers.

As for the capturing of aggregated data, the webDHIS (District Health Information System is used to capture data daily.

The other system which used is RX- Solutions for Pharmaceutical services. As for the management of HIV/AIDS patients, we use the system called Tier.Net. It was approved in 2010 aiming at collection, capturing, and analyzing of data on patients enrolled on the ART. The NHLS (National Health Laboratory Service) is a private company which caters to the hospital regarding the patients' tests. All these systems are not integrated but operating in silos.

1.3 Research Problem Statement

The study originated from several electronic health systems used in the hospital such as eHIS & IBA, RX solutions, NHLS, Tier.Net, webDHIS, Radiography and the NHLS. These systems are not integrated to provide a smooth health service to patients. The institution finds itself with challenges such as high complaint rate, decreased patient satisfaction rate, and increased patient waiting times, litigations, missing of patients' files and audit queries as a result of the electronic health systems which are not functioning as expected. This has a negative impact on service delivery, especially patient care, and it creates a bad image of the hospital in the communities it is serving.

In their study, Wright, O'Mahony and Cilliers (2017:6; 8, 9, and 11) on the Electronic Health Information Systems for public health care in South Africa: a review of current operational systems, it was mentioned that "there is a lack of integration between the various systems identified and this makes it difficult to use the systems for patient-centric care. However, there is a beginning of the integration of systems in the Western Cape which links a unique patient identifier module to a master patient index that can be interfaced.

The unavailability and inaccessibility of the information for the patients and doctors electronically result in long waiting times for the folders, blood results, x-ray films, etc. depending on the inflow. Such leads to a decreased client satisfaction rate, increased complaints etc. Also, the availability and accessibility of health information electronically are vital,

especially for patients who are referred to tertiary hospitals for operations and so forth. Such delays cost patients because they would not get beds in the tertiary hospital where there are specialists, for example, orthopedic patients who need to be operated on. This has already caused the Department of Health to be in debt as a result of litigation over the alleged maltreatment of patients by health professionals. It is the responsibility of the health sector to improve patient care by providing patient information within and between hospitals, but as long as the systems are not integrated, it remains a challenge.

The missing of manual medical records (folders/files) is at an alarming rate and that affects patients negatively since their histories are vital. Some folders are stolen by the patients themselves, which is the available electronic system that is fully functional. It was going to reduce that because patients would not have to move the files from one place to another; because all the systems were going to pick up the patients as and when they get registered at the Reception.

Some of the authors, such as Menachemi and Collum (2001:48- 49) and the Queensland Government (2016) depicted the advantages of an electronic system, which they call Electronic Health Record that clinically improves quality of care and reduces medical errors. At an organizational level, it improves satisfaction among patients and clinicians, and financial and operational performance. It also helps at the financial level, whereby organizations can back up records and keep them safe in case of fire, theft, and floods. It is easy to generate orders, invoices, debtor reports, financial statements, employee pay records, and inventory reports. Efficient way to keep financial records and requires less storage space. Helps you record business transactions, including income and expenses, payments to workers, and stock and asset details. At the societal level, it helps in conducting research and achieving improved population health. It is easy.

The culture that was cultivated in health facilities, including Helene Franz Hospital, is that of a manual system which makes service delivery deteriorate and does not yield the desired result in the healthcare sector.

The high demand for medical information compels health facilities to use the electronic system in the sense that it supports data analysis, gives a variety of views on data, and it helps in decision support, easy electronic data exchange, and sharing care support (e.g. Telemedicine), support of structured data entry and simultaneous access of data from the

multiple locations. As such, both systems seem to be working for the hospital even though the data contained in them is not accurate and complete and one cannot rely on one system completely.

Goldschmidt (2005) in Ben-Assuli et al. (2013:2) indicated that the healthcare sector has invested heavily in IT in recent years to enhance medical decision-making and increase its efficiency through improved medical processes and the use of integrative and interoperable electronic health record (EHR) information systems (IS). Dogac 2012; Waegemann 1996 (in Ben-Assuli et al. (2013:2) went further to show the advantages of IT, that the use of EHR IS enables the Physician to consult medical information required for critical decision-making infrequently Ben-Assuli et al. 2012 (in Ben-Assuli et al. 2013:2).

The point that the study wants to show here is that if all the systems that are used in Helene Franz Hospital were integrated, things would be better for the physicians, nurses as well as patients in the same way that was mentioned above.

Main research question

What are the factors that influence/affect the quality of Electronic Health Systems at Helene Franz Hospital?

Sub-research Questions

a) What are the factors affecting the Information Quality of Electronic Health Systems in the institution?

b) What are the factors affecting the Service Quality of Electronic Health Systems in the institution?

c) What are the factors affecting the system quality of Electronic Health Systems in the institution?

1. **Research Main Objectives**

(a) To explore factors that affect the quality of Electronic Health Systems in the institution.

Research sub Objectives

a) To investigate Information Quality factors affecting Electronic Health Systems in the institution.

b) To investigate Service Quality factors affecting Electronic Health Systems in the institution.

c) To investigate System quality factors affecting Electronic Health Systems in the institution.

1.6. The scope of the study

The study was conducted in Helene Franz Hospital with different sections utilizing a purposeful sampling method to choose what needs to be known and setting out to find people who can and are willing to provide the information by knowledge or experience. This involves the identification and selection of individuals or groups that are capable and well-informed about the subject of interest. In addition to knowledge and experience, the participants would also be considered based on the availability and willingness to participate in the study, and the ability to communicate experiences and opinions well in a thoughtful manner.

1.7 Significance of the study

The study is significant because, through its findings and recommendations, the health issues will be addressed. For example, long waiting times, client satisfaction rates, litigation and missing files. The study would contribute to the body of knowledge on the use of electronic health systems. The study would also open doors for future researchers to perfect and enlarge studies into the electronic health systems utilized in public health facilities.

1.8 Study limitations

The limitations of this study were the constant interruption of electronic systems as a result of power failure, unavailability of the network, and load shedding. The delay as well in terms of getting assistance from the services provider (SITA) to attend to systems queries after calls are logged. A lower response rate in the sample was limited. The other limitation was accessing the staff since some were working night shifts and some were off duty.

The area of confidentiality also affected this study since it is about patients' information which the department has to secure. The other area of concern is that of the copyright act which might restrict the researcher, from acquiring some material to be used in the study. The case study was adopted but was not the representation of all South African hospitals as it focuses only on one hospital, which is Helene Franz Hospital. Though it might be similar to other district hospitals in South Africa, it excludes urban areas since the hospital under study is located in a deep rural area, 118 kilometers away from the city.

1.9 Layout of the dissertation – Chapter outline

This section provides a summary of what each chapter entails as they appear in the study.

In Chapter 1, the study is introduced indicating the status of the electronic health systems globally and in South Africa, specifically Limpopo Province, where Helene Franz Hospital is the area of study. The background of the hospital was explained and its status on electronic health systems. The broad problem that informs the rationale for undertaking this study was explained as well as the main and sub-objectives.

Chapter 2 involves a literature review that explains the theory of electronic health systems. The study adopted the proposed Electronic Health System Quality Model in which the three contrasts, namely, Service Quality, System Quality, and Information Quality, were fully discussed.

In Chapter 3, the research methodology was discussed. This study adopted the concept of research onion proposed by Saunders et al, (2016:33) which explains the six layers, namely, philosophy, approaches, research strategy, choice of methods, time horizons, data collection techniques, and procedures and analysis. Positivism as one of the philosophies was preferred in this research and was also discussed. The deductive approach was considered in this study to be the most suitable strategy for answering the research questions of this study and was discussed. The strategies such as case studies and surveys were discussed and used in this study.

On methodology, this study adopted the mono-method, which is a quantitative method and was fully discussed. On time horizon, this study adopted the cross-sectional study, and lastly, techniques and procedures were also explained.

Chapter 4 discusses the research results. It is composed of data that has been collected to make this study a success. Data has been collected from staff in various departments (CEO's Office, Information, and IT Management, Clinical, Nursing, Finance, HRM, HRD, HRP, PMDS, Records Management, Pharmacy, NHLS, Radiography, and Quality Assurance) through the use of questionnaires. The study included demographic variables such as age.

For example, those that request medical records for Road Accident Funds, litigations, social grants, and others.

gender, education, and the department in which the respondents are discharging their duties, as well as quality variables such as service quality, system quality, and information quality.

Chapter 5 involves the discussion and interpretation of the findings, contribution to the body of knowledge, shortcomings, areas of future research, and conclusion.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

This section reviewed both previous and current literature on the factors affecting the electronic health system. The literature will be reviewed based on which dimension/contrast such as Service Quality, System Quality, and Information Quality will be discussed.

2.2.1 Service Quality

Gronroos 1982; Lehtinen and Lehtinen 1992; Lewis and Booms 1983; Sasser, Oslen, and Wyckoff 1978 (in Parasuraman, Zeithal, Berry, fall 1985:42) denote that there is not much literature on service quality, but just a few writings which suggest three underlying themes namely: 1) Service quality, is more difficult for the consumer to evaluate than goods quality, 2) service quality perception result from a comparison of consumer expectations with actual service performance, 3) quality evaluations are not made solely on the outcome of a service; they also involve evaluation of the process of service delivery.

Parasuraman et al. 1988 (in Anjum and Aftab, 2016: 510) stated that the most ordinarily utilized meaning of service quality (SQ) is the differentiation that consumers make between their desires and judgments about the services they receive.

Anjum and Aftab (2016:509) conducted a study of factors affecting Service Quality and Customer Satisfaction in the Telecom Industry of Pakistan. Their objective was to find if there is an association between service quality and customer satisfaction and to evaluate the impact of service quality dimensions on customer satisfaction in the telecom industry of Pakistan.

The results showed that, indeed, service quality has significance in customer satisfaction. They further noted that the result could be useful to the management to improve their service quality because customers not only add loyalty but also improve the reputation of the company. Therefore, service quality must be considered as the priority at any cost for the survival of the company. This study discussed service quality based on customer satisfaction and customers here refer to the patients and other clients requiring medical assistance.

Service quality is normally measured by the SERVQUAL model developed by Parasuraman et al. 1988 (in Anjum and Aftab 2016: 512) for measuring customer perception, wherein a five-dimensional model of service quality which includes reliability, empathy or competence of staff, responsiveness, tangibles, and communication etc. as the instruments for measuring (SQ) was recommended. The dimensions are discussed below:

• Reliability

According to Armstrong, 2012 (in Anjum and Aftab 2016: 512), reliability is the ability to provide services to the customers reliably and precisely wherein the company and staff can respond timeously to the needs/ requests and queries of their customers as expected. Toosi and Kohonali, 2011 (in Anjum and Aftab 2016: 512) mentioned that there should not be delays in terms of responding to queries about services and products since there are essential issues. They went further to say that some companies offer online support wherein customers are provided with instant solutions to their queries. Parasuraman et al. (in Pakurár, et al., 2019:5) reliability is when the organizations perform a service correctly the first time; such organizations are striving to fulfil promises and pay attention to the results. Studies by Lam (in Pakurár, et al., 2019:5) ranked reliability as the highest dimension of the service quality model.

• Assurance

Assurance is defined as the knowledge and good manners or courtesy of employees in an organization. 'The assurance dimension of service quality refers to employees' competence, knowledge and courtesy, and the ability to build bridges of trust with customers. Pakurár, et al. (2019) also share the same idea that assurance has been defined as employees' courtesy and knowledge, and their capacity to transfer confidence and trust to customers. It also means keeping customers informed in their native language and listening to them, regardless of their educational level, age, and nationality. Parasuraman et al. (1988) state that 'assurance indicates the attitudes of the employees and their behaviour, the staff's ability to provide friendly, confidential, courteous, and competent services'.

• Tangibles

Parasuraman, Zeithal, and Berry, (1985:47) mentioned that tangible includes the physical evidence of the service such as physical facilities, appearance of personnel, tools, and equipment used to provide services. It also includes a physical presentation of the service, such as a plastic credit card and bank statement.

It is the appearance of the physical facilities, equipment, personnel, and communication materials, that, in some instances, customers develop their perception of service quality and compare the physical equipment with the services provided. Castle (2008) described the tangibles not only as objects but also the appropriately dressed staff and a comfortable and attractive environment for all contributes to the tangibles of service delivery as well as branded and visually appealing materials associated with the service.

• Empathy or competence of staff

The interaction between customers and employees is referred to as empathy. It is also about the care and individualized concentration that the company is giving its customers, Armstrong, 2012 (in Anjum and Aftab 2016: 512). Gbadeyan and Gbonda, 2011 (in Anjum and Aftab 2016: 512) proposed that for companies to attract customer care should be a key determinant and also fulfill variety in the structure of the service product that fulfils their wants and needs in the marketplace.

Kang and James (2004: 267) refer to it as the interactive quality, which involves interaction, a two-way encounter between the service provider and the customer, including both automated and animated interactions.

• Responsiveness

It is about the readiness and the willingness of the employees to provide services for their clients. For example, in the hospital, setup is about the retrieval of patients from time to time from the reception, taking of vital signs by the nurses, assessment by doctors, and collection of medication from pharmacies, as well as the speedy admission processes in case the patient gets admitted for further management. The provision of services on-time reduces patient waiting time, and complaints increase patient satisfaction.

Parasuraman, Zeithal, and Berry (1985:47) indicated that responsiveness concerns the willingness and readiness of the employees to provide services timeously to the customers by mailing the transaction slip immediately, calling the customer back immediately, and giving prompt service; that is setting up time quickly. In the hospital, it allows calling back and setting up the appointment as quickly as possible, especially if there is a complaint from a patient. This must be done to address and redress issues encountered by the patient.

Communication

Parasuraman, Zeithal, and Berry, (1985:47) noted that communication means keeping customers informed in their local language and the means of communication should also be understandable to the customer. The most important thing is to listen to them during consultation meetings and when customers visit the institution. It involves explaining the service itself which is what the institution is going to offer them.

In the case of a hospital, there would be Physiotherapy services, Speech and Audiology, Psychology, Optometry, Dental, and Eye services, just to mention a few, even the cost explained the services, explaining the trade-offs between service and costs; assuring the customers that their problems are handled professionally and will be redressed.

Anjum and Aftab (2016) focused on identifying the service quality dimensions that have a positive impact on customer satisfaction. The outcome of their findings was that only assurance, responsiveness, and reliability have a direct impact on customer satisfaction rather than empathy and tangibility. In other studies, Parasuraman, Zeithal, and Berry (1985: 47) added other determinants of service quality such as access, courtesy, communication, credibility, security, as well as understanding/knowing customers.

While other authors debated service quality in terms of dimensions, in their research on factors affecting customers" perception of service quality of Grab, Najmah, Menudin, and Laidey (2019:55) debated their case using three identified variables, namely, service quality, customer satisfaction, and brand image.

Parasuraman, et al., 1988 (in Najmah, Menudin, and Laidey 2019:56) denoted that service quality has been increasingly recognized as a critical factor in the success of any business. That is why service organizations should ensure that they help their customers with consistent service, the best products, and loyalty of customers with brand a mitigating cost in the competitive world as argued by Ahmed, 2014 (in Najmah, Menudin, and Laidey 2019:56).

Wu, et al. 2014 (in Najmah, Menudin, and Laidey 2019:56) also mentioned that for service organizations to provide quality service to their customers, they should have systems or measures in place to assess their expectations and perceptions of their customers to get exactly what they need which leads customer satisfaction. Customer satisfaction, as mentioned is an overall evaluation of products and services by customers themselves as per their previous

experience. So, if the desired or the actual outcome provided by the service provider is higher than what the customer needed or expected, then the customer will be highly satisfied; if it is to the contrary, the customers are very dissatisfied and eventually go to the next service provider, as mentioned by Prentice, 2013; Cheng & Rashid, 2013 (in Najmah, Menudin and Laidey 2019:56) that poor-quality service creates customer dissatisfaction, and customers may not return to the institution in the future or even immediately move their business dealings to other providers. However, companies that have goods and services that are of high quality have greater market share, higher profit on investment, and higher asset income than firms that have goods and services perceived as being of low quality (Najmah, Menudin, and Laidey 2019:56).

- Customer satisfaction.

Customer satisfaction depends on the quality of services and products that have been provided to them according to their expectations. Poor quality service may lead to the loss of customers to competitors. From a health perspective, patients will resort to traditional medicine, which sometimes poses a risk to them. Dissatisfied customers are more likely to switch to the competitors or complain to the service provider if their services are below the customer's expectations. Furthermore, they want to tell about the poor services of the company to their friends, relatives, or their family. This will damage the reputable industry in the future. As much as high-quality service is provided, they will return and maybe even tell others about the quality service that the company is providing. For example, customer satisfaction is a very important influence on customers to purchase products and services repeatedly and positive words of mouth to their friends, relatives, and family also provides good recommendation for the company to improve in the future. The same applies when the service is poor, as it eventually damages the status of the industry in the future (Najmah, Menudin and Laidey 2019:56).)

From the health perspective, clients have little power to decide how services or treatment should be provided. The entire responsibility lies with professional medical service personnel because of the nature of the service, which is knowledge –intensive industry. This makes the customers rely completely on service providers to supply medical information and treatment (Hung et al. 2009). They went further and mentioned that only medical staff knows exactly what kind of disease needs particular treatment and that seemingly requires a total reliance of customers (patients) on the health professionals to provide suitable treatment and medical services. For example, Kang and James (2004:267) agreed that customers are not able to

evaluate the technical competence as well as the immediate result from the treatment as such they rely completely on other measures of quality aspects associated with the process (the "how") of health care delivery. For healthcare services, consumers would likely rely on attributes such as reliability and empathy to assess quality.

- **Brand image**

They rely completely on other measures of quality aspects associated with the process (the "how") of health care delivery. For healthcare services, consumers would likely rely on attributes such as reliability and empathy to assess quality. Brand image is defined as a set of mental associations in customers' perceptions that increase the value of products or services. It plays a vital role in differentiating between brands similar within product or brand categories.

A brand image focuses on product or service quality, price, social status, and differentiation of customer's perception towards the brand. From a company's point of view, a brand is an intangible and conditional asset for a company that has the ability to generate profitability for the firm and compromise functional and emotional value. From the customer's point of view, a brand can be defined as the total accumulation of all his/her experiences and is built at all points of contact with the customer. (Keller, 2012; Martisiute, et al., 2010 and Erdil, 2015 (in Najmah, Menudin and Laidey, 2019:56-57).

A successful brand is an identifiable product, service, person or place, augmented in such a way that the buyer or user perceives relevant, unique added values which match their needs most to be effective, a brand identity needs to resonate with customers, differentiate the brand from competitors, and represent what the organization can and do over time closely (Chernatony, et al., 1998; Rahi, 2016) and Aaker, 1997; Najmah, Menudin and Laidey, 2019:57).

Most of the researchers, like Parasuraman, Zeithal, and Berry 1985, Armstrong 2012, Anjum and Aftab 2016, Gbadeyan and Gbonda 2011 and many others, discussed service quality based on the SERVQUAL model. This model was criticized by other researchers, like Asubonteng et al., 1996; Buttle, 1996; Babakus and Boller, 1992; Carman, 1990; Cronin and Taylor, 1992 (in Kang and James (2004: 267). They argued that the model reflects the service delivery process, and it is based on observations and experience and examines the European perspective (Gro¨nroos' model) and also the use of different scores, dimensionality, applicability, and the lack of validity of the model, especially for the dependence or independence of the five main

variables. It was suggested that service quality consists of three dimensions; technical, functional, and image Gro¨nroos 1982 (in Kang and James (2004: 267).

- **Image**

An image is a picture that the customer has towards the firm or services provided by the firm in terms of process and the outcome. Gro¨nroos, 2001 (in Kang and James (2004: 67) noted that customers bring their earlier experiences and overall perceptions of a service firm to each encounter because customers often have continuous contact with the same service firm. Therefore, a favourable and well-known image is an asset for any firm because image has an impact on customer perceptions of the communication and operations of the firm in many respects. It goes to extend that if a firm has got a positive image, minor mistakes can be forgiven by its customers but should not be continuous since it damages the image of the firm in the long run. Therefore, an image can be viewed as a filter in terms of a consumer's perception of quality.

2.3 System Quality

Seddon 1997 (in Clay, Dennis and Ko 2005: 3) defined System Quality as being 'concerned with whether there are 'viruses' in the system, the consistency of the user interface, ease of use, quality of documentation, and sometimes, quality and maintainability of the system code.' It is concerned with the hardware and software. Mason and Mitroff, 1973 (in Robey, and Zeller, 1978:70) argued that an information system is composed not only of hardware and software, but also involves a person, his or her psychological characteristics, the nature of the decision problem, the organizational context, data, and the mode of data presentation.

Clay, Dennis and Ko (2005: 3) defined System Quality as the reliability and predictability of the system independent of the knowledge it contains and the ease of using the system.

They suggest that System Quality is positively related to Perceived Ease of Use. Even though it was mentioned that Perceived Ease of Use is different from the system's quality, because a system may be absolutely reliable, in that it performs the requested operations on time, every time, however, the way in which the user interfaces with the system may be awkward. However, a low Perceived Ease of Use (PEU) while being very reliable and having a high System Quality. They went further to say systems that tend to exhibit ease of use are those that are clear, understandable and those that require little mental effort to use.

In their discussion, Clay, Dennis and Ko (2005: 8) mentioned that the use of the system can be increased by the following manipulations:

- Increase System Quality through reductions in viruses, anomalies and crashes.
- Increase the ease of using the system by developing a clear and understandable interface.
- Increase the quality of the system content by ensuring that the knowledge is relevant and appropriate in meeting users' needs.
- Decrease the voluntariness of use behaviour.
- Base public recognition, financial compensation, and promotion on used behaviour.

The measures of the information processing system from experiential studies listed by DeLone and McLean, 1992 (in Myers, Kappelman, and Prybutok 1997:14) are experimental reliability, response time, ease of use, usefulness, flexibility accessibility, etc.

Almrashdeh et al. (2011) agree that System Quality refers to the stability, reliability and suitability of the hardware and software that provides the required information.

Sun (2010:97) added that System Quality refers to attributes such as usability, ease of use, download time, system responsiveness, navigation, adaptability, and flexibility. She/he went further, adding other aspects that are of concern to the customers, namely; a system that is frequently down, slow response to user requests, and does not provide a good navigation system. Such issues may lead users to question its trustworthiness, especially its competence in delivering high-quality services as well as low user satisfaction. The attributes are discussed below as follows:

1) Reliability

According to Ashanin (2017), reliability is a system that is dependable enough to withstand any situation in an organization. This means that it must be operational over time and not fail to perform its intended functions over specified time intervals. It must be consistent and produce a correct result. He went further, describing reliability as an aspect of the system responsible for the ability to continue to operate under predefined conditions.

Quality Assurance (2011) stated reliability of a software system is defined as the probability that this system fulfils a function (determined by the specifications) for a specified number of

input trials under specified input conditions in a specified time interval (assuming that hardware and input are free of errors).

2)   Response time

Response time is the degree to which a system offers quick task-related or timely responses to requests for information or action. Hoxmeier and DiCesare (2000:140) also agree that computer system response time is generally defined as the number of seconds it takes from the moment a user initiates an activity until the computer begins to present results on the display or printer.

Systems are designed to provide certain response times, and users may perceive the response time of a system based on the kind of task that they are performing. For example, users may be very tolerant of long response times for an Internet application, but they will be much less tolerant of a similar response time in a desktop application; and that harms the service for the customers as a result of delays (Nelson, Todd and Wixom 2005:205-206).

Hoxmeier and DiCesare (2000:140) debated that delay has a bearing on user performance and the effect can be evidenced through increased user productivity at decreased system response times. Response time measures the degree to which a system offers quick or timely responses to requests for information. Nelson et al. (2005:205-206) show that response time has, in most cases, an unimportant impact on perceived system quality by data warehouse users. Furthermore, response time is not meaningful for management accounting systems rather than information systems (Heidmann, 2008). DNSSTUFF (2019) indicated that when considering response time, especially in the context of user experience and overall performance, it can be useful to refer to a few different measurements, including:

The average response time is essentially the average round-trip request time (for loading HTML, JavaScript files, or images). Peak response time can help you understand which components, queries, or requests may be dragging down response times. The error rate shows you how many requests are problematic when compared with all occurring requests (within a certain time frame).

Response time 'concerns the apparent readiness of the system to provide service, paying special attention to whether the system is prompt and tells when to expect service' (Negasha, Ryanb and Igbariab, M. (2003:760). Chemuturi (n.d) also shares the same idea that response time is understood as the elapsed time between when the customer gives a command, and the software begins to display a response.

Ease of use/Usability

Usability is the extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency, and satisfaction in a specified context of use. Usability refers to how easy and pleasant it is to use the features of the system. According to Nielsen and Mack, 1994 (in Fruhling and Lee, 2005: 2394), usability is key to making systems easy to learn and easy to use.

Usability includes the consistency and ease with which the user can manipulate and navigate the website, clarity of interaction, ease of reading, arrangement of information, speed, and layout. Fruhling and Lee, 2005: 2394 went further, indicating that usability improves the design of user interfaces by evaluating the organization, presentation, and interactivity of the interface'.

Ashanin (2017) debated that usability is concerned with how easy it is for the user to accomplish a desired task and the kind of user support the system provides. It can be broken down into the following areas:

- Learning system features. If the user is unfamiliar with a particular system or a particular aspect of it, what can the system do to make the task of learning easier?
- Using a system efficiently. What can the system do to make the user more efficient in its operation?
- Minimizing the impact of errors. What can the system do so that a user error has minimal impact?

Adapting the system to user needs. How can the user (or the system itself) adapt to make the user's task easier?

Increasing confidence and satisfaction. What does the system do to give the user confidence that the correct action is being taken?

Adaptability

Adaptability refers to the 'capabilities of the system to manage provided services for the requirements of users and the context' (Cappiello, 2006:308). Engel and Browning (2008:126) added that 'adaptability is a characteristic of a system willing to change to fit altered circumstances, where "circumstances" include both the context of a system's use and its stakeholders' desires'. Pernici (2006:9-10) mentioned that 'the main goal of the design of

adaptive information systems is to consider all possible interfaces, keeping in mind the possibility of adapting to different physical devices, the context of use, and user preferences. She went further indicating that some important issues are the usability of the system and its accessibility, which means that a system should be usable by everyone, accommodating variety in technology and diversity of users.

Giacomazzi (2006: 120) stated the examples of the adaptability of the system, namely, the adaptive modulation and coding, meaning that the user should be able to choose the constellation and the code rate; removal of adaptive weak subcarrier among the active subcarriers from use; and adaptive equalization and adaptive frequency-offset/phase-noise compensation.

Giacomazzi (2006: 126) went further indicating that 'in the design of a flexible function, be it adaptive or based on cross-layering, the following functional requirements must be met: it is necessary to define a control entity and one or more measurement entities; it is necessary to define the flexibility rules and the associated cost functions; the flexibility information, that is, the parameters to be measured, and according to which decisions are taken, should be well-defined; the flexibility domain, that is, the number and type of devices, protocol layers, and network entities whose behaviour is to be measured and modified, should be identified and characterized; they should be placed under the control of the measurement and control entities; a channel for exchanging the relevant control information must be provided; sufficient computational resources for executing tasks related to flexibility and for propagating control information must be provided.

2) Availability

Ashanin (2017) defines availability as part of reliability and is expressed as the ratio of the available system time to the total working time. Important indicators for this attribute are availability, planned downtime time needed to update the software, and so on. It is often expressed in the number of nines after the comma, that is, nines of availability (hours / minutes / seconds).

The availability of a system is a measure of its readiness for use. Availability is always a concern when considering a system's dependability, though to varying degrees, depending upon the application. Availability is measured as the limit of the probability that the system is functioning correctly at time t, as it approaches infinity. This is the steady-state availability of the system. It may be calculated as MTTF (MTTF + MTTR) where MTTF is the mean time to

failure, and MTTR is the mean time to repair. Availability is concerned with system failure and its associated consequences.

A system failure occurs when the system no longer delivers a service consistent with its specifications; such a failure is observable by the system's users, either humans or other systems. Cappiello (2006:308) stated that the availability of the service is provided for customers. This is the degree of availability of the service relative to a maximum availability of 24 hours, seven days a week.

Flexibility

Fruhling and Lee (2005) define 'flexibility as the capacity of a system to be adapted for different environments and situations to face changes related to business environment policies and rules. Flexibility improves the quality of the system within its development life cycle. It promises stability between the artifacts of the following phases of the life cycle of development. Torlone et al. (2006) refer to flexibility as the extent to which the user and the system exchange information and control. He/she went further, indicating that it is made up of the following parts:

Task migratability - refers to the ability to transfer control of tasks between the system and the user: for instance, a ubiquitous computing system can be used to run tasks that are mundane, routine, repetitive and obvious.

Substitutivity - is the extent to which an application allows equivalent input and output values.

Customizability - refers to the ability of the user or the system to modify the user interface. For example, the presence or absence of some user interface objects and features could imply that computing resources would be strained or could even directly mean a higher bill for the user.

The system should be flexible enough to be modified. By modification, Ashanin (2017) means to determine how many common changes need to be made to the system to make changes to each individual item. Ideal is the case where each change affects only one element, adaptable to other products with which it needs interaction. The system should be easy to interface with other standard 3rd party components.

2.1.3 Information Quality

Information is increasingly becoming a critical resource in current societies and organizations. For institutional and individual processes that depend on information, the quality of information (IQ) is one of the key determinants of the quality of decisions and actions taken

by institutions and companies. (Stvilia, Twidale and Smith, 2007: 2), Ratnaningtyasa and Surendro (2013:1167) went further denoting that information quality in hospital becomes a critical factor in health service to patient because it promotes accountability between health provider, inform the focus policy development, and it is the provider and functionary to learn about quality improvement between them.

Information quality is the information's "fitness for use" as defined by Wang & Strong, 1996 (in Stvilia Mon and Yi, 2009:1). Strong, Lee, & Wang, 1997; Stvilia, Gasser, Twidale, & Smith, 2007 (in Stvilia, Mon and Yi, 2009:1) went further, highlighting that it may be evaluated differently in different contexts and different times. Marschak, 1971; Stvilia & Gasser, 2008 (in Stvilia Mon and Yi, 2009:1) said that it is the key determinant of the quality of decision and actions which is evaluated by the cost or value of the decision or by the lack of it. In the hospital context, Ratnaningtyasa and Surendro (2013:1171) mentioned that information quality is a critical element in healthcare facilities because it is one of the determiners of the hospital healthcare level. For example, the hospital used in this study has been specified as a District Hospital because of the available information that it has got 149 beds. Ju-Ling, Hui-Chuan and Rai-Fu (2011: 156) define information quality as the integrity, accuracy, format, completeness, and timeliness of information and reports generated by an HIS.

Huang, Lee and Wang 1999 (in Al-Hiyari, A. et al. 2013) denote that poor information quality may have adverse effects on decision-making. For example, Ge and Helfert (2014) showed the danger of poor information quality that a major financial institution was embarrassed because of wrong data entry on an execution of an order amounting to $500 million. And the space shuttle Challenger and the shooting down of an Iranian Airbus by the

USS Vincennes. Bowen, 1993(in Al-Hiyari, A. et al. 2013) also gave an example that error in an inventory database may cause managers to take wrong decisions resulting in over and over stocking, which might have a negative impact on productivity and customer satisfaction. Xu, 2003 (in Al-Hiyari, A. et al. 2013) concur with other authors that quality of accounting information can be evaluated by four attributes: accuracy, timeliness, completeness, and consistency, and these attributes or dimensions examine critical success factors for accounting information quality.

In addition, Gustafson & Wyatt, 2004; Institute of Medicine, 1999 (in Stvilia, Mon and Yi, 2009:1) pointed out that in healthcare, where decisions and actions can affect human life and health, the value of information can be particularly high.

In their argument on information quality, (Stvilia, Mon and Yi, 2009:7; Statistics South Africa (SASQAF), 2010:3, 34; The National Department of Health (DoH, 2011:27) identified Information Quality criteria or dimensions, namely, Relevancy, Accuracy, Timeliness, Accessibility, coherence and Integrity, which are discussed as follows:

Relevancy

It means that data/information should reflect the degree to which it meets or satisfies the real needs of the customers, and it is also concerned whether the available information sheds light on the issues which are of most importance to the end –users. The rationale behind measuring the relevance of statistics is to ensure that they are useful to different kinds of users, and it has to be maintained by keeping up to date with the full range of both the current and the prospective customers' needs. In addition, to ensure relevancy, three primary processes should take place, i.e. documenting and monitoring user needs, analysis of user needs and implementation of findings of the user satisfaction assessment (Statistics South Africa (2010:15).

Accuracy

Accuracy denotes the degree to which the output correctly describes the phenomenon it was designed to measure, ensuring that the information from the sources provides the basis to compile data (Statistics South Africa, 2010:20). The Department of Health ensures that data is accurate by having strategies in place. For example, at the facility level, managers are conducting assessments/data quality audits comparing tally sheets, registers and /or patient folders with the summary data and applying data validation rules before data is submitted for capture (Department of Health 2011:27).

Timeliness

It addresses issues of periodicity and punctuality. Periodicity is about the frequency of compiling and publishing information or data, which is monthly and annually.

Punctuality

Punctuality refers to any phase of the Statistical Value Chain that occurred within the planned timeframe and according to the schedule (Statistics South Africa, 2010:34). The National Department of Health (2011: 26) refers to timelines as the significant delay in collection, conversion into information or data submission compromises the value of data for decision-making processes.

Accessibility

It refers to the easiest way through which the users can obtain information; it should also be in an appropriate and understandable format through which the information can be accessed. SASQAF (2010:38) agrees that it refers to the ease with which the existence of information can be ascertained, as well as the suitability of the form or medium through which information can be accessed. Myers, Kappelman and Prybutok (1997:14) share the same sentiment with other authors in discussing access, approachability and ease of contact; convenient hours and location. In other words, it is getting the right information at the right time.

Integrity

Integrity denotes that organizations producing data/information should build a culture that focuses on quality and emphasize objectivity and professionalism to maintain users' confidence. According to DoH, 2011:25, integrity refers to values and related practices that maintain the confidence users have in the system producing health information and, ultimately, in the health information itself.

Sääksjärvi and Talvinan 1993 (in Myers, Kappelman and Prybutok (1997:14) used content, availability, and accuracy as measures of information quality in their study of two specific marketing information systems. Rainer and Watson in 1995 (in Myers, Kappelman and Prybutok (1997:14) used accuracy, timeliness, conciseness, convenience and relevance of the information as measured measures of information quality in their study of the keys to executive information system success.

Rieh and Belkin (1998) identified seven facets of judgment of information quality from the analysis of the interview data, namely, source, content, format, presentation, currency, accuracy, and speed of loading.

In their study of accessing information sharing and information quality in supply chain management, Lia, and Lin (2006:1643) indicated that information quality includes such aspects as the accuracy, timeliness, adequacy, and credibility of information exchanged. Even though they mentioned that information sharing is crucial, that depends on accurate and timely information, which has to be taken into consideration. It is well known that information notoriously suffers from delay and distortion as it moves up and there should be measures in place to reduce information distortion and improve the quality of information shared. Information shared has to be as accurate as possible and organizations must ensure that it flows with minimal delay and distortion.

O'Reilly 1992 (in Ge and Helfert, 2007) uses accessibility, accuracy, specificity, timeliness, relevance, and the amount of information to assess IQ in the context of decision-making. Ballou and Pazer (in Ge and Helfert, 2007) mentioned accuracy, timeliness, completeness and consistency in modeling IQ deficiencies in multi-input, multi-output information systems.

Wang and Strong 1996 (in Fürber, 2015:21 and Stvilia Mon and Yi, 2009:3), conducted an empirical study to identify 100 important quality dimensions from the perspective of data consumers. Out of them, they identified the fifteen most important dimensions as perceived by consumers when judging the quality of information. The dimensions can be classified into Intrinsic, Contextual, representational and accessibility quality dimensions. Intrinsic contains qualities or characteristics of data such as accuracy, objectivity, believability, and reputation. Contextual includes characteristics that can only be observed when using data in a task context, such as reliability, value-added, timeliness, completeness, and appropriate amount of data. For example, completeness can only be judged together with completeness requirements for the task at hand.

The representational category includes dimensions related to, format and meaning of data, such as the consistent representation of data or the ease of understanding the data at hand. It includes Interpretability, Ease of Understanding, Representational Consistency, and Concise Representation. The accessibility category considers quality attributes regarding access to data and data access security.

2.2. Theoretical Framework

PROPOSED ELECTRONIC HEALTH SYSTEM QUALITY MODEL
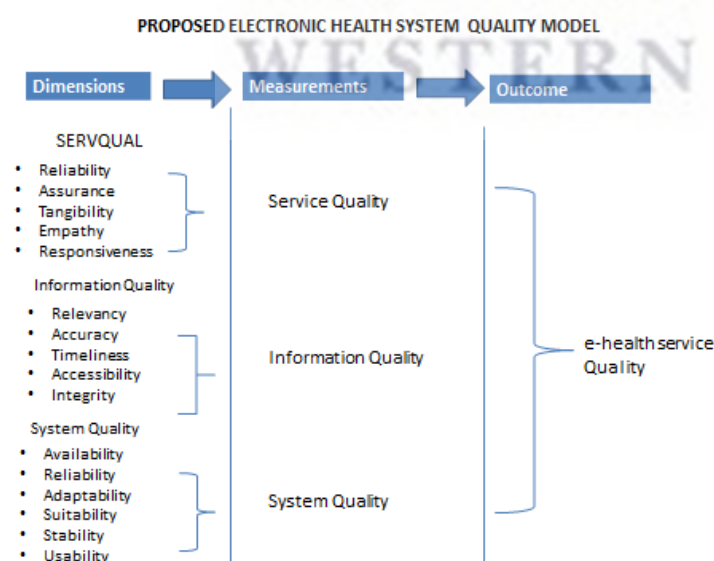
Figure 1: PROPOSED ELECTRONIC HEALTH SYSTEM QUALITY MODEL

The study adopted the proposed Electronic Health System Quality Model to explore factors affecting the electronic health system.

The model describes the service quality, system quality, information quality. For example, system quality represents the quality of information processing itself, which is characterized by the employment of state-of-the-art technology, a system offering key functions and features, and software that is user-friendly, easy to learn, and easily maintainable.

Service quality concerns the service delivered by IS service providers to business in terms of reliability, responsiveness, assurance, and empathy. These concepts of IS service quality are reflected through IS meeting user expectations (by satisfying IS users by providing services to users at the time promised, building confidence in IS users, and being courteous to users when dealing with service requests) and demonstrating IS excellence by having highly knowledgeable IS experts and by ensuring "error-free" performance. Bharati and Berg (2003:12) support that service quality is governed by the extent to which a service me the expectation of customers.

Information quality, a concept that is related to the quality of information system outputs, can be described in terms of outputs that are useful for business users, relevant for decision-making and easy-to-understand, as well as outputs that meet users' information specifications (Gorla, Somers and Wong, 2010). The Service Quality, System Quality and Information Quality are discussed lengthy in chapter 2.

Chapter Summary

This chapter is an expression of the different literatures reviewed and discussed in this study. It also offers the theoretical and conceptual framework of the study. On the conceptual framework, the Proposed Electronic Health System Quality Model was presented and adopted for evaluating factors affecting Electronic Health Systems, such as Service Quality, System Quality and Information Quality. The next chapter presents the research design and methodology used in the study for the collection and analysis of data in the study.

CHAPTER 3: RESEARCH METHODOLOGY

3.1 Introduction

This chapter discusses the research methodology for the study on the factors affecting the electronic health system at Helene Franz Hospital. It confirms and supports the theoretical framework of the study. Melnikovas (2018:33) defines research methodology as a strategy which describes how the research should be carried out. It includes a system of beliefs and philosophical assumptions which shape the understanding of the research questions and support the choice of research methods. The research design includes the research philosophical assumptions, research methods, data collection techniques, data analysis and presentation approach. The research design links the research problem to the methodology, data collection technique and analysis strategy in order to answer the research question and augment the study's validity.

The study adopted the concept of the research onion model by Saunders et al., (2016:33) which describes the various conclusions one will need to make when developing a research methodology. The benefits of the research onion are thus that it creates a series of stages under which the different methods of data collection can be understood and illustrates the steps by which a methodological study can be described. Raithatha, 2019 (in Melnikovas (2018:33) agrees that the research onion offers a detailed description of the main layers or stages which are to be accomplished in order to formulate an effective methodology.

The research process involves the first layer where the philosophy has to be defined, which creates the starting point for the appropriate research approach to be adopted in the second step. In the third stage, the research strategy is adopted, and the fourth step identifies horizons. The fifth stage identifies the data collection methodology. The following is the research opinion where each step is discussed in detail:
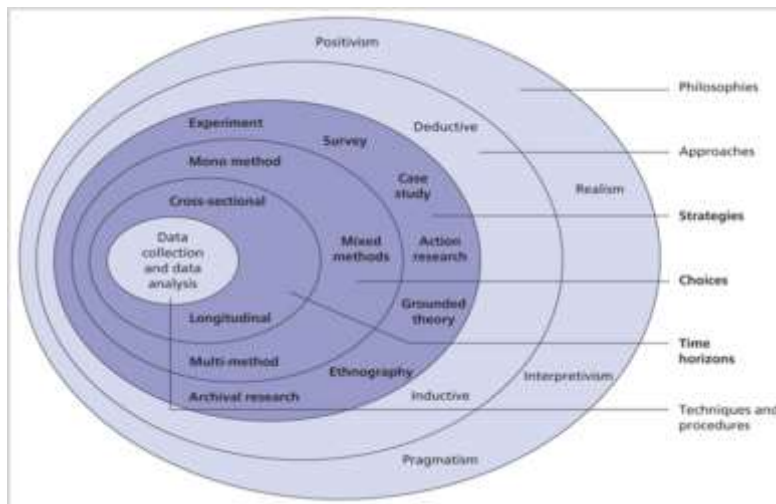
Figure 3.2.1: (Source; Saunders, Lewis, and Thornhill, 2009, p.108.)

The first layer of the research opinion includes philosophies such as Interpretivism, Realism, Pragmatism and Positivism. The philosophy preferred in this research is positivism.

According to Luong and Ha (2011:9), positivism is adopted from natural science by using natural science's methods in studying social reality. Bam (2014) agrees that it is also known as scientific philosophy and is based on the facts. It emphasizes that reality exists objectively out there. That is why it is believed that there should be research questions and hypotheses that one can put to test to find an explanation measuring the acceptable knowledge of the world. They went further, saying positivism aims at finding the factors influencing decisions, from which synthesize the general rule to generalize for the whole population, rather than try to explain and interpret the meanings of such decisions.

Bam (2014) stated that philosophy of positivism states that logical treatment is the best method of gathering the desired information. The purpose of positivism is to produce general laws for behavior prediction. Fisher, 2010 (in Luong and Ha, 2011:9) is consistent with the goals of understanding the behaviors for generalization and prediction. Researchers are expected to be neutral to the object of the study, which promotes a value-free manner in data collection and analysis. In other words, the researchers do not affect or be affected by the subjects of the research.

That is why Pasco and Aibinu (2008:275) agree that 'the researcher would detach from the research environment and takes the role of an independent observer without interfering with the research environment and would not allow the values and bias to distort the research results.

What they simply mean is that the researcher would not affect or be affected by the research processes.

There would be a questionnaire with structured questions to be completed by the participants individually. As indicated above, the researcher would not interfere with the research processes, the participants are not somehow affected by the researcher as much as the researcher is not affected by the participants. What can be indicated further is that all expectations and hypotheses as well as the structure of the questions used in the questionnaire are defined based on the current theories and researchers. The hypotheses are then tested through data collected from the survey, which is consistent with what positivism suggests.

The second stage of the research onion includes the approaches such as inductive and deductive. This study is going to adopt the deductive approach, which is considered to be the most suitable strategy for answering the research questions of this study, based on the fact that it satisfied the six list of sequential steps through which a deductive approach progresses (Blaikie, 2010 in Saunders, Lewis, and Thornhill, 2007:153- 154). Bringing forth the testable ideas or a theory which one is not certain about and putting it to test to form a theory.

i.   By using existing literature, or by specifying the conditions under which the theory is expected to hold, deduce a testable proposition or number of propositions. For example, one may want to establish the reasons for high employee absenteeism in a retail store. After reading about absence patterns in the academic literature, you develop a theory that there is a relationship between absences, the age of workers and length of service.

ii. Examine the evidence and the logic of the argument that produced it. Compare this argument with existing theories to see if it offers an advance in understanding. If it does, then continue.

iii. Test the premises by collecting appropriate data to measure the concepts or variables and analysing them.

iv. If the results of the analysis are not consistent with the premises (the tests fail!), the theory is false and must either be rejected or modified and the process restarted.

v.   If the results of the analysis are consistent with the premises, then the theory is corroborated.

The third step of the research onion is about the research strategies, namely, experiment, action research, grounded theory, ethnography (separated/disconnected), archival research, survey, and case study. This study adopted survey and case study research. Surveys are very relevant

to the study because it enables the researcher to collect the reality from large sample size (Helene Franz Hospital staff) perfected by the ability to present holistic findings. They used a data collection technique whereby the approach includes questionnaires, content analysis, and observation, and adopted a quantitative approach and focused on questions such as what, who, where, how much or how many.

In addition, the case study is adopted in this study because it affords an opportunity to use multiple sources of evidence to empirically investigate a current phenomenon and allow a researcher to find answers to 'what', 'why' and 'how' types of questions, the same as surveys. Its utmost advantage is that the case study research approach embraces a variety of evidence such as document reviews, interviews, which is considered as a strength that increases the richness of the collected data whilst creating the prospects for data triangulation (Elvitigalage, Amaratunga and Haigh, 2008:278).

Although there were some traditional prejudice against case studies such as lack of rigor, an allowance of biased views to influence the direction of findings and conclusions and an inability to generalize the findings and taking too long and producing substantial documents as some of the common criticisms of case study research, Yin, 2003; Yin, 2003b (in Kulatunga Amaratunga, and Richard, 2007:486-487); yet it was noted that the quality of a case study can be improved by following the four assessments that are common to empirical research; construct validity, internal validity, external validity and reliability Yin, 2003b; Fellows and Liu, 2008 (in Wedawatta, Ingirige, and Amaratunga, 2001). Both of them are also decided in order to meet the objectives and aim of the study.

The fourth stage of the research involves mono-methods, mixed-methods, and multi-methods. This study adopts the mono-method, which is a quantitative method, considering the fact that it does require more work and financial resources and is not time-consuming either. It also meets the aim and objectives of the study. It is used when the research is focused either on quantitative or qualitative data gathering. A researcher can choose to use a single data collection technique and corresponding analysis procedure, either a mono method or quantitative design; collecting data through a questionnaire, and it being analyzed statistically. It could be a mono-method qualitative design whereby data is collected through in-depth interviews, analyzed as narratives. Alternatively, they can use multiple methods, meaning both quantitative and qualitative. (Saunders and Tosey, 2013:56-57).

The fifth section of the research opinion involves cross-sectional and longitudinal study. This study adopted the cross-sectional study. The Cross-sectional studies' data collection is a one-time activity, Chassin et al., 1986 (in Al Marri, 2008:34), where research was undertaken to answer a question or address a problem at a particular time, this 'snapshot' is cross-sectional and is likely to make use of strategies such as a survey or case (Saunders and Tosey, 2013:59). With this study, the researcher can deploy both qualitative and quantitative research. It may help you in observing the behaviour of a group of people or an aspect, or one also use the same method to do study on an individual at one point in time.

The sixth layer of the research Onion involves data collection methods.

Data collection: Procedures

A quantitative research method was adopted to address the objectives of the study. A questionnaire technique was used for data collection in this study. deVaus, 2002 (in Saunders, Lewis and Thornhill, 2003:280) defines a questionnaire 'as a general term to include all techniques of data collection in which each person is asked to respond to the same set of questions in a predetermined order'.

The pre-testing or pilot testing was conducted to establish the potential effectiveness of the questionnaire; the rationale being that of refining the questionnaire design and to identify errors in the questionnaire and be corrected. This process was undertaken before the final distribution of the questionnaire to the participants. A 5-point Likert scale-based instrument with opinion-based questionnaires was used to investigate quality factors affecting the electronic health systems at Helene Franz Hospital. Here, the participants would be expected to specify their level of agreement or disagreement on a symmetric agree-disagree scale for a series of statements.

The sixth stage of the research opinion involves data collection methods.

a) **Data analysis: Techniques**

Data analysis is a process where a researcher is engaged in the processes of gathering, demonstrating, altering data with the aim of emphasizing and highlighting useful information, suggesting conclusions, discussing strategies, and supporting decision-making. It has multiple aspects and approaches encompassing various techniques under different names, in different business, science, and social science; Vignali, Feraco, and Vranesevic (in Güler, 2015:82). In

quantitative, data collected was analyzed through descriptive analysis in the form of tables, graphs, and numerical measures.

3.3 Study Design

A Study Design is defined as an action plan for getting from the questions to conclusions. This involves ensuring that there is a clear view of what is to be achieved by the case study, defining the basic components of the investigation, such as research questions and propositions, appreciating how validity and reliability can be established, and selecting a case study design (Rowley, 2002:18). Each and every aim of the research is to add value to the gathered knowledge by identifying, investigating, and yielding solutions to an unsolved problem/challenge. Pasco and Aibinu (2008:274) described the process as not being a clear-cut arrangement of procedures followed by a well-ordered, designed, but messy interaction between the conceptual and empirical worlds.

Bechhofer and Booth et al. (in Pasco and Aibinu 2008:273) also agree with this view, stating that "research follows a crooked path, taking unexpected turns, even looping back itself". Even though the research process is uncertain and risky, the appropriate research design would minimize the possibilities of any failure by identifying and forecasting problems and pitfalls that the researcher may come across".

In addition, research design looks into the philosophical facets of the research, which in turn helps to identify the overall research strategy, that is, collection, analysis, and interpretation of data to draw up conclusions; evaluate various research methods and identify their limitations; increase the compatibility of research approaches and research techniques (Pasco and Aibinu 2008: 274).

3.4 Research methods

3.4.1 Qualitative method

It focuses on gaining an in-depth understanding of the reason and motivations of the phenomenon. Mack et al. (2005:1) describe it as a scientific research method which seeks to understand a given research problem or topic from the perspectives of the local population it involves. It consists of investigation that seeks answers to a question, scientifically uses a predefined set of procedures to answer the question, collects evidence, yields findings that were not determined in advance and produces findings that are applicable beyond the immediate

boundaries of the study. Use semi-structured methods such as in-depth interviews, focus groups, and participant observation.

3.4.2 Quantitative method

It is about quantifying the data and generalizes the results from a sample to the entire population. Struwig and Stead (2001:4), define quantitative research as a form of conclusive research involving large representative samples and fairly structured data collection procedures such as questionnaires with closed-ended questions, structured observations, and surveys. Data collected is expressed in numbers. Thomas (2003) agrees that quantitative research uses numbers and statistical methods. Richard, Opoku and Oppong, (2013:8) add that 'quantitative analysis is more likely to be secondary and exploratory (or descriptive) in nature, summarizing data in the form of charts, tables, percentages, and averages. They went further to say data might be represented in terms of frequency, central tendency, or dispersion. It is highly likely the research might require the necessity of inferential data analysis.

A quantitative research method in this study was adopted to address the objectives of the study. The other reasons are that it is relevant because of the significant amount of data and feedback it provides, and the fact that it is easily accessible to the participants and it is not costly either. A questionnaire was designed for data collection.

3.4.3 ANOVA Statistical test

The study adopted ANOVA to analyze the difference between the means of more than two groups. This technique was used to determine whether there are any statistically significant differences between the means of different groups, which refers to Service Quality, Service Quality, and Information Quality. It indicates that dependent variables change according to the level of the independent variables. It does fit in this study because one is able to conduct multiple t-tests for each pair of groups. Again, it allows researchers to analyze the variations between all groups in one comprehensive test. This saves time and reduces the chances of making false positives that can occur when conducting multiple tests.

3.4.4 Correlation technique

Correlation determines the relationship or association between two variables, or the degree to which the two variables are related. Through correlation analysis, one assesses correlation,

coefficient changes that tell you how much one variable changes when the other one does. A positive correlation means that both variables change in the same direction.

A negative correlation means that the variables change in opposite directions. The advantages of correlational research include the possibility of predicting underlying relationships, predicting human behaviour, being the most cost-effective, and the methodology and statistical analysis may be easier to implement. The rationale behind the usage of the correlation was to find if there is a relationship between Service Quality, Service Quality, and Information Quality.

3.4.5 Population

Population refers to the pool of people from which research participants are drawn (Mack et al., 2005). The study population for this study were staff members who worked in Helene Franz Hospital from January 2017 to December 2017. Through this period, we are sure that they do have enough experience on the use of electronic health systems.

3.4.6 Purposeful sampling

It is a non-random technique that does not require underlying theories or a set number of participants. Here, the researcher chooses what needs to be known and sets out to find people who can and are willing to provide the information by virtue of knowledge or experience. This involves identification and selection of individuals or groups of individuals that are capable and well-informed about a phenomenon of interest. In addition to knowledge and experience, the participants would also be considered based on the availability and willingness to participate in the study, the ability to communicate experiences and opinions well, an expressive, and thoughtful manner (Etikan, Musa and Alkassim (2016:2-3).

In this study, purposeful sampling was used in selecting the respondents that are mostly to produce suitable and useful information and who possess the same characteristics or experience. It is relevant as the study involves Helene Franz Hospital staff only. Again, it is convenient because the participants can be found in one place.

3.4.5 Sampling criteria

According to Mack et al. (2005), it is a process for selecting research participants in which the criteria and number of people to be included in the study are predetermined. A target number

of participants is set, and people who meet the desired criteria are recruited until the target number is reached. In this study, the criteria used was identifying those sections that are using the electronic health system and including all employees in each section as the participants. This refers to the staff that has been using the electronic health system, such as Admin/Revenue Clerks, Radiographers, Pharmacists, Accountants, and Data Capturers etc. The study excludes nurses and cleaners as they are not involved in capturing transactions in the hospital on the electronic system.

3.5 Ethical considerations

The researcher applied for ethical clearance with UWC Research Ethics Board. With respect to ethical considerations, first permission to conduct the research was obtained from the Provincial Department of Health, Government Information and Technology Officer (GITO) and the Chief Executive of Helene Franz Hospital.

The procedure was to approach the relevant staff members whom the researcher wanted to take part in the study. The approved ethical clearance document was produced to get permission from them to participate. It was clarified to all participants that they are at liberty to participate and to withdraw from the study if they feel uncomfortable in any way. Consent forms and participation information sheets were provided for the participants to inform them about the content and objectives of my study.

A consent form was read together with the participants individually, so where some words were not understood, they were further explained in the language that they did understand. Although it was not only Pedi-speaking participants, most of them knew the language since they interacted with the patients and ended up knowing the language. So, it was not difficult for the researcher to explain. The other advantage was that almost all the participants came from schools where English was their first language, so it was not that difficult for them to understand what was written in the form. For confidentiality, the questionnaires were not written names to make it easy for the researcher to identify the individuals. Again, the submission was made in the absence of the researcher in the office and was put in the box but under close monitoring by officials who did not have an idea of the content of the document. The researcher collected them and put them safe but could not identify the owners. No participants were forced to partake in the study because it would make them not provide truthful and honest information. This study did not involve minors or children.

3.6 Chapter Summary

In this chapter, the different stages of onion research were discussed, and the following were adopted in this study, namely, positivism philosophy, deductive approach, surveys, and case study. A Mono-method where the quantitative research method was also adopted, as well as the cross-sectional study. A questionnaire was developed for data collection that conveyed the research design and methodology utilized in the study for data collection and analysis. The study adopted the quantitative research method. The following chapter illustrates the data results and a discussion of the findings.

4: Research Results and Interpretation

4.1. Introduction

This chapter is composed of the data that has been collected to make this study a success. Data has been collected from staff in various departments (CEO's Office, Information, and IT Management, Clinical, Nursing, Finance, HRM, HRD, HRP, PMDS, Records Management, Pharmacy, NHLS, Radiography, and Quality Assurance) using questionnaires.

Section 1 presents the demographics (age, gender, education, occupation, department, and years of experience) variables frequency results of the study, and section 2 presents the frequency results of the quality constructs (Service Quality, System Quality, and Information Quality) variables and section 3 present reliability testing and T- testing.
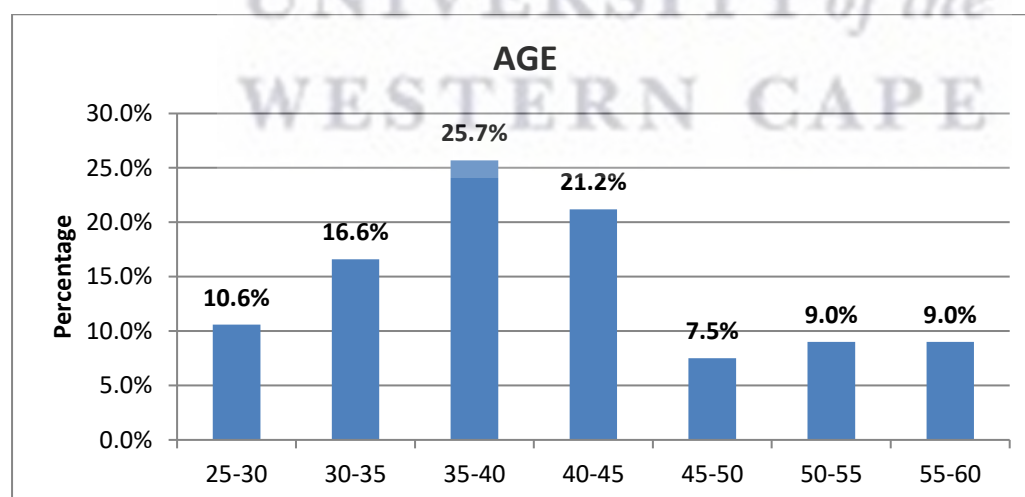
4.2. Demographic Data

Figure 1: Age

Figure 1 displays results from the data analysis which shows the age group of the population of the study. The outcome of the results is that 35-40 age groups is the highest in the population at 25.7%, followed by the age group 10-45 at 21.2%, having 30-35 at 16.6% and 25-30 at 10.6,followed by 50-55 and 55-60 both at 9.0%, then followed by 45-50 at 7.5%.
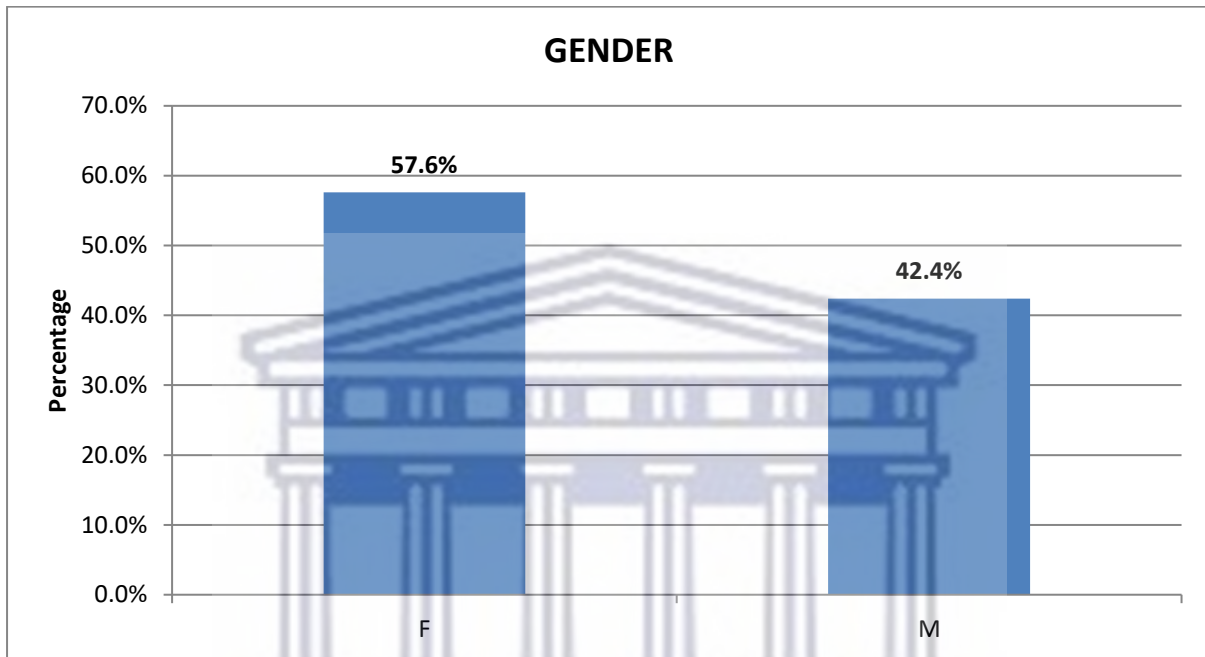
4.2.2   Gender

Figure 2: Gender

Figure 2 displays results from the data analysis which shows the greater number of the population is the female gender at 57.6% whilst male is the lowest at 42.4%.
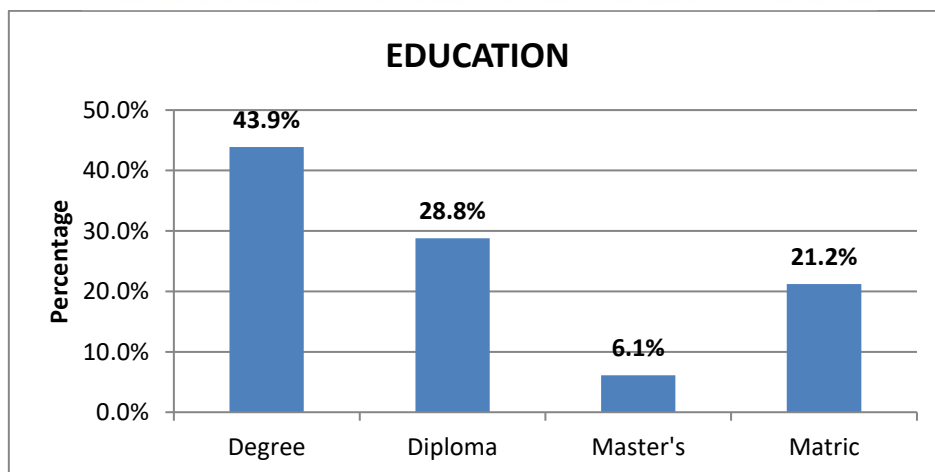
4.2.3 Education

Figure 3: Education

Figure 3 displays results from the data analysis which shows the level of education of the population. Those that are having the degrees are at the highest rate of 43. %, followed by those that are having diplomas at 28.8%, having 21.2% of those that are having matric, followed by the few of those that are having masters at 6.1%.
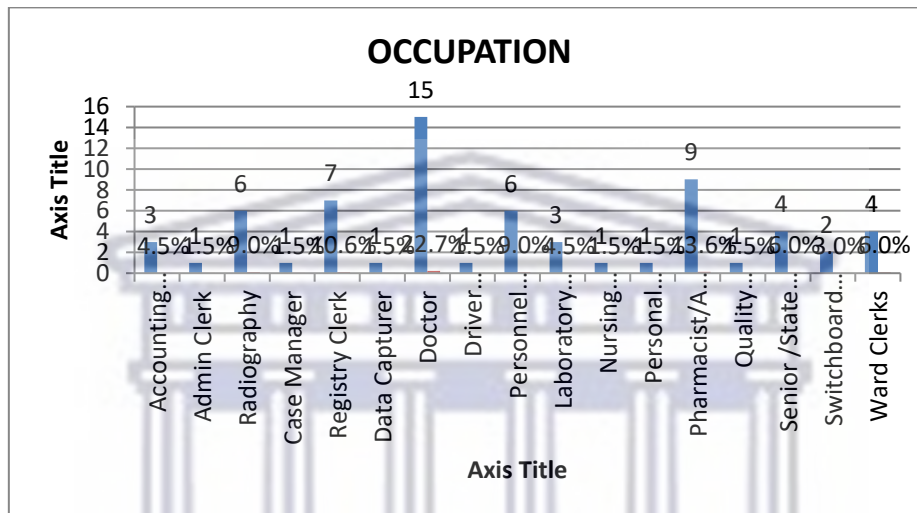
4.2.4 Occupation

Figure 4: Occupation

Figure 4 displays results from the data analysis which shows various occupation or designation of the population under the study. The results show the highest of Doctors who took part at 22.7%, followed by 13.6% of Pharmacists, 10.6% of Registry Clerks, 9.0% of both Radiographers and Personnel Practitioners, having 6.0% of both State Accountants and Ward Clerks, followed by 4.5% of both Accounting Clerks and Laboratory Assistants/Technician. Switchboard Operators are at 3.0% then 1.5% of Admin Clerk, Case manager, Data Capturer, Driver, Nursing Manager, Personal Assistant and Quality Assurance Practitioner.
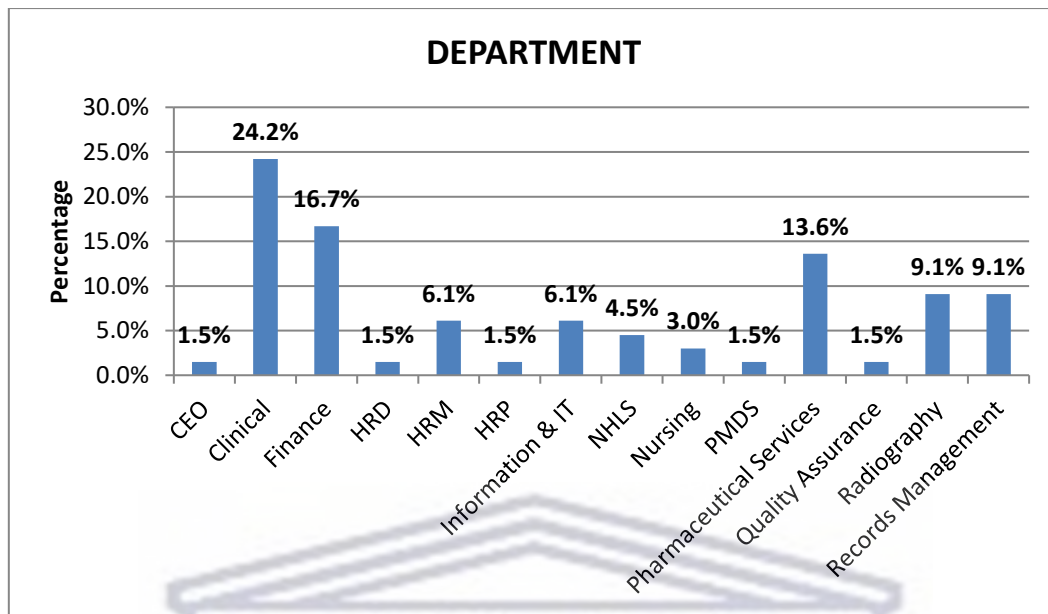
4.2.5   Department

Figure 5: Department

Figure 5 displays results from the data analysis which shows various departments in the department. The results show the highest department participated in the study is Clinical at 24.2% with 16.7% from Finance. Pharmaceutical Services is at 13.6, followed by Radiography Services and Records Management sharing 9.1%. Human Resources Management and Information and IT management are at 6.1%. The NHLS is at 4.5% followed by Nursing Services at 3.0%. CEO, HRM, HRP, PMDS and Quality Assurance Services are at 1.5%.
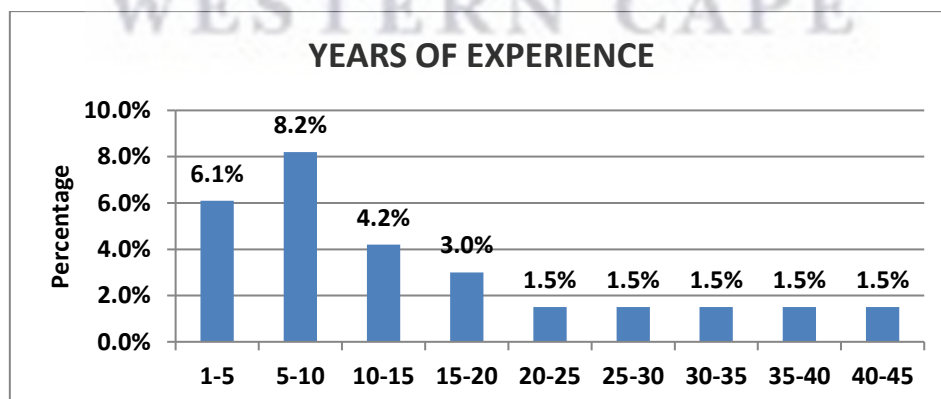
4.2.6 Years of experience

Figure 6: Years of Experience

Figure 6 displays results from the data analysis which shows the years of experience of the participants. The results show that 8.2% worked 5-10 years, followed by those who worked 1-5 years at 6.1%. Those that worked 10-15 are at 4.2%, having 3.0% of those that worked 15-20 years. Staff that worked 20-25, 25-30, 30-35, 35-40 and 40-45 is each at 1.5%.

4.3 Frequency results of the variables
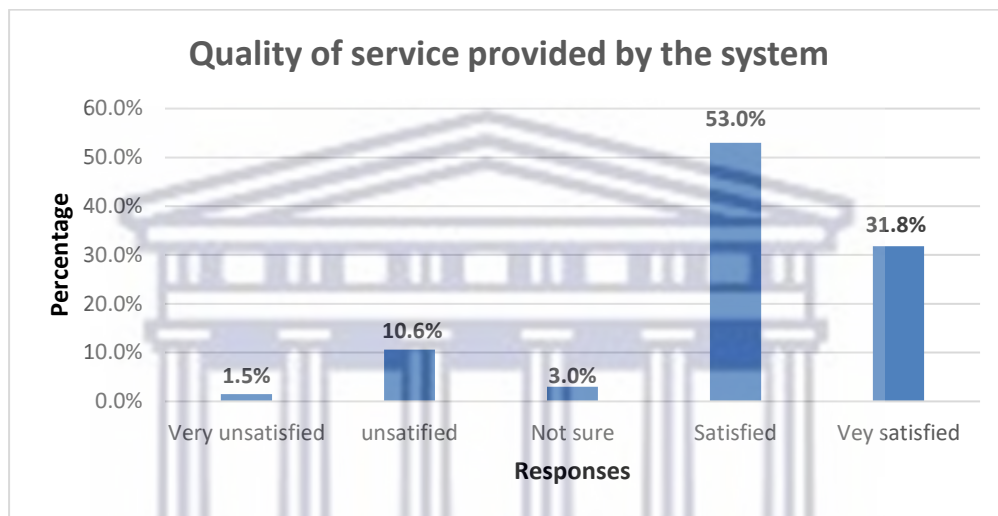
4.3.1 Service Quality

SERVQ1

Figure 4.3.1.1: Quality of service provided by the system.

Figure 1 displays result from the data analysis which shows status of the quality provided by the systems used in the hospital when providing services to the patients, with respect to the percentages of their satisfaction level. The results show that 1.5% of staff is very unsatisfied, followed by 3.0% of those that are not sure. Those that are unsatisfied are 10.6%. There is a slight increase rate of those very satisfied at 31.8%, followed by the highest rate of 53.0% of staff is satisfied of the quality of service provided by the system.
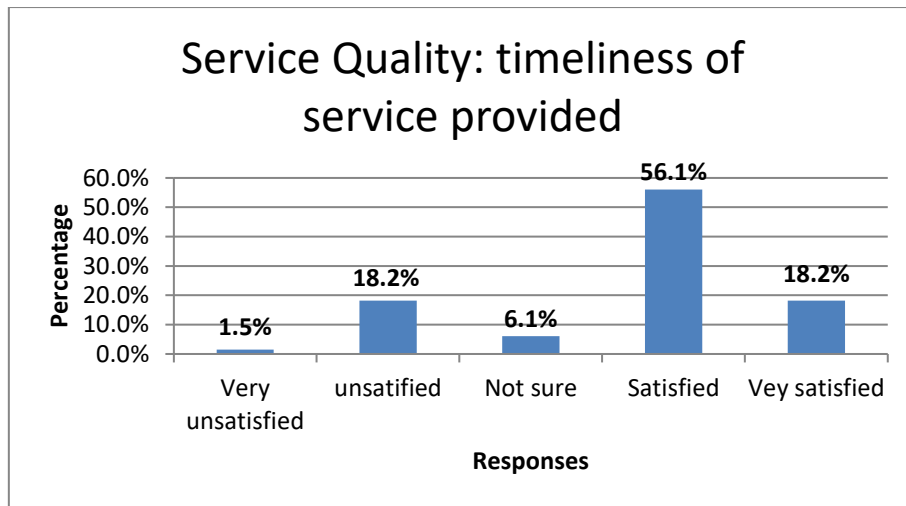
SERVQ2

Figure 4.3.1.2: Timeliness of service provided

Figure 2 displays result from the data analysis which shows status of the timeliness of service provided to the patients by staff, with respect to the percentages of their satisfaction level. The results show that 56.1% of staff is satisfied followed by those that are very satisfied at 18.2%. Only 1.5% seems to be very unsatisfied followed by 1.8% which is equal to those that very satisfied and 6.1% of those that are not sure of timeliness of service provided by the system.
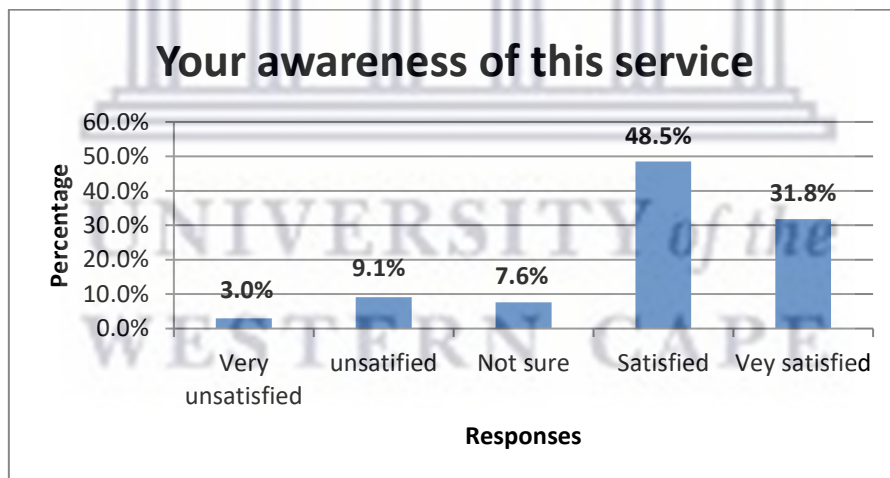
SERVQ 3

Figure 4.3:1 3 Your awareness of this service

Figure 3 displays result from the data analysis which shows status of the awareness of service. The results show that 48.5% of staff is satisfied followed by those that are very satisfied at 31.8%. Only 3.0% are very unsatisfied followed by 9.1% of those that are unsatisfied and then 7.6% of those that are not sure of awareness of this service.
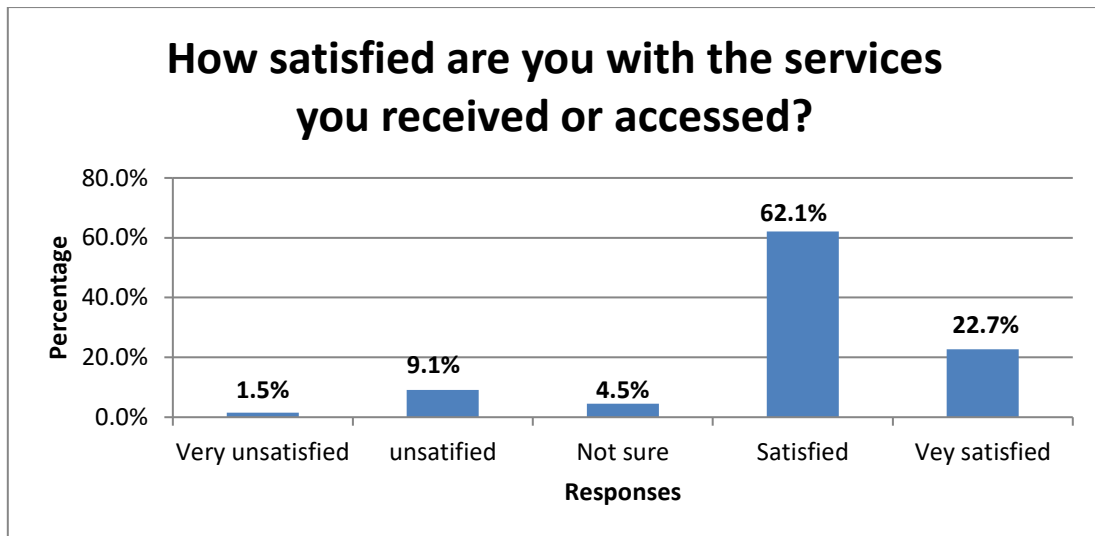
SERVQ 4

Figure 4.3.1.4: How satisfied are they with the service received or accessed

Figure 4 displays result from the data analysis which shows status of how satisfied are they with the service received or accessed. The results show that 62.1% of staff is satisfied with 22.7% of very satisfied ones, followed by 9.1% of those that are unsatisfied. The 4.5% of those that are not sure and 1.5% of very unsatisfied of how satisfied are they with the service received or accessed.
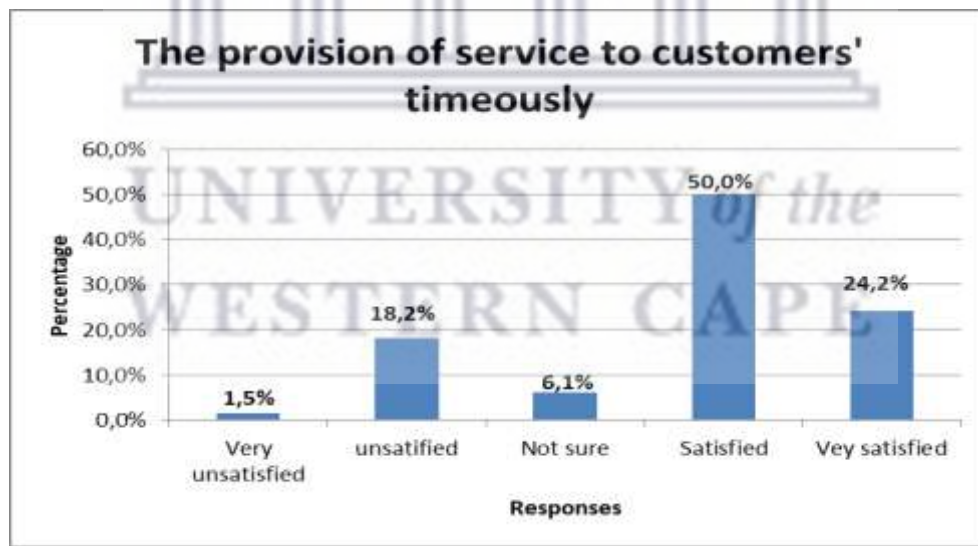
SERVQ 5

Figure 4.3.1.5: The provision of service to customers' timeously

Figure 5 displays result from the data analysis which shows status of the provision of service to customers timeously, with respect to the percentages of their satisfaction level. The results show that 50.0% of staff is satisfied followed by those that are very satisfied at 24.2%. The 18.2% feel unsatisfied followed by 6.1% of those that are not sure. Only 1.5% is very unsatisfied of the quality of service provided by the system.
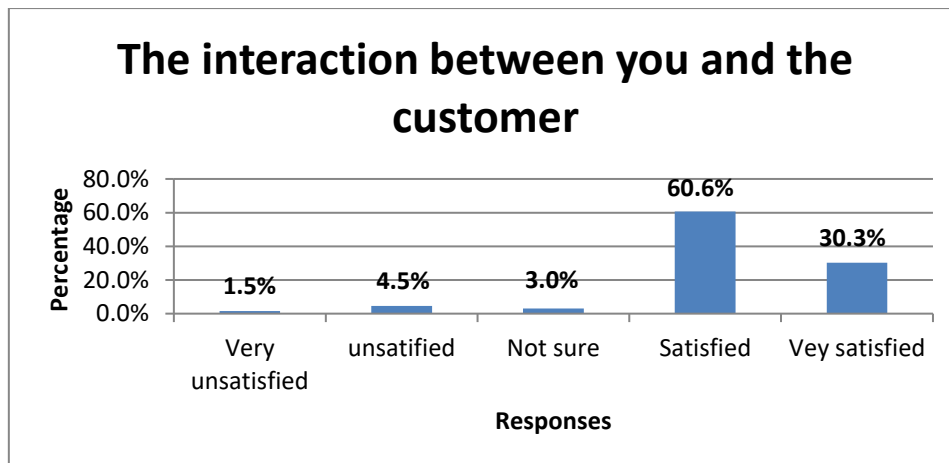
SERVQ 6

Figure 4.3.1.6: The interaction between you and the customer.

Figure 6 displays result from the data analysis which shows status of the interaction between the staff and the customer. The results show the highest rate of 60.6% of those that are satisfied, followed by 30.3% of very satisfied ones. The 4.5% seems to be unsatisfied, with 3.0% of not sure ad lastly 1.5% of those that are very unsatisfied regarding the interaction between the staff and the customer.

SERVQ 7
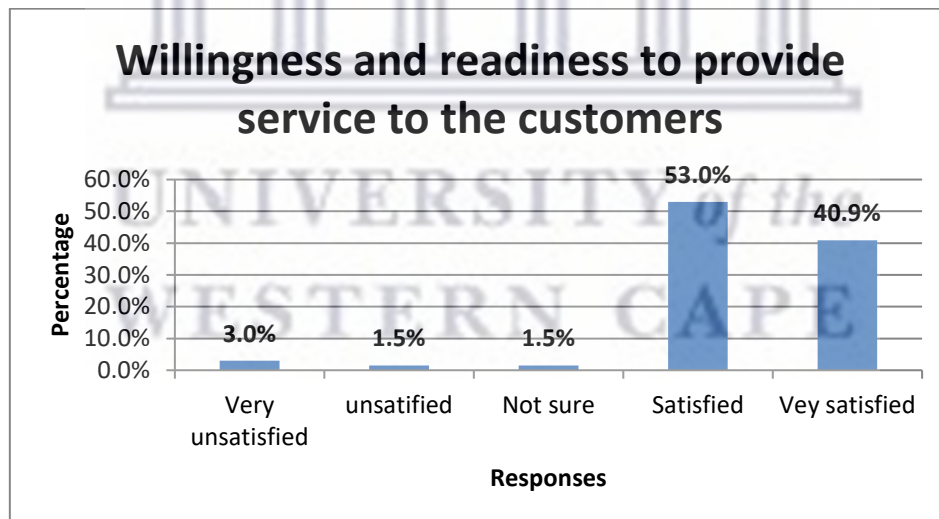
Figure 4.3.1.7: Willingness and readiness to provide service to the customer

Figure 7 displays result from the data analysis which shows status of the willingness and readiness to provide service to the customer. The results show that 53.0% of staff is satisfied with 40.9% of very satisfied ones, then 3.0% of those that are very unsatisfied and equal rates of 1.5% of both very unsatisfied and unsatisfied of the willingness and readiness to provide service to the customer.

4.3.2. System Quality

SYSQ 1

The system has user friendly interface

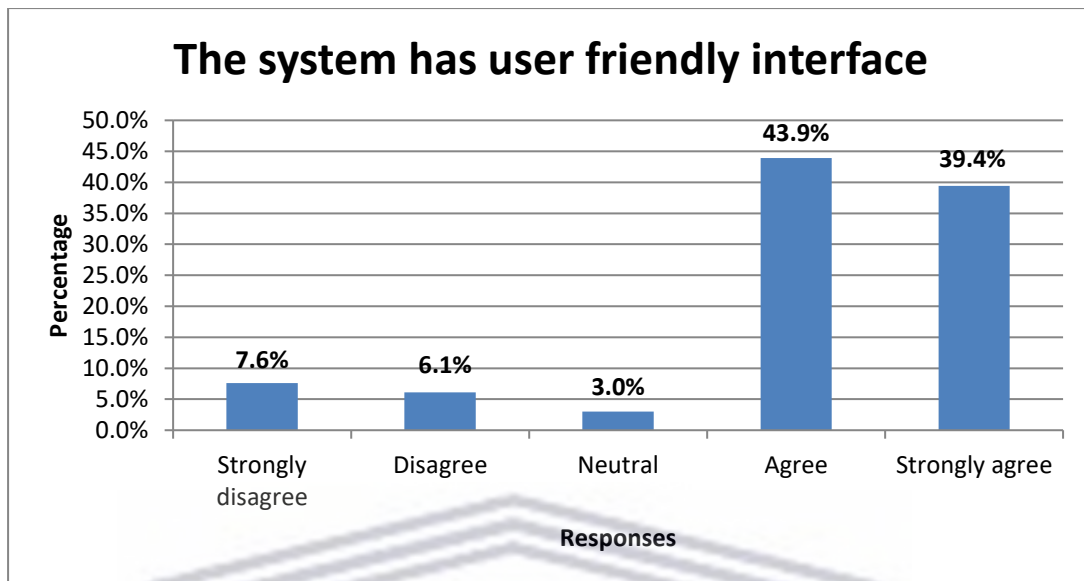

Figure 4.3.2.1: The system has user friendly interface

Figure 1displays result from the data analysis which shows status of the system that has user friendly interface, with respect to the percentages of their satisfaction level. The results show that 3.0% of staff is neutral, followed by 6.1% of those that disagree. Those that strongly disagree are at 7.6%. There is a slight increase rate of those strongly agree at 39.4%, followed by the highest rate of 43.9% of staff who do agree that the system has user friendly interface.

SYSQ2

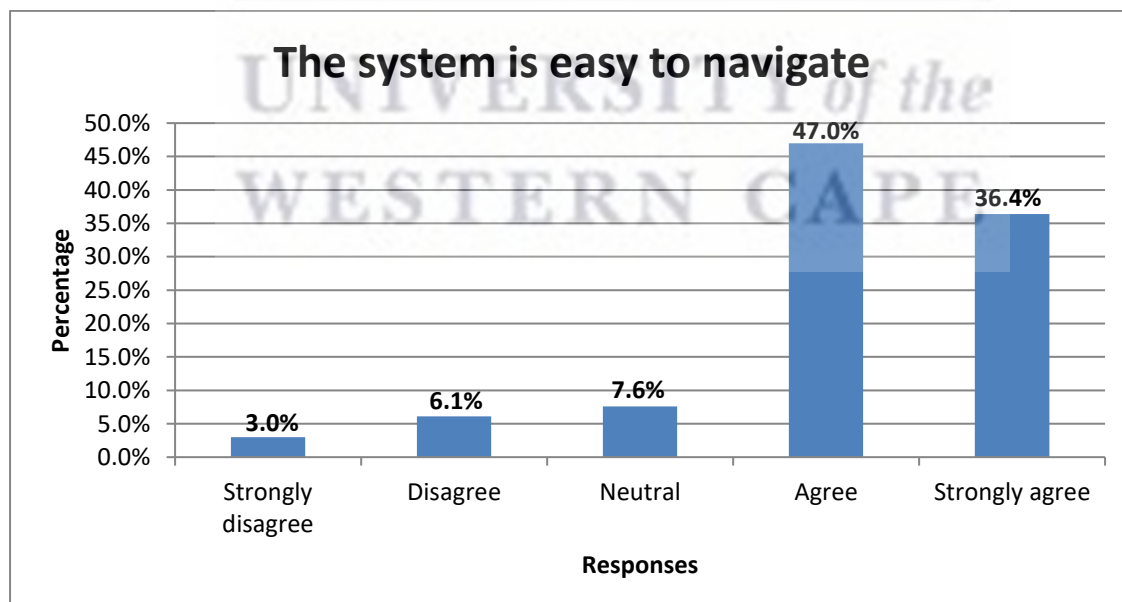## The system is easy to navigate

Figure 4.3.2.2: The system is easy to navigate

Figure 2 displays result from the data analysis which shows status of the system that is easy to navigate, with respect to the percentages of their satisfaction level. The results show that 47.0%

of staff agrees, followed by those that strongly agree at 36.4%. Only 3.0% strongly disagree, followed by 6.1% of those that disagree and 7.6% of those that are neutral that the system is easy to navigate.

SYSQ 3

The pages have generally good images

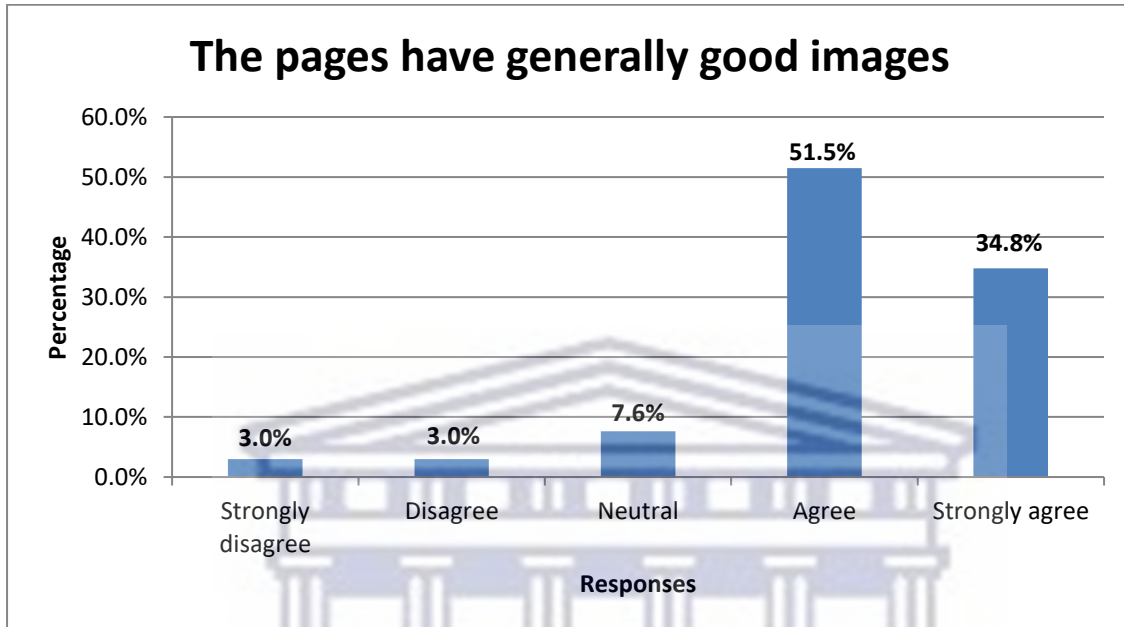Figure 4.3.2.3: The pages have generally good images

Figure 3 displays result from the data analysis which shows status of the pages that generally have good image. The results show that 51.5% of staff agrees, followed by those that strongly agree at 34.8%. Those that are neutral are at 7.6% having both strongly disagree and disagree are at 3.0% of the pages that generally having good images.

SYSQ 4

The system allows the user to upload pictures easily
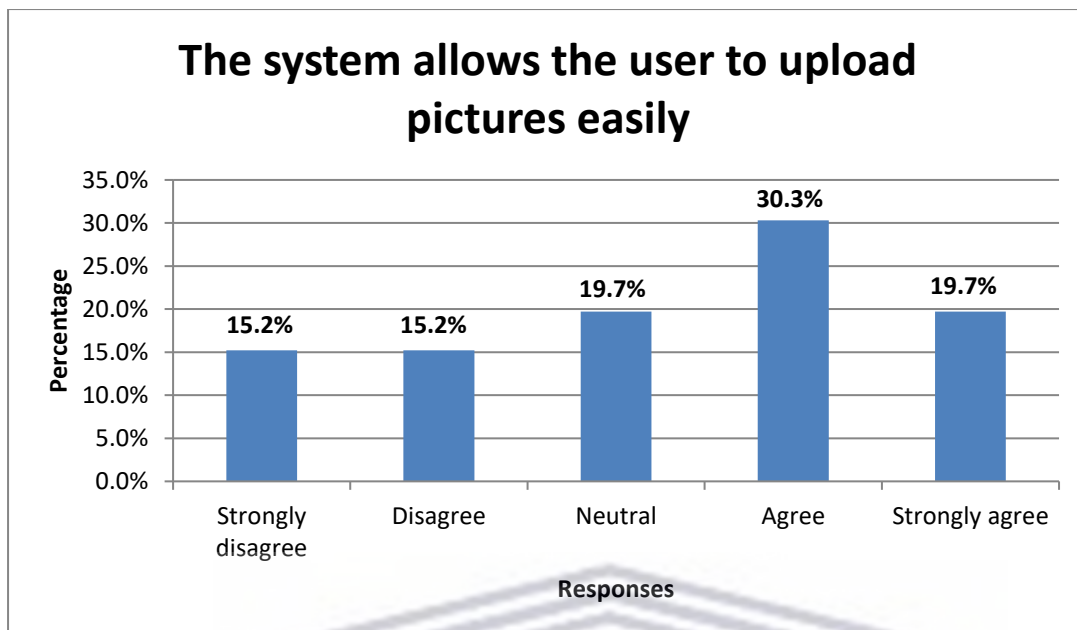
Figure 4.3.2.4: The system allows the user to upload pictures easily

Figure 4 displays result from the data analysis which shows status of the system that allows the user to upload the pictures easily. The results show that 30.3% of staff agrees. Those that strongly agree and neutral are sharing the rate of 19.7%. Same as those strongly agree and disagree having the rate of 15.2%.

SYSQ 5

The system has a pleasing colour scheme
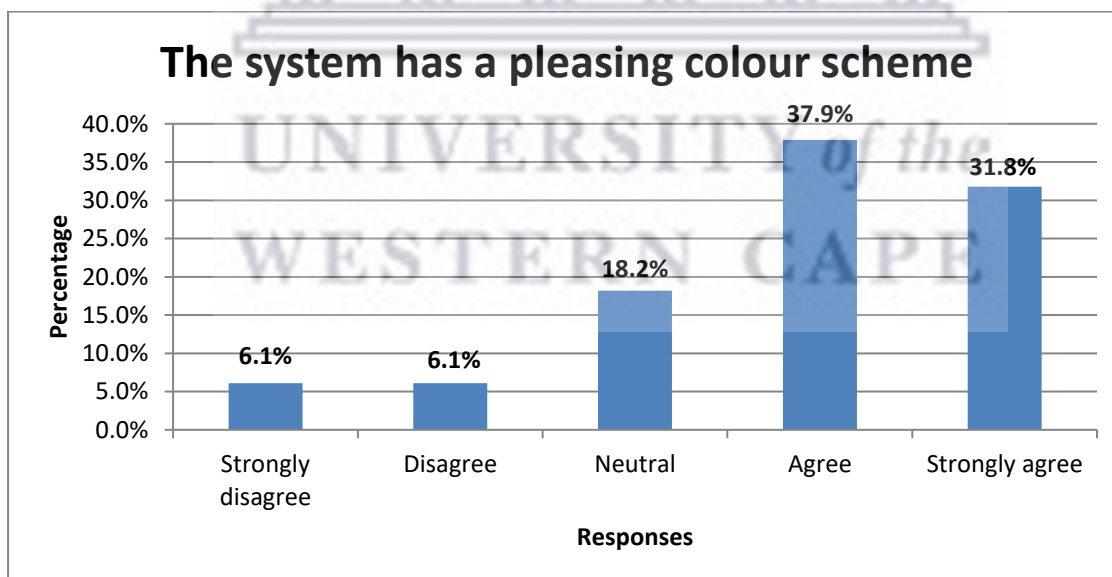
Figure 4.3.2.5: The system has pleasing colour scheme

Figure 5 displays result from the data analysis which shows status of the system that has a pleasing colour scheme, with respect to the percentages of their satisfaction level. The results show that 37.9% of staff agrees, followed by those that are strongly agree at 31.8%. The 18.2% are neutral, having both strongly disagree and disagree at 6.1%.

SYSQ 6

I would like to use this frequently
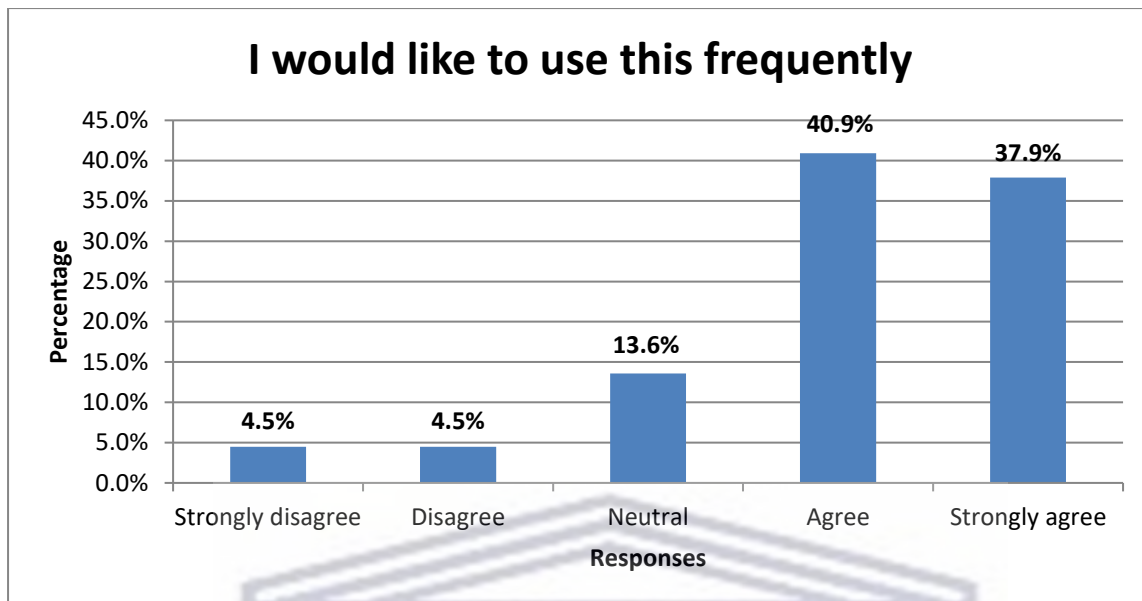
Figure 4.3.2.6: I would like to use this frequently

Figure 6 displays result from the data analysis which shows status of how frequent does the user want to use the system. The results show the highest rate of 40.9% of those that are agree, followed by 37.9% of those that strongly agree. The neutral ones are at 13.6% whilst having both strongly disagreed and disagree at 4.5%.

SYSQ 7

I found the system unneccesary complex
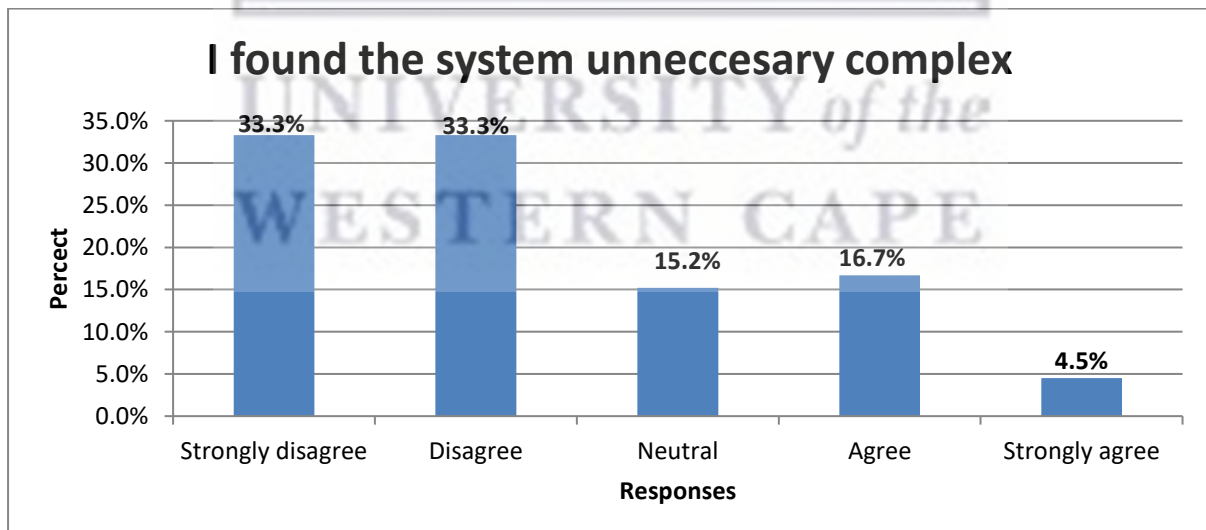
Figure 4.3.2.7: I found the system unnecessary complex

Figure 7 displays result from the data analysis which shows status of the system that found unnecessary complex. The results show that 33.3% of staff strongly disagree and disagree, followed by 16.7% of those that strongly agreeing that they found the system unnecessary complex.

4.3.3. Information Quality

INFOQ 1

Figure 4.3.3.1: Information from the system is relevant to my work

Figure 1 displays result from the data analysis which shows status of the information from the system which is relevant to their work, with respect to the percentages of their satisfaction level. The results show that 0% are strongly disagreeing and disagreeing. The 1.5% is undecided, having 3.0% of staff more or less disagree. The 6.1% more or less agree having 34.8 agreeing and lastly, 54.4% strongly agree that information from the system is relevant to their work.

INFOQ 2

Information from the system is accurate

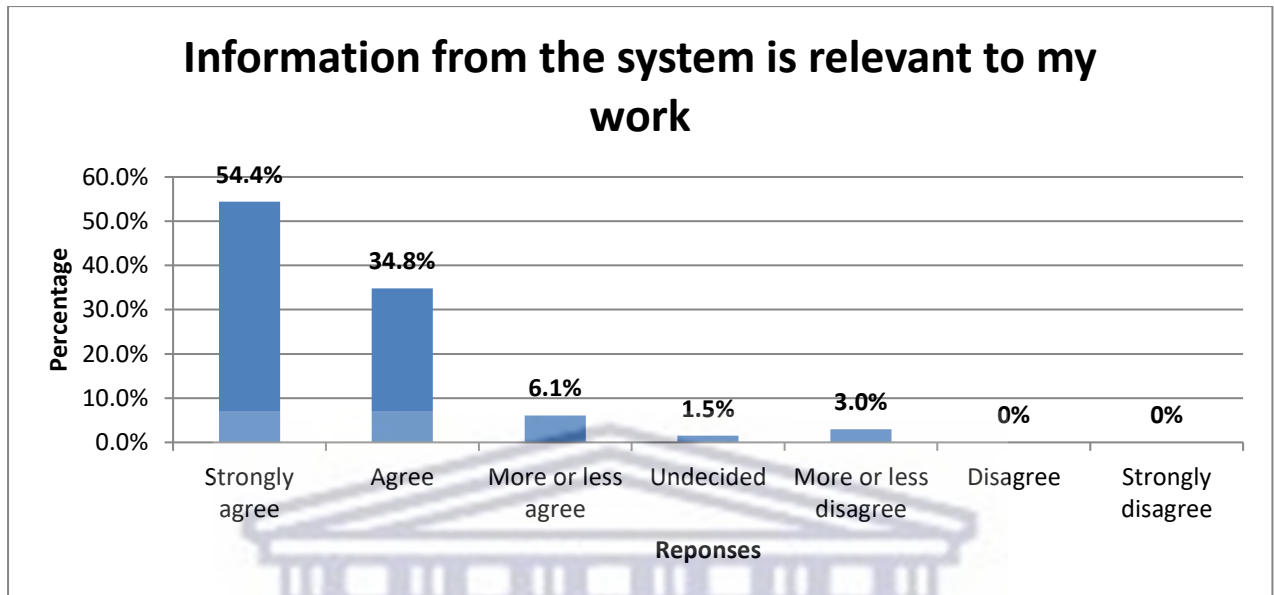**Figure 4.3.3.2: Information from the system is accurate**

Figure 2 displays result from the data analysis which shows status of information from the system is accurate, with respect to the percentages of their satisfaction level. The results show that 36.4% of staff strongly agrees and agree, followed by more or less agree at 22.7%. Undecided, more or less disagree, disagree are all at 1.5% with 0% of strongly disagree.

INFOQ 3

The information is presented in a useful format
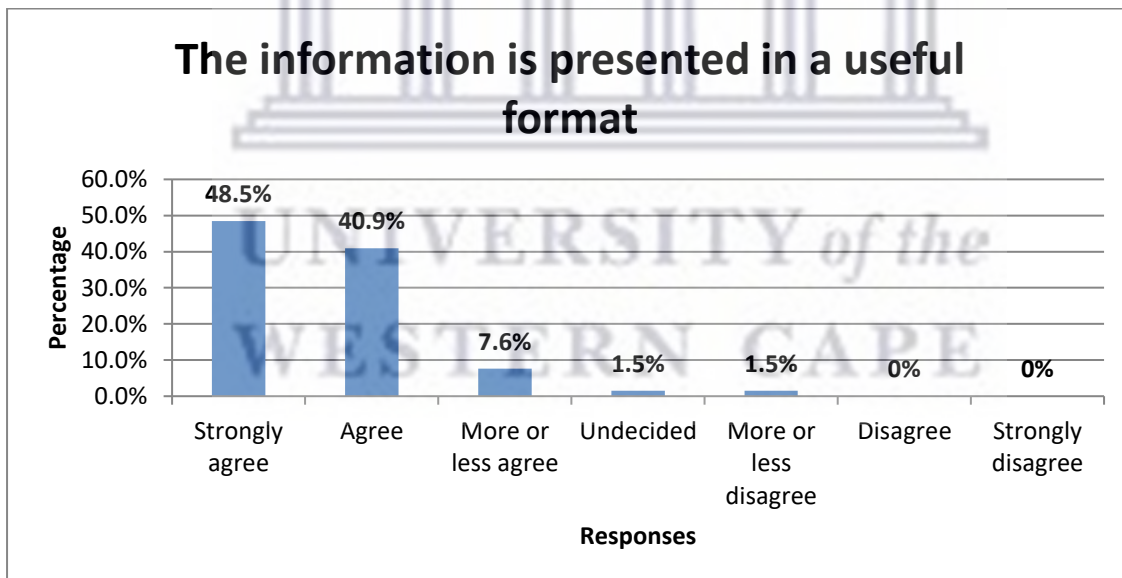
Figure 4.3.3.3: The information is presented in a full format

Figure 3 displays result from the data analysis which shows status of information is presented in a full format. The results show that 48.5% of staff strongly agrees, followed by those that agree at 40.9%. Those that are more or less agreeing are at 7.6%, having both undecided and more or less disagree at 1.5%. Those that disagree and strongly disagree are at 0%.

INFOQ 4
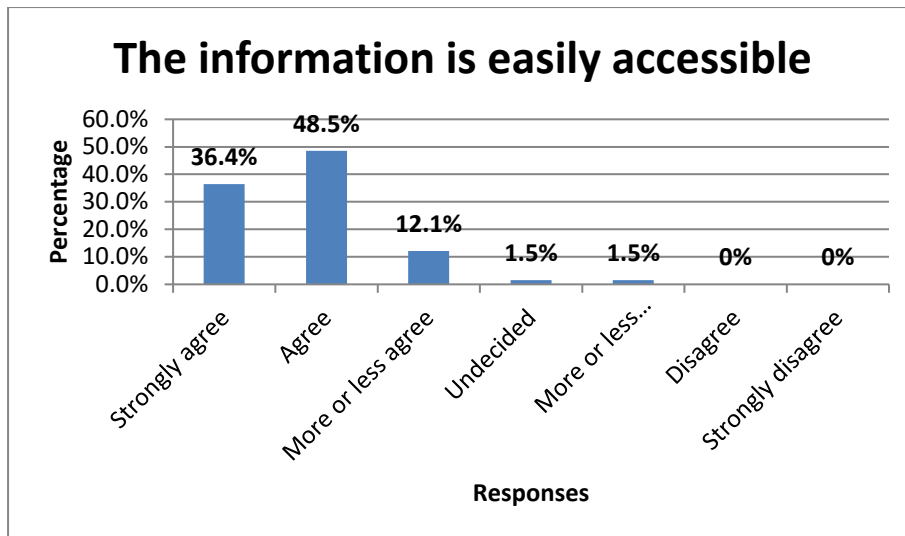
Figure 4.3.3.4: The information easily accessible

Figure 4 displays result from the data analysis which shows status of the information which is easily accessible. The results show that 48.5% of staff agrees. Those that strongly agree and neutral are at 36.4%. More or less agree is at 12.1%, followed by undecided and more or less disagree at 1.5%, having disagree and strongly disagree at 0%.

INFOQ 5
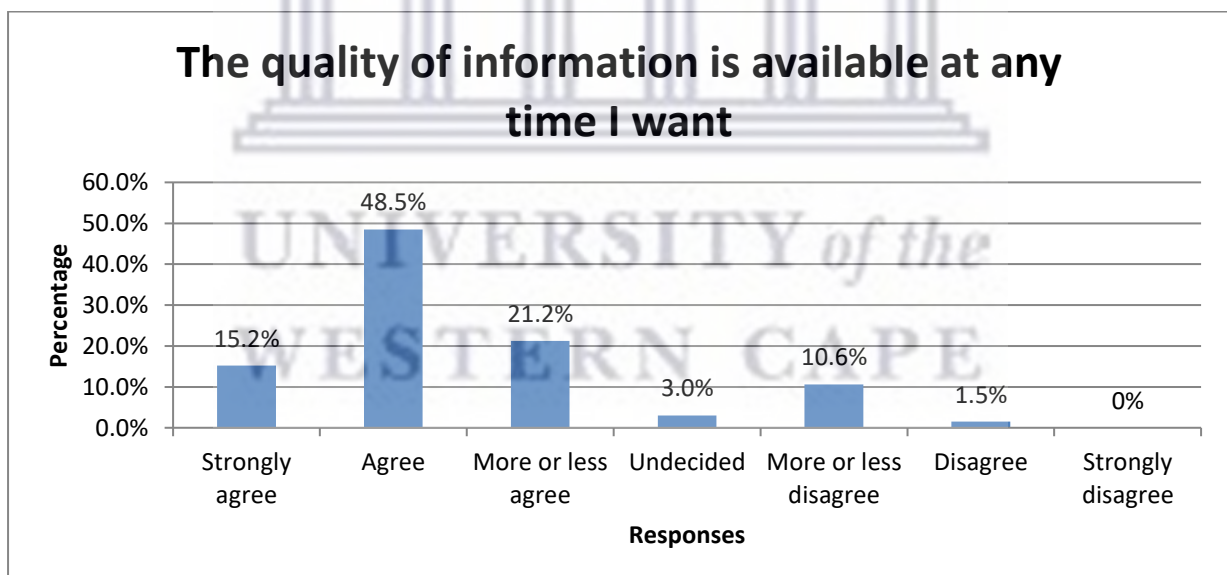
Figure 4.3.3.5: The quality of information is available at any time I want

Figure 5 displays result from the data analysis which shows status of the quality of information which is available at any time the user wants, with respect to the percentages of their satisfaction level. The results show that 48.5% of staff agrees, followed by those that are more or less agree at 21.2%, followed by 15.2% who strongly agree, then 10.6% of more or less disagree. Those that are undecided are at 3.0%, having 1.5% of those that disagree, followed by 0% of strongly disagree.

INFOQ 6

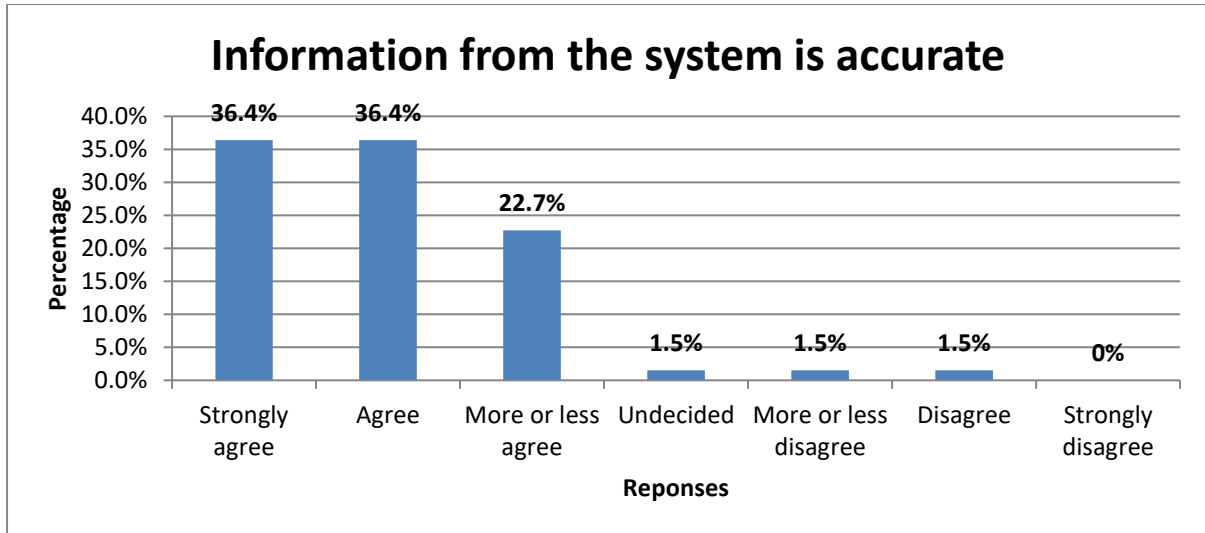## The information from the system is of good quality

Figure 4.3.3.6: The information from the system is of good quality

Figure 6 displays result from the data analysis which shows status of the information from the system which is of good quality. The results show the highest rate of 43.9% of those that are agree, followed by 30.3% of those that strongly agree. More or less the same are at 16.7%, having undecided at 7.6%, followed by more or less disagree at 1.5%, having 0% of both disagree and strongly disagree.
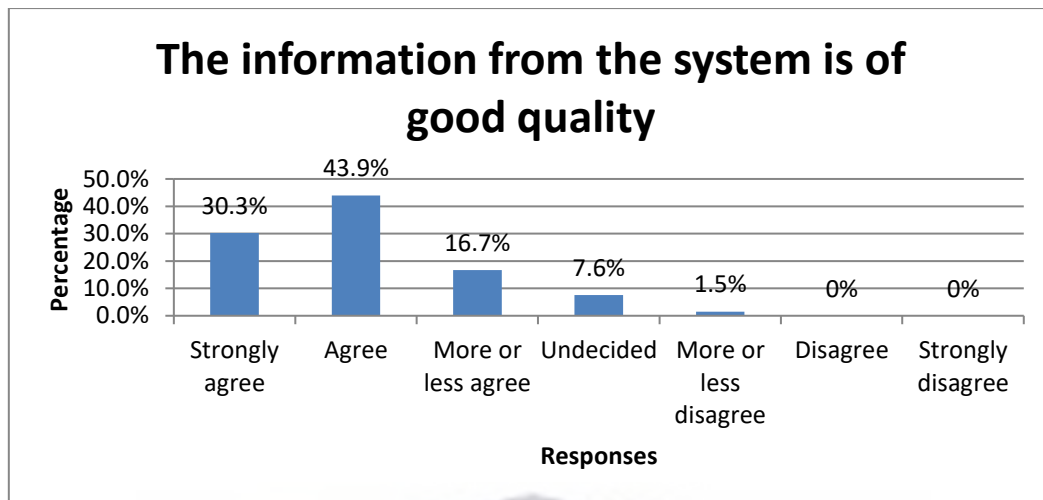
INFOQ 7

The information produced is complete
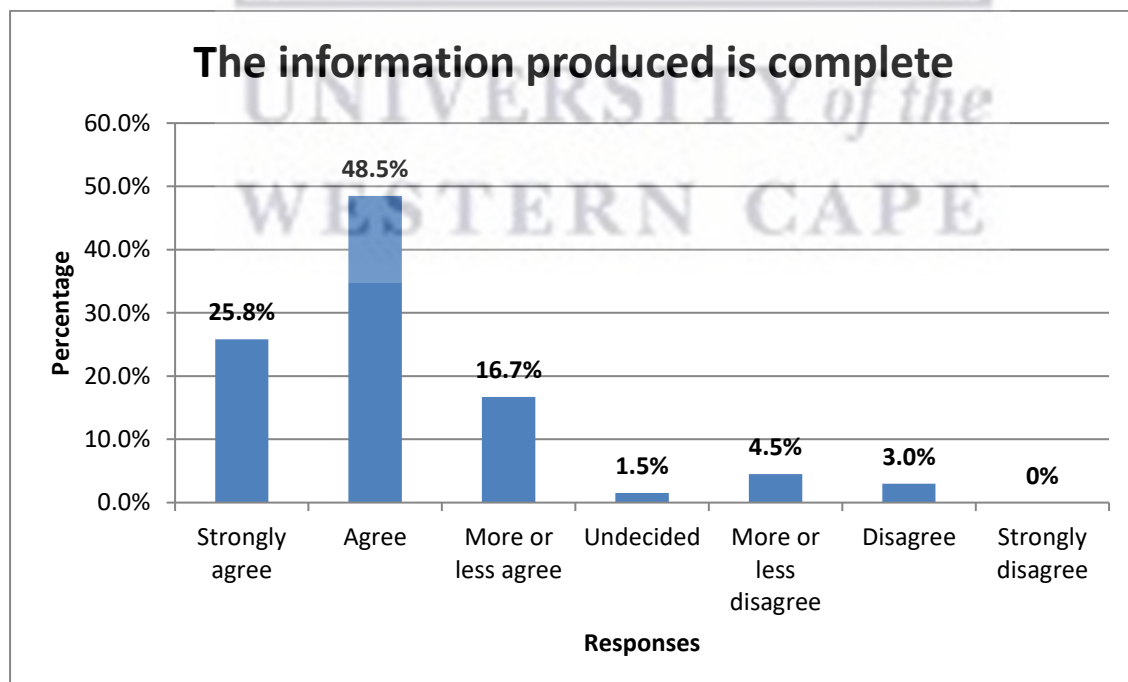
Figure 4.3.3.7: The information produced is complete

Figure 7 displays result from the data analysis which shows status of the information produced is complete. The results show that 48.5% of staff agrees, followed by 25.8% of those that strongly agree, having 16.7% of those that more or less agreeing. Those that are more or less disagree are at 4.5%, while 3.0% do disagree, followed by 1.5% of undecided. Strongly disagree is at 0%.

4.4 RELIABILITY TEST

4.4.1 Reliability Statistics

Cronbach's Alpha	N of Items
,81	7

In this study Cronbach's Alpha Coefficient was used to measure the reliability, that is, how closely related a set of items are as a group. It does indicate whether the items measure the same construct. Its general rule of thumb is between 70 and 80 and more than that it is regarded as duplication (e.g. .90), of which if it is below the value the internal consistency of the common range is low.

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
SERVQ1	23,82	16,49	,43	,81
SERVQ2	24,14	15,97	,46	,81
SERVQ3	23,88	14,69	,64	,77
SERVQ4	23,89	15,14	,70	,77
SERVQ5	24,08	15,12	,54	,79
SERVQ6	23,71	15,62	,71	,77
SERVQ7	23,58	16,96	,45	,81

The results indicate the Cronbach's Alpha of, 81 which means that the instrument used was internally consistent or reliable.

Reliability Statistics

Cronbach's Alpha	N of Items
,70	7

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
SYSQ1	21,61	15,57	,54	,63
	21,55	16,41	,57	,63
SYSQ2	21,50	17,02	,55	,64
	22,38	17,29	,25	,71
SYSQ 3	21,79	16,02	,51	,64
	21,58	16,09	,58	,62
SYSQ 4	23,33	20,07	,03	,76
SYSQ 5				
SYSQ 6				
SYSQ 7				

The results indicate the Cronbach's Alpha of, 70 which means that the instrument used was internally consistent or reliable.

Reliability Statistics

Cronbach's Alpha	N of Items
,98	7

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
INFOQ1	12,41	24,03	,71	,85
INFOQ2	12,05	22,38	,79	,84
INFOQ3	12,38	25,50	,61	,86
INFOQ4	12,18	25,63	,49	,87
INFOQ5	11,53	23,98	,45	,89
INFOQ6	11,88	20,54	,81	,83
INFOQ7	11,85	21,39	,78	,84

The results indicate the Cronbach's Alpha of, 98 which means that the instrument used was not reliable.

4.5 ANOVA

- AGE

Variable	F	Sig
SERVQ7	2.18	0.013
SYSQ2	2.36	0.007
SYSQ6	2.27	0.010
INFOQ1	2.05	0.021
INFOQ4	2.77	0.002

Analysis of variables was done, the following variables were tested; namely- SERQ7, SYSQ2, SYSQ, INFOQ1 and INFOQ4 and their relationship is statistically significant at less than 0.5. The result from the data analysis shows that age group have different opinions.

- **EDUCATION**

Variable	F	Sig
SYSQ5	3.33	0.016
INFOQ3	2.81	0.032
INFOQ6	2.86	0.031
INFOQ TOTAL	2.87	0.030

Analysis of variables was done, the following variables were tested; namely- SYSQ5, INFOQ3, INFOQ6, and INFOQTOT and their relationship is statistically at less than 0.5. The result from the data analysis shows there was a different thinking because of level of education.

- **DEPARTMENT**

Variable	F	Sig
INFOQ1	2.88	0.006
INFOQ2	2.74	0.008
INFOQ3	3.04	0.004
INFOQ4	2.24	0.028
INFOQ6	2.00	0.050
INFOQ7	3.54	0.001
INFOQ TOTAL	7.72	0.001

Analysis of variables was done, the following variables were tested; namely: - INFOQ1, INFOQ2, INFOQ3, INFOQ4, INFORQ 5, INFOQ6, and INFOQTOT and their relationship is statistically significant at less than 0.5. The result from the data analysis shows there was a different thinking only on information quality.

- **OCCUPATION**

Variable	F	Sig
INFOQ2	2.01	0.039
INFOQ3	2.74	0.005
INFOQ5	2.02	0.038
INFOQ7	2.62	0.007
INFOQ TOTAL	2.77	0.005

Analysis of variables was done, the following variables were tested; namely: - INFOQ2, INFOQ3, INFORQ 5, INFOQ6, and INFOQTOT and their relationship is statistically significant at less than 0.5. The result from the data analysis shows there was a different perception.

- **GENDER**

Variable	F	Sig
SERVQ 2	7.99	0.006
SERVQ 3	5.85	0.018
SERVQ 4	8.09	0.006
INFOQ5	7.34	0.009
SERVQ TOTAL	9.01	0.004

With regard to gender, T-Testing was used to determine if there is a significant difference between the means of two categories and in this study the two categories here are referring to female and male to which may be related in certain features. The results indicate that variables that are statistically significant are SERVQ2, SERVQ4, INFOQ5 and SERVQTOT, except SERVQ 3 where some of the genders were not significant difference, since they were not agreeing on some of the variables mentioned above.

SECTION 5: CORRELATION

	SERVQTOT	SYSQTOT	INFOQTOT	ADOPTION
SERVQTOT	1000	376[a]		637[a]
SYSQTOT	376[a]	1000		626[a]
INFOQTOT			1000	455[a]
ADOPTION	637[a]	626[a]	455[a]	1000

The testing of contrast or variables was done, and the findings were that they are correlating. The results indicate that SERVQTOT and SYSQ are correlating and INFOQ and SYSQ are not correlating but INFOQTOT is correlating with Adoption, which correlates with all variables. What was also found is that there is a relationship between SERVQTOT and SYSQTOT as they both increases, thus saying that when all qualities improve, the adoption also improves. Their relationship is statistically significant at less than 0.5.

4.6 Chapter summary

The chapter presented the results from the data collected from the participants in Helene Franz Hospital. A descriptive analysis of the data was carried out and was used to produce the summary of the data. Analysis of variables was done through ANOVA to relate and determine the relationships between the data. In this study, Cronbach's Alpha was used to measure reliability that is, how closely related a set of items are as a group.

The T-testing was used to determine if there is a significant difference between the means of two categories and in this study the two categories here refer to females and males refer to those which may be related to certain features. The results were grouped into three main categories, namely, Service Quality, System Quality, and Information Quality. It was discovered in the study that there are factors affecting the electronic health system in Service Quality, System Quality, and Information Quality at Helene Franz Hospital. The next chapter presents the research findings and discussion of the study.

Chapter 5: Research findings and discussion

5.1 Introduction

In this chapter, a brief summary of how the study was undertaken was provided, and the findings were discussed. The objective of this research is to explore factors that affect the quality of Electronic Health Systems at Helene Franz Hospital. The study used the Proposed Electronic Health System Quality Model to explore the factors that affect the service quality, information quality and system quality of the Electronic Health System.

5.2 What are the factors affecting Service Quality of Electronic Health Systems in the institution?

The main findings from the study concerning the Service Quality factors affecting Electronic Health Systems in Helene Franz Hospital are timeliness/time, user satisfaction, service awareness, interaction with the customer and willingness and readiness system quality. This agrees with Armstrong, 2012 (in Anjum and Aftab 2016: 512) debating that the staff need to respond timeously to the needs/ requests and queries of their customers as expected.

Toosi and Kohonali, 2011 (in Anjum and Aftab 2016: 512) mentioned that there should not be delays in terms of responding to the queries about services and products since there are essential issues. Again, the interaction between customers is quite important, as Armstrong, 2012 (in Anjum and Aftab 2016: 512) is also about the care and individualized concentration that the company gives its customers.

Helene Franz Hospital staff also mentioned that they are satisfied with the response of the system when attending to patients. Willingness and readiness of the employees to provide services to their clients are found to be another factor. For example, in the hospital, set up is about retrieval of patients' time-time from the administration side, taking of vital signs by the nurses, assessment by doctors and collection of medication from pharmacies, as well as the speedy admission processes in case the patient gets admitted for further management. The provision of services on time reduces patient waiting time, complaints and increases patient satisfaction.

5.2 What are the factors affecting System quality of Electronic Health Systems in the institution?

The key findings from the study on system quality factors affecting Electronic Health Systems in Helene Franz Hospital are systems that are user-friendly, easy to navigate, systems having good images, a system uploading pictures easily, a system having a pleasing color scheme, frequency of system utilization and the complexity of the system. Sun (2010:97) agreed that system quality concerns usability, ease of use, download time, system responsiveness, navigation, adaptability, and flexibility. Clay, Dennis, and Ko (2005: 3) suggest that System Quality is positively related to Perceived Ease of Use. Even though it was mentioned that Perceived Ease of Use is different from the system's quality, because a system may be absolutely reliable, in that it performs the required operations on time, every time.

However, the way in which the user interfaces with the system may be awkward, resulting in a low Perceived Ease of Use (PEU) while being very reliable and having high quality. They went further to say systems that tend to exhibit ease of use are those that are clear, understandable and those that require little mental effort to use. DeLone and McLean, 1992 (in Myers, Kappelman and Prybutok 1997:14) support the measures of the information processing system from experimental studies listed such as reliability, response time, ease of use, usefulness, flexibility, and accessibility.

Nielsen and Mack,1994 (in Fruhling and Lee, (2005: 2394) debated usability as a key to making systems easy to learn and easy to use. It includes the consistency and ease with which the user can manipulate and navigate the website, clarity of interaction, ease of reading, and arrangement of information, speed, and layout. Fruhling and Lee, (2005: 2394) went further, indicating that usability improves the design of user interface.

5.3 What are the factors affecting the Information Quality of Electronic Health Systems in the institution?

The key findings from the study on system quality factors affecting the Electronic Health System in Helene Franz Hospital are relevancy, accuracy, accessibility, availability, completeness, useful format, and good quality information. Xu, 2003 concurs that information can be evaluated by four attributes: accuracy, completeness, and these attributes or dimensions examine critical success factors for information quality. In their argument on information quality, Stvilia Mon and Yi, (2009:7) noted that relevancy, accuracy, accessibility, coherence,

and integrity are criteria to measure information quality. Healthcare is a domain in which the timely provision of accurate, current, and complete patient data is one of the most important objectives (Almutiry, 2022:98). Ratnaningtyasa and Surendro (2013:1167) went further, denoting that information quality in quality information becomes a critical factor in health service for patients because it promotes accountability between health providers, informs the focus on policy development, and it is the provider and functionary to learn about quality improvement between them.

5.4 Chapter summary

This chapter presented and discussed the key findings of the study on the following variables: Service Quality, System Quality, and Information Quality. Amongst others, the following are found to be crucial in all variables, namely, user satisfaction, timeliness, easy to use or navigate, relevancy, accuracy, accessibility, availability, and completeness.

Chapter 6: Conclusions and Recommendations

6.1. Introduction

Chapter six presents conclusions and recommendations of the study on evaluating the quality of the Electronic Health System at Helene Franz Hospital in Limpopo Province. These conclusions and recommendations were drawn from the findings and the discussions in chapter four. The objective of this research is to explore factors that affect the quality of the Electronic Health System in Helene Franz Hospital. The recommendations emanated from the questions and objectives of the study, in order to comprehend the factors affecting the quality of the Electronic Health System at Helene Franz Hospital. The following are the objectives:

(a) To investigate Information Quality factors affecting Electronic Health Systems in the institution.

b) To investigate Service Quality factors affecting Electronic Health Systems in the institution.

c) To investigate system quality factors affecting Electronic Health Systems in the institution.

6.2 Summary of research findings

In the findings, the researcher discovered that indeed there are factors affecting the electronic health system in Helene Franz Hospital researcher in service quality, system quality and

information quality. Among others, the following are found to be crucial in all variables, namely, user satisfaction, timeliness, easy to use or navigate, relevancy, accuracy, accessibility, availability, and completeness.

The attainment of the research aims and objectives.

6.3 Contribution of research to literature

The achievement of the research aims and objectives was through descriptive analysis to produce the summary of the data. Analysis of variables was done through ANOVA to relate and determine the relationships between the data. In this study, Cronbach's Alpha was used to measure reliability, that is, how closely related a set of items are as a group. The T-testing was used to determine if there is a significant difference between the means of two categories and in this study the two categories here refer to females and males refer to those which may be related to certain features. The results were grouped into three main categories, namely, Service Quality, System Quality, and Information Quality. It was discovered in the study that there are factors affecting the electronic health systems of Service Quality, System Quality, and Information Quality at Helene Franz Hospital. The next chapter presents the research findings and discussion of the study.

This study made contributions to literature because it provides a comprehensive investigation of the three quality contrasts, namely, service quality, system quality, information quality. They were described individually and combined influences on organizational impact. Our results show that service quality has the extreme influence of all three quality constructs, thus highlighting its importance to both internal efficiency and strategic benefits.

The understanding the relative importance of these quality attributes, managers can allocate resources accordingly and thus plan for an effective IS quality management program. Again, give the direction to the principals as to how to approach IS in terms of planning, budgeting programme development and training.

6.4 Limitations of the study

The focus of this study was to investigate quality factors affecting the Electronic Health Systems at Helene Franz Hospital. The results obtained from this study were used as a point of

reference by other researchers as limited research has been done on the study. The conceptual framework (proposed electronic health system quality model) validated could be extended or reused by other researchers to help in the development of other frameworks that assess factors affecting Electronic Health Systems. Nonetheless, governments, private sector health facilities and other decision-making bodies may use the results of this study to understand the factors that affect Electronic Health Systems. This also assists in taking an informed decision, developing strategic plans and programs, implementation of the proper IT infrastructure.

6.5 Recommendation (s) for future research

The researcher applied for ethical clearance with UWC Research Ethics Board. With respect to ethical considerations, first permission to conduct the research was obtained from the Provincial Department of Health: Government Information and Technology Officer (GITO) and the Chief Executive of Helene Franz Hospital.

The procedure was to approach the relevant staff members whom the researcher wanted to take part in the study. The approved ethical clearance document was produced to get permission from them to participate. It was clarified to all participants that they are at liberty to participate and to withdraw from the study if they feel uncomfortable in any way. A consent form and participation information sheet were provided to the participants to inform them about the content and objectives of my study. No participants were forced to partake in the study because it would make them not provide truthful and honest information. This study did not involve minors or children.

In the future, related studies may use a combination of quantitative and qualitative methods to investigate quality factors affecting Electronic Health Systems. Other sampling techniques other than purposeful sampling may be used in carrying out a similar study. The study can be extended to other health facilities inclusive of the private sector.

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Appendix A: SERVICE QUALITY

No.	Item	Very satisfied 1	Satisfied 2	Unsatisfied 3	Very unsatisfied 4	Not sure 5
1.	Quality of service provided by the system					
2.	Timeliness of service provided					
3.	Your awareness of this service					
4.	How satisfied are you with the services you received or accessed.					
5.	The provision of service to customers' timeously					
6.	The interaction between you and customers.					
7.	Willingness and readiness to provide service to the customers					

Appendix B: SYSTEM QUALITY

NO.	Item	Strongly disagree 1	Disagree 2	Neutral 3	Agree 4	Strongly agree 5
	1.The system has user friendly interface					
	2.The system is easy to navigate					
	3.The pages have generally good images					

	4.The system allows the user to upload pictures easily						
	5.The system has a pleasing colour scheme						
	6. I would like to use this frequently						
	7. I found the system unnecessary complex						

Appendix C: INFORMATION QUALITY

No.	Item	Strongly Agree 1	Agree 2	More or less agree 3	Unde cided 4	More or less disagree 5	Disagree 6	Strongly disagree 7
1.	Information from the system is relevant to my work.							
2.	Information from the system is accurate.							
3.	The information is presented in a useful format.							
4.	The information is easily accessible							
5.	The quality information is available at any time I want it.							
6	The information from the system is of good quality							
7.	The information produced is complete							