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The Impact of E-Health Information System (HIS) Characteristics at UNRWA-Gaza Health Centers on Healthcare Quality

**أثر خصائص نظام الصحة المحوسب في المراكز الصحية التابعة
لوكالة الغوث على جودة الرعاية الصحية**

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إقرار

أنا الموقع أدناه مقدم الرسالة التي تحمل العنوان:

The Impact of E-Health Information System (HIS) Characteristics at UNRWA-Gaza Health Centers on Healthcare Quality

**أثر خصائص نظام الصحة المحوسب في المراكز الصحية التابعة
لوكالة الغوث على جودة الرعاية الصحية**

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بناءً على موافقة عمادة البحث العلمي والدراسات العليا بالجامعة الإسلامية بغزة على تشكيل لجنة الحكم على أطروحة الباحثة/ علياء عادل جميل عطاالله لنيل درجة الماجستير في كلية التجارة/ قسم إدارة الأعمال وموضوعها:

أثر خصائص نظام الصحة المحوسب في المراكز الصحية التابعة لوكالة الغوث على جودة الرعاية الصحية

The Impact of E-Health Information System (HIS) Characteristics at UNRWA-Gaza Health - Centers on Healthcare Quality

وبعد المناقشة التي تمت اليوم الثلاثاء 20 محرم 1439 هـ، الموافق 2017/10/10م الساعة

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واللجنة إذ تمنحها هذه الدرجة فإنها توصيها بتقوى الله ونزوم طاعته وأن يسخر علمها في خدمة دينها ووطنها.

والله ولي التوفيق،،،

عميد البحث العلمي والدراسات العليا

أ.د. مازن اسماعيل هنية



Abstract

New in house built e-health information system has been implemented in the United Nations Relief and Works Agency Palestine Refugees in the Near East (UNRWA) primary health care centers. This study aims to study how the implementation of e-health information system in the primary health care centers enhance the health care quality that the UNRWA-Gaza health centers provides.

The implementation of the e-health information system in all 22 Gaza primary health care centers has just been finished this year. Population was the primary health care centers staff who using the e-health information system in their daily activities and have attitude toward it (979 clinical staff), the population include doctors, nurses, physicians Pragmatics and administrative staff. Quantitative approach was followed and questionnaire as a tool. The researcher distributed 310 questionnaire and 286 were received. Researcher used multiple regression and correlation to test the hypothesis.

Study concluded that there is a significant positive relationship between e-health information system characteristics and health care quality. While usability, relative advantages and compatibility has direct significant impact on medical error prevention and reduction. More ever, perceived ease of use ,perceived usefulness and relative advantages has direct significant impact on Health care outcomes improvements. In addition, relative advantages and compatibility has direct significant impact on Redesign patient care pathway.

The designer of the system should clarify the alerts and error message and make it easier for the user to indicate the problems solutions. It is also recommended that patient should have access to their personal medical record. Thus, initiation of a patient-portal website is essential. And the system should enhance to support the x-ray physiotherapy.

المخلص

تهدف الدراسة إلى دراسة مدى تأثير تطبيق نظام الصحة المحوسب على جودة الرعاية الصحية والذي تم تطبيقه حديثاً في المراكز الصحية التابعة لوكالة الغوث في غزة. وقد قامت وكالة الأمم المتحدة لغوث وتشغيل اللاجئين بتطبيق نظام الصحة محوسب في جميع المراكز الصحية تدريجياً وصولاً إلى 22 مركز صحي في قطاع غزة.

يشمل مجتمع الدراسة جميع الموظفين الذين كونوا وجهات نظر باتجاه نظام الصحة المحوسب ويستخدمون النظام في مهامهم اليومية ويبلغ عددهم 979 موظف من ضمنهم الأطباء، الممرضين، الفيزيائيين، الصيادلة والموظفين الإداريين. تم اتباع المنهج الكمي في الدراسة واستخدم الاستبيان كأداة تم توزيع 310 استبيان 286 تم استردادها. استخدمت الباحثة الانحدار المتعدد والارتباط لتحليل الاستبيانات ودراسة الفرضيات.

توصلت الدراسة بوجود علاقة إيجابية بين خصائص نظام الصحة المحوسب وجودة الرعاية الصحية وكما أن المزايا النسبية، سهولة الاستخدام والتوافق لها تأثير إيجابي على تقليل والأخطاء الطبية والوقاية منها. بالإضافة إلى أن إدراك سهولة الاستخدام، إدراك المنفعة والمزايا النسبية لها تأثير إيجابي على تحسين جودة الرعاية الصحية وكما يوجد علاقة إيجابية بين المزايا النسبية والتوافق وإعادة تصميم مسار المرضى.

على مصممين البرنامج ضرورة العمل على توضيح التنبيهات ورسائل الخطأ في النظام ليسهل على المستخدم تحديد المشكلة وحلها. بالإضافة إلى أن وصول المرضى إلى سجلاتهم ومتابعتها يجب أن يكون متاحاً لهم لهذا يجب إنشاء موقع إنترنت خاص بالمرضى هذا ويجب على النظام أن يدعم العاملين على الأشعة السينية.

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

﴿ ... وَكَانَ فَضْلُ اللَّهِ عَلَيْكَ عَظِيمًا ﴾

[النساء: 113]

Dedication

For my dear Parents who always support me.

For my dear husband and stand beside me with kindness.

My little son make who make my life have a value.

For my beloved brother and sister.

For my best friend .

For my family

I dedicate this study

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First and foremost, I would like to thank Allah, whose many blessings have made me who I am today. I would like next to thank my thesis advisor Dr. Khalid Abed Dahleez whose office door was always open whenever I ran into a trouble spot or had a question about my research or writing. He consistently allowed this thesis to be my own work, but guided me to the right direction whenever he thought I needed it. Hence I would extend my grateful gratitude and appreciation to him for the valuable guidance and advices.

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Alia'a A.Atallah

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Chapter 1

Introduction

Chapter 1

Introduction

1.1 Introduction

Information is one of the fundamental resources in organization. It's the base of the Administrative processes that include planning, decision-making, organizing and control. For that reason information management is critical for organization and the success of organization depends on it. The health information system lives depends on, the decisions must be right and information have be available and reliable at any time for decision-makers, such as: healthcare providers, top management, patients...etc. Abdool (2014). Implementing Manual information systems in health care include potential risks, such as: misunderstanding medications instructions, unavailability of allergy alerts and no access to patients' history information, However, all these can be avoided or at least minimized by implementing e-health information systems (Abdool, 2014). Besides the e-health information system provide integrated view of patient data, clinical decision support, clinician order entry, access to knowledge resources, integrated communication and reporting support (Botha, Botha, & Herselman, 2014).

The challenge in the e-health information systems is the complex socio-technical systems that designed to meet the need of different types of users who have different requirements. That maybe a reason for poor usability that result in untoward outcomes and unintended negative consequences and medical errors (Middleton et al., 2013). More ever, the e-health information system must be design to have high degree of relative advantages, that mean the end user must understand the new technology, recognize the impact on the behavior (Rogers, 2010). The theory of planned behavior one of the important theories that studied the intention to use illustrated that there are three dimensions to accept innovation Perceived ease of use, Perceived usefulness and compatibility (Asua, Orruño, Reviriego, & Gagnon, 2012).

The designers should improve the system characteristics to reach higher quality of health care that improve communication, facilitation providing care, medical error reduction and workload among the users (Peikari, Shah et al., 2015). In addition

(Abdool 2014), added different criteria for how e-health information system can improve patients outcomes through gathering a full documented information about patients“ lab results and radiology reports) that help in making therapeutic decisions, how the system helps in to track patients care progress, help patients of drug duration, reminders which e-health information system send it for doctors to follow patients improvement outcomes.

The present study will focus on how the newly adopted e-health system at UNRWA health centers really influences the quality of health care system and advise those who are concerned with the study outcome and recommendations.

1.2 Problem Statement

In 2009, UNRWA began developing and piloting the electronic medical records (EMRs) named as the classical e-health system in its health centers, transitioning away from the time consuming, costly and labor-intensive imprecise paper-based system. In 2011 new Approach of family health teams (FHT) implemented, the new package is more comprehensive; it incorporates a synergized interface that accommodates the information technology and management needs for the FHT model. On the ground, the use of e-health information system has facilitated and streamlined the daily operation of the health centers. It led to better documentation and follow-up of referrals, more efficient use of space, less use of stationary and printed forms and streamlined patient movement, reduced patient waiting times, and increased provider patient contact time; thereby increased opportunities for the delivery of better health services and the delivery of health education messages(UNRWA, 2016).

The improved accuracy and reliability of statistical information, enables the development of evidence-based policies in the future that are essential to sustain and improve the outcomes of the health reforms. Despite of many attempts to implement e-health information systems, failure rates are high due to various reasons, such as: inadequate trainings, eliminating users to involve in these projects and poor implementation strategies. So, organizations need to understand the system adoption from the user’s perspective to prepare the employees to face new challenges and learn how to make good use of the system to increase the profit earns (Rajan & Baral,

2015), Unfortunately, users acceptance or rejection of Information system is not fully understood (Al-Jabri & Roztockki, 2015). If the organization unable to evaluate the system, how can judge against the competitors, or even the organization previous versions of the system? (Rogers, 2010). Ms. Taghreed El-Masri, e-health system coordinator, concluded that UNRWA e-health system is still under development , there are many issues and problems that the system suffer from it are reported back to system developers in regular basis to maintain and redesign to be suitable for work flow. This has triggered the need for systematic evaluation of the system in scientific approach (El-Masri, 2017).

Hence, this study aims to examine the successful implementation of the health information system that implemented in 22 UNRWA/Gaza care health centers and to explore the extent to which such system impacts on medical error prevention and reduction, health care outcome improvement and redesigning patient care pathway. To achieve this goal, the researcher has developed a model to answer the main question of the research, namely: **“What is the impact of e-health information system characteristics on Health care quality at UNRWA-Gaza health centers?”**

RQ1: How do respondents evaluate the e-health information system characteristics (usability, perceived ease of use, perceived usefulness, relative advantages, compatibility) of the adopted e-health information system?

RQ2: How do respondents evaluate the Health care quality (medical error prevention and reduction, patient outcomes improvements, redesign patient care pathway) of the adopted e-health information system?

RQ3: To what extent does the e-health information system characteristics (usability, perceived ease of use, perceived usefulness, relative advantages, compatibility) affect the medical error prevention and reduction.

RQ4: To what extent does the e-health information system characteristics (usability, perceived ease of use, perceived usefulness, relative advantages, compatibility) affect the patient outcomes improvements .

RQ5: To what extent does the e-health information system characteristics (usability, perceived ease of use, perceived usefulness, relative advantages, compatibility) affect the redesign of patient care pathways .

RQ6: Are there differences in responses towards the impact of e-health information system characteristics on healthcare quality due to demographic characteristics.

1.3 Research Objectives

Based on the above introduction, this study has the following objectives:

1. Identify the level of health care characteristics.
2. Identify the level of health care Quality.
3. Examine the impact of e-health information system characteristics at UNRWA-Gaza health centers on significantly enhancing the medical error reduction and prevention.
4. Examine the impact of e-health information system characteristics at UNRWA-Gaza health centers on health care outcomes improvements.
5. Examine the impact of e-health information system characteristics at UNRWA-Gaza health centers on redesign patient care pathways.
6. Shedding light on the frequency discrepancy of surveyed sample attitudes in regards with questions of the survey attributable to demographic differences such as gender, age, experience and IT background.

1.4 Study Model and Variables

To answer the main and sub questions of the research, the researcher depend on Technology Acceptance model(TAM) (Davis Jr, 1986) , (Rajan & Baral, 2015) added the effect of usability and Compatibility on the model, perceived ease of use and perceived usefulness according to (Peikari, Shah, Zakaria, Yasin, & Elhissi, 2015) improve the outcomes and error prevention, (Moore & Benbasat, 1991) study the relative advantages ,compatibility and ease of use and how they affect the successful IS adaption.

Many researcher study the model variable but non study this model specially .

Figure (1.1): illustrates the final version of the model used by the researcher.

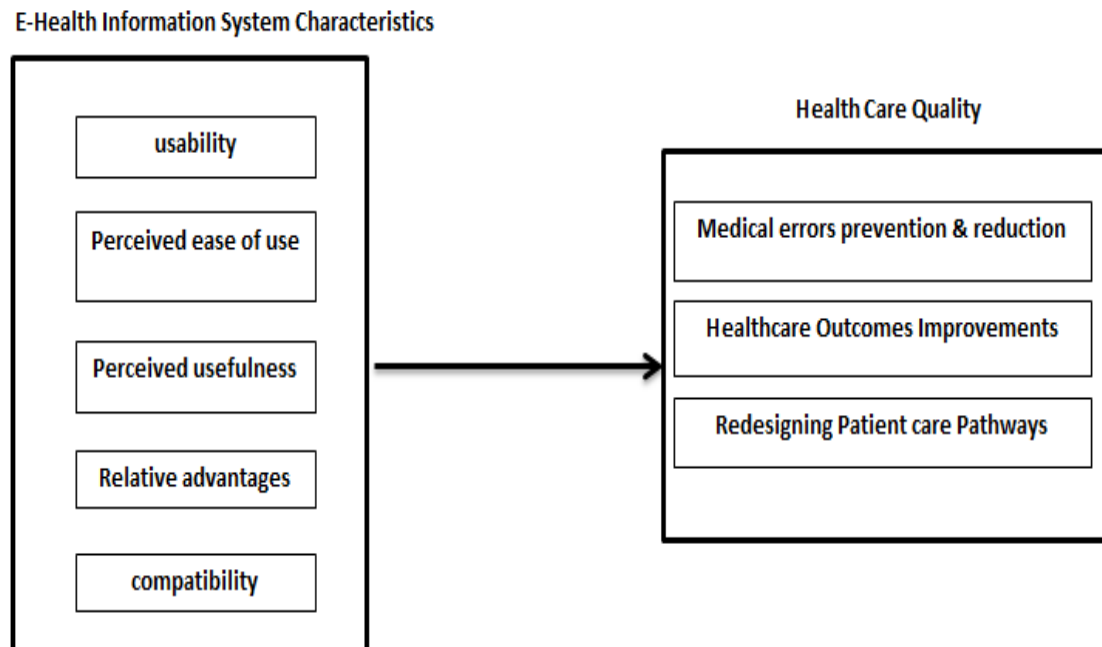


Figure (1.1): Study model

Independent Variables:

Usability : The degree to which Information system can be used by users to achieve quantified objectives with efficiency, effectiveness and satisfaction in a quantified context of use (Middleton et al., 2013) .

Perceived Ease of Use : The degree to which user believes that using information system would be free of physical and mental effort and easy to learn understand, manipulate and deal with (Ali & Younes, 2013).

Perceived Usefulness: The degree to which user believes that using information system would enhance his or her job performance (Ali & Younes, 2013).

Relative Advantages: The degree that the Information system perceived as being better than the previous one (Rogers, 2010).

Compatibility: The degree that the information system consistency with the potential users existing values ,needs ,past experience that means four dimensions:

compatibility with existing work practices, with preferred work style, with prior experience, and with existing values (Rogers, 2010).

Independent Variables:

Medical Errors Prevention and Reduction: The degree that the information systems protect or minimize the preventable not desirable effect of care, whether or not it is harmful to the patient. This might include an incomplete or inaccurate diagnosis or treatment of a disease, injury, behavior, infection, or other ailment (Kushniruk, Bates, Bainbridge, Househ, & Borycki, 2013).

Health Care Outcomes Improvements: The change of the health care result or ability to live normal productive live (Porter, 2010).

Redesign Patient Care Pathway: structured multidisciplinary care plans that detail essential steps in the care of patients with a specific clinical problem (Gooch & Roudsari, 2011).

1.5 Study Hypotheses

Based on study analytical questions and study objectives, the following hypotheses can be derived:

H1: There is a significant positive relationship between e-health information system characteristics and health care quality.

H2: E-health information system characteristics (usability, perceived ease of use ,perceived usefulness, relative advantages, compatibility) has direct significant impact on medical error prevention and reduction.

H3: E-health information system characteristics (usability, perceived ease of use, perceived usefulness, relative advantages, compatibility) has direct significant impact on Health care outcomes improvements.

H4: E-health information system characteristics (usability, perceived ease of use, perceived usefulness, relative advantages, compatibility) has direct significant impact on Redesign patient care pathway.

H5: There are significant differences among respondents for the impact of health information system (HIS) characteristics on healthcare quality due to demographic characteristics.

1.6 Importance of the Study

UNRWA in all of its operation areas is counted as a fundamental service provider to Palestinian refugees in the fields of education, relief, health, and camp infrastructure. The implementation of an in-house developed computerized health information system in Gaza health centers has the objectives of improving the functionality of clinic workflow, employees' performance level, health care service delivery and reduction of cost. This system is anticipated to positively affect the local community and increase the level of quality of health services for all segments of refugees. This system is the first in Gaza in terms of its functionality comprehension, integration, and totally replacing paper work.

The importance of this study emerges from the fact that such systems are still new in Gaza and need to be thoroughly studied in order to figure out whether such systems are up to expectations and worth the investment and to identify any significant impact on medical performance and health care attributed to the implementation of such systems.

1.6.1 Theoretical Importance

This study can be a reference for those interested in studying the implementation of the e-health care systems and focus on factors that lead to successful system consider the work flow, reduce error and improve the outcomes.

1.6.2 Practical Importance

This study can also be important to decision makers specially health department leaders at UNRWA by highlight the weakness and strengths on the system and make the appropriate improvements needed.

Gaza field office, the largest amongst UNRWA's operation fields, provides primary health care services to more than a million refugees scattered across Gaza

Strip through a network of 22 health centers. Improvements applied to the newly adopted e-health program would have crucial effect on the overall quality of the delivered health care service and protect and promote the health of the registered Palestinian refugees.

1.7 Study Limitation and Challenges

This study has the following limitations:

1. Location Limitation:

this study is limited to UNRWA-Gaza health centers. Health centers in other areas of UNRWA operation such as West Bank, Jordan aren't be included. Similarly, non-UNRWA health centers and hospitals in Gaza are out of the scope of this study.

2. Human Limitation:

Study population is limited to admin and medical health centers' staff members who make use of the system in their daily operation and who have already developed attitudes toward the system operability and effect on the clinic daily activities (staff members such as cleaners, doorkeepers and clinicians who don't utilize the system are excluded from the population).

3. Time Limitation:

It was big challenge for the researcher to disseminate study questionnaire and collect data from the sampled clinical staff as the targeted population is available at 22 health centers scattered at all side of Gaza strip starting from Beit-Hanoun health center in the extreme North to Shoka health center in the extreme south and from Gaza-town health center at the extreme east to Beach health center at the extreme Thereby, it was an extremely exhausting time consuming and costly data collection process.

1.8 Organization of the Thesis

The study consists of five chapters. Chapter 1 contains an introduction, problem statement, study questions and objectives, study model and variables, hypotheses, importance of the study, study limitations and challenges and structure of

the thesis. Chapter 2, covers information system conception, health information system, then moves to development of study model followed by elaboration about e-health system characteristics and quality. Chapter two ends by introducing UNRWA and UNRWA health system and health reform. Chapter 3 presents previous relevant studies, researches, papers, articles and publications then commenting on them highlighting matching and differences between this study and previous study and sheds light on the benefits grasped from them. Why this study is special follows. Chapter 4 contains research design and methodology, which includes study population and sample, data collection, questionnaire design, piloting, and testing questionnaire for validity and reliability. Chapter 5 contains the data analysis and results, including demographic description of the sample, descriptive analysis answering study questions, data analysis, and discussing results of hypotheses testing. Finally, Chapter 6 includes the conclusions and the recommendations of the study.

1.11 Chapter Summary

In this chapter the researcher introduced the problem under study, elaborated on the study objectives, questions and hypotheses, three main hypotheses with 15 sub-hypotheses, and explained the various variables handled throughout the study. He also pointed out the importance of the research to the different parties encompassing researcher, UNRWA and the society. Study boundaries and challenges were also briefed.

Chapter 2

Theoretical Framework

Chapter 2

Theoretical Framework

2.1 Introduction

Information technology has emerged in our life rapidly and affecting out personal, social and public life and has impact on the quality of our life . It supports the complex decision making due to competitive environment .So, Investments by firms in information technologies (IT) have increased rapidly over the past 30 years ,many organization look to the Information system as investment that the money invested to change useless data to productive knowledge (R. S. Taylor, 1982) . So, the new information systems are result of the attitude and assumption that consider the user perspective and environment.

It is not surprising, therefore, that managers and researchers have made plausible claims that investments in IT can have important strategic consequences for firms: IT investment decisions have the potential to either improve a firm's competitive position or to allow the firm to become more vulnerable to competitive forces. So, IT investments have a significant impact on firm performance and, therefore, has value to the firm.(Dos Santos, Peffers, & Mauer, 1993)

This chapter discusses the conceptions and definitions in connection with information systems in general and with health information system (HIS) in particular. It also highlight on the important role HIS plays in providing high quality of health care services . Furthermore, it addresses some of the theories and models used by researchers in evaluating the quality of the health care provided.

2.1.1 The General Concept of Systems

A system is defined as an asset of related events that collectively form a unified whole(Parker & Case, 1993). Skyttner (1996) defined the system as a set of interacting units or elements that form an integrated whole intended to perform some function. These elements continually influence one another (directly or indirectly) to maintain their activity and the existence of the system, in order to achieve the goal of the system.Carlsson, Jacobsson, Holmén, and Rickne (2002) Cited that a system is

defined as a set of interrelated components working toward a common objective. Systems are made up of components, relationships, and attributes.

- a. **Components** :*are the operating parts of a system.*
- b. **Relationships** :*are the links between the components .*
- c. **Attributes** :*are the properties of the components and the relationships between them; they characterize the system.*

According to the definition before the researcher can define system as asset of interrelated components that integrated together to perform some functions to achieve the goal of the system.

All systems have (a) inputs, outputs and feedback mechanisms, maintain an internal steady-state despite a changing external environment, display properties that are different than the whole but are not possessed by any of the individual elements, and have boundaries that are usually defined by the system observer.

Although ,there is deferent type of systems with different functions ,output, input, environment and ...etc.

2.1.2 The Concept of Information Systems:

Parker and Case (1993) defined information system as, any system that provides people either with data or information relating to an organization operation.

Information system is one of the key instruments business managers rely on for achieving operational excellence, building new products and services, enhancing decision making, and attaining competitive advantage (Laudon & Laudon, 2016) .Gupta (2000) Defined information system as a system which provides information for decision making or control of the organization. More ever he defined information system as any combination of Information Technology and people's activities using that technology to support operations, management, and decision-making. Yeo (2002) cited that information systems has been defined to denote any of a wide combination of computer hardware, communication technology and software designed to handle information related to one or more business processes. And he also defined

information system as user-interfaced and designed to provide information and information processing capability to support the strategy, operations, management analysis, and decision-making functions in an organization.

According to definitions mentioned before, Information System can be defined as a combination of interacted people, hardware, software and infrastructure that support all management process to reach the organization goals.

2.1.3 Basic Processes of Information Systems (IS)

Information systems are a series of formal processes that enhance and add value to the input to get useful output. The Information system process are (S. Taylor & Todd, 1995)

1. Input process:

- a. Select: decide what data must be inter into the system*
- b. Acquire: gather the selected data from many resources within the firm and/or its environment*
- c. Organize: sort gathered data into groups based on some criteria such as similar characteristics*
- d. Store: securely save grouped data into a database for later reclaim and use*

2. Manipulation Processes:

- a. Retrieve: recall stored data for analysis*
- b. Analyze: process retrieved data by applying mathematical, logical, and comparative operations to produce information that would be useful to system users.*

3. Output Processes:

- a. Interpret: expand in the generated information and put them in specific shapes, rules and context to help in decision making.*
- b. Display: show in time dashboard, graphs and summaries that would help decision makers take the right decisions.*

2.1.4 General Conceptions of Data to Wisdom

Information system is a series of processes that added value (S. Taylor & Todd, 1995). These process move the data to information then to knowledge then to informed knowledge to productive knowledge the last two concepts have the same meaning to understanding and wisdom.

Ackoff (1989) classify the human mind into:

1. **Data:** consists of representations of events, people, resources, or conditions. The representations can be in a variety of forms, such as numbers, codes, text, graphs, or pictures (Buckland, 1991). While Laudon and Laudon (2016) defined it as streams of raw facts representing events occurring in organizations or the physical environment before they have been organized and arranged into a form that people can understand and use.
2. **Information:** is a result of processing data. It provides the recipient with some understanding, insight, conclusion, decision, confirmation, or recommendation. The information may be a report, an analysis, data organized in a meaningful output, a verbal response, a graph, picture, or video (Buckland, 1991). According to Ackoff (1989) information is data that has been given meaning by way of relational connection. To be valuable, information must have several characteristics: It should be accurate, complete, economical to produce, flexible, reliable, relevant, simple to understand, timely, verifiable, accessible, and secure.
3. **Knowledge:** Laudon and Laudon (2016) defined it as a cognitive, even a physiological, event that takes place inside people's heads to transform information into patterns, rules, and contexts. Knowledge residing in the minds is called tacit knowledge, whereas knowledge that has been documented is called explicit knowledge. Ackoff (1989) defined it as the appropriate collection of information, such that it is intent to be useful and is usually held in human mind or memory.
4. **Understanding:** According to Ackoff (1989) understanding is a cognitive and analytical process by which man can take knowledge and generate new knowledge from the previously held knowledge.

5. **Wisdom:** Ackoff (1989) sees wisdom as the process by which we also differentiate, or judge, between right and wrong, good and bad.

2.2 E-Health Information system (HIS)

There are many terms the researchers studied using information system in health. The term e-Health is thus a broad term that refers to everything that applies to the combination of computing or electronic devices and healthcare or medicine.(Botha et al., 2014). The World Health Organization defines e-health as the usage of information and communication technologies (ICT's) in the health domain, to administer treatment of patients, research, health education and the monitoring of public health (WHO, 2016).

On the other hand health information technology is defined as a broad array of technologies involved in managing and sharing patient information electronically rather than through paper records. These information technologies include the application of health information systems (HIS) designed primarily to support the management of patient's records such as Electronic Health Record (EHR) system, and to assist medical and health care delivery such as clinical decision support system (CDSS) and computerized provider order entry (CPOE) system(Jamal, McKenzie, & Clark, 2009).

In this research, however, HIS is referred to computer based information system that manage the processes workflow and daily activity, at health care centers; support management to the patient health record, generate laboratory analyses, record pharmacy transactions and provide all report needed to the daily work flow and decision making.

2.2.1 Importance of E-Health Information System (HIS)

Many researchers studied the e-health information systems and how it impact the quality ,performance , profit etc. to try to answer the question how much the HIS is important. For instance Ash, Berg, and Coiera (2004) argued that one of the most important international issue the medical care error reduction in the U.S according to the Institute of Medicine's report cost approximately \$38 billion per year and cause

up to 98,000 deaths in hospitals. The National Patient Safety Agency estimates that 850,000 incidents and errors occur in the United Kingdom. Implementing the HIS reduce the medical errors and patient safety. In addition, Hillestad et al. (2005) investigated that Using HIS increase the productivity about 1.5% and decrease the annual spending on the national health care decrease of \$346 billion in U.S . HIS improve chronic disease prevention and manage ,decrease adverse drug events, provide preventive care, reduce paper work, improve the quality and clinical performance.

The researcher can conclude that HIS is important to reach high quality health care ,higher productivity and lower medical error .

2.2.2 Types of E-Health Information Systems

There are many types of e-health information system every system has functions and it's named according to this functionality:

Electronic Health Records (EHR): is defined as standalone system or a central component of an integrated health information system where patient data in digital form are stored and exchanged securely by multiple authorized users (Häyrinen, Saranto, & Nykänen, 2008). The system allows input interface, printing ,storage, view, reporting, and sharing with many user of information contained in Electronic Health record. In addition , EHR contains the demographic information's ,all the health care history of the patient including the laboratory result ,scanned documents, digital image ,and may include health care management information such as billing information and bed management (Black et al., 2011) .

Picture Archiving and Communication Systems (PACS): are clinical information systems used to transmit, acquire, display and store image. Besides acquiring images directly from digital modalities such as computed tomography (CT), magnetic resonance imaging (MRI), nuclear medicine (NM) and computed radiography (CR), these systems can convert images on radiographic film to digital images using laser digitizers . The images stored in PACS can be reproduced either on film with a laser camera or be displayed using television monitor with high resolution (Arenson, 1992). PACS Provides image quality, accessibility, transportation, search-ability,

preservation of medical images and sharing. In addition, it's provide the remotely view images, efficiency ,time consuming and continuing of care(Black et al., 2011).

Computerized Provider (or Physician) Order Entry (CPOE): such systems use to modify, enter, review, and communicate orders by clinicians (E. M. Campbell, Sittig, Ash, Guappone, & Dykstra, 2006) and return results for laboratory tests, radiological images, and referrals . CPOE integrate PACS images and orders with patient data and they also electronically transfer orders and the retrieve of results. The electronic request of orders and return of results is expected to result in organizational efficiency gains and time savings (Black et al., 2011).

E-Prescribing: refers to clinical information systems are used by clinicians to enter, modify, review, and output or communicate medication prescriptions. This system can be a part of CPOE or integrated interface with EHR (Black et al., 2011) .E-prescribing systems support transfer between the pharmacy and the prescriber electronically and often five different functions: computerized prescribing associated with formulary compliance, clinical decision support , pharmacy benefit eligibility checking and medication history reporting (Halamka et al., 2006) . The system improve patient outcomes, leading to better medications by reducing prescribing errors (Black et al., 2011).

Computerized Decision Support Systems (CDSSs): information systems that integrate clinical and information from EHR to provide support for decision making. These systems have highly variable levels of sophistication and configurability with regards to inputs such as patient data, suggestion mechanisms , knowledge bases and outputs. The main anticipated impact of the system is the improvement of clinical decision making. This improvement should, in turn, lead to improvement in performance in a variety of care activities like preventive care, disease management, diagnosis, and ways in which these care activities are delivered. These systems should also be able to facilitating standardization to prevent inconsistencies in care specially when integrated in one of the other systems (Black et al., 2011).

2.2.3 Objectives of E-Health Information System

Eysenbach (2001) introduce that e in e health is not just stand for electronic it's also the 10 purpose of the e-health information system :

1.Efficiency : One of the main objectives of the e-health information system is to decrease the cost and increase the efficiency of the health care. The most effective way to decrease cost by eliminate the unnecessary or duplicated therapeutic interventions, by improve communication between health care departments and through patient involvement.

2.Enhancing quality of care: Efficiency increasing includes improving quality not only decreasing the cost. E-health information system provide butter quality of health care .For instance ,by compare the deference's between the providers , using the customer as quality assurance tool and make sure that the patient direct to the best quality providers.

3.Evidence based: e-health interventions should be evidence-based in a sense that their effectiveness and efficiency should not be assumed but proven by rigorous scientific evaluation. Much work still has to be done in this area.

4.Empowerment of consumers and patients: by provide higher accessibility to the patient on the electronic health records over internet, provide patient-centered service and evidence-based patient choice.

5.Encouragement of a new relationship between the professional and patient, to reach a good partnership , which provide shared decision making.

6.Education of physicians and customers by providing online services for physicians and health education for consumers.

7.Enabling communication and information exchange in a standardized way between health care departments.

8.Extending the scope of health care beyond its conventional boundaries. In the conceptual and geographical sense .e-health information system enables the

consumers to obtain health services online from global providers. These services can be simple such as advice or complex interventions

9.Ethics: e-health information system is a new shape of physician-patient relationship ,which lead to challenges in the ethical issues such as informed consent ,online professional practice and equity and privacy issues.

10.Equity: insure equity between patient is one of the features of the e-health information system

to make health care more equitable is one of the promises of e-health, but at the same time there is a considerable threat that e-health may deepen the gap between the "haves" and "have-nots". People, who do not have the money, skills, and access to computers and networks, cannot use computers effectively. As a result, these patient populations (which would actually benefit the most from health information) are those who are the least likely to benefit from advances in information technology, unless political measures ensure equitable access for all. The digital divide currently runs between rural vs. urban populations, rich vs. poor, young vs. old, male vs. female people, and between neglected/rare vs. common diseases.

2.2.4 Benefits of E-Health Information Systems

Botha et al. (2014) studied the benefits of the e-health information system by search for papers (journal papers, conference papers and documents) ranged from August 2013 to August 2014 that contains the benefit phrase or any phrase with the same meaning and he found that the higher rate is :

4. Cost savings, financial benefits in general
5. Health safety improvements
6. Improvement of efficiency and effectiveness of healthcare
7. Improved decision making
8. Access to physicians remotely

9. Reduce medical errors Sharing of information
10. Medical science and research
11. Workflow efficiency Employee satisfaction
12. Patient satisfaction Reduces paperwork

2.2.5 Challenges of E-Health Adoption

Botha et al. (2014) found that the most challenges that effect e-health information system is:

1. The financial barrier to purchase necessary hardware and cost challenges in general
2. Lack of IT and clinical resources
3. Difficulty learning and using the software
4. systems should be standardized
5. It might be time consuming to update the EHR thoroughly
6. The implementation of health information systems in small and rural facilities, and not only big hospitals, remains a challenge
7. Data privacy and Data access
8. Interoperability
9. Sustainability
10. Data quality
11. Usability
12. Transferring data from paper to electronic records
13. Physicians are hesitant to change existing processes
14. Forming electronic health records as part of the facilities daily routine
15. Meeting needs at each provider level, reaching goals

16. The shortage or absence of the necessary infrastructure, such as internet connections

2.3 Development of Study model

Investments by firms in information technologies (IT) have increased rapidly over the past 30 years ,many organization look to information system as investment to change useless data to productive knowledge (S. Taylor & Todd, 1995). E-health information system is not just IT project it's human project also . So, the e-health information must include many characteristic such as usability, workflow patient safety and organizational change to achieve system that increase efficiency and productivity, increase ease of use, decrease human error, decrease support and development time (J. Zhang & Walji, 2011).

J. Zhang and Walji (2011) developed a framework to evaluate usability in EHR and provide the principles, guidelines and standers for usability in the health information system. Furthermore Kushniruk, Triola, Borycki, Stein, and Kannry (2005) studied the usability in the health care information system as important factor to gain the benefit of the IS and reduce the medical error. And concluded that there is significant relation between usability and medical error reduction. A health information system reduces medical error by providing features and alerts and redesign the work flow. many studies in the last years that have investigated the effectiveness of the e-health information systems in hospitals, these systems provided low level of adverse events such as adverse events involving drug-drug interactions, unnecessary laboratory testing, transcription errors. Which improving health care quality and patient safety. Despite, the benefit of Health care system if the system not design well that lead to new category of medical error .

The intention to use one of the important factors that indicate the IS success and performance ,which studied by Davis (1989) in the technology acceptance model which consider perceived ease of use and perceived usefulness as important factors in the user behavior towards information system. More ever, the theory of planned behavior studied perceived ease of use and perceived usefulness as determinants of the intention to use in addition to compatibility. The users perceived the system that not compatible with their practices or work style as not useful (Liang, Xue, & Byrd,

2003). So, the compatibility is important factor in the adaption of the health information system. Rogers (2010) argued that compatibility and Relative advantages effect the adaption of innovation success.

Health information system is not just effective and reduce medical error but also it effect the patient outcomes. Dorr et al. (2007) found that information system has positive effect on the patient outcome .

Health information system adaption one of the important reason to redesign patient care pathway . Which is essential to improve the processes, reducing organizational waste, decrease waiting and provide more efficient use of the staff and focus on the needs of the patient.

From the previous studies and the consideration that UNRWA health care system is not generic software customize to fit UNRWA operation, it has been developed in-house to cover all the health care process and fit with UNRWA style and process and satisfy clinical staff need. The system is not yet mature and is being amended day by day to get it best fit work and most satisfy health centers' staff members. For this reason the researcher developed model from factors that impact the quality and effect the system performance. To make the model more applicable for the health care system the researcher studied the effect on the redesign health care pathway ,medical error reduction and prevention and improvement patient outcome, the model illustrated on figure (1.1).

2.4 Health information system characteristics

This study addresses usability, perceived ease of use ,perceived usefulness, relative Advantages, compatibility as system characteristics of e-health information system and investigates their direct and indirect influence on medical error reduction and prevention, improvement health care outcome and redesign patient pathways.

2.4.1 Usability

Multiple factors in the socio-technical framework that lead to save and effective use of EHR these factors include consideration across requirements

assessment, application design, training, monitoring, human factors engineering and usability. The barriers to physicians' use of EHR systems and Analyses of facilitators suggest that usability is the major factor among them (Middleton et al., 2013).

E-health information systems Designers often consider user Tasks, user characteristics usability issues and user preferences which make it not productive or unusable. The US General Accounting Office, a major supporter of software engineering, documented that 98% of software designed for the US government was unusable as delivered. Similarly, the same problem found in e-health information systems(Johnson, Johnson, & Zhang, 2005) .Shaw (1996) constructed that there are five reasons why the software hard to use :

1. Development focuses on the machine or system.
2. Target audiences change and adapt.
3. Designing usable software is difficult.
4. Team specialists don't always work in integrated ways.
5. Design and implementation don't always match .

The challenge in the health care systems that it's a complex socio-technical systems that designed to meet the need of different types of users who have different requirements, work across temporal ,geographic, cultural and organizational boundaries, who may be a part of the software design. The poor usability may result in untoward outcomes and unintended negative consequences and medical errors. So, the health information system need to be usable efficient to enhance the quality of care and patients safety, the expert suggested that the usability improving is critical to successful technology (Middleton et al., 2013).

2.4.1.1 Usability Definition

The term usability was basically defined in the field of Human computer interaction (HCI) to study the relationship between the computers and humans. J. Zhang and Walji (2011)defined usability as how useful, usable, and satisfying a system is for the intended users to accomplish goals in the work domain by

performing certain sequences of tasks. ISO has two definition of usability , ISO 9241 defined usability as 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. ISO 9126, usability compliance is one of five product quality categories, in addition to understandability, learnability, operability, and attractiveness. Some authors defined usability as interaction between task ,user and defined environment as the capability of the software product to be understood, learned, used and attractive to the user, when used under specified conditions (Johnson et al., 2005).

The researcher define the usability as the capability of the software to be useful, usable , satisfied and learnable for user under specified condition.

2.4.1.2 Usability dimensions

According to (J. Zhang & Walji, 2011), to measure the system usability there are 3 dimensions

:

1. **Useful:** A system is useful if it supports the work domain where the users accomplish the goals for their work, independent of how the system is implemented. It is measured by:
 - *Across-model Domain Function Saturation:* Percentage of domain functions in the EHR vs. all domain functions in the work domain.
 - *Within-model Domain Function Saturation:* Percentage of domain functions over all functions (domain and non-domain) in the HER.
2. **Usable:** A system is usable if it is easy to learn, easy to use, and error-tolerant.
 - *Learnability:* measure by Number of trials to reach a certain performance level and Number of items that need to be memorized
Number of sequences of steps that need to be memorized .
 - *Efficiency:* measure by Time on task ,Task steps, Task Success, Mental effort.

- *Error Prevention and Recovery* measure by Error occurrence rate ,Error recovery rate .

3. **Satisfying:** A system is satisfying to use if the users have good subjective impression of how useful, usable, and likable the system is Measure by Various ratings through survey, interview, and other instruments

2.4.2 Relative Advantages

Relative Advantages is one of the basic dimensions of Diffusion of innovation.

2.4.2.1 Diffusion of innovation

Diffusion of innovation as a term studied by Rogers in 1960s in the agricultural field and expanded by time in many fields. He defined the *Diffusion* as the process by which an innovation is communicated through certain channels over time among the members of a social system. The diffusion of new ideas elements are: innovation , communication channels, time and social system. And defined *innovation* as an practice, idea, or object perceived as new by an individual or other unit of adoption. The rate of adaption is determined by the characteristics that perceived from the members of social system. The *innovation attributes* are : (1) relative advantage, (2) compatibility, (3) complexity, (4) trialability, and (5) observability. The process that the individual pass from the first Knowledge of innovation ,to have attitude toward the innovation ,to take the decision to adapt or reject, to implementation to the innovation and to confirmation of this decision this process called The innovation-decision process. To reduce uncertainty and achieving the outcomes the designers try always to increase the adaption rate by the members (Rogers, 2010).

The diffusion of innovation paradigm has spread to many areas of specialization, in the mid-1980s appear in the medicine, Carlford, Lindberg, Bendtsen, Nilsen, and Andersson (2010) and other researchers found that the attributes of innovation are important factors in adaption new innovation *in health care*, many innovation expected to be affected in the health services but it fail to translate a meaningful patient care outcomes. In fact, two –third of effort to adapt change fail .So, the health care organization must evaluate the change to optimize intervention

benefits, prolong sustainability of the intervention to gain the desired outcomes because it's effect the quality, cost and patient satisfaction(Cain & Mittman, 2002). The innovation usually resisted by individuals who affected by the innovation ,it's required to engage the individual to finish the implementation that because the health care innovation is often complex and multi interacted components (Damschroder et al., 2009).

2.4.2.2 Relative advantages definition

Rogers (2010) defined Relative advantage as the degree to which an innovation is perceived as better than the idea it supersedes. While Damschroder et al. (2009) defined it as Stakeholders' perception of the advantage of implementing the intervention versus an alternative solution. Similarly ,L. Zhang, Wen, Li, Fu, and Cui (2010) defined it as the extent to which people believe that the innovation is better than the traditional one. While Moore and Benbasat (1991) cited that relative advantages is the innovation is technically superior (in functionality ,cost, image etc.) that technology that supersede .

In this research, relative advantages is defined as the degree that the innovation is perceived as spurious than the alternative solution.

The relative advantage can be measured with economic terms, social prestige, convenience and satisfaction. Besides, every innovation has its own criteria to measure these terms(L. Zhang et al., 2010). The relative advantage of an innovation, as perceived by members of a social system, is positively related to its rate of adoption (Rogers, 2010). According to Cain and Mittman (2002) the decision to adapt technology is influenced by 1.if the benefit of using technology is better than the risk of using it 2.whether the innovation improves upon the existing technology ,the more benefit that the users gain is relative to what they are already do. Furthermore to reach higher relative advantages the adapter should consider these issues: the end use must understand the new technology, recognize the impact on the behavior and consider the business case for new technology adaption.

2.4.3 Compatibility

Compatibility as concept was identified first by (Rogers, 2010) in the diffusion of innovation book as one of the determinants of innovation acceptance. Many studies in the IT field verified the linkage between IT Adaption and Compatibility .For instance, Moore and Benbasat (1991) argued that compatibility and Relative advantages equivalent to Perceived ease of use .In other hand In the latest studies compatibility appears as determinant to Perceived ease of use . Users expect that the adaption of HIS will change in their work style and behavior. So, that may make resistance to change. The Theory of planned behavior constructed that there are three dimensions to accept innovation Perceived ease of use ,Perceived usefulness and compatibility (R. S. Taylor, 1982). The familiarity of innovation and how much it's compatible with the exists environment and behavior it's linked to the diffusion . If the new innovation compatible with the potential users past experience, needs and values the change decision is facilitated, In addition ,the more compatible is the less behavior change required (Cain & Mittman, 2002). In health care the work process is complex involve multiple test, synthesis information from multiple sources, discussion with colleagues, trying out different courses of treatment, and conducting multiple treatments simultaneously. So ,the system designer some time not able to understand the complex process and may force their process on users (Bhattacharjee & Hikmet, 2007) .

2.4.3.1 Compatibility Definition

Rogers (2010) defined compatibility as the degree to which an innovation is perceived as consistent with the existing values, past experiences, and needs of potential adopters. While (Damschroder et al., 2009) defined it as The degree of tangible fit between meaning and values attached to the intervention by involved individuals, how those align with individuals' own norms, values, and perceived risks and needs, and how the intervention fits with existing workflows and systems.Cain and Mittman (2002) defined it as the ability of an innovation to coexist with technology and social patterns already in place improves the prospects for adaption.Innovations that are compatible with the intended users' values, norms, beliefs, and perceived needs are more readily adopted defined by (Glanz, Rimer, & Viswanath, 2008).

In this research compatibility is defined as the degree that the HIS fit with the users experience ,believes, norms, needs and work style.

2.4.4 Perceived Usefulness

Perceived usefulness was defined by (Davis Jr, 1986) as the degree to which individuals believe that using a particular system would enhance their job performance. GÜRSEL, ZAYİM, GÜLKESEN, ARİFOĞLU, and Saka (2014) defined it as dependent on how much features of the information system fit with user and job's needs and expectations. Therefore, Perceive Usefulness is defined as the user's subjective beliefs regarding the benefits of using HIS to achieve job goals and enhance performance within a medical practice (MAAMUOM, SATRIA, Supriyanto, & YUNUS, 2015). While Ali and Younes (2013) defined it as whether the system provides accurate, timely, relevant, reliable and valid information for users and is regarded for the individual impacts such as improving individual productivity and user performance which in turn would enhance the overall job performance..

The technology acceptance model developed by (Davis Jr, 1986) to be the better measure for explaining and predicting system use .The model focus on two factors which is the fundamental determinants of the system use, the first determinant the people tend to use the system or not. In addition their thought the system will help them to perform their job better or not. For that reason the effort of using the system should be less than the performance benefit of system use. In addition the perceived usefulness influence by perceived ease of use. The definition is constructed from the definition of useful which defined as capable of being used advantageously .Despite the organizational context that people generally have good performance by rewards, A system with high perceived usefulness is one for which a user believes in the existence of a positive use-performance relationship. Although, System quality, human characteristics ,information quality and organizational characteristics are influencing users perceived usefulness, organizational characteristics and human characteristics are important factors . MAAMUOM et al. (2015) argued that the designers should concentrate on the quality aspects. Wu, Shen, Lin, Greenes, and Bates (2008) found that perceived usefulness has positive impact in HIS behavioral intention to use

2.4.5 Perceived Ease of Use

Perceived ease of use (Davis Jr, 1986) defined it as the degree to which a person believes that using a particular system would be free of effort. The term ease means freedom from difficulty or great effort, in this sense perceived ease of use would refer to the degree to which a person believes using a particular information system would be free of effort. Furthermore, he defined effort as a finite resource that a person may allocate to the various activities for which he or she is responsible. Ali and Younes (2013) Defined perceived ease of use as the extent to which a user believes using a particular system would be easy to manage, manipulate and deal with or the degree to which a system is considered easy to understand, learn and use.

Many researcher found that the perceived ease of use has significant positive effect on user intention to use system and the user performance, and effect on perceived usefulness. For instance Damschroder et al. (2009) found that perceived ease of use for innovation increase the intention to adopt it. In the Decomposed theory of planned behavior perceived ease of use is important factor to use .In addition Wu et al. (2008) found that compatibility, perceived usefulness and perceived ease of use significantly affected healthcare professional behavioral intent.

2.5 Health Care Quality

2.5.1 Health Care Outcomes Improvements

A Health care outcomes defined as the changes in health that result from measures or specific health care investments or interventions (care, 2017). While Dorr et al. (2007) defined it as the Changes in laboratory values.Porter (2010) defined it as the results of care in terms of patients' health over time. while The International Consortium for Health Outcomes Measurement (ICHOM) defined it as the results people care about most when seeking treatment, including functional improvement and the ability to live normal, productive lives.

In this research health care outcome is defined as the change of the health care result or ability to live normal productive live .

The health information system designed to achieve many goals that include improve patient outcomes, increase patient satisfaction, reduce error and inappropriate treatment and provide sustainability (Shortell et al., 1995). HIS can provide the appropriate knowledge to achieve these goals like the information about patient conditions, patient characteristics ,treatments reminders and providers at the point of care that important to quality steps ,some type of patient like chronic diseases need special information base ,task and process include tracking the patient measures over time , involving the team giving feedback about progress, and provide the necessary support .In addition, HIS using is impact the health care outcomes for the chronic illness patient (Dorr et al., 2007). Many researcher provide many metrics to measure the quality and efficiency of the health care, but few matrices track the actual patient health care outcomes .The proper measure should determine all activities, services that jointly meeting the patient needs, this needs determined according to the patient's medical condition through the care cycle. Furthermore, The current organizational structure make it challenge to measure the outcomes. That because the providers measure what easily to measure or what they directly control not what exactly matters as outcomes. For example, current measures cover a single department (too narrow to be relevant to patients) or outcomes for a whole hospital, such as infection rates (too broad to be relevant to patients)(Porter, 2010).

Most conventional metrics to measure outcomes not matter to the patient outcomes, the conventional measures include the following:

- **Patient Initial Conditions:** Used to compare the patient baseline status which includes the risk factors ,age, comorbidities and the patient's clinical history with the end line status and adjust the outcomes.
- **Structure:** These metrics provide indicator about the relative weakness, such as the providers facilities conditions, staff-to-patient ratio ,these matrices don't reflect the patient outcomes.
- **Processes:** There is treatment protocols that the providers commonly track , such as surgical technique used, time of biopsy, radiation treatment settings, time of biopsy, medication administered etc. that kind of process can the

physicians use as guidelines to monitor how different techniques lead to different outcome.

- **Patient Experience:** the Patient-Reported Experience Measures (PREMs) used to measure the patient satisfaction about the health care that the hospital provide that may include the satisfaction about the clinical staff and the quality of food and waiting times.
- **Health Indicators:** the outcomes in the short terms is hard to evaluate . There are indicators that predict the outcomes and it's very important. This indicators can predict the outcomes that important to the patients, but it's not provide areal outcomes.

These conventional matrices important to provide vital data if it correlated with patient health care outcome. ICHOM provide 12 matrices for the major medical conditions that matter to the patients and the Principles for Selecting the Right Outcomes Metrics.

2.5.2 Redesign patient care pathway

Wanyonyi and Karuga (2010) defined patient care pathways as a methodology for the mutual decision-making and organization of care for a well-defined group of patients during a well-defined period with the aim to enhance the quality of care by improving patient outcomes, promoting patient safety, increasing patient satisfaction, and optimizing the use of resources. While Augusto et al. (2015) defined it as a sequence of health and social care services a patient in receives after entering the system during a particular episode of care. Johnson et al. (2005) defined it as tools that assist in providing general guidelines for dealing with individuals and groups of patients suffering for a wide variety of diseases. (Pearson, Goulart-Fisher, & Lee, 1995) define it as a management plan that displays goals for patients and provides the sequence and timings of actions necessary to achieve these goals with optimal efficiency. H. Campbell, Hotchkiss, Bradshaw, and Porteous (1998) defined it as an outline or plan of anticipated clinical practice for a group of patients within a particular diagnosis or set of symptoms. It provides a multidisciplinary template of the plan of care, leading each patient towards a desired objective. While Gooch and

Roudsari (2011) defined it as structured multidisciplinary care plans that detail essential steps in the care of patients with a specific clinical problem.

In this research the patient care pathway defined as patient journey from start the health care to the end to achieve specific goal with the optimum pathway.

The patient care pathway first time used by New England Medical Centre Boston USA 1985 ,as concept used in industrial quality control .After that it's moved to the nursing practices to improve the quality and efficiency of the patient care. Although , There are many concept in the same meaning . The most frequently used care pathway and care map (Jones, 2009). The term used inter changeably with clinical protocols and guidelines, The *guideline* provide the best practices in the clinical domain out implementation details, clinical *protocol* provides a local, consensus view of a guideline with explicit steps for implementation (Gooch & Roudsari, 2011). The mapping process allow us to understand the patient experience by separating the management of specific condition into series of steps that maximizing the efficiency for the staff and facilities by minimizing the unnecessary ineffective care to deliver what valued to the patient (Mould, Bowers, & Ghattas, 2010) . The health care provider sometimes recommended to redesign the patient care pathway, which involves review for the current practices to improve the processes , reduce the waste and focus on the patient need ,that mean fewer visit less waiting for the patient(Mould et al., 2010). Trebble, Hansi, Hydes, Smith, and Baker (2010) investigated that non-value steps account for nine times more effort than steps that add value and he recommended a steps involved in a redesign patient pathway :

- Determine condition or intervention requiring pathway redesign.
- Agree aims of project and identify evidence base.
- Agree team member roles, methods, time frame, locations.
- Data collection; walk the journey; pathway observation Draw map, collect missing data, analysis Pathway redesign develop protocol .
- Implement pathway; repeat process mapping exercise .

In spite of , The patient pathway can serve various roles and it may be mapped in different ways using a variety of media. The health care provider should be careful in choose the pathway , For that reason , Kuwornu et al. (2016) results showed that using different care pathways lead to different health care outcomes.

In the paper based health care it's hard to link the care pathway to the individual patient care and the interdependencies between different pathways are not made that because multiple paths should be merged into simple list of tasks .The computerized care pathway solve this problems, some researcher call it e-pathways and defined it as systematically developed, computerized care pathways that describe:

- The clinical data sets used.
- The onscreen forms and user interface elements required.
- The formal model of the roles, tasks, sequencing, and business rules of clinical workflow.
- The messages to be exchanged between the systems that invoke the pathway (Gooch & Roudsari, 2011).

E-health provide patient care pathway that include the clinical process and the information flow between them and the information will move instead of the patient.

2.5.3 Medical Error Reduction & Prevention

Error defined as the failure of a planned action to be completed as intended (i.e., error of execution) or the use of a wrong plan to achieve an aim (i.e., error of planning) (Leape, 2002). While Force (2000) complete the definition and defined it as the failure of a planned action to be completed as intended or the use of a wrong plan to achieve an aim. Errors can include problems in practice, products, procedures, and systems.Kushniruk et al. (2005) defined it as a significant cause of death and disability.

In this research error defined as Failure of planned action to be completed that cause death or disability .

In October 1996, the American Association for the Advancement of Science, the American Medical Association (AMA), and the Joint Commission on Accreditation of Healthcare Organizations (JCAHO) joined with the Annenberg Center for Health Sciences to convene the first multidisciplinary conference on errors in health care. That because the medical errors result annual costs from 17 to 28 billion in united states in 1998 . Additionally ,fear of becoming a victim of medical error that may lead the patient to delay the health care (Leape, 2002) . In Spite of, the medication errors not just increase the cost of the medical care ,but also result patient harm, or even death .Errors in medical care still frequent as result of the complexity of medical management and it's human nature (Otero, Leyton, Mariani, & Cernadas, 2008). Error analysis focus on the cause of the error that lead to new look that error occur in complex systems through multiple small factors of failure it's produce the accident jointly (Leape et al., 1998). For that error reduction system approach should include human factors, technical and organizational factors not just blame individual. Organizational culture changing, Allocate resources to prevent error and support them by the suitable knowledge and recognizing the solution often comes out of the box thinking (Force, 2000).

Within broader look to the medical errors as problem in health care quality there are three categories of the medical errors :

- Overuse: the medical care not provide the service net benefit.
- Underuse: a n important services not supported .
- Misuse :the service used inappropriate way.

Most of the medical errors categorized as misuse . Overuse medical errors such as prescribing unnecessary therapy and underuse like failure to have the appropriate treatment because diagnosis error.

Common Sources of Medical Error as Listed by the American Hospital Association (Ash et al., 2004):

- The patient information Incomplete such as the patient take another medicine , not knowing the laboratory results and not knowing about patients' allergies.
- The drug information Unavailable such as lack of up-to-date warnings.
- Problems in drug orders, which may include misunderstanding to the drugs with similar names due to poor handwriting, dismiss decimal points and zeroes, confusion of metric and other dosing units, and inappropriate abbreviations Lack of appropriate labeling as a drug is prepared and repackaged into smaller units .
- Environmental factors that can disturb professionals from their tasks such as lighting, interruptions, noise and heat.

These sources of medical error lead to a fact that there is a need to redesign useful , well-design information system to make error commitment is difficult, create a culture that the prevention is every one responsibility, and including knowledgeable and empowered workers. (Leape et al., 1998) .

HIS provide high level of communication between departments and individuals and solve the decentralization and fragmentation problems ,provide automated reminding and alerts to improve the lake of awareness problems (Force, 2000), adverse events reduced by this improvement which include drug—drug interactions, unnecessary laboratory testing and transcription errors. This improvement lead to improving safety in health care . In spite of the benefit , the e-health information system may cause an increased medical error .In addition ,new class of error introduced if e-health information system designed poorly.

Types of error related to e-health information system (Ash et al., 2004):

- Retrieving and entering information errors.
- The interface not suitable a highly interruptive use context.

- Causing cognitive overload by overemphasizing structured and complete Information Entry or Retrieval.
- Errors in the communication and coordination process.
- Misrepresenting collective, interactive work as a Linear, clear-cut, and predictable workflow.

The system design should support communication, flexibility and fit real system practices , hiring more clinical informatics and designer with more clinical experience (Ash et al., 2004).

2.6 Health care at UNRWA Health Centers

The United Nations Relief and Works Agency for Palestine Refugees (UNRWA) after the Israeli occupation of Palestine 1948 was established by United Nations General Assembly resolution 302 (IV) of 8 December 1949 to carry out the worker program and direct relief for the Palestinian refugees. UNRWA began her operation on 1st May 1950. The Agency's services include primary health care, relief and social services, camp infrastructure and improvement, education, microfinance and emergency assistance , including in the time of conflict.

The UNRWA Health program for over 60 years has been delivering primary comprehensive health care services, both curative and preventive to 3.5 million Palestinian refugee, in the 143 health facilities in five areas operation in Gaza, Syria, West Bank, Lebanon and Jordan . In addition, the Agency supports Palestine refugees' access to secondary and tertiary health care services.

The largest operation field among UNRWA ,Gaza field office, Provides primary health care services for more than million refugee scattered across Gaza Strip through 22 health centers. UNRWA Health program mission is to promote and protect the registered Palestinian refugees health.

United Nations Adopted Human development initiative which is a process of enlarging people's choices which is achieved by expanding human capabilities. UNRWA aims to achieve the highest possible level of health care to align with the first and most essential capabilities for human development to lead long and healthy

lives within the medium-term plan from 2010 until 2015. The main objective is to ensure unique and comprehensive primary care and high quality service, for the protection and development of family health and control of diseases. A healthy life from infancy to old age is a continuum of phases, each of which has unique specific needs, and the health program takes a 'life-cycle approach' to provide package of curative and preventive health services (UNRWA, 2017).

UNRWA offers preventive and curative health services to sustain and promote the health of Palestine refugees, from conception through childhood, pregnancy, adolescence, adulthood and active ageing. These services include pre-conception care, family planning and postnatal follow-up, antenatal care infant care (medical check-ups ,growth monitoring and immunizations), oral health, outpatient consultations, school health, laboratory services and chronic diseases management.

Infant and Child Care: the new born or infants under 1 year of children, under 5 years and school age need curative and preventive special care .that include well-baby care, periodic physical examinations, immunization, growth monitoring, assessment, micronutrient supplementation, preventive oral health and care of sick children

1.Well-Baby Clinic and Growth Monitoring: every health center contains a system of registration for the children under 5 years old .this system provide flow-ups for the children who missed important appointments like growth monitoring or immunization.

- 1. Immunization :** provide immunization against ten diseases: tetanus, diphtheria, pertussis, tuberculosis, measles, rubella, mumps, polio, haemophilus influenza type B (Hib) and hepatitis. In addition, the pneumococcal vaccine is provided in the West Bank and Gaza, and for the first year of the child's life in Jordan.
- 2. Screening and Medical Checkups:** record data on children under the age of 5 who have permanent physical or mental impairments, in order to facilitate medical follow-ups, such as screening newborns for hypothyroidism and phenylketonuria.

Reproductive Health: includes antenatal care, pre-conception care, intra-natal care, postnatal care and family planning.

- 1. Pre-conception Care:** consists of six main components: health promotion, counseling, screening, periodic risk assessments, intervention and follow-up and regular folic acid supplementation
- 2. Antenatal Care:** UNRWA encourages pregnant women to follow up with health centers for antenatal care and early pregnancy risk detection and intervention.
- 3. Intra-Natal (Delivery) Care:** delivery takes place at UNRWA health centers whenever complications are manageable, otherwise, UNRWA subsidizes hospital delivery.
- 4. Postnatal Care:** UNRWA provides postnatal care services through which the mother and the new born are examined and advised about family planning, breastfeeding and caring for the newborn.
- 5. Family Planning:** UNRWA facilitate family planning services through medical advice and availing modern contraceptives to those women who decide to do family planning.

Non-Communicable Diseases (NCDs): continued to account for the vast majority of deaths occurring in UNRWA's host-country populations. They also represent an increasing health challenge among Palestine refugees, with a steady increase in the number of diabetes and or hypertension patients treated at UNRWA health centers.

School Health: health department provide health care service to students at schools that helps them to overcome health problems and concentrate more for better learning abilities. Some of these health care services are, supplying schools with first aid kits, vitamin "A" for children, deworming program and assistance to children with special health needs. Special attention is given to diseases and disabilities that can negatively influence learning capabilities, such as hearing and vision impairment.

Outpatient Care: UNRWA currently provides comprehensive primary health care through a network of 137 health centers, of which 70 are located inside Palestine

refugee camps. In addition, UNRWA operates five mobile clinics in the West Bank to facilitate access to health services in areas affected by closures, checkpoints and the Barrier. Utilization of outpatient services Agency-wide reached a total of approximately 9,652,066 medical consultations during 2012. Of these consultations, 211,832 were specialist consultations.

2.7 UNRWA E-Health System and Health Reform

UNRWA in 2011 start the way to improve the health care services quality , that mean two parallel ways the reform process which provided by Family Health Team(FHT) and the e-Health electronic health record .this model aim to provide efficient health service and provide comprehensive primary health care package for all the family and sustain the provider–patient and provider-family relationship, and improve the efficiency, quality effectiveness of health care services the following subsection expand on this.

2.7.1 E-Health (Electronic Medical Records)

UNRWA in 2009 start develop electronic health record system (EMR) in house . this system was the second part of the major reform of UNRWA health care delivery via which UNRWA pushed away the old fashion, costly and labor-burdening, time consuming inaccurate paper based system. The system supported four fundamental modules: outpatient, None Communicable Disease (NCD), child health, and maternal health in addition to other vital supporting modules such as laboratory , pharmacy, dental, and specialist care. It is noteworthy that the system lacks X-Ray and physiotherapy support, plus, although the system has a Laboratory module, it does not directly communicate with lab machinery and chemical analyzers to gather analysis results, on the contrary, lab results are manually inserted into the system. The main roll of e-health was to facilitate and streamline paperless daily operation at health centers. UNRWA management anticipated a set of benefits all stakeholders would realize comprising better documentation, follow-up of referrals, improved human resources' job performance, increased clinician-patient contact time, reduced patient waiting times, minimized use of stationary and printed forms, more controlled medical stock and eventually better overall patient care via error reeducation and error

prevention, better diagnoses and better physician-patient relationship. At the administrative level, e-health was expected to stress the continuous process of quality improvement, enhance staff managerial and administrative capacity and enable information based decision making. The system provides a comprehensive set of health reports and compiles accurate and reliable statistical information and health indicators. The improved information quality supports evidence-based strategic planning for best overall health care outcomes.

2.7.2 Health Reform

Late 2011, UNRWA commenced a reform in health service by implementing a new service delivery approach of Family Health Team (FHT). This approach provides a full primary health care package for the entire family, focusing on long-term clinician-patient and clinician-family relationships, and aiming to improve the quality, efficiency and effectiveness of health services. Clinicians at one health center are grouped into teams of health professionals each of which comprise a doctor, nurse and midwife. When a family registers at a health center, it is mapped to one of these teams which become responsible for the entire family's health needs, through all stages of the lifecycle. This reform was supported by the parallel introduction of electronic medical records (e-health), and the necessary health center infrastructure upgrades.

2.8 Chapter Summary

This chapter addressed study literature and demonstrated efforts exerted by other researchers in the field of implementing information systems at health organizations and the impact such system adoption may have on the daily life of health facilities' staff, operation and delivered medical service. The chapter started by introducing the general conception of information systems then transitioned to define what health information system is, what it does and what the different types of it are. Thereafter, development of study model was illustrated followed by detailed explanation of model variables with elaboration on the e-health systems Characteristics. Having this covered, the researcher shed light on UNRWA agency, what it is and what it does, before expanding on UNRWA-health department and the recent e-Health System adoption and health reform.

Chapter 3

Previous Studies

Chapter 3

Previous Studies

3.1 Introduction

This chapter lists and investigates a number of previous studies and researches that addressed the implementation of health information system at health organizations and the different aspects and factors that drove such system implementation to succeed or fail and the relationship between HIS implementations and the change in health organization's daily life. This chapter also stops at the benefits and added values as well as problems and shortfalls of e-health system adoption concluded by previous studies and the effects they introduce on the medical realm. Furthermore, many previous studies were investigated in order to stand on the different matching and discrepancy facets between this study and others studies. Other benefits of reviewing literature were identifying issues and problems faced by other studies, the best methodology to use, variables studied to avoid duplications, access to validated questions that would assist measuring variables of this study and many other benefits. By reviewing previous studies, the researcher drew a wider picture of the so far exerted efforts to understand the impact of e-health on health settings and to develop a clearer understanding to the context of the study and its dimensions and characteristics. It was also necessary for selecting proper study variables and setting hypothesis.

3.2 List of Relevant Previous Studies

1.(Dorr et al., 2007)

Informatics Systems to Promote Improved Care for Chronic Illness: A Literature Review.

This research aimed to study the effect of the health information system on the care of chronic illness support.

The research collected literatures from 1996-2005 that evaluated information systems that designed to improve the health care of chronic illness. Many measurements was used and evaluated such as the effect of the components ,settings, IS, quality, design with quality of outcomes, process and the cost of the health care.

112 description of health information system involved , in 109 articles. Mental illness, diabetes and health disease included in Chronic disease. 67% of experiments had positive outcomes. There is positive impact of the health information system components on the chronic illness outcomes.

2. (Yu, Li, & Gagnon, 2009)

Health IT Acceptance Factors in Long-term Care Facilities:A Cross-Sectional Survey.

Modified technology acceptance model used to determine the factors that affect the caregivers acceptance of health information system in long-term care facilities. The research study the impact of social influence factors including image and subjective norm and demographic variables such as job title age, experience and computer skill on users acceptance of health information system.

Based on TAM2 researcher developed a self-administered questionnaire ,across-sectional survey was used to collect data. structural equation modeling techniques used.

The result showed that computer skills , perceived ease of use and perceived usefulness effect the intention to use positively. Furthermore, image has negative effect on caregivers' intention to use. Ease of use mediate the relation between subjective norms, computer skills and image and intention to use. Perceived usefulness determined by job level, subjective norms and ease of use. There is no effect of the experience on caregivers' intention to use.

3.(Jao & Hier, 2010)

Clinical Decision Support Systems: An Effective Pathway to Reduce Medical Errors and Improve Patient Safety.

PLE program and clinical decision support system linked together to automated the maintenance of the electronic medical record and link the problem list and medications ordering. To study the effect of the clinical decision support system on the patient care pathway and medical error.

Data mining method used in PLE design .Which used as electronic medical error in medication recording In addition as clinical patient ordering entry for medication ordering. The program helped the experts to discover mismatch problems.

The users agreed that the clinical decision support system provide better patient safety and decrease the medical error. Particularly when it influence the health care directly by linking it with electronic medical records.

4.(Carlfjord et al., 2010)

Key Factors Influencing Adoption of an Innovation in Primary Health Care :a Qualitative Study Based on Implementation Theory.

There is gap between knowledge and practice in health care and the bridging between them is an important issue. Many Studied the successful implementation factors in various setting. However, this settings is not studies deeply in primary health care. This article is aimed to apply the adaption of innovation theory on the PHC system in Sweden to identify the key factors that affect the implementation success.

The study conducted in six PHC unit in Sweden, the qualitative method was used with the staff who works on the system. The researcher performed two individual interviews and 16 focus groups to evaluate the factors that affect the adoption. The framework developed using many theoretical studies .

The result showed that the adaption of new health information system on primary health care clinics influence by the users expectation, compatibility and perceived of need assessment.

5.(Khajouei & Jaspers, 2010)

The Impact of CPOE Medication Systems' Design Aspects on Usability, Workflow and Medication Orders.

This research aimed to examine how the usability, medication orders and work flow affected by the computerized physician order entry system design.

The researcher collected the published articles from 1986 to 2007 using EMBASE, Ovid MEDLINE and EMBASE .The computer screen principles used to categorize the articles into groups.

The result showed that 19 papers taking about the CPOE. 2 articles used quantitative and qualitative methods and the rest 16 qualitative. In addition, the adaption of the CPOE increase and the medical error reduce if the system design is stable. The interfaces should facilitate the ordering process to be ease to use by the physicians.

6.(Wanyonyi & Karuga, 2010)

The Utility Of Clinical Care Pathways In Determining Perinatal Outcomes For Women With One Previous Caesarean Section; A Retrospective Service Evaluation.

This research aimed to demonstrate the use of a care pathway for natural birth after caesarean section as a service evaluation tool to determine perinatal outcomes.

A retrospective service evaluation by review of delivery case notes and records was undertaken at the Aga Khan University Hospital, Nairobi, Kenya between January 2008 and December 2009 Women with ≥ 2 previous caesarean sections, previous classical caesarean section, multiple gestation, breech presentation, severe preeclampsia, transverse lie, placenta praevia, conditions requiring induction of labour and incomplete records were excluded. Outcome measures included the proportion of eligible women who opted for test of scar (ToS), success rate of vaginal birth after caesarean section (VBAC); proportion on women opting for elective repeat caesarean section (ERCS) and their perinatal outcomes.

Ensuring standardized management, care pathways could be objective audit and service evaluation tools for determining perinatal outcomes.

7.(Gooch & Roudsari, 2011)

Computerization of Workflows, Guidelines, And Care Pathways: A Review of Implementation Challenges for Process-Oriented Health Information Systems.

The objective was to study the implementation of process-oriented Health information system challenges, with consideration to the workflows, care pathways and guidelines.

The researcher performed a qualitative meta-synthesis on English articles between 1995 and 2010 .Many techniques used to group the implementation

challenges such as data visualization techniques, principal component analysis (PCA) and Thematic analysis.

For review 108 article selected. The articles were grouped into 10 groups ,the researcher developed implementation process and used the conceptual method .The results showed that to adapt Health information system that useful in clinical decision the system should have clear care pathway, and written guideline and use the workflow management systems.

8.(Asua et al., 2012)

Healthcare Professional Acceptance of Telemonitoring for Chronic Care Patients in Primary Care.

The objective of this study is to study the factors that affect the professional acceptance of telemonitoring .

Availed questionnaire developed based in technology acceptance model distributed to 605 system users which include general practitioners, pediatricians and nurses. To test the model Logistic regression analysis was executed .

Although ,the technology acceptance model predicted the factors that influence the intention to use .TAM2 includes other factor that make the model more powerful. Compatibility , perceived usefulness and facilitators is determinants of intention to use . The results showed that this factors should be supported by technical support and good training . The telemonitoring system support primary care patients and chronic illness. Facilitator is the most variable that effect the intention to use from the organization point of view.

9.(Middleton et al., 2013)

Enhancing Patient Safety and Quality of Care by Improving the Usability of Electronic Health Record Systems: Recommendations from AMIA.

The objective of this research was to study the effect of the health information system usability on medical error from literature and make recommendation.

Using Health information system may be a reason for medical error. So , AMIA examined the evidence from published articles to make recommendations about Health information system usability for vendors and academic settings.

The task force recommendations grouped into 4 areas : health information system policy, human factors, users recommendations and industry recommendations examine evidence from the literature and make recommendations. The recommendation aimed to reach higher quality of health care by implementation usable health information system.

10.(Kuo, Liu, & Ma, 2013)

An Investigation of The Effect of Nurses' Technology Readiness on The Acceptance of Mobile Electronic Medical Record Systems.

Improving health care services and nurse's bedside is what expected to deliver by mobile electronic medical record. Despite, nurses may perform more functions more than what mobile electronic medical record system provides. This depends on the nurses acceptance to MEMR. This study aimed to study how the nurses acceptance to MEMR affected by nurses personality characteristics.

This study conducted in hospital in Taiwan, the researcher distributed 665 self-administered questionnaire. The data analyzed using Structural Equation modeling.

The result showed that perceived ease of use affected positively by personality characteristic such as innovation, optimistic and secure but negatively by comfortable. While just the optimism trait affect the perceived usefulness and there was significant relationship between perceived ease of and perceived usefulness with the behavioral intention to use MEMR.

11.(Kushniruk et al., 2013)

National Efforts to Improve Health Information System Safety in Canada, The United States of America and England.

This research aimed to investigated the challenges that face the safety of health information system and the progress achieved in in adapting HIS Canada ,England and United States.

Many articles reviewed from the national programs and web resources about the safety of Health information system in the three countries.

Patient safety expected to improve patient safety. Despite , HIS may led to new kind of errors if it's not designed properly. So, The United States ,Canada and England support ensure safety in all HIS design stages.

12.(Lee, Kuo, & Goodwin, 2013)

The Effect of Electronic Medical Record Adoption on Outcomes in US Hospitals.

Although, the electronic health record has signs for future success. The effect of the electronic health record on the patient outcomes is not clear . The research question was how the 30-day mortality, 30-day rehospitalization, length of stay and length of stay affected by electronic medical record implementation.

The researcher depended on comparison between the outcomes in the two years before and two years after electronic medical record implementation from 2000 to 2007 in 708 US hospitals. In addition, the researcher used a generalized linear model to compare the outcomes.

30-day mortality decreased and 30-day rehospitalization increased in small percentage but it have positive relationship with electronic medical record implementation.

13.(Sugarhood, Wherton, Procter, Hinder, & Greenhalgh, 2014)

Technology as System Innovation: a Key Informant Interview Study of The Application of The diffusion of Innovation Model to Telecare.

This study aimed to study that determines the telecare adaption success. The researcher conducted 16 semi-structured interviews ,the interviews targeted the telecare technologies and services organization. Diffusion of innovation was the data analysis tool.

The result showed that that many factors determined the adaption success include the support of initial adaption ongoing work , system complexity and there is no links between the user and producer of the system.

14.(Gagnon et al., 2014)

Electronic Health Record Acceptance by Physicians: Testing An Integrated Theoretical Model.

Despite many countries promote the electronic health record adaption, the electronic health successful depends on the acceptance of the system. This study aimed to study the physicians acceptance of the electronic health record and what is the key factors that affect it . The sample is the physicians who use the system in Quebec in Canada .

The researcher used multiple linear regression and path analysis to analyse data that collected by electronic questionnaire which depended on four models Integrated Model, TAM ,TAM2 and Psychosocial Model. multi-group analysis of structural weights invariance used to study the sociodemographic effect.

The researcher found that professional norm, demonstrability of the results and perceived ease of use is the key factors of physician's intention to use . The socidemographic factors has mediate role between intention to use and it's determinants .

15.(Krist et al., 2014)

Engaging Primary Care Patients to Use a Patient Centered Personal Health Record.

There was many challenges when the patient supported to had access to their health records. Because of a practices in smaller scale needed and the complexity of the large health system.

The research method include an interactive preventive health record associated with practices that include collaborative learning series.

25.6 percent of the patients using the system ,in one month increased by 1 percent most of patient use the system during one day after their clinical visit.

16.(Hsieh, 2015)

Physicians' Acceptance of Electronic Medical Records Exchange: An Extension of The Decomposed TPB Model with Institutional Trust and Perceived Risk.

This study aimed to address the factors that affect the physicians intention to use Electronic medical Record(EMR) by using the composed theory of planned behavior (TPB) model .

The researcher conducted field survey ,collected Data from the physicians who has experience in EMR Using .Sample of 191 collected and the test proposed structural equation modeling using the partial test square method.

The result found that intention to use effect by 5 factors attitude, subjective norms ,perceived behavior control and perceived risk mediated by perceived usefulness, perceived ease of use and compatibility

17.(Maillet, Mathieu, & Sicotte, 2015)

Modeling Factors Explaining The Acceptance, Actual Use and Satisfaction of Nurses Using An Electronic Patient Record in Acute Care Settings: An Extension of The UTAUT.

This research used the Unified Theory of Acceptance and Use of Technology to study the nurses actual use , acceptance and satisfaction of electronic patient record.

The research was conducted in four hospitals which adapted electronic patient record in deferent stages .cross-sectional method used and data analyzed by Structural equation modeling techniques.

In 20 research, the main result was the effects between facilitating conditions and effort expectancy, performance expectancy and actual of the ERP, compatibility and performance expectancy, this result supported by all studies ,but there was an exception ,no significant relationship between the effort expectancy and actual use of the EPR. There was a mediating effect of performance expectancy construct and effort expectancy. Compatibility of the EPR with preferred work style, existing work practices and the values of nurses which the most important factor for the nurses satisfaction.

18.(X. Zhang, Yu, Yan, & Spil, 2015)

Using Diffusion of Innovation Theory to Understand The Factors Impacting Patient Acceptance and Use of Consumer E-Health Innovations: A Case Study in A Primary Care Clinic

The aim of the research was study the influencing factors of patients technology acceptance and how much the patient accepted the usage of the consumer e-health innovation. Which provided an e-appointment scheduling service and implemented and developed in a regional town in Australia in a primary health care clinic.

A longitudinal case study was undertaken for 29 months after system implementation. To examine the main factors that influence the patients use and acceptance of the e-appointment .The theoretical base of the examination was Rogers innovation diffusion theory . The source of data was the log records of 25,616 patients who visited the medical Centre in the entire study period, and in-depth interviews with 125 patients.

The study results showed that e-health system adaption rate was low ,for many reasons: the patients not communicated well with nurses about e-appointment service, most of the patients can make appointments by calls and substitute e-appointments, the new service not compatible with patients' preference and the patient has limited characteristics such as the experience of the patients is lack in internet and e-health services.

19.(Peikari et al., 2015)

The Impacts of second Generation E-Prescribing Usability on Community Pharmacists Outcomes.

Although , Study the determinants of the pharmacists outcome is essential . There is a limitation of the studies that study how the pharmacists outcomes affected by e-prescribing systems. Besides the efficiency and effectiveness of the systems. This research aimed to study the relation between pharmacists' outcomes and usability of the system interfaces.

The researcher used the questionnaires as a tool to collect data from the e-prescribing system users. 152 questionnaire was analyzed by Partial Least Squares (PLS) path modeling.

The result showed that there was significant relationship between pharmacists' outcomes and information quality and ease of use and ease of use affected by system error prevention and interface consistency .

20.(Zahabi, Kaber, & Swangnetr, 2015)

Usability and Safety in Electronic Medical Records Interface Design: A Review of Recent Literature and Guideline Formulation.

The objectives of this study were to study the usability of the electronic health record and its effect on the safety to conclude guidelines that improve the Electronic health record interfaces.

The published research since 2000 from science databases which study the electronic medical record usability.

The research concluded design guidelines based on safety analysis and usability techniques. With consideration to the documentation and diagnosis process.

21.(Ratwani, Fairbanks, Hettinger, & Benda, 2015)

Electronic Health Record Usability: Analysis of The User-Centered Design Processes of Eleven Electronic Health Record Vendors.

Although , The vendors require to have a certification from the Office of the National Coordinator which require user-centered design process. The electronic health records usability is a problem for providers .

11 interviews were conducted with the software developer and vendors to the study challenges that the vendors face in UCD implementation .

The vendor understanding of the USD classified into misconceptions UCD, basic UCD and well-developed UCD. The researcher concluded that the vendors should support leadership and consider the clinical workflow and improve the usability.

22.(Schiff et al., 2015)

Computerized Physician Order Entry-Related Medication Errors: Analysis of Reported Errors and Vulnerability Testing of Current Systems.

This research aimed to study the reports that include the computerized physician order entry-related as cause of the medication error.

The researcher reviewed the reports about medication errors to United States Pharmacopeia MEDMARX. Each error was evaluated and studied to demonstrate the causes and potential prevention strategies .

Using Health information system reduce Medical errors by specifying the error scenario and the suitable prevention method .

23.(Czaja et al., 2015)

The Usability of Electronic Personal Health Record Systems for an Underserved Adult Population

This study aimed to study the impact of the health literacy and socioeconomic status on electronic Personal health record system use and the demand of performing health management on it.

To identified the associated demand the researcher used health literacy load analysis and Task analysis. Test lab was conducted for 54 adult on the electronic personal health record system and performed related tasks.

Most of the participants needed assistance and faced complexity on completing tasks .There was some variability according to task and PHR system. However, most participants perceived the use of PHRs as valuable.

24.(Augusto et al., 2015)

Performance Evaluation of Health Information System Using ARIS Modeling and Discrete Event Simulation.

This research aimed to provide a global methodology to assess the impact of Health information system on patient pathway.

Formal modeling with ARIS (Architecture of Integrated Information Systems) models and a Discrete Event Simulation approach used to evaluate the performance of HIS. The methodology was applied to the consultation for cancer treatment process.

To conclude about the impact of HIS on patient pathway Simulation scenarios was established.

High level HIS lengthen the consultation, occupation rates of oncologists was lower and quality of care was higher (through number of available information accessed during the consultation). The methodology was flexible enough to be applied to other health care systems.

25.(ALKADI, 2016)

The Healthcare System in Saudi Arabia and Its Challenges: The Case of Diabetes Care Pathway.

The study aimed to study the effect of the HIS on redesign patient care pathways in Eastern and Central regions hospitals of Saudi Arabia.

The researcher used different types of approaches, quantitative approach ,qualitative approach and mixed approach, include conducting surveys , interviews and group discussions besides review a reliable information sources .

Through an analysis of the EPR systems utilization in Saudi Arabia and the diabetes care pathway, three factors have been determined. These factors affect the workflow of the implementation and utilization of health information system (HIS) in terms of capturing, sharing and using its data efficiently.

26.(Kuwornu et al., 2016)

Identifying Distinct Healthcare Pathways During Episodes of Chronic Obstructive Pulmonary Disease Exacerbations

Although, The Health care pathway expected to has impact on outcomes. defining the patient pathways is challenging that because the patient has heterogenetic pathways in using health care services. This research described the healthcare pathways during episodes of chronic obstructive pulmonary disease exacerbations. Linked administrative databases from Saskatchewan, Canada were used to identify a cohort of newly diagnosed COPD patients and their episodes of healthcare use for disease exacerbations.

The Data classified by Latent class analysis (LCA) into homogeneous pathways using emergency department visits, interviewed with physician, outpatient prescription drug dispensations and respiratory-related hospitalizations. Disease

characteristics and patients' demographic tested using Multinomial logistic regression models , this characteristics linked to the patients pathway group.

The result showed that when the pathway complexity increased and provide many health care services this led to higher cost.

27.(Bader, 2016)

Impact of E-Health System Implementation at UNRWA-Gaza Health Centers on Medical Performance and Health Care.

The study aimed to study how the adapting of e-health system in the UNRWA primary health care centers enhance the medical performance and health care at UNRWA-Gaza primary health care centers.

Researcher followed quantitative approach and target sample utilizing questionnaire tool to survey 320 clinical staff, only 247 usable responses were returned. Researcher used partial least square/structural equation modeling technique to analysis the collected data and test study hypotheses.

Study concluded that information quality of the adopted Health Information System (HIS) has both direct and indirect positive impact on staff performance, only direct positive impact on patient care and only positive indirect impact on physician-patient relationship, while system quality was found to have negative direct impact and positive indirect impact on staff performance and has only indirect positive impact on both physician-patient relationship and patient care.

28.(Nejim, 2016)

The Impact of Hospital Information System Quality on the Health Care Quality (A Case Study on European Gaza Hospital).

The study aimed to study how the implementing of Hospital Information System in the European Gaza Hospital effect the health care Quality .

The research followed the descriptive analytic approach and employed survey method. Accordingly, questionnaire was designed especially to measure the research variables . The research was employed on a sample of 258 employees in different departments at European Gaza Hospital. 270 questionnaires were distributed to the research population and 258 questionnaires were received.

The study found that there was a significant relationship between the independent variables (performance quality, information quality and service quality) and the dependent variable, In addition to a positive correlation statistically significant between the hospital information system quality and patients healthcare quality through the perspective of hospital employees in European Gaza Hospital in Gaza.

3.3 Summary of Previous Studies

Table (3.1): Summary of previous studies

NO	Study Citation	Independent Variables	Dependent Variables	Findings
1	(Dorr et al., 2007)	Health information system	Patient outcome	112 description of health information system involved , in 109 articles. Mental illness, diabetes and health disease included in Chronic disease. 67% of experiments had positive outcomes. There is positive impact of the health information system components on the chronic illness outcomes.
2	(Yu et al., 2009)	Subjective norm, Demographic factors, Perceived ease of use, perceived usefulness.	Intention to use	The result showed that computer skills , perceived ease of use and perceived usefulness effect the intention to use positively .Furthermore , image has negative effect on caregivers' intention to use. Ease of use mediate the relation between subjective norms, computer skills and image and intention to use. Perceived usefulness determined by job level, subjective norms and ease of use . There is no effect of the experience on caregivers' intention to use.
3	(Jao & Hier, 2010)	Health information system	Patient care Pathway , Medical error	The users agreed that the clinical decision support system provide better patient safety and decrease the medical error. Particularly when it influence the health care directly by linking it with electronic medical records .
4	(Carlfjord et al., 2010)	Compatibility, Relative Advantages, Observability, Traiability.	Health information system Adaption Success	The result showed that the adaption of new health information system on primary health care clinics influence by the users expectation ,compatibility and perceived of need assessment

NO	Study Citation	Independent Variables	Dependent Variables	Findings
5	(Khajouei & Jaspers, 2010)	Usability	Medical Error Reduction	The result showed that 19 papers taking about the CPOE. 2 articles used quantitative and qualitative methods and the rest 16 qualitative. In addition ,the adaptation of the CPOE increase and the medical error reduce if the system design is stable .The interfaces should facilitate the ordering process to be ease to use by the physicians.
6	(Wanyonyi & Karuga, 2010)	Redesign Patient Care Pathway	Patient Outcome	Choose the right patient pathway effect patient outcome positively
7	(Gooch & Roudsari, 2011)	Health Information system	Redesign patient Care pathway	For review 108 article selected. The articles were grouped into 10 groups ,the researcher developed implementation process and used the conceptual method .The results showed that to adapt Health information system that useful in clinical decision the system should have clear care pathway , and written guideline and use the workflow management systems.
8	(Asua et al., 2012)	Compatibility, Facilitator , Subjective norms ,Habit Perceived ease of use, perceived usefulness	Intention to Use	Although ,the technology acceptance model predicted the factors that influence the intention to use .TAM2 includes other factor that make the model more powerful. Compatibility , perceived usefulness and facilitators is determinants of intention to use . The results showed that this factors should be supported by technical support and good training . The telemonitoring system support primary care patients and chronic illness. Facilitator is the most variable that effect the intention to use from the organization point of view.
9	(Middleton et al., 2013)	Usability	Medical Error	The task force recommendations grouped into 4 areas : health information system policy , human factors, users recommendations and industry recommendations examine evidence from the literature and make recommendations. The recommendation aimed to reach higher quality of health care by implementation usable health information system.

NO	Study Citation	Independent Variables	Dependent Variables	Findings
10	(Kuo et al., 2013)	Optimism , Innovativeness, Innovativeness ,Insecurity, Discomfort Perceived Ease of Use, Perceived Usefulness	Behavioral Intention to Use	The result showed that perceived ease of use affected positively by personality characteristic such as innovation, optimistic and secure but negatively by comfortable. While just the optimism trait affect the perceived usefulness and there was significant relationship between perceived ease of and perceived usefulness with the behavioral intention to use MEMR.
11	(Kushniruk et al., 2013)	Usability	Medical Error Reduction	Patient safety expected to improve patient safety. Despite , HIS may led to new kind of errors if it's not designed properly .So, The United States ,Canada and England support ensure safety in all HIS design stages.
12	(Lee et al., 2013)	Health Information System	Patient Care Outcome	30-day mortality decreased and 30-day rehospitalization increased in small percentage but it have positive relationship with electronic medical record implementation.
13	(Sugarhood et al., 2014)	Compatibility, Relative Advantages, observability, Traiability , Perceived ease of use.	HIS Adaption	The result showed that that many factors determined the adaption success include the support of initial adaption ongoing work , system complexity and there is no links between the user and producer of the system.
14	(Gagnon et al., 2014)	Perceived ease of use, Perceived usefulness, Professional norms, Social norms , Demonstrability	Intention to Use	The researcher found that professional norm, demonstrability of the results and perceived ease of use is the key factors of physician's intention to use . The socidemographic factors has mediate role between intention to use and it's determinants .
15	(Krist et al., 2014)	Usability	HIS Success	25.6 percent of the patients using the system ,in one month increased by 1 percent most of patient use the system during one day after their clinical visit.

NO	Study Citation	Independent Variables	Dependent Variables	Findings
16	(Hsieh, 2015)	Attitude, Subjective norms, Perceived behavior control, Perceived risk, Perceived usefulness, perceived ease of use, Compatibility	Intention to Use	The result found that intention to use effect by 5 factors attitude, subjective norms ,perceived behavior control and perceived risk mediated by perceived usefulness, perceived ease of use and compatibility
17	(Maillet et al., 2015)	Compatibility, Self-efficacy ,Performance Expectancy, Effect expectancy, Social influence, Facilitating condition,	Actual use, Satisfaction	In 20 research ,the main result was the effects between facilitating conditions and effort expectancy, performance expectancy and actual of the ERP, compatibility and performance expectancy, this result supported by all studies ,but there was an exception ,no significant relationship between the effort expectancy and actual use of the EPR. There was a mediating effect of performance expectancy construct and effort expectancy. Compatibility of the EPR with preferred work style, existing work practices and the values of nurses which the most important factor for the nurses satisfaction.
18	(X. Zhang et al., 2015)	Relative advantages, Compatibility, Traiability , Observability.	Adaption Success	The study results showed that e-health system adaption rate was low ,for many reasons : the patients not communicated well with nurses about e-appointment service, most of the patients can make appointments by calls and substitute e-appointments, the new service not compatible with patients' preference and the patient has limited characteristics such as the experience of the patients is lack in internet and e-health services.
19	(Peikari et al., 2015)	Ease of use, Information quality, Consistency , Error prevention.	System Outcome (communication, medical error reduction ,workload reduction)	The result showed that there was significant relationship between pharmacists' outcomes and information quality and ease of use and ease of use affected by system error prevention and interface consistency .
20	(Zahabi et al., 2015)	Usability	HIS success	The research concluded design guidelines based on safety analysis and usability techniques. With consideration to the documentation and diagnosis process.

NO	Study Citation	Independent Variables	Dependent Variables	Findings
21	(Ratwani et al., 2015)	Usability	HIS Success	The vendor understanding of the USD classified into misconceptions UCD, basic UCD and well-developed UCD. The researcher concluded that the vendors should support leadership and consider the clinical workflow and improve the usability.
22	(Schiff et al., 2015)	Health Information System	Medical Error Reduction	Using Health information system reduce Medical errors by specifying the error scenario and the suitable prevention method .
23	(Czaja et al., 2015)	Usability	HIS Success	Most of the participants needed assistance and faced complexity on completing tasks .There was some variability according to task and PHR system. However, most participants perceived the use of PHRs as valuable.
24	(Augusto et al., 2015)	Health Information System	Redesign Patient Care Pathway	High level HIS lengthen the consultation, occupation rates of oncologists was lower and quality of care was higher (through number of available information accessed during the consultation). The methodology was flexible enough to be applied to other health care systems.
25	(ALKADI, 2016)	Health Information System	Redesign Patient Care Pathway	Through an analysis of the EPR systems utilization in Saudi Arabia and the diabetes care pathway, three factors have been determined. These factors affect the workflow of the implementation and utilization of health information system (HIS) in terms of capturing, sharing and using its data efficiently.
26	(Kuwornu et al., 2016)	Health Information System	Redesign Patient Care Pathway	The result showed that when the pathway complexity increased and provide many health care services this led to higher cost.

NO	Study Citation	Independent Variables	Dependent Variables	Findings
27	(Bader, 2016)	Perceived Usefulness, Perceived Ease of Use , Information Quality, System Quality,	Performance, Doctor Patient Relationship, Patient Care	Study concluded that information quality of the adopted Health Information System (HIS) has both direct and indirect positive impact on staff performance, only direct positive impact on patient care and only positive indirect impact on physician-patient relationship, while system quality was found to have negative direct impact and positive indirect impact on staff performance and has only indirect positive impact on both physician-patient relationship and patient care.
28	(Nejim, 2016)	Service Quality, Performance Quality, Information Quality, System Quality , Safety Quality.	Patient Outcome, Patient Care Pathway, Reduction of Prescribing Error.	The study found that there was a significant relationship between the independent variables (performance quality, information quality and service quality) and the dependent variable, In addition to a positive correlation statistically significant between the hospital information system quality and patients healthcare quality through the perspective of hospital employees in European Gaza Hospital in Gaza.

3.4 Commenting on Previous Studies

After reviewing a number of previous studies that addressed similar study topics to the current one, this section will elaborate researcher comment on previous studies by addressing the various matching aspects as well as the differences between the current study and previous ones.

3.4.1 Matching and consistency with previous studies

This section concentrates on the various agreement between this study and previous studies in terms of study environment, study variables, methodology used and main data analysis tools used to analyze primary data of the study.

3.4.1.1 Study Environment

This study conducted in primary health care center, which Health information system implemented. the study is consistent with many of the previous study such as hospital in Taiwan(Hsieh, 2015) ,Similarly Maillet et al. (2015) conducted in four hospitals at different stage of HIS adaption , also X. Zhang et al. (2015) in a primary health care clinic in a regional town in Australia, Wanyonyi and Karuga (2010) was conducted in Khan University Hospital, Nairobi, Kenya, while Kuo et al. (2013)was conducted in large hospital in Taiwan , Asua et al. (2012) was conducted in then Bilbao Primary Care Health Region (Basque Country, Spain), ALKADI (2016) was also conducted in Central and Eastern regions hospitals of Saudi Arabia. Carlford et al. (2010) with staff at six Primary Care Health units in Sweden, Augusto et al. (2015) was conducted in French hospital, as well as Jao and Hier (2010) was held in USA hospital , Lee et al. (2013) was conducted in Us hospital, Gagnon et al. (2014) study was held on practitioners and specialists of the Province of Quebec (Canada).

3.4.1.2 Study Variables

This study agreed with the previous study with many variables such as perceived ease of use and perceived usefulness impact the intention to use HIS studied by Kuo et al. (2013), Gagnon et al. (2014) and Yu et al. (2009) ,where (Asua et al., 2012) add the compatibility to the model ,but Maillet et al. (2015) study just the compatibility impact on the intention to use, X. Zhang et al. (2015) and Sugarhood et al. (2014) studied the effect of compatibility and Relative advantages as attribute to innovation adaption success . Although many researcher study the impact of the

usability on the medical error like (Khajouei & Jaspers, 2010), (Middleton et al., 2013) and (Kushniruk et al., 2013), Schiff et al. (2015) studied the impact of the HIS on medical error .All Czaja et al. (2015), Ratwani et al. (2015), Zahabi et al. (2015) and Krist et al. (2014) studied the impact of usability on HIS success . (Jao & Hier, 2010) which investigated the effect of HIS on Patient care pathway and medical error. where Gooch and Roudsari (2011), Augusto et al. (2015) and Kuwornu et al. (2016) addressed the effect of the HIS on patient care pathway, Wanyonyi and Karuga (2010) studied the effect of Redesign patient pathway on patient care outcome.

3.4.1.3 Methodology and Study Tools

This study followed the descriptive analytical methodology where target sample members were surveyed using a quantitative self-developed questionnaire. This methodology has dominated other previous studies that made use of quantitative questionnaire to survey their target populations' and collect study primary data. For example all of the following studies used quantitative questionnaire to collect primary data of their studies such as (Hsieh, 2015), (Peikari et al., 2015), (Kuo et al., 2013), (Gagnon et al., 2014), (Asua et al., 2012) and (Yu et al., 2009)

3.4.1.4 Data Analysis Methods

This study made use of regression analysis technique to analyzing collected data and addresses research hypotheses. Gagnon et al. (2014) and Kuwornu et al. (2016) use the same analysis method.

3.4.2 Discrepancy and Differences from Previous Studies

3.4.2.1 Study Environment

This study conducted in primary health care center ,which Health information system implemented. the study is Difference with many of the previous studies not conducted in Health center or hospital like (Khajouei & Jaspers, 2010), (Middleton et al., 2013) , (Dorr et al., 2007) and(Zahabi et al., 2015) which was qualitative studies that collected published articles and developed a recommendation on HIS development and usage , but Ratwani et al. (2015) study conducted in the company of Software developer vendors .

3.4.2.2 Study Variables

This study deference with the previous study with many variables such as intention to use which studied as Dependent variable in (Hsieh (2015)) that affected by attitude, subjective norms ,perceived behavior control and perceived risk . while Kuo et al. (2013) studied the effect of Optimism , Innovativeness, Innovativeness ,Insecurity and Discomfort on it . In Yu et al. (2009) study it's effected by subjective norm and demographic . X. Zhang et al. (2015), Carlford et al. (2010)and Sugarhood et al. (2014)studied the impact of traiability and observability on Adaption of innovation success.

3.4.2.3 Methodology and Study Tools

The current study followed a quantitative approach together with questionnaire as a data gathering instrument .while ALKADI (2016)and Augusto et al. (2015) used a mixed approach quantitative(questionnaire) and qualitative (interviewed) , Carlford et al. (2010) used interviewed and focus group, Ratwani et al. (2015) used the interview , Sugarhood et al. (2014), X. Zhang et al. (2015) used semi-structured interviewed ,while Maillet et al. (2015) used cross sectional study.

3.4.2.4 Data Analysis Methods

The current study used frequency and descriptive analysis to describe study sample regression analysis technique to analyzing collected data and addresses research hypotheses. Many previous studies were inconsistent with this current study in terms of the methods used to analyze data and test hypotheses. Maillet et al. (2015), Hsieh (2015), Kuo et al. (2013), Asua et al. (2012) and (ALKADI, 2016) used structural equation method .while Peikari et al. (2015) used partial least square, Schiff et al. (2015) use generalization linear model.

3.5 Benefits Grasped from Previous Studies

Reviewing previous studies and literature provide a wider understanding of the different scenarios and contexts of studying of health information systems at health organizations and its implementation, and sheds light on the importance of addressing health care quality factors. Most of previous studies showed that researchers built study models on different sociotechnical theories and keep amending on these models by adding and removing variables or by integrating multiple models together for best

reaching clearer understanding of the impact of health information system characteristics on the Health quality factors. Previous studies also assisted in identifying variables mostly used by researchers and the tools used to measure these variables which in turn assisted the researcher to pick the current study variables and provided validated measuring tools that researchers could rely on to build current study model and to test study variables. One more benefit is having wider grasping of the different study designs and touching dominant methodologies used by other researchers so as to select study design and methodology that best suits the nature of current study. Furthermore, data collection tools are very vital benefit of reviewing previous studies as the researcher can stand on the different data gathering instruments and identify the dominant ones and select the one best fits with this study design and context. Previous studies also suggest a set of proposed future studies from which the researcher can choose and declare a number of limitations that researcher should work to overcome. One of the most valuable benefits of previous studies is to compare study results with other similar studies' conclusions to ensure validity and rationale of study results.

3.6 What Makes This Study Special

1. This study is conducted in Gaza strip which has its special unstable political, economic and industrial environment. Gaza is under crippling siege since 2006 and suffers shortage in almost everything, medicine, pharmaceuticals, medical equipment, and professional experience. This special environment also lacks scientific researches due to limitation in resources and fund. Conducting the current study in such environment makes it special.

2. Although this study is not the first in Gaza-strip to address e-health systems, it is the first to address e-health system at UNRWA health centers which is the only system in GAZA that fully replace paper-based system to convert health centers to fully computerize workplace

3. This study addresses issues in a current system being implemented at UNRWA health centers, study outcome and conclusion together with researcher practical recommendation could be a vital source for both health management and system developers to stand on system shortfall and possible interventions.

4. This study also contributed to literature, up to the knowledge of the researcher, by addressing the impact of health care system characteristics (Relative advantages, compatibility, usability, perceived ease of use and perceived usefulness) on medical error reduction, patient care out come and Redesign patient pathway. Most previous studies concentrated on the impact of characteristics as a whole on these three variables and one can hardly-ever stop at studies that addressed effect of individual success factors on them.

5. This study unique, up to the knowledge of the researcher in contribution variables from diffusion of innovation theory and usability and theory planned behavior and studying there impact on the three of health quality especially the patient care outcome.

3.7 Chapter Summary

This chapter has listed a number of previous studies dealt with the implementation of health information systems at health facilities. It also covered several aspects of matching and mismatching between the current study and other studies in terms of environment, methodology, variables studied and data analysis tools used to test gathered data, then lessons learnt from previous studies were shed light on via standing on benefits of reviewing literature. Finally, it emphasized what makes this study distinguished.

Chapter 4

Research Methodology

Chapter 4

Research Methodology

4.1 Introduction

This chapter describes the methodology that was used in this research. The adopted methodology to accomplish this study uses the following techniques: the information about the research design, research population, questionnaire design, statistical data analysis, content validity and pilot study.

4.2 Research Design

- **The first phase** of the research thesis proposal included identifying and defining the problems and establishment objective of the study and development research plan.
- **The second phase** of the research included a field survey, which was conducted with "The Impact of Health Information System (HIS) Characteristics on Healthcare Quality".
- **The third phase** of the research focused on the modification of the questionnaire design, through distributing the questionnaire to pilot study, The purpose of the pilot study was to test and prove that the questionnaire questions are clear to be answered in a way that help to achieve the target of the study. The questionnaire was modified based on the results of the pilot study.
- **The fourth phase** of the research focused on distributing questionnaire. This questionnaire was used to collect the required data in order to achieve the research objective.
- **The fifth phase** of the research was data analysis and discussion. Statistical Package for the Social Sciences, (SPSS) was used to perform the required analysis.

4.3 Research methodology

This study follows the analytical descriptive approach, which is considered as the most used in business and social studies. Babbie (1989) defined the descriptive research as the research that describes the characteristics or behaviours of specific group in numerical terms. The descriptive research does not answer the questions of when how or why the problem or the situation under study is happening. In another side, analytical approach detects the causes of a specific phenomenon and creates the causal relation between two variables.

4.3.1 Duration of the Study

The study has been conducted on the period of June – December 2017.

4.3.2 Place of the Study

The study was applied on health centers' staff (UNRWA) – in Gaza Strip.

4.3.3 Secondary Data

The researcher has used plenty of secondary data resources to justify the problem and gain maximum information regarding the Impact of Health Information System (HIS) Characteristics on Healthcare Quality. The used secondary included:

1. Scientific journals and academic magazines such as Research Management, and Research administration journals.
2. Thesis and dissertations accessed through the universities' libraries.
3. Textbooks and research papers.
4. Internet articles and websites.

4.3.4 Primary Data

The primary data are information collected through questionnaire survey.

4.4 Population and sample

4.4.1 Study Population for the Questionnaire

Study population is limited to admin and medical health centers' staff who make use of the system in their daily operation and who have already developed attitudes toward the system operability and effect on the clinic daily activities (staff members such as cleaners, doorkeepers and clinicians who don't utilize the system are excluded from the population).

4.4.2 Study Sample

For large population, Cochran (1963, p. 75) developed the Equation to yield a

$$n_0 = \left\{ \frac{Z}{2m} \right\}^2$$

Where:

Z: The abscissa of the normal curve that cuts off an area α at the tails (i.e. Z= 1.96 at $\alpha = 0.05$)

m: is the desired level of precision (i.e. 0.05)

According to equation $n_0 = \left\{ \frac{1.96}{2 \times 0.05} \right\}^2 \cong 384$

Finite Population Correction for Proportions

Since the population of the study is relatively small then the sample size can be reduced slightly. The sample size (n_0) can be adjusted using the following formula (Israel, 2012):

$$n = \frac{n_0 \times N}{n_0 + N - 1}$$

Where n is the sample size and N is the population size.

Substituting with $N= 979$ (Health Department in UNRWA- Gaza field office, 2017).

The sample size of the study (n) is $n = \frac{384 \times 979}{384 + 978} = 276$

Thus, the representative sample of the study population equals 276 healthcare centers staff at least.

The sample has been randomly selected from the twenty-two health centers.

Table (4.1): Study Population and Sample

Health center	Population	Sample	%
B\Hanoon	39	11	3.98
Jabaia	77	22	7.87
Fakhoura	27	8	2.76
NorthGaza	62	17	6.33
Beach	41	12	4.19
Rimal	83	23	8.48
Sheikh Radwan	32	9	3.27
Gaza Town	54	15	5.52
Sabra	54	15	5.52
Bureij	37	10	3.78
Nuseirat	66	19	6.74
West Nusirat	18	5	1.84
Maghazi	35	10	3.58
D\EI\Balah	43	12	4.39
Japanese	33	9	3.37
KhanYounis	65	18	6.64
Maen	47	13	4.80
Rafah	71	20	7.25
TalSultan	44	12	4.49
AlNaser	13	4	1.33
Shaboura	26	7	2.66
ElShouka	12	3	1.23
Total	979	276	100

Source: Health Department in UNRWA- Gaza field office, 2017

We distributed to the research population (310) Questionnaires and 286 questionnaires are received with response rate 92.25%

4.5 Research Instruments

The study was conducted using questionnaire.

4.5.1 Questionnaire

Initially the questionnaire was developed in Arabic (Appendix B) to be distributed to the healthcare center staff. Then the questionnaire has been translated into English for documentation purposes (Appendix A). A cover letter explaining the purpose of the questionnaire, the aim of the study and the privacy of information has been provided to the questionnaire in order to encourage more responses.

The questionnaire was composed of two main parts:

1. Part one: Demographic information includes 7 paragraphs.
2. Part two: include 58 paragraphs grouped in 8 fields distributed as following:
 - Usability contains 12 paragraphs. Which were adapted from (Lewis, 2006)
 - Perceived usefulness contains 6 paragraphs. Which were adapted from (Davis, 1989)
 - Perceived ease of use contains 7 paragraphs. Which were adapted from (Davis, 1989)
 - Relative advantages contains 9 paragraphs. Which were adapted from (Moore & Benbasat, 1991) .
 - Compatibility contains 4 paragraphs. Which were adapted from (Moore & Benbasat, 1991) .
 - Medical errors prevention and reduction contains 5 paragraphs . Which were adapted from (Peikari et al., 2015)
 - Health care outcomes improvements contains 7 paragraphs. Which were adapted from (Abdool, 2014)
 - Redesign patient care pathway contains 8 paragraphs. Which were adapted from (Abdool, 2014).

4.6 Study Application Procedures

The researcher performed the following main procedures for study application:

1. Developing initial questionnaire for data collection and analysis.

2. Evaluating the questionnaire by different experts in the study subject and questionnaire preparation process.
3. Modifying the questionnaire according to the experts' recommendations.
4. Conducting pilot study to assess the questionnaire validity and reliability by distributing the questionnaire to 30 randomly selected staff from the population.
5. Distributing the questionnaire to the study population to collect data for the study.
6. Analyzing the collected data and giving suggestions & recommendations.

4.7 Statistical Analysis

In this study, the researcher used the numerical scale 1-7 as data measurement, where: 7 correspond to a strong agreement with the statement, and it gradually decreased until 1 that indicates the strong disagreement with the statement. In order to extract information from collected data, different statistical analysis tests were utilized. These statistical tests could be parametric tests or non-parametric tests. Identification of the statistical tests types depends on testing the normality of the collected data; if the collected data is normally distributed, parametric test will be used. Whereas if the collected data is non-normally distributed, then non-parametric tests will be used. In the following sub-section, normality test will be applied to identify the type of the statistical tests.

4.7.1 Test of Normality

The Central Limit Theorem states that for sample sizes sufficiently large (greater than 30), the shape of the distribution of the sample means obtained from any population (distribution) will approach a normal distribution (Klemens, 2008).

The number of the respondents equals 286 which is large enough to consider the shape of the data distribution approaching normal distribution. Thus, the researcher can use parametric tests to perform all required computations to test the study hypotheses and answering its questions.

4.7.2 Parametric Tests

As the collected data is normally distributed, then the following parametric test will be used:

- Cronbach's Alpha for Reliability Statistics.
- Pearson correlation coefficient for Validity.

- Frequency and Descriptive analysis.
- Regression Analysis.
- Parametric Tests (One sample T test, Independent Sample T test, Analysis of Variance- ANOVA).

4.8 Validity& Reliability of the Study Instruments

Validity of the instrument refers to the degree to which the instrument measure what it supposed to measure. Whereas the reliability of the instrument refers to the consistency in the obtained results if the same measures has been used in different occasions or applied on different participants (Easterby-Smith, Thorpe, & Lowe, 2002). There are many instruments that could be used to evaluate the study tool; in this study content validity and statistical validity were used to evaluate instrument validity.

4.8.1 Content Validity of the Questionnaire

To verify the content validity of the study questionnaire; it was submitted to 12 experts in the field from IUG and Al-Azhar and AL-Esra'a University (Appendix C). The experts evaluated the questionnaire content in a period of two weeks. The final copy of the questionnaire was modified according to the evaluators' recommendations.

4.8.2 Statistical Validity& Reliability (Pilot Study)

To insure the validity of the questionnaire, two statistical tests should be applied. The first test is internal validity (Pearson test) which measure the correlation coefficient between each item in the field and the whole field. The second test is structure validity (Pearson test) that used to test the validity of the questionnaire structure by testing the validity of each field and the validity of the whole questionnaire. It measures the correlation coefficient between one filed and all the fields of the questionnaire that have the same level of similar scale.

4.8.2.1 Internal validity:

Internal validity of the questionnaire was the first statistical test conducted on the collected data from the pilot study. The internal validity was conducted by measuring the correlation coefficients between each paragraph in one field and the whole filed.

In statistics different correlation coefficient can be used depending on the variables types (numeric or nominal); in this study the variables were numerical so Pearson correlation coefficient was applied. Which is a measure of the linear association of two variables. The values of correlation coefficient vary from -1 to +1. Positive values of correlation coefficient indicate a tendency of one variable to increase or decrease together with another variable. Negative values of correlation coefficient indicate a tendency that the increase of values of one variable is associated with the decrease of values of the other variable and vice versa. Values of correlation coefficient close to zero indicate a low association between variables, and those close to -1 or +1 indicate a strong linear association.

As it is clarified in Table (4.2): Correlation coefficient of each item of Usability & the total of this field are significant at $\alpha = 0.05$ and the P-Value equals 0.000 (less than 0.05). Thus, it can be said that the paragraphs of this field are consistent and valid to be measure what it was set for.

Table (4.2): The correlation coefficient between each paragraph in the first field (Usability) and the whole field

No.	Paragraph	Pearson Correlation Coefficient	p-value
1.	Overall, I am satisfied with how easy it is to use this system.	0.811	0.000*
2.	I feel comfortable using this system.	0.839	0.000*
3.	The system gives error messages that clearly tell me how to fix problems.	0.367	0.000*
4.	Whenever I make a mistake using the system, I recover easily and quickly.	0.685	0.000*
5.	It is easy to find the information I need.	0.814	0.000*
6.	The information provided with the system is easy to understand.	0.812	0.000*
7.	The information is effective in helping me complete my work.	0.815	0.000*
8.	The organization of information on the system screens is clear.	0.821	0.000*
9.	The interface of this system is pleasant	0.760	0.000*
10.	I like using the interface of this system.	0.771	0.000*
11.	This system has all the functions and capabilities I expect it to have.	0.663	0.000*
12.	Overall, I am satisfied with this system.	0.793	0.000*

*Correlation is significant at the 0.05 level

Table (4.3): Correlation coefficient of each item of the Perceived usefulness field. The correlation values ranges from 0.735 to 0.830 with P-value = 0.000 The correlation values are significant at $\alpha = 0.05$ and the paragraphs of this field are consistent and valid to be measure what it was set for.

Table (4.3): The correlation coefficient between each paragraph in the second field (Perceived usefulness) and the whole field

No.	Paragraph	Pearson Correlation Coefficient	p-value
1.	HIS allows me to have quick access to patients data	0.785	0.000*
2.	HIS facilitates communication of information among various care providers	0.735	0.000*
3.	HIS assists in avoiding duplication of examinations	0.775	0.000*
4.	HIS reduces the risk of error in healthcare service	0.830	0.000*
5.	HIS gives me greater control over my work schedule	0.785	0.000*
6.	HIS makes it easier to do my job	0.775	0.000*

Table (4.4): Correlation coefficient of each item of the Perceived ease of use field. The correlation values ranges from 0.737 to 0.849 with P-value = 0.000 The correlation values are significant at $\alpha = 0.05$ and the paragraphs of this field are consistent and valid to be measure what it was set for.

Table (4.4): The correlation coefficient between each paragraph in the third field (Perceived ease of use) and the whole field

No.	Paragraph	Pearson Correlation Coefficient	p-value
1.	I think it is easy to learn to use HIS	0.835	0.000*
2.	I think HIS is easy to use	0.849	0.000*
3.	I think HIS makes my consultations with patients easier	0.836	0.000*
4.	I think I will become skilled using HIS	0.817	0.000*
5.	I think HIS will be easy for physicians to use	0.753	0.000*
6.	I think it is easy to get the system do what I want it to do	0.737	0.000*
7.	I think it is easy to interact with HIS (respond to pop up dialogs and system instructions, supply input needed to some processes execution or report generation)	0.799	0.000*

Table (4.5): Correlation coefficient of each item of the Relative Advantages field. The correlation values ranges from 0.811 to 0.857 with P-value = 0.000 The correlation values are significant at $\alpha = 0.05$ and the paragraphs of this field are consistent and valid to be measure what it was set for.

Table (4.5): The correlation coefficient between each paragraph in the fourth field (Relative advantages) and the whole field

No.	Paragraph	Pearson Correlation Coefficient	p-value
1.	Using HIS improves the quality of work I do	0.817	0.000*
2.	Using HIS makes it easier to do my job	0.849	0.000*
3.	The disadvantages of my using HIS far outweigh the advantages	0.620	0.000*
4.	Using HIS improves my job performance	0.826	0.000*
5.	Overall, I find using HIS to be advantageous in my job	0.811	0.000*
6.	Using HIS enhances my effectiveness on the job	0.839	0.000*
7.	Using HIS gives me greater control over my work	0.857	0.000*
8.	Using HIS increases my productivity	0.848	0.000*
9.	Using HIS enable me to accomplish tasks more quickly	0.813	0.000*

Table (4.6): Correlation coefficient of each item of the compatibility field. The correlation values ranges from 0.831 to 0.914 with P-value = 0.000 The correlation values are significant at $\alpha = 0.05$ and the paragraphs of this field are consistent and valid to be measure what it was set for.

Table (4.6):The correlation coefficient between each paragraph in the fifth field (Compatibility) and the whole field

No.	Paragraph	Pearson Correlation Coefficient	p-value
1.	Using HIS is compatible with all my aspects of my work	0.831	0.000*
2.	Using HIS is completely compatible with my current situation	0.874	0.000*
3.	I think that using HIS fits well with way like to work	0.887	0.000*
4.	using HIS fits into my work style	0.914	0.000*

Table (4.7): Correlation coefficient of each item of the Medical error prevention & reduction field. The correlation values ranges from 0.747 to 0.834 with P-value = 0.000 The correlation values are significant at $\alpha = 0.05$ and the paragraphs of this field are consistent and valid to be measure what it was set for.

Table (4.7): The correlation coefficient between each paragraph in the sixth field (Medical errors prevention and reduction) and the whole field

No.	Paragraph	Pearson Correlation Coefficient	p-value
1.	The error message inform me of error severity and suggest the cause of the problem	0.761	0.000*
2.	The system help me recover from system error	0.834	0.000*
3.	The system reduce error rate on the report	0.816	0.000*
4.	The system makes it possible to me to reduce drug allergy	0.747	0.000*
5.	The system has reduced dosing error	0.767	0.000*

Table (4.8): Correlation coefficient of each item of Health care outcome improvements field. The correlation values ranges from 0.755 to 0.850 with P-value = 0.000 The correlation values are significant at $\alpha = 0.05$ and the paragraphs of this field are consistent and valid to be measure what it was set for.

Table (4.8): The correlation coefficient between each paragraph in the seventh field (Health care outcomes improvements) and the whole field

No.	Paragraph	Pearson Correlation Coefficient	p-value
1.	The system allows having a comprehensive picture about a Patient that helps in diagnosing problems sooner.	0.821	0.000*
2.	The implementation of such systems helped in diagnosing medical conditions at earlier stage.	0.755	0.000*
3.	The system allows gathering all information related to a patient in one place (e.g. lab results and radiology reports) that helps in making therapeutic decisions).	0.822	0.000*
4.	The system allows viewing drug formulary information.	0.821	0.000*
5.	This HIS allows to access and view patients'' assessments easily and quickly.	0.846	0.000*
6.	The system has the option to send reminders to healthcare providers (e.g. surgeries appointments and nurses to give medications to inpatients).	0.743	0.000*
7.	Overall, the system helped to improve follow up patient's health outcomes.	0.850	0.000*

Table (4.9): Correlation coefficient of each item of Redesign patient care pathway field. The correlation values ranges from 0.667 to 0.822 with P-value = 0.000 The correlation values are significant at $\alpha = 0.05$ and the paragraphs of this field are consistent and valid to be measure what it was set for.

Table (4.9): The correlation coefficient between each paragraph in the eightieth field (Redesign patient care pathway) and the whole field

No.	Paragraph	Pearson Correlation Coefficient	p-value
1.	This HIS facilitates a patient's journey in the hospital; since the patient enters the facility until leaving it.	0.812	0.000*
2.	Patients'' registration or scheduling appointment processes take maximum from 5 to 10 minutes per patient.	0.667	0.000*
3.	This HIS Allows reviewing patients'' progress notes.	0.810	0.000*
4.	Hospital information system has the option to send notices for patient's reservation and checking appointments.	0.738	0.000*
5.	This HIS helps in simplifying supporting processes, such as billing, therapy cost) and make it easier than before.	0.751	0.000*
6.	Hospital information system help to decrease patients time to complete hospital management procedures.	0.803	0.000*
7.	Hospital information system facilitates documenting patients'' care activities.	0.778	0.000*
8.	Overall, the system helped in redesigning patients'' care Pathway.	0.822	0.000*

4.8.2.2 Structure Validity

Structure validity is the second statistical test that used to test the validity of the questionnaire structure by testing the validity of each field and the validity of the whole questionnaire. It measures the correlation coefficient between one filed and all the fields of the questionnaire that have the same level of liker scale.

As shown in table (4.10), the significance values are less than 0.05, so the correlation coefficients of all the fields are significant at $\alpha = 0.05$, so it can be said that the fields are valid to be measured what it was set for to achieve the main aim of the study.

Table (4.10): Correlation Coefficient of Each Field and the Whole of Questionnaire

No.	Field	Pearson Correlation Coefficient	p-value
1.	Usability.	0.888	0.000*
2.	Perceived usefulness.	0.882	0.000*
3.	Perceived ease of use.	0.865	0.000*
4.	Relative advantages.	0.894	0.000*
5.	Compatibility.	0.850	0.000*
6.	Medical errors prevention and reduction.	0.829	0.000*
7.	Health care outcomes improvements.	0.864	0.000*
8.	Redesign patient care pathway.	0.797	0.000*

4.8.2.3 Questionnaire Reliability

The questionnaire reliability was measured by applying Cronbach's Alpha test on the questionnaire fields. This test is used to measure the reliability of the questionnaire fields and the mean of the whole fields of the questionnaire. The value of Cronbach's Alpha coefficient lies between (0-1), the higher the value of Cronbach's Alpha coefficient the higher the reliability of the measured items and it equals square root of the Cronbach's Alpha coefficient.

The resultant value of Cronbach's Alpha coefficient of each field is as shown in Table (4.11): Cronbach's Alpha for each field of the questionnaire and the entire. The values of Cronbach's Alpha coefficient range from 0.842 to 0.922 and consequently the reliability values range from 0.918 to 0.960 which is considered relatively high values reflecting high reliability of questionnaire paragraphs.

Table (4.11): Cronbach's Alpha for each field of the questionnaire and the entire field

No.	Section	Cronbach's Alpha	Reliability*
1.	Usability.	0.922	0.960
2.	Perceived usefulness.	0.868	0.932
3.	Perceived ease of use.	0.908	0.953
4.	Relative advantages.	0.897	0.947
5.	Compatibility.	0.899	0.948
6.	Medical errors prevention and reduction.	0.842	0.918
7.	Health care outcomes improvements.	0.906	0.952
8.	Redesign patient care pathway.	0.900	0.949

*The square root for Cronbach's Alpha

4.9 Chapter Summary

This chapter discussed and elaborated on the research design and methodology followed by the researcher in conducting this study. It also expanded on study population and sample and illustrated tools and instruments used in data gathering. Questionnaire design was presented in details and investigation on questionnaire validity and reliability were also thoroughly discussed.

Chapter 5

Findings & Discussion

Chapter 5 Findings & Discussion

5.1 Introduction

This chapter includes detailed description of the findings resulted from applying the statistical tests on the collected data from the questionnaires.

The collected data of the respondents will be presented and the findings will be described and discussed in three main parts:

- The first part will tackle the analysis of the demographic information of the questionnaire respondents.
- The second part will apply the statistical tests indicated in section 4.7: Statistical Analysis on the collected data from questionnaire respondents; the overall results will be compared to each other, interpreted and finally compared with the previous studies results.
- The third part will testify the study hypothesis. The findings of this test will be discussed and compared with previous studies results.

5.2 Part I: Respondents Characteristics

In this section, the researcher describes and analyzes the respondents personal characteristics (Gender, Age, Educational Degree, Job title, Years of experience in using System).

5.2.1 Gender

As shown in Table (5.1): Gender Distribution of respondents, the respondents gender distribution shows the dominance of female respondents on the sample as it constituted (174) 60.8% of the total respondents. That mean the female in Primary care centers staff twice the female staff .This could be due to the most of the nurse is female and may UNRW in the last years support employ the female .

Table (5.1): Gender Distribution of Respondents

Gender	Frequency	Percent%
Male	112	39.2
Female	174	60.8
Total	286	100

5.2.2 Age

According to Table (5.2): Age Distribution of Respondents (39) 13.6% from the staff their ages “Less than 25 years“, and (115) 40.2% from the staff their ages “25- less than 35 years“, and (75) 26.2% from the staff ages “35- less than 45 years“, and (57) 19.9% from the staff ages “More than 45 years“. The largest groups from 24-less than 35 years and from 35 –less than 45 years which equal 66.4% of the Primary Health care centers staff, that mean the it’s a young staff that could be due to the student graduated in age 22 and retirement in age 60 .

Table (5.2): Age Distribution of Respondents

Age	Frequency	Percent%
Less than 25 years	39	13.6
25 – less than 35 years	115	40.2
35 – less than 45 years	75	26.2
More than 45 years	57	19.9
Total	286	100

5.2.3 Educational Degree

According to Table (5.3): Educational Degree Distribution of Respondents; major respondents are Bachelor holders 64.0%, whereas Master degree holder constitutes 11.9%, and 0.3% from the staff their level education “PhD“, and 23.1% from the staff their level education “Diploma“, and 0.7% from the staff their level education (High school).

The heights group is the bachelor degree that because most of staff nurses that require bachelor degree or diploma, but in Gaza there is many graduates with bachelor degree and UNRWA prefer to employ them than diploma degree

Table (5.3): Educational Degree Distribution of Respondents

Educational Degree	Frequency	Percent%
PhD	1	0.3
Master	34	11.9
Bachelor	183	64.0
Diploma	66	23.1
High school	2	0.7
Total	286	100

5.2.4 Job Title

Table (5.4) show that (67) 23.4% from the staff their job title are “Doctor“, and (71) 24.8% their job title “Administrative Nurse“, and (8) 2.8% their job title “Administrative Doctor“, and (19) 6.6% their job title “Administrative“, and (13) 4.5% their job title “Secretary“, and (28) 9.8% their job title “Technical“, and (80) 28.0% their job title “Nurse “.

Most of the staff Nurses that because the Primary Health centers provide primary care which can attended by general doctors or nurses, the cases that need to more intervention refers to private or general hospital.

Table (5.4): Job title Distribution of Respondents

Job Title	Frequency	Percent%
Doctor	67	23.4
Administrative Nurse	71	24.8
Administrative Doctor	8	2.8
Administrative	19	6.6
Secretary	13	4.5
Technical	28	9.8
Nurse	80	28.0
Total	286	100

5.2.5 Persons who benefit from your services:

Table (5.6) Show that (143) 50.0% from the staff provide their services to “patients“, and (20) 7.0% provide their services to “Colleagues at Work“, and (123) 43.0% provide their services to “Multiple categories“. The high rate group is the ‘Patient’ that because the UNRWA provide services for all refugees distributed according to their areas on the primary health care centers and the target is the patient .

Table (5.5): Persons who benefit from your services

Persons who benefit from your services	Frequency	Percent%
Patients	143	50.0
Colleagues at Work	20	7.0
Multiple categories	123	43.0
Total	286	100

5.3 Part II: Findings Description and Discussion

In this section, the researcher describes the collected data from the questionnaire 8 fields, which contain 58 paragraphs. These findings will be discussed and interpreted to answer the study questions and testify its hypothesis. Moreover, the study findings will be compared to the previous studies findings identifying the differences and similarities and explain the reasons for each of the two cases. The researcher used T- Test which used to determine if the mean of a paragraph is significantly different from a Hypothesized value (4) (Approximately the middle value of numerical scale (1-7). If the P-value (Sig.) is smaller than or equal to the level of significance ($\alpha= 0.05$), then the mean of a paragraph is significantly different from a hypothesized value (4). The sign of the Test value indicates whether the mean is significantly greater or smaller than hypothesized value (4). On the other hand, if the P- value (Sig.) is greater than the level of significance ($\alpha= 0.05$), then the mean of a paragraph is insignificantly different from a hypothesized value (4).

5.4 Research Questions

RQ1: How do respondents evaluate the e-health information system characteristics (usability, perceived ease of use ,perceived usefulness ,relative advantages, compatibility) of the adopted e-health information system?

1. How do respondents evaluate the usability of e-health information system.

Table (5.7): Means and Test values for of each item of the usability field, shows the following results:

- The mean of paragraph No. 7 “The information is effective in helping me complete my work” equal 5.70, Test value = 16.7, and p-value = 0.000 which is smaller than the level of significance $\alpha = 0.05$. The sign of the test is positive, so the mean of this paragraph is significantly greater than the hypothesized value 4. It is concluded that the respondents agreed to this paragraph.
- The mean of paragraph No. 6 “The information provided with the system is easy to understand” equal 5.67, Test value = 17.3, and p-value = 0.000 which is smaller than the level of significance $\alpha = 0.05$. The sign of the test is positive, so the mean of this

paragraph is significantly greater than the hypothesized value 4. It is concluded that the respondents agreed to this paragraph.

- The mean of paragraph No. 3 “The system gives error messages that clearly tell me how to fix problems” equal 4.34, Test value = 2.7, and p-value = 0.000 which is smaller than the level of significance $\alpha = 0.05$. The sign of the test is positive, so the mean of this paragraph is significantly greater than the hypothesized value 4. It is concluded that the respondents agreed to this paragraph.

- ☒ In general the mean of this field equals 5.35, Test-value = 17.9, and P-value = 0.000 which is smaller than the level of significance $\alpha = 0.05$. The sign of the test is positive, so the mean of this field is significantly greater than the hypothesized value 4. It is concluded that the respondents agreed to this field.

The previous result is not in line with Czaja et al. (2015) who conclude that the HIS has low usability, and in line with Kushniruk et al. (2005) study which the participant evaluate the usability of the system high .

Table (5.6): Means and Test values for of each item of the usability field

No.	Item	Mean	Proportio nal mean (%)	Test value	P-value Sig.	Rank
1.	Overall, I am satisfied with how easy it is to use this system.	5.43	77.5%	13.7	0.000	7
2.	I feel comfortable using this system.	5.62	80.2%	15.7	0.000	4
3.	The system gives error messages that clearly tell me how to fix problems.	4.34	62.0%	2.7	0.000	12
4.	Whenever I make a mistake using the system, I recover easily and quickly.	5.10	72.9%	10.4	0.000	11
5.	It is easy to find the information I need.	5.65	80.7%	16.0	0.000	3
6.	The information provided with the system is easy to understand.	5.67	81.0%	17.3	0.000	2
7.	The information is effective in helping me complete my work.	5.70	81.4%	16.7	0.000	1
8.	The organization of information on the system screens is clear.	5.59	79.8%	16.7	0.000	5
9.	The interface of this system is pleasant	5.23	74.8%	12.1	0.000	9
10.	I like using the interface of this system.	5.24	74.9%	12.2	0.000	8
11.	This system has all the functions and capabilities I expect it to have.	5.16	73.8%	11.6	0.000	10
12.	Overall, I am satisfied with this system.	5.54	79.2%	16.4	0.000	6
	All paragraphs of the filed	5.35	76.5%	17.9	0.000	

2. How did respondents perceive the usefulness of the adopted e-health system?

Table (5.8): Means and Test values for of each item of the Perceived Usefulness field, shows the following results:

- The mean of paragraph No. 1 “HIS allows me to have quick access to patients data” equal 5.76, Test value = 17.6, and p-value = 0.000 which is smaller than the level of significance $\alpha = 0.05$. The sign of the test is positive, so the mean of this paragraph is significantly greater than the hypothesized value 4. It is concluded that the respondents agreed to this paragraph.
 - The mean of paragraph No. 6 “HIS makes it easier to do my job” equal 5.62, Test value = 16.5, and p-value = 0.000 which is smaller than the level of significance $\alpha = 0.05$. The sign of the test is positive, so the mean of this paragraph is significantly greater than the hypothesized value 4. It is concluded that the respondents agreed to this paragraph.
 - The mean of paragraph No. 2 “HIS facilitates communication of information among various care providers” equal 5.16, Test value = 10.0, and p-value = 0.000 which is smaller than the level of significance $\alpha = 0.05$. The sign of the test is positive, so the mean of this paragraph is significantly greater than the hypothesized value 4. It is concluded that the respondents agreed to this paragraph.
- In general the mean of this field equals 5.52, Test-value = 19.1, and P-value = 0.000 which is smaller than the level of significance $\alpha = 0.05$. The sign of the test is positive, so the mean of this field is significantly greater than the hypothesized value 4. It is concluded that the respondents agreed to this field.

The previous result is in line with Kuo et al. (2013), Gagnon et al. (2014), Asua et al. (2012) and Yu et al. (2009) that the participants evaluated the perceived usefulness high, Bader (2016) also the participant agreed that they perceived usefulness and the study conducted in UNRWA primary care centers in Gaza.

Table (5.7): Means and Test values for of each item of the Perceived usefulness field

No.	Item	Mean	Proportional mean (%)	Test value	P-value Sig.	Rank
1.	HIS allows me to have quick access to patients data	5.76	82.2%	17.6	0.000	1
2.	HIS facilitates communication of information among various care providers	5.16	73.7%	10.0	0.000	6
3.	HIS assists in avoiding duplication of examinations	5.54	79.1%	13.9	0.000	3
4.	HIS reduces the risk of error in healthcare service	5.50	78.5%	16.2	0.000	5
5.	HIS gives me greater control over my work schedule	5.53	79.0%	16.5	0.000	4
6.	HIS makes it easier to do my job	5.62	80.2%	16.5	0.000	2
	All paragraphs of the filed	5.52	78.8%	19.1	0.000	

3. How did respondents perceive the ease of use of the adopted e-health system?

Table (5.9): Means and Test values for of each item of the Perceived ease of use field, shows the following results:

- The mean of paragraph No. 4 “I think I will become skilled using HIS” equal 5.94, Test value = 22.7, and p-value = 0.000 which is smaller than the level of significance $\alpha = 0.05$. The sign of the test is positive, so the mean of this paragraph is significantly greater than the hypothesized value 4. It is concluded that the respondents agreed to this paragraph.
- The mean of paragraph No. 2 “I think HIS is easy to use” equal 5.68, Test value = 18.1, and p-value = 0.000 which is smaller than the level of significance $\alpha = 0.05$. The sign of the test is positive, so the mean of this paragraph is significantly greater than the hypothesized value 4. It is concluded that the respondents agreed to this paragraph.
- The mean of paragraph No. 6 “I think it is easy to get the system do what I want it to do” equal 5.24, Test value = 12.7, and p-value = 0.000 which is smaller than the level of significance $\alpha = 0.05$. The sign of the test is positive. So ,the mean

of this paragraph is significantly greater than the hypothesized value 4. It is concluded that the respondents agreed to this paragraph.

☒ In general the mean of this field equals 5.57, Test-value = 20.8, and P-value = 0.000 which is smaller than the level of significance $\alpha = 0.05$. The sign of the test is positive, so the mean of this field is significantly greater than the hypothesized value 4. It is concluded that the respondents agreed to this field.

The previous result is in line with Kuo et al. (2013), Gagnon et al. (2014), Asua et al. (2012) and Yu et al. (2009). Bader (2016) also conducted in UNRWA primary care centers in Gaza and the participant agreed that they perceived ease of use.

Table (5.8): Means and Test values for of each item of the Perceived ease of use field

No.	Item	Mean	Proportional mean (%)	Test value	P-value	Sig.	Rank
1.	I think it is easy to learn to use HIS	5.49	78.4%	14.2	0.000		5
2.	I think HIS is easy to use	5.68	81.1%	18.1	0.000		2
3.	I think HIS makes my consultations with patients easier	5.67	81.1%	17.9	0.000		3
4.	I think I will become skilled using HIS	5.94	84.8%	22.7	0.000		1
5.	I think HIS will be easy for physicians to use	5.56	79.4%	17.0	0.000		4
6.	I think it is easy to get the system do what I want it to do	5.24	74.8%	12.7	0.000		7
7.	I think it is easy to interact with HIS (respond to pop up dialogs and system instructions, supply input needed to some processes execution or report generation)	5.41	77.2%	15.3	0.000		6
	All paragraphs of the filed	5.57	79.5%	20.8	0.000		

4. How did respondents evaluate the relative advantages of the adopted e-health system?

Table (5.10): Means and Test values for of each item of the Relative Advantages field, shows the following results:

- The mean of paragraph No. 5 “Overall, I find using HIS to be advantageous in my job” equal 5.71, Test value = 18.6, and p-value = 0.000 which is smaller than the level of significance $\alpha = 0.05$. The sign of the test is positive, so the mean of this paragraph is significantly greater than the hypothesized value 4. It is concluded that the respondents agreed to this paragraph.
- The mean of paragraph No. 2 “Using HIS makes it easier to do my job” equal 5.59, Test value = 15.7, and p-value = 0.000 which is smaller than the level of significance $\alpha = 0.05$. The sign of the test is positive, so the mean of this paragraph is significantly greater than the hypothesized value 4. It is concluded that the respondents agreed to this paragraph.
- The mean of paragraph No. 3 “The disadvantages of my using HIS far outweigh the advantages” equal 3.56, Test value = -3.3, and p-value = 0.001 which is smaller than the level of significance $\alpha = 0.05$. The sign of the test is negative, so the mean of this paragraph is significantly smaller than the hypothesized value 4. It is concluded that the respondents disagreed to this paragraph.
 - ☒ In general the mean of this field equals 5.32, Test-value = 17.0, and P-value = 0.000 which is smaller than the level of significance $\alpha = 0.05$. The sign of the test is positive, so the mean of this field is significantly greater than the hypothesized value 4. It is concluded that the respondents agreed to this field.

The previous result is not in line with (X. Zhang et al., 2015) . In other hand it's in line with Carljord et al. (2010) and Sugarhood et al. (2014) which the respondents agreed that the relative advantages of HIS is high.

Table (5.9): Means and Test values for of each item of the Relative Advantages field

No.	Item	Mean	Proportional mean (%)	Test value	P-value Sig.	Rank
1.	Using HIS improves the quality of work I do	5.54	79.1%	14.7	0.000	4
2.	Using HIS makes it easier to do my job	5.59	79.8%	15.7	0.000	2
3.	The disadvantages of my using HIS far outweigh the advantages	3.56	50.8%	-3.3	0.001	3
4.	Using HIS improves my job performance	5.51	78.7%	15.4	0.000	5
5.	Overall, I find using HIS to be advantageous in my job.	5.71	81.6%	18.6	0.000	1
6.	Using HIS enhances my effectiveness on the job	5.48	78.3%	14.7	0.000	9
7.	Using HIS gives me greater control over my work	5.51	78.7%	15.1	0.000	6
8.	Using HIS increases my productivity	5.50	78.6%	14.7	0.000	7
9.	Using HIS enable me to accomplish tasks more quickly	5.49	78.4%	14.2	0.000	8
	All paragraphs of the filed	5.32	76.0%	17.0	0.000	

5. How did respondents evaluate the compatibility of the adopted e-health system?

Table (5.11): Means and Test values for of each item of the compatibility field, shows the following results:

- The mean of paragraph No. 2 “Using HIS is completely compatible with my current situation” equal 5.47, Test value = 16.4, and p-value = 0.000 which is smaller than the level of significance $\alpha = 0.05$. The sign of the test is positive, so the mean of this paragraph is significantly greater than the hypothesized value 4. It is concluded that the respondents agreed to this paragraph.
- The mean of paragraph No. 1 “Using HIS is compatible with all my aspects of my work” equal 5.20, Test value = 12.0, and p-value = 0.000 which is smaller than the level of significance $\alpha = 0.05$. The sign of the test is positive, so the mean of this paragraph is significantly greater than the hypothesized value 4. It is concluded that the respondents agreed to this paragraph.
- ☒ In general the mean of this field equals 5.34, Test-value = 16.0, and P-value = 0.000 which is smaller than the level of significance $\alpha = 0.05$. The sign of the test

is positive, so the mean of this field is significantly greater than the hypothesized value 4. It is concluded that the respondents agreed to this field.

The previous result is not in line with X. Zhang et al. (2015) .In other hand agreed with Carlford et al. (2010) and (Sugarhood et al., 2014) .AboAmra (2017) also the respondents has high evaluation of the compatibility And studied the compatibility in the UNRWA ERP system .

Table (5.10): Means and Test values for of each item of the compatibility field

No.	Item	Mean	Proportional mean (%)	Test value	P-value Sig.	Rank
1.	Using HIS is compatible with all my aspects of my work.	5.20	74.3%	12.0	0.000	4
2.	Using HIS is completely compatible with my current situation.	5.47	78.1%	16.4	0.000	1
3.	I think that using HIS fits well with way like to work.	5.32	76.0%	13.5	0.000	3
4.	Using HIS fits into my work style.	5.38	76.9%	14.3	0.000	2
	All paragraphs of the filed	5.34	76.3%	16.0	0.000	

RQ2: How do respondents evaluate the Health care quality (medical error prevention and reduction, patient outcomes improvements ,redesign patient care pathway) of the adopted e-health information system?

1.How did respondents evaluate the medical errors prevention and reduction of the adopted e-health system?

Table (5.12): Means and Test values for of each item of the Medical error prevention & reduction field, shows the following results:

- The mean of paragraph No. 4 “The system makes it possible to me to reduce drug allergy” equal 5.45, Test value = 14.7, and p-value = 0.000 which is smaller than the level of significance $\alpha = 0.05$. The sign of the test is positive, so the mean of this paragraph is significantly greater than the hypothesized value 4. It is concluded that the respondents agreed to this paragraph.

- The mean of paragraph No. 1 “The error message inform me of error severity and suggest the cause of the problem” equal 4.95, Test value = 8.8, and p-value = 0.000 which is smaller than the level of significance $\alpha = 0.05$. The sign of the test is positive, so the mean of this paragraph is significantly greater than the hypothesized value 4. It is concluded that the respondents agreed to this paragraph.

☒ In general the mean of this field equals 5.23, Test-value = 15.5, and P-value = 0.000 which is smaller than the level of significance $\alpha = 0.05$. The sign of the test is positive, so the mean of this field is significantly greater than the hypothesized value 4. It is concluded that the respondents agreed to this field.

The previous result is in line with Schiff et al. (2015).

Table (5.11): Means and Test values for of each item of the Medical error prevention & reduction field

No.	Item	Mean	Proportional mean (%)	Test value	P-value Sig.	Rank
1.	The error message inform me of error severity and suggest the cause of the problem.	4.95	70.7%	8.8	0.000	5
2.	The system help me recover from system error.	5.27	75.2%	13.4	0.000	3
3.	The system reduce error rate on the report.	5.37	76.8%	13.8	0.000	2
4.	The system makes it possible to me to reduce drug allergy.	5.45	77.8%	14.7	0.000	1
5.	The system has reduced dosing error.	5.09	72.7%	10.3	0.000	4
	All paragraphs of the filed	5.23	74.7%	15.5	0.000	

2. How did respondents evaluate the health care outcomes improvements of the adopted e-health system?

Table (5.13): Means and Test values for of each item of the Health care outcome improvements field, shows the following results:

- The mean of paragraph No. 5 “HIS allows to access and view patients” assessments easily and quickly” equal 5.80, Test value = 19.4, and p-value = 0.000 which is smaller than the level of significance $\alpha = 0.05$. The sign of the test is positive, so the mean of this paragraph is significantly greater than the hypothesized value 4. It is concluded that the respondents agreed to this paragraph.
- The mean of paragraph No. 1 “The system allows having a comprehensive picture about a Patient that helps in diagnosing problems sooner” equal 5.76, Test value = 18.6, and p-value = 0.000 which is smaller than the level of significance $\alpha = 0.05$. The sign of the test is positive, so the mean of this paragraph is significantly greater than the hypothesized value 4. It is concluded that the respondents agreed to this paragraph.
- The mean of paragraph No. 6 “The system has the option to send reminders to healthcare providers (e.g. surgeries appointments and nurses to give medications to inpatients)” equal 4.63, Test value = 5.1, and p-value = 0.000 which is smaller than the level of significance $\alpha = 0.05$. The sign of the test is positive, so the mean of this paragraph is significantly greater than the hypothesized value 4. It is concluded that the respondents agreed to this paragraph.

☒ In general the mean of this field equals 5.47, Test-value = 18.3, and P-value = 0.000 which is smaller than the level of significance $\alpha = 0.05$. The sign of the test is positive, so the mean of this field is significantly greater than the hypothesized value 4. It is concluded that the respondents agreed to this field.

The previous result is in line with Lee et al. (2013) , Abdool (2014) and Nejim (2016) also which her study conducted in the European hospital in Gaza.

Table (5.12): Means and Test values for of each item of the Health care outcome improvements field

No.	Item	Mean	Proportional mean (%)	Test value	P-value Sig.	Rank
1.	The system allows having a comprehensive picture about a Patient that helps in diagnosing problems sooner.	5.76	82.2%	18.6	0.000	2
2.	The implementation of such systems helped in diagnosing medical conditions at earlier stage.	5.09	72.8%	10.1	0.000	6
3.	The system allows gathering all information related to a patient in one place (e.g. lab results and radiology reports) that helps in making therapeutic decisions).	5.65	80.7%	17.9	0.000	5
4.	The system allows viewing drug formulary information.	5.71	81.6%	18.1	0.000	3
5.	This HIS allows to access and view patients'' assessments easily and quickly.	5.80	82.8%	19.4	0.000	1
6.	The system has the option to send reminders to healthcare providers (e.g. appointments and nurses to give medications to inpatients).	4.63	66.1%	5.1	0.000	7
7.	Overall, the system helped to improve follow up patients health outcomes.	5.66	80.9%	17.8	0.000	4
	All paragraphs of the filed	5.47	78.2%	18.3	0.000	

3. How did respondents evaluate the redesign patient care pathway of the adopted e-health system?

Table (5.14): Means and Test values for of each item of the Redesign patient care pathway field, shows the following results:

- The mean of paragraph No. 8 “Overall, the system helped in redesigning patients’ care Pathway” equal 5.55, Test value = 17.3, and p-value = 0.000 which is smaller than the level of significance $\alpha = 0.05$. The sign of the test is positive, so the mean of this paragraph is significantly greater than the hypothesized value 4. It is concluded that the respondents agreed to this paragraph.
- The mean of paragraph No. 7 “Hospital information system facilitates documenting patients’ care activities” equal 5.38, Test value = 14.4, and p-value = 0.000 which is smaller than the level of significance $\alpha = 0.05$. The sign of the test is positive, so the

mean of this paragraph is significantly greater than the hypothesized value 4. It is concluded that the respondents agreed to this paragraph.

- The mean of paragraph No. 5 “HIS helps in simplifying supporting processes, such as billing, therapy cost) and make it easier than before” equal 4.69, Test value = 5.7, and p-value = 0.000 which is smaller than the level of significance $\alpha = 0.05$. The sign of the test is positive, so the mean of this paragraph is significantly greater than the hypothesized value 4. It is concluded that the respondents agreed to this paragraph.

☒ In general the mean of this field equals 5.20, Test-value = 15.0, and P-value = 0.000 which is smaller than the level of significance $\alpha = 0.05$. The sign of the test is positive, so the mean of this field is significantly greater than the hypothesized value 4. It is concluded that the respondents agreed to this field.

The previous result is in line with Augusto et al. (2015) ,Abdool (2014) and Nejim (2016) also which her study conducted in the European hospital in Gaza.

Table (5.13): Means and Test values for of each item of the Redesign patient care pathway field

No.	Item	Mean	Proportion al mean (%)	Test value	P-value Sig.	Rank
1.	This HIS facilitates a patients journey in the hospital; since the patient enters the facility until leaving it.	5.38	76.9%	13.5	0.000	3
2.	Patients'' registration or scheduling appointment processes take maximum from 5 to 10 minutes per patient.	5.20	74.3%	11.6	0.000	5
3.	This HIS Allows reviewing patients'' progress notes.	5.37	76.7%	13.9	0.000	4
4.	Hospital information system has the option to send notices for patient's reservation and checking appointments.	4.91	70.2%	7.6	0.000	7
5.	This HIS helps in simplifying supporting processes and make it easier than before.	4.69	66.9%	5.7	0.000	8
6.	Hospital information system help to decrease patients time to complete hospital management procedures.	5.16	73.7%	11.4	0.000	6
7.	Hospital information system facilitates documenting patients'' care activities.	5.38	76.9%	14.4	0.000	2
8.	Overall, the system helped in redesigning patients'' care Pathway.	5.55	79.2%	17.3	0.000	1
	All paragraphs of the filed	5.20	74.4%	15.0	0.000	

5.5 Part III: Hypotheses Testing

In this section the study four hypothesizes will be tested:

H1: There is a significant positive relationship between e-health information system characteristics and health care quality.

H2: E-health information system characteristics (usability, perceived ease of use ,perceived usefulness, relative advantages, compatibility) has direct significant impact on medical error prevention and reduction.

H3: E-health information system characteristics (usability, perceived ease of use ,perceived usefulness, relative advantages, compatibility) has direct significant impact on Health care outcomes improvements.

H4: E-health information system characteristics (usability, perceived ease of use ,perceived usefulness, relative advantages, compatibility) has direct significant impact on Redesign patient care pathway.

H5: There are significant differences among respondents for the impact of health information system (HIS) characteristics on healthcare quality due to demographic characteristics.

5.5.1 Testing Hypothesis

H1: There is a significant positive relationship between e-health information system characteristics and health care quality.

Table (5.14): Correlation Matrix

Correlation	Usability	Perceived usefulness	Perceived ease of use	Relative advantages	Compatibility	Medical errors prevention and reduction	Health care outcomes improvements	Redesign patient care pathway
Usability		.809**	.758**	.729**	.716**	.677**	.667**	.614**
Perceived usefulness	.809**		.766**	.773**	.702**	.656**	.740**	.609**
Perceived ease of use	.758**	.766**		.742**	.702**	.652**	.773**	.565**
Relative advantages	.729**	.773**	.742**		.789**	.713**	.735**	.655**
Compatibility	.716**	.702**	.702**	.789**		.673**	.680**	.684**
Medical errors prevention and reduction	.677**	.656**	.652**	.713**	.673**		.732**	.695**
Health care outcomes improvements	.667**	.740**	.773**	.735**	.680**	.732**		.664**
Redesign patient care pathway	.614**	.609**	.565**	.655**	.684**	.695**	.664**	

Table (5.15): Correlation Matrix that shows the correlation between the health care characteristics and health care quality .The correlation values ranges from .565 to .773 which concluded that there is significant positive relationship between health care characteristics and health care quality.

- In the medical error prevention and reduction field the correlation with relative advantages =.713, usability =.677 and compatibility =.673 is the highest . The relation between medical error prevention and reduction and usability is in line with Middleton et al. (2013) and Kushniruk et al. (2005) who concluded that there is significant positive relationship between usability and medical error reduction and prevention.
- In the redesign patient care pathway field the correlation with relative advantages =.684 and compatibility=.655 is the highest.
- In the health care outcome improvements field the correlation with perceived ease of use=.773,perceived usefulness=.740 and relative advantages =.735 is the highest.

This results may indicate the relation between variables and what is has the most effect on dependent variables

H₂: Health Information System (HIS) Characteristics (usability, perceived ease of use, perceived usefulness, relative advantages, compatibility) has significant effect on medical error prevention and reduction.

Table (5.15): Model Summary for the first Hypothesis, shows the following results: adjusted R Square= 57.1% which means that 57.1% of the variation in "medical error prevention and reduction" is explained by this model.

Table (5.15): Model Summary for the first Hypothesis

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.760	0.578	0.571	0.878

Table (5.16): Analysis of Variance for the Regression Model shows the assessment of the overall significance of the model. As $p < 0.05$, the model is significant.

Table (5.16): Analysis of Variance for the Regression Mode

Model	Sum of Squares	Df	Mean Square	F	Sig.
Regression	296.194	5	59.239	76.800	0.000
Residual	215.974	280	0.771		
Total	512.169	285			

In hypothesis testing the researcher used Multiple Regressions Method which calculates multiple regression equations and associated statistics and plots. In addition, this method calculates collinearity diagnostics, predicted values, residuals. This test is used to measure the statistical relation between two variables or more; such that one variable will be the dependent variable and other variables will be the independent variables. If there is significant relation then the independent variables will affect the dependent variable value.

The relation between variables will them be presented by the following equation:

$$Y = \alpha + bx$$

Regression Model Equation

Where:

α : constant value represent the intersection value between the line and the Y-axis.

b :is the regression line slop. Which means the percentage of changing in Y value as a result of changing X value.

The regression analysis model produces several statistical measures such as R, R^2 ; R is a measure of the correlation between the observed value and the predicted value of the dependent variable. R^2 is the square of this measure of correlation and indicates the proportion of the variance in the dependent variable which is accounted for by the model.

Table (5.17): The Regression Coefficients of the Independent Variables shows Beta values for each independent variable, the bigger the value of Beta, the bigger the effect of independent variable on the value of the dependent variable value. Only independent variables whose P-values <0.05 are significantly affecting the dependent variable.

The Beta values indicate that Relative advantages is the most effective subfield with $\beta= 0.321$ followed by Usability with $\beta= 0.223$ and finally, Compatibility $\beta= 0.158$.

Table (5.17): The Regression Coefficients of the Independent Variables

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	0.622	0.247		2.521	0.012
Usability	0.223	0.077	0.213	2.898	0.004
Perceived usefulness	0.039	0.077	0.039	0.511	0.610
Perceive ease of use	0.115	0.072	0.110	1.598	0.111
Relative advantages	0.320	0.077	0.314	4.188	0.000
Compatibility	0.159	0.064	0.168	2.481	0.014

Thus the regression equation is:

$$Y = 0.622 + 0.223X_1 + 0.320X_2 + 0.159X_3$$

Y: Medical error prevention and reduction.

X1: Usability

X2: Relative advantages

X3: Compatibility

In conclusion, there is a significant relationship between the dependent variable "Medical error prevention and reduction" and the independent variables previously identified and their rank is as following (the first one means the most effective variable):

1. Relative advantages
2. Usability
3. Compatibility

Medical error effected by the usability of the system which agreed with (Middleton et al., 2013) who concluded that to reach safer and higher quality care by the adoption of useful and usable EHR systems. (Kushniruk et al., 2005) found that certain types of usability problems were closely associated with the occurrence of specific types of errors in prescription of medications. The compatibility of the HIS to the user style

,behavior and environment and how much the system provide high degree of relative advantages functionality, image, reduce cost is important and accepted logically that there is significant relationship between compatibility and relative advantages with medical error reduction due to the significant relation between the two variables and the success of the HIS Adaption (Rogers, 2010), but up to the researcher know there is no previous studies conduct this relation

H₃: Health Information System (HIS) Characteristics (usability, perceived ease of use, perceived usefulness, relative advantages, compatibility) has significant effect on Health care outcome improvements.

Table (5.18): Model Summary for the second hypothesis, shows the following results: adjusted R Square= 67.1% which means that 67.1% of the variation in "Health care outcome improvements" is explained by this model.

Table (5.18): Model Summary for the second Hypothesis

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.823	0.677	0.671	0.777

Table (5.19): Analysis of Variance for the Regression Model shows the assessment of the overall significance of the model. As $p < 0.05$, the model is significant.

Table (5.19): Analysis of Variance for the Regression Mode

Model	Sum of Squares	Df	Mean Square	F	Sig.
Regression	355.497	5	71.099	117.500	0.000
Residual	169.428	280	0.605		
Total	524.925	285			

Table (5.20): The Regression Coefficients of the Independent Variables shows Beta values for each independent variable, the bigger the value of Beta, the bigger the effect of independent variable on the value of the dependent variable value. Only independent variables whose P-values < 0.05 are significantly affecting the dependent variable.

The Beta values indicate that Perceive ease of use is the most effective subfield with $\beta = 0.431$ followed by Perceived usefulness with $\beta = 0.259$ and finally, Relative advantages $\beta = 0.213$.

Table (5.20): The Regression Coefficients of the Independent Variables

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	0.381	0.219		1.740	0.083
Usability	-0.080	0.068	-0.075	-1.170	0.243
Perceived usefulness	0.259	0.068	0.256	3.813	0.000
Perceive ease of use	0.432	0.064	0.406	6.767	0.000
Relative advantages	0.213	0.068	0.206	3.148	0.002
Compatibility	0.103	0.057	0.107	1.809	0.072

Thus the regression equation is:

$$Y = 0.381 + 0.259X_1 + 0.432X_2 + 0.213X_3$$

Y: Health care outcome improvements.

X1: Perceived usefulness

X2: Perceive ease of use

X3: Relative advantages

In conclusion, there is a significant relationship between the dependent variable "Health care outcome improvements" and the independent variables previously identified and their rank is as following (the first one means the most effective variable):

1. Perceive ease of use
2. Perceived usefulness
3. Relative advantages

Although, Perceived ease of use and perceived usefulness is a determinants to the performance (Ali & Younes, 2013) . Peterson et al. (2006) conclude that there is significant relationship between performance and patient outcome. Up to the researcher know there is Neither previous study studied the direct relation between perceived ease of use ,perceived usefulness and patient care outcomes improvements. Nor relation between relative advantages and patient care outcome improvements.

H₄: Health Information System (HIS) Characteristics (usability, perceived ease of use, perceived usefulness, relative advantages, compatibility) has significant effect on Redesign patient care pathway.

Table (5.21): Model Summary for the third hypothesis, shows the following results: adjusted R Square= 51.0% which means that 51.0% of the variation in "Redesign patient care pathway" is explained by this model.

Table (5.21): Model Summary for the third hypothesis

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.720	0.519	0.510	0.948

Table (5.22): Analysis of Variance for the Regression Model shows the assessment of the overall significance of the model. As $p < 0.05$, the model is significant.

Table (5.22): Analysis of Variance for the Regression Mode

Model	Sum of Squares	Df	Mean Square	F	Sig.
Regression	271.754	5	54.351	60.390	0.000
Residual	251.999	280	0.900		
Total	523.753	285			

Table (5.23): The Regression Coefficients of the Independent Variables shows Beta values for each independent variable, the bigger the value of Beta, the bigger the effect of independent variable on the value of the dependent variable value. Only independent variables whose P-values < 0.05 are significantly affecting the dependent variable.

The Beta values indicate that Compatibility is the most effective subfield with $\beta = 0.360$ followed by Relative advantages with $\beta = 0.210$.

Table (5.23): The Regression Coefficients of the Independent Variables

Model	Unstandardized Coefficients		Standardized Coefficients	T	Sig.
	B	Std. Error	Beta		
(Constant)	1.009	0.267		3.783	0.000
Usability	0.148	0.083	0.140	1.785	0.075
Perceived usefulness	0.098	0.083	0.096	1.179	0.239
Perceive ease of use	-0.032	0.078	-0.030	-0.410	0.682
Relative advantages	0.210	0.083	0.203	2.542	0.012
Compatibility	0.360	0.069	0.377	5.206	0.000

Thus the regression equation is:

$$Y = 1.009 + 0.210X_1 + 0.360X_2$$

Y: Redesign patient care pathway.

X1: Relative advantages

X2: Compatibility

In conclusion, there is a significant relationship between the dependent variable " Redesign patient care pathway " and the independent variables previously identified and their rank is as following (the first one means the most effective variable):

1. Compatibility
2. Relative advantages

According to Rogers (2010) Compatibility and relative advantages is determinants for HIS adaption success .While ALKADI (2016) and Jao and Hier (2010) concluded that the HIS effect Redesign patient care pathway .but up to the researcher know there is no previous study constructed that there is a significant relationship between compatibility, relative advantages and Redesign patient care pathway.

Hypothesis Discussion

- Medical error prevention and reduction is affected by the usability of the system . Middleton et al. (2013) concluded that to reach safer and higher quality care by adoption of useful and usable EHR systems. More ever Kushniruk et al. (2005) found that certain types of usability problems were closely associated with the occurrence of specific types of errors in prescription of medications. In addition the medical error reduction is also affected by relative advantages and compatibility which is an important dimensions of success of adaption of innovation which need further studies
- Relative advantages is also effect health care outcome. besides perceived usefulness and perceived ease of use which effect the user performance which has positive significant relationship with health care outcome improvements (Ali & Younes, 2013) .
- Redesign patient care pathway is important to minimize waiting time and improve the quality of the health care(Abdool, 2014), which has significant positive relationship with two dimensions of adaption of innovation compatibility and relative advantages .

H5: “There are significant differences among respondents for the impact of health information system (HIS) characteristics on healthcare quality due to personal information (Gender, Age, Educational Degree, Job title, Years of experience in using System)”

In the following section, significant differences between respondents will be measured by each attribute.

1. **There are significant differences among respondents for the impact of health information system (HIS) characteristics on healthcare quality due to Gender.**

To test the hypothesis we use the Independent Samples T- Test and the result illustrated in table (5.24) which show that the p-value for each field is greater than the level of significance ($\alpha = 0.05$). Thus, there is no significant difference among the respondents regarding all fields due to Gender. The researcher concludes that the respondents' Gender has no effect on these fields

Table (5.24): Independent Samples T- Test of the fields and their p-values for Gender

No.	Field	Test value	p-value sig.	Means	
				Male	Female
.1	Usability.	-1.091	0.276	5.25	5.42
.2	Perceived usefulness.	-1.713	0.088	5.34	5.62
.3	Perceived ease of use.	-1.828	0.069	5.40	5.68
.4	Relative advantages.	-0.472	0.637	5.27	5.35
.5	Compatibility.	-0.288	0.774	5.31	5.36
.6	Medical errors prevention and reduction.	-0.370	0.712	5.19	5.25
.7	Health care outcomes improvements.	-0.917	0.360	5.37	5.53
.8	Redesign patient care pathway.	-0.338	0.736	5.17	5.23

2. **There are significant differences among respondents for the impact of health information system (HIS) characteristics on healthcare quality due to Age.**

Table (5.25): ANOVA test of the fields and their p-values for Age; shows the following results:

Table (5.25): ANOVA test of the fields and their p-values for Age

No.	Field	Test value	p-value sig.	Age			
				<25	25<35	35<45	45+
.1	Usability.	0.207	0.892	5.43	5.37	5.37	5.24
.2	Perceived usefulness.	0.439	0.726	5.52	5.59	5.52	5.34
.3	Perceived ease of use.	1.299	0.275	5.49	5.60	5.74	5.31
.4	Relative advantages.	1.400	0.243	4.96	5.30	5.41	5.49
.5	Compatibility.	1.664	0.175	4.89	5.35	5.46	5.47
.6	Medical errors prevention and reduction.	0.066	0.978	5.18	5.26	5.18	5.23
.7	Health care outcomes improvements.	1.011	0.388	5.16	5.46	5.63	5.48
.8	Redesign patient care pathway.	Q`	0.017	4.61	5.41	5.15	5.26

The P-value of field “Redesign patient care pathway” equals 0.017 which is smaller than the level of significance ($\alpha=0.05$). Thus, there is significant difference among the respondents regarding to this field due to Age. The researcher concludes that the respondents’ Age has significant effect on this field.

The p-values (Sig.) for other fields are greater than the level of significance ($\alpha=0.05$), thus there is insignificant difference among the respondents regarding to these fields due to Age. The researcher concludes that the respondents’ Age has no effect on these fields.

3. **There are significant differences among respondents for the impact of health information system (HIS) characteristics on healthcare quality due to Education Degree.**

Table (5.26): ANOVA test of the fields and their p-values for Education degree; shows the following results:

Table (5.26): ANOVA test of the fields and their p-values for Education Degree

No.	Field	Test value	p-value sig.	Education Degree				
				PhD	Master	Bachelor	Diploma	High school
.1	Usability.	0.997	0.410	5.66	5.26	5.32	5.44	7.00
.2	Perceived usefulness.	0.709	0.586	4.66	5.32	5.49	5.67	6.33
.3	Perceived ease of use.	0.654	0.624	4.71	5.46	5.56	5.62	6.78
.4	Relative advantages.	1.119	0.348	4.67	5.11	5.29	5.49	6.67
.5	Compatibility.	0.856	0.491	6.00	5.28	5.28	5.50	6.75
.6	Medical errors prevention and reduction.	1.686	0.153	4.00	4.89	5.21	5.42	6.70
.7	Health care outcomes improvements.	1.366	0.246	3.86	5.19	5.46	5.61	6.78
.8	Redesign patient care pathway.	1.995	0.095	6.25	4.75	5.20	5.36	6.75

The p-values (Sig.) for all fields are greater than the level of significance ($\alpha=0.05$), thus there is insignificant difference among the respondents regarding to these fields due to Education Degree. The researcher concludes that the respondents' Education Degree has no effect on these fields.

4. **There are significant differences among respondents for the impact of health information system (HIS) characteristics on healthcare quality due to Years of experience.**

The researcher used The One- Way Analysis of Variance (ANOVA) to examine if there is a statistical significant difference between three means or more toward The Impact of Health Information System (HIS) Characteristics on Healthcare Quality due to the personal characteristics such as (Age, Educational Degree, Job title, Years of experience).

Table (5.27): ANOVA test of the fields and their p-values for Years of experience; shows the following results:

Table (5.27): ANOVA test of the fields and their p-values for Years of experience

No.	Field	Test value	p-value sig.	Years of experience			
				<1	1<5	5<10	10+
.1	Usability.	1.477	0.221	5.64	5.18	5.26	5.43
.2	Perceived usefulness.	0.636	0.592	5.68	5.42	5.41	5.59
.3	Perceived ease of use.	0.197	0.898	5.68	5.59	5.53	5.51
.4	Relative advantages.	0.847	0.469	5.27	5.19	5.26	5.50
.5	Compatibility.	2.352	0.072	5.09	5.18	5.29	5.66
.6	Medical errors prevention and reduction.	0.589	0.623	5.15	5.09	5.23	5.36
.7	Health care outcomes improvements.	1.019	0.385	5.41	5.41	5.33	5.68
.8	Redesign patient care pathway.	1.572	0.196	5.10	4.95	5.33	5.35

The p-values (Sig.) for all fields are greater than the level of significance ($\alpha=0.05$), thus there is insignificant difference among the respondents regarding to these fields due to Years of experience. The researcher concludes that the respondents' Years of experience has no effect on these fields.

5. **There are significant differences among respondents for the impact of health information system (HIS) characteristics on healthcare quality due to Job title.**

Table (5.28): ANOVA test of the fields and their p-values for Job title; shows the following results:

Table (5.28): ANOVA test of the fields and their p-values for Job title

No.	Field	Test value	P-value sig.	Job title						
				Doctor	Nurse	Administrative Doctor	Administrative	Secretary	Technical	Other
.1	Usability.	1.730	0.114	5.14	5.47	5.73	5.69	6.07	5.05	5.28
.2	Perceived usefulness.	1.510	0.175	5.30	5.63	5.97	5.66	6.19	5.15	5.52
.3	Perceived ease of use.	0.791	0.578	5.50	5.53	5.46	5.75	6.26	5.56	5.50
.4	Relative advantages.	1.665	0.129	5.21	5.27	5.31	5.79	5.95	4.85	5.39
.5	Compatibility.	2.112	0.052	5.04	5.45	5.81	5.89	5.84	4.83	5.40
.6	Medical errors prevention and reduction.	1.196	0.309	5.02	5.41	5.17	5.22	4.92	5.23	5.22
.7	Health care outcomes improvements.	1.012	0.417	5.21	5.47	5.33	5.64	5.92	5.28	5.64
.8	Redesign patient care pathway.	1.913	0.079	4.91	5.48	5.48	5.40	5.81	4.87	5.14

The p-values (Sig.) for all fields are greater than the level of significance ($\alpha=0.05$), thus there is insignificant difference among the respondents regarding to these fields due to Job title. The researcher concludes that the respondents' Job title has no effect on these fields.

6. **There are significant differences among respondents for the impact of health information system (HIS) characteristics on healthcare quality due to the benefit from services.**

Table (5.29): ANOVA test of the fields and their p-values for the benefit from services; shows the following results:

Table (5.29): ANOVA test of the fields and their p-values for the benefit from services

No.	Field	Test value	p-value sig.	the benefit from services		
				Patients	Colleagues at Work	Multiple categories
.1	Usability.	0.482	0.618	5.32	5.16	5.42
.2	Perceived usefulness.	0.289	0.749	5.46	5.65	5.55
.3	Perceived ease of use.	1.450	0.236	5.51	5.23	5.69
.4	Relative advantages.	0.487	0.615	5.36	5.48	5.23
.5	Compatibility.	1.115	0.329	5.23	5.68	5.40
.6	Medical errors prevention and reduction.	0.171	0.843	5.24	5.06	5.23
.7	Health care outcomes improvements.	0.051	0.950	5.46	5.39	5.49
.8	Redesign patient care pathway.	0.715	0.490	5.19	5.55	5.16

The p-values (Sig.) for all fields are greater than the level of significance ($\alpha=0.05$), thus there is insignificant difference among the respondents regarding to these fields due to the benefit from services. The researcher concludes that the respondents' the benefit from services has no effect on these fields.

Chapter 6
Conclusion &
Recommendations

Chapter 6

Conclusion & Recommendations

6.1 Introduction

This chapter initiates discussion of the results concluded in chapter-5 and summarizes the key findings and conclusion of this study. Additionally, it addresses recommendations and suggestions for future research.

6.2 Results Discussion and Conclusion

6.2.1 Conclusion of Respondents Attitudes towards Study Variables

Referencing research questions and attitudes of respondents towards the different study variables, respondents highly agreed that relative advantages , compatibility and usability has significant effect on medical error reduction , perceived ease of use and perceived usefulness and compatibility has significant effect on patient care outcome improvements and compatibility, relative advantages effect Redesign patient pathway significantly .

- Q 3 *“The system gives error messages that clearly tell me how to fix problems.”* is lowest in the usability section and medical care reduction section Q1 *“The error message inform me of error severity and suggest the cause of the problem.”* it’s also has the lowest mean in the section that mean generally the error message has problem that lead to make a recommendation for the designer of the system to clarify the alerts and error message and make it easier for the user to indicate the problems solutions.
- The system designer should improve the reminder option for the health care staff . For instance, Q6 *“The system has the option to send reminders to healthcare providers”* in patient care outcome improvement “ his mean is the lowest in the section.
- Send a notice to the patient with the reservation details it’s recommended to work on it more due to the mean of Q4 *“Hospital information system has the option to send notices for patient's reservation and checking appointments.”* Was the lowest in Redesign patient care pathway group.

- In Redesign patient care pathway section Q5 *"This HIS helps in simplifying supporting processes and make it easier than before."* Was in mean 4.6 that because the HIS doesn't support the x-ray physiotherapy which recommended to enhance the system to cover this process.
- In Relative advantages section The mean of paragraph No. 3 *"The disadvantages of my using HIS far outweigh the advantages"* equal 3.56, Test value = -3.3 The sign of the test is negative, It is concluded that the respondents disagreed to this paragraph. That because the paragraph meaning is reverse.

6.2.2 Conclusion of Hypotheses Testing

Hypotheses testing conclude that there significant effect of usability ,relative advantages and compatibility on medical error reduction, In the other hand perceived ease of use and perceived usefulness has no effect on medical error reduction . From the second hypothesis there is effect of the perceived ease of use , perceived usefulness and relative advantages on patient care outcome improvements and no significant effect for compatibility and usability. While compatibility and relative advantages has significant effect on redesign patient care pathway but usability ,perceived ease of use and perceived usefulness has no effect on it.

From the researcher point of view as developer these variables is important to consider in any system design for instance the designer should make the interfaces usable by working on colors, fonts and comfortable shapes that suitable for the users, In Addition to work on the user attitude towards the system. So, the user should by apart of the designing team, that make the system more compatible with the users last experience and behavior, Furthermore the user should perceived ease of use and usefulness to reach satisfaction about the system and attendance to use .

6.3 Recommendations

Following is a number of recommendations the researchers believes could enhance the impact of HIS on clinical performance and patient care and overcome the shortfalls identified in this study.

6.3.1 Practical Recommendations

1. The designers of the system should clarify the alerts and error message and make it easier for the user to indicate the problems solutions.
2. The system designer should improve the reminder option for the health care staff to remind them in appointments that will be easier of the staff to plane for their day and not dismiss important appointments .
3. The system should enhance to send a notice to the patient with the reservation details, that make the patient up to date with the staff and provide more health care quality that enhance participation of patients in the medical process, it is also recommended that patient should have access to their personal medical record. Thus, initiation of a patient-portal website is highly recommended.
4. The system should enhance to support the x-ray physiotherapy.
5. The system should be integrated with other system in the UNRWA which reduce the duplication especially with REACH the pharmacies (pharmacy module).

6.3.2 Theoretical Recommendations

1. The other Adaption of innovation determinants should be studied further and its impact on the Redesign patient care pathway and medical error reduction.
2. It's important to study and evaluate the system after it's finished and make recommendation to prevent the error
3. This study use the questionnaire as tool other tools recommended comparing the outcomes.
4. Using the proposed model to study other systems adopted by other health care providers in Gaza is recommended.
5. This research study the some variables of the Technology acceptance model (TAM) and Adaption of innovation variables and link them with health care variables this scope need more studies that collect the Information technology and Health care.

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Appendices

Appendix-A: Questionnaire (English)

Health Center: _____



QUESTIONNAIRE

The Impact of Health Information System (HIS) Characteristics on Healthcare Quality

Dear Employee,

This study aims to contribute to the understanding of the effects of the adoption of information technology systems in health care centers in general. Additionally, it focuses on identifying potential improvements in the Health care Quality in primary health care centers of UNRWA in Gaza, in particular attributable to the recent implementation of health information system. This scientific research is a mandatory prerequisite for the researcher to complete requirement of master degree in business administration.

Researcher thank you for your generous voluntary participation in this study by carefully reading the questions in the various paragraphs of this questionnaire and answer them accurately and objectively. Your post is necessary for the success of this study, which aims to highlight the role of health information systems in improving medical performance and health care, which in turn contribute to the improvement and development of the healthcare sector in general and health care services in UNRWA-Gaza in particular.

I would like to emphasize that all the answers you provide, which should not take more than 20 minutes, will be treated confidentially and will only be used for research purposes.

Thank you very much for your time and support.

Note: should you have the willing to get a copy of the results of this research, please write your name, e-mail,

Name: _____ Email: _____

Researcher: **Alia'a Adel Atallah**
Mobile: 0599012570
Master of business administration
Faculty of Commerce
Islamic University of Gaza

Section one: Demographic Information

Please supply your input for the following demographic questions, cross next to the proper category.

1. Gender	<input type="checkbox"/> Female	<input type="checkbox"/> Male	
2. Education level	<input type="checkbox"/> Doctor or higher	<input type="checkbox"/> Master's degree	<input type="checkbox"/> Bachelor degree
	<input type="checkbox"/> diploma	<input type="checkbox"/> high school or less	
3. age	<input type="checkbox"/> Less than 25 years	<input type="checkbox"/> From 25 to less than 35 years.	<input type="checkbox"/> From 35 to less than 45 years.
	<input type="checkbox"/> 45 years and over		
4. Current job	<input type="checkbox"/> Doctor	<input type="checkbox"/> Nurse	<input type="checkbox"/> Administrative Doctor
	<input type="checkbox"/> Administrative	<input type="checkbox"/> Secretary	<input type="checkbox"/> Technical
	<input type="checkbox"/> Other		
6. The ratio to which your work depends using of hospital information system?			%
7. Persons who benefit from your services	<input type="checkbox"/> Patients	<input type="checkbox"/> Colleagues at Work	<input type="checkbox"/> Multiple categories

Section Two: Usability

#	1- Strongly Disagree.....7- Strongly Agree	1	2	3	4	5	6	7
1	Overall, I am satisfied with how easy it is to use this system.	1	2	3	4	5	6	7
2	I feel comfortable using this system.	1	2	3	4	5	6	7
3	The system gives error messages that clearly tell me how to fix problems.	1	2	3	4	5	6	7
4	Whenever I make a mistake using the system, I recover easily and quickly.	1	2	3	4	5	6	7
5	It is easy to find the information I need.	1	2	3	4	5	6	7
6	The information provided with the system is easy to understand.	1	2	3	4	5	6	7
7	The information is effective in helping me complete my work.	1	2	3	4	5	6	7
8	The organization of information on the system screens is clear.	1	2	3	4	5	6	7
9	The interface of this system is pleasant	1	2	3	4	5	6	7
10	I like using the interface of this system.	1	2	3	4	5	6	7
11	This system has all the functions and capabilities I expect it to have.	1	2	3	4	5	6	7
12	Overall, I am satisfied with this system.	1	2	3	4	5	6	7

Section Three: Perceived usefulness

#	1- Strongly Disagree.....7- Strongly Agree	1	2	3	4	5	6	7
1	HIS allows me to have quick access to patients data	1	2	3	4	5	6	7
2	HIS facilitates communication of information among various care providers	1	2	3	4	5	6	7
3	HIS assists in avoiding duplication of examinations	1	2	3	4	5	6	7
4	HIS reduces the risk of error in healthcare service	1	2	3	4	5	6	7
5	HIS gives me greater control over my work schedule	1	2	3	4	5	6	7
6	HIS makes it easier to do my job	1	2	3	4	5	6	7

Section Four :Perceived ease of use

#	1- Strongly Disagree.....7- Strongly Agree	1	2	3	4	5	6	7
1	I think it is easy to learn to use HIS	1	2	3	4	5	6	7
2	I think HIS is easy to use	1	2	3	4	5	6	7
3	I think HIS makes my consultations with patients easier	1	2	3	4	5	6	7
4	I think I will become skilled using HIS	1	2	3	4	5	6	7
5	I think HIS will be easy for physicians to use	1	2	3	4	5	6	7
6	I think it is easy to get the system do what I want it to do	1	2	3	4	5	6	7
7	I think it is easy to interact with HIS (respond to pop up dialogs and system instructions, supply input needed to some processes execution or report generation)	1	2	3	4	5	6	7

Section Five: Relative Advantages

#	1- Strongly Disagree.....7- Strongly Agree	1	2	3	4	5	6	7
1	Using HIS enable me to accomplish tasks more quickly	1	2	3	4	5	6	7
2	Using HIS improves the quality of work I do	1	2	3	4	5	6	7
3	Using HIS makes it easier to do my job	1	2	3	4	5	6	7
4	The disadvantages of my using HIS far outweigh the advantages	1	2	3	4	5	6	7
5	Using HIS improves my job performance	1	2	3	4	5	6	7
6	Overall, I find using HIS to be advantageous in my job	1	2	3	4	5	6	7
7	Using HIS enhances my effectiveness on the job	1	2	3	4	5	6	7
8	Using HIS gives me greater control over my work	1	2	3	4	5	6	7
9	Using HIS increases my productivity	1	2	3	4	5	6	7

Section six: compatibility

#	1- Strongly Disagree.....7- Strongly Agree	1	2	3	4	5	6	7
1	Using HIS is compatible with all my aspects of my work	1	2	3	4	5	6	7
2	Using HIS is completely compatible with my current situation	1	2	3	4	5	6	7
3	I think that using HIS fits well with way like to work	1	2	3	4	5	6	7
4	using HIS fits into my work style	1	2	3	4	5	6	7

Section Seven: Medical error prevention & reduction

#	1- Strongly Disagree.....7- Strongly Agree	1	2	3	4	5	6	7
1	The error message inform me of error severity and suggest the cause of the problem	1	2	3	4	5	6	7
2	The system help me recover from system error	1	2	3	4	5	6	7
3	The system reduce error rate on the report	1	2	3	4	5	6	7
4	The system makes it possible to me to reduce drug allergy	1	2	3	4	5	6	7
5	The system has reduced dosing error	1	2	3	4	5	6	7

Section eight t: Health care outcome improvements

#	1- Strongly Disagree.....7- Strongly Agree	1	2	3	4	5	6	7
1	The system allows having a comprehensive picture about a Patient that helps in diagnosing problems sooner.	1	2	3	4	5	6	7
2	The implementation of such systems helped in diagnosing medical conditions at earlier stage.	1	2	3	4	5	6	7
3	The system allows gathering all information related to a patient in one place (e.g. lab results and radiology reports) that helps in making therapeutic decisions).	1	2	3	4	5	6	7
4	The system allows viewing drug formulary information.	1	2	3	4	5	6	7
5	This HIS allows to access and view patients'' assessments easily and quickly.	1	2	3	4	5	6	7
6	The system has the option to send reminders to healthcare providers (e.g. surgeries appointments and nurses to give medications to inpatients).	1	2	3	4	5	6	7
7	Overall, the system helped to improve follow up patients health outcomes .	1	2	3	4	5	6	7

Section nine : Redesign patient care pathway								
#	1- Strongly Disagree.....7- Strongly Agree	1	2	3	4	5	6	7
1	This HIS facilitates a patients journey in the hospital; since the patient enters the facility till leaving it.	1	2	3	4	5	6	7
2	Patients'' registration or scheduling appointment processes take maximum from 5 to10 minutes per patient.	1	2	3	4	5	6	7
3	This HIS Allows reviewing patients'' progress notes.	1	2	3	4	5	6	7
4	Hospital information system has the option to send notices for patients reservation and checking appointments .	1	2	3	4	5	6	7
5	This HIS helps in simplifying supporting processes, such as billing, therapy cost) and make it easier than before.	1	2	3	4	5	6	7
6	Hospital information system help to decrease patients time to complete hospital management procedures .	1	2	3	4	5	6	7
7	Hospital information system facilitates documenting patients'' care activities .	1	2	3	4	5	6	7
8	Overall, the system helped in redesigning patients'' care Pathway.	1	2	3	4	5	6	7

Appendix-B: Questionnaire (Arabic)



اسم العيادة: _____

استبيان

أثر خصائص نظام الصحة المحوسب في مراكز الصحة التابعة لوكالة الغوث (الأونروا) بغزة على جودة الرعاية الصحية

عزيزي الموظف،

تهدف هذه الدراسة للمساهمة في فهم الآثار المترتبة على اعتماد نظم تكنولوجيا المعلومات في مراكز الرعاية الصحية بوجه عام كما وتركز على تحديد التحسينات الممكنة في أداء العاملين في مراكز الرعاية الصحية الأولية التابعة لوكالة الغوث (الأونروا) بغزة بشكل خاص والتي تعزى إلى تطبيق الأونروا لنظام المعلومات الصحي المحوسب. هذا، وتقوم الباحثة بإجراء هذه الدراسة كمتطلب إلزامي لإكمال الأطروحة العلمية لنيل درجة الماجستير في إدارة الأعمال

تشكر الباحثة منك مشاركتك الطوعية الكريمة في هذه الدراسة من خلال قراءة الأسئلة في الفقرات المختلفة لهذا الاستبيان بعناية والإجابة عليها بدقة وموضوعية. مشاركتك ضرورية لإنجاح هذه الدراسة التي تهدف إلى تسليط الضوء على الدور الذي تلعبه نظم المعلومات الصحية في تحسين أداء العاملين في مجال الصحة والذي بدوره يساهم في تحسين وتطوير قطاع الرعاية الصحية بشكل عام وخدمات الرعاية الصحية في الأونروا-غزة بشكل خاص.

أود التأكيد على أن جميع الأجوبة التي تقدمها والتي لا ينبغي أن تستغرق أكثر من 20 دقيقة-ستعامل بسرية تامة وأنها لن تستخدم إلا لأغراض البحث العلمي فقط.

شكراً جزيلاً لكم على وقتكم ودعمكم

ملاحظة: إذا كنت ترغب في الحصول على نسخة من نتائج هذا البحث، رجاءً سجل اسمك وبريدك الإلكتروني.

الاسم: _____

البريد الإلكتروني: _____

الباحثة: **علياء عادل عطاالله**

رقم الجوال: 0599012570

برنامج الماجستير في إدارة الأعمال

كلية التجارة

الجامعة الإسلامية بغزة

المحور الأول: المعلومات الديمغرافية

الرجاء الإجابة على الأسئلة التالية، ضع علامة x في المربع المجاور للفئة المناسبة


1. الجنس	<input type="checkbox"/> ذكر	<input type="checkbox"/> أنثى
2. المستوى التعليمي	<input type="checkbox"/> دكتوراه أو أعلى	<input type="checkbox"/> ماجستير
	<input type="checkbox"/> دبلوم	<input type="checkbox"/> ثانوية عامة فأقل
3. العمر	<input type="checkbox"/> أقل من 25 عام	<input type="checkbox"/> من 25 إلى أقل من 35 عام
	<input type="checkbox"/> من 35 إلى أقل من 45 عام	<input type="checkbox"/> 45 عام فأكثر
4. الوظيفة الحالية	<input type="checkbox"/> طبيب	<input type="checkbox"/> ممرض إداري
	<input type="checkbox"/> مساعد إداري	<input type="checkbox"/> سكرتير
	<input type="checkbox"/> فني	<input type="checkbox"/> طبيب إداري
	<input type="checkbox"/> غير ذلك،.....	
5. إلى أي درجة يعتمد عملك على استخدام النظام الصحي المحوسب؟		%
6. المستفيدون من خدماتك	<input type="checkbox"/> المرضى	<input type="checkbox"/> الزملاء في العمل
		<input type="checkbox"/> فئات متعددة


المحور الثاني: سهولة استخدام نظام الصحة المحوسب (Usability)

إلى أي مدى تتفق مع الفقرات التالية الخاصة بسهولة استخدام نظام الصحة المحوسب؟

#	1- غير موافق بشدة7- موافق بشدة
1.	بشكل عام، انا راضي عن سهولة استخدام نظام المعلومات الصحية المحوسب.
2.	اشعر براحة عند استخدام نظام المعلومات الصحية المحوسب.
3.	نظام المعلومات الصحية المحوسب يعطى رسائل خطأ تقودني بوضوح لكيفية حل المشكلة.
4.	عندما اقوم بخطأ باستخدام نظام المعلومات الصحية المحوسب، استطيع تدارك المشكلة بسهولة وسرعة.
5.	من السهل ايجاد المعلومات التي احتاجها.
6.	المعلومات التي يزودها نظام المعلومات الصحية المحوسب سهلة الفهم.
7.	المعلومات التي يزودها نظام المعلومات الصحية المحوسب مفيدة تساعدني في اتمام عملي.
8.	تنظيم المعلومات على واجهة نظام المعلومات الصحية المحوسب واضحة
9.	شكل الواجهة في نظام المعلومات الصحية المحوسب جميلة ومرضية.

							10. أحب استخدام الواجهة في نظام المعلومات الصحية المحوسب.
							11. نظام المعلومات الصحية المحوسب يحتوي على جميع الوظائف والامكانيات التي اتوقع وجودها.
							12. بشكل عام، انا راض عن نظام المعلومات الصحية المحوسب.

المحور الثالث: الفوائد المدركة لنظام الصحة المحوسب (Perceived Usefulness)							
إلى أي مدى تتفق مع الفقرات التالية الخاصة بالفوائد المدركة لنظام الصحة المحوسب؟							
#	1- غير موافق بشدة7- موافق بشدة					7
1.	يمكنني نظام الصحة المحوسب من الوصول إلى بيانات المرضى بشكل سريع						
2.	يساعد نظام الصحة المحوسب على تبادل المعلومات بين مؤسسات الرعاية الطبية المختلفة						
3.	يساعد نظام الصحة المحوسب على تجنب ازدواجية/تكرار الفحوص الطبية						
4.	يقلل نظام الصحة المحوسب نسبة خطر الوقوع في الأخطاء أثناء تقديم خدمة الرعاية الطبية						
5.	يعطيني نظام الصحة المحوسب قدرة أكبر على التحكم بجدول أعمالي						
6.	يمكنني نظام الصحة المحوسب من إنجاز عملي بشكل أسهل						

المحور الرابع: سهولة الاستخدام المدركة لنظام الصحة المحوسب (Perceived Ease of Use)							
إلى أي مدى تتفق مع الفقرات التالية الخاصة بسهولة الاستخدام المدركة في استخدام نظام الصحة المحوسب؟							
#	1- غير موافق بشدة7- موافق بشدة					7
1.	أعتقد أنه من السهل تعلم كيفية استخدام نظام الصحة المحوسب						
2.	أعتقد أن نظام الصحة المحوسب سهل الاستخدام						
3.	أعتقد أن نظام الصحة المحوسب يسهل عملية اتخاذ القرار ووضع خطط علاجية صحيحة						
4.	أعتقد أنني سأصبح ماهرا في استخدام نظام الصحة المحوسب						
5.	أعتقد أن أي موظف يمكنه استخدام نظام الصحة المحوسب بسهولة						
6.	أعتقد أنه من السهل أن أجعل نظام الصحة المحوسب يقوم بفعل ما أريده أن يفعل						
7.	أعتقد أنه من السهل التفاعل مع نظام الصحة المحوسب (الاستجابة للرسائل المنبثقة عن النظام ومدّة المدخلات التي يطلبها من أجل تنفيذ عمليات معينة أو إخراج تقارير محددة)						

المحور الخامس: الميزات الخاصة (Relative Advantages)						
إلى أي مدى تتفق مع الفقرات التالية الخاصة بالميزات الخاصة؟						
#	1- غير موافق بشدة 7- موافق بشدة					
1.						استخدام نظام المعلومات الصحية المحوسب حسن من جودة العمل الذي أقوم به
2.						استخدام نظام المعلومات الصحية المحوسب سهل أدائي للوظيفة
3.						مساوي استخدام نظام المعلومات الصحية المحوسب تفوق كثيراً مزايا استخدامه
4.						استخدام نظام المعلومات الصحية المحوسب حسن أدائي الوظيفي
5.						عموماً أجد أنه من المفيد استخدام نظام المعلومات الصحية المحوسب في عملي
6.						استخدام نظام المعلومات الصحية المحوسب يعزز من كفاءتي الوظيفية
7.						استخدام نظام المعلومات الصحية المحوسب منحني سيطرة أكبر على عملي
8.						استخدام نظام المعلومات الصحية المحوسب يزيد من قدرتي الانتاجية
9.						من خلال استخدام نظام المعلومات الصحية المحوسب أصبحت أنجز المهام بسرعة

المحور السادس: التوافق (Compatibility)						
إلى أي مدى تتفق مع الفقرات التالية الخاصة بالتوافق؟						
#	1- غير موافق بشدة 7- موافق بشدة					
1.						استخدام نظام المعلومات الصحية المحوسب متوافق مع كل جوانب عملي
2.						استخدام نظام المعلومات الصحية المحوسب متوافق تماماً مع متطلبات عملي الحالي
3.						اعتقد ان نظام المعلومات الصحية المحوسب متوافق مع الطريقة التي أحب العمل بها
4.						استخدام نظام المعلومات الصحية المحوسب متوافق مع أسلوب عملي في العمل

المحور السابع: الحماية والتقليل من الأخطاء الطبية (Medical errors prevention & reduction)						
إلى أي مدى تتفق مع الفقرات التالية الخاصة بالحماية والتقليل من الأخطاء الطبية؟						
#	1- غير موافق بشدة	7- موافق	←			
#	بشدة					
1.	تنبهني رسائل الخطأ في نظام المعلومات الصحي المحوسب بخطورة الأخطاء.					
2.	يساعدني نظام المعلومات الصحي المحوسب على التغلب على الأخطاء.					
3.	يقلل نظام المعلومات الصحي المحوسب من معدل الأخطاء بالتقارير الطبية.					
4.	يساهم نظام المعلومات الصحي المحوسب في تقليل الأخطاء المرتبطة بالحساسية تجاه بعض الأدوية.					
5.	يقلل النظام الصحي المحوسب من أخطاء الجرعات الزائدة.					

المحور الثامن: تحسين النتائج الصحية للمرضى (Healthcare Outcomes Improvements)						
إلى أي مدى تتفق مع الفقرات التالية الخاصة بتحسين النتائج الصحية للمرضى؟						
#	1- غير موافق بشدة	7- موافق	←			
#	بشدة					
1.	يسمح نظام المعلومات الصحي المحوسب بتكوين صورة شاملة عن المريض.					
2.	يساعد نظام المعلومات الصحي المحوسب في تشخيص الحالات المرضية في مرحلة مبكرة.					
3.	يسمح نظام المعلومات الصحي المحوسب بجمع كافة المعلومات ذات الصلة بالمريض في مكان واحد (مثل نتائج المختبر وتقارير الأشعة) والتي تساعد في اتخاذ القرارات العلاجية.					
4.	يسمح نظام المعلومات الصحي المحوسب في عرض معلومات الأدوية التي يتم وصفها للمرضى.					
5.	يسمح نظام المعلومات الصحي المحوسب بالوصول إلى المعلومات السابقة عن المرضى وعرض تقييمات حالتهم المرضية بسهولة وبسرعة.					
6.	لدى نظام المعلومات الصحي المحوسب الخيار لإرسال رسائل تنكيرية إلى مقدمي الرعاية الصحية (مثل العمليات الجراحية التعيينات والمرضات لإعطاء الأدوية للمريض).					
7.	بشكل عام، يساعد النظام في تحسين متابعة النتائج الصحية للمرضى.					

المحور التاسع: إعادة تصميم مسار الرعاية الطبية للمرضى (Redesigning Patient care Pathway)						
إلى أي مدى تتفق مع الفقرات التالية الخاصة ب إعادة تصميم مسار الرعاية الطبية ؟						
#	1- غير موافق بشدة7- موافق بشدة					
1.						يسهل نظام المعلومات الصحي المحوسب رحلة المريض منذ دخوله للمركز حتى مغادرته.
2.						تستغرق عملية التسجيل للمرضى أو اخذ المواعيد من 5 الى 10 دقائق كحد أقصى.
3.						يسمح نظام المعلومات الصحي المحوسب بمراجعة الملاحظات عن مدى تقدم المرضى.
4.						يمتلك نظام المعلومات الصحي المحوسب الخيار من اجل إرسال إشعارات للمرضى بمواعيد الحجوزات ومواعيد المراجعة.
5.						يساعد نظام المعلومات الصحي المحوسب على تبسيط الإجراءات الإدارية الداعمة (مثلا الفواتير وتكلفة العلاج) وجعلها أكثر سهولة.
6.						يساعد نظام المعلومات الصحية المحوسب على تقليل الوقت الذي يستغرقه المرضى لاستكمال الإجراءات الإدارية المتبعة في المركز.
7.						يساعد نظام المعلومات الصحي المحوسب في توثيق أنشطة الرعاية الصحية والتميز بينها.
8.						بشكل عام، يساعد نظام المعلومات الصحي المحوسب في إعادة تصميم مسارات الرعاية الطبية للمرضى.

انتهى الاستبيان End of Questionnaire

Appendix-C: Questionnaire Evaluation (List of Referees)

Academic and Professional Referees' Names and Titles

	Name	Title
1	Dr. Wasim I. Habil	Associate Professor, Faculty of Commerce, Islamic University of Gaza
2	Dr. Hatem A. Elaydi	Associate Professor, Faculty of Engineering, Islamic University of Gaza.
3	Dr. Mansour M. Alayoubi	Assistant Professor, Business Administration, Palestine Technical College - Deir balah -Gaza.
4	Dr. Nabeel A. Allouh	Human Development Consultant, General Personnel Council - Gaza
5	Hisham Madi	Assistant Professor, Faculty of Engineering, Islamic University of Gaza.
6	Khalil Madi	Faculty of Economics and Administrative Sciences, Al-Azhar University
7	Akram Sammour	Assistant Professor, Faculty of Engineering, Islamic University of Gaza.
8	Dr. Nabeel AboShamala	Assistant Professor, Faculty of Economics and Administrative Sciences, El-Esra'a University
9	Samar Atallah	Assistant Professor, Faculty of Economics and Administrative Sciences, El-Esra'a University
10	Kamal El-Masri	Assistant Professor, Faculty of Economics and Administrative Sciences, El-Esra'a University