A NOVEL KNOWLEDGE MANAGEMENT FRAMEWORK FOR MANAGING INFORMATION OVERLOAD IN THE DIABETES CLINICS OF THE HOSPITALS IN JORDAN

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Abstract

This thesis introduces a study for knowledge management of information overload in the healthcare domain. The study selected the diabetes clinics of seven hospitals in Jordan as a case study based on obtaining consent letters from these hospitals. First, a comprehensive literature was conducted in order to explore the existing information overload problem in-depth and to investigate existing solutions that assist in developing a new framework for reducing this problem. The literature findings integrated six theoretical factors adopted from the literature to form a data collection survey representing the initial primary research stage where the mixed approach methodology was considered. The data was collected by approaching the medical staff in person, and was analysed to determine the arising problems affected by information overload, and to find out about the information type that is used, the way information is used/communicated, and how information is going to be held. The findings from the primary research analysis showed that the results were statistically approaching the average indicating to an average problem. The researcher afterwards produced an information flow and processing models for the information that is running into these clinics. Thus, a knowledge management framework is proposed in order to reduce information overload affecting these clinics by enhancing an appropriate existing method from the literature, and by enhancing the analytical primary research findings. The framework is based on sharing the information to the right person at the right time in the right place with the right quantity. Furthermore, a validation of the framework was conducted with the assistance of a subset of medical experts in the field existing in these clinics. In conclusion, the future research is that the framework will form the basis of teaching by future researchers for further possible enhancements.

Keywords: Knowledge management, Information overload, Healthcare, Diabetes Mellitus, the SECI model, Dervin's model.

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Declaration

I declare that this thesis was composed by myself, that the work contained herein is my own except where explicitly stated otherwise in the text, and that this work has not been submitted for any other degree or professional qualification except as specified.

The ethical aspects relating to the questionnaires used in the primary research are including informed consent, anonymity and the code of practice of Staffordshire University. This assures that this is in line with the procedures and guidelines of Staffordshire University, which can be further reviewed under:

<<http://www.fcet.staffs.ac.uk/current_students/academic_ethics.htm>.

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Abbreviations

AI	Artificial Intelligence
CDSS	Clinical Decision Support Systems
DNA	Deoxyribonucleic Acid
ESN	Enterprise Social Network
FACS	Fellow of the American College of Surgeons
FICS	Fellow of the International College of Surgeons
FRCS	Fellowship of the Royal College of Surgeons
GCC	Gulf Cooperation Council
HR	Human Resources
IC	Intellectual Capital
ICT	Information and Communication Technology
ID	Identity Document
IOKMF	Integrated Organisational Knowledge Management Framework
IT	Information Technology
KM	Knowledge Management
KMS	Knowledge Management System
MM	Mixed Methods
MNEs	Multinational Enterprises
OL	Organisational Learning
PACS	Picture Archiving and Communication System
PCMH	Patient Centered Medical Home
PPTM	People, Process, Technology, and Management
QUAL	Qualitative
QUAN	Quantitative

RIS	Radiology Information System
SECI	Socialisation, Externalisation, Combination, Internalisation
SMBG	Self-Monitoring of Blood Glucose
SPSS	Statistical Package for the Social Sciences
T1DM	Type 1 Diabetes Mellitus
T2DM	Type 2 Diabetes Mellitus
UAE	United Arab Emirates
UCLA	University of California, Los Angeles
UML	Unified Modelling Language
UNHCR	United Nations High Commissioner for Refugees
UNRWA	United Nations Relief and Works Agency
US	United States
USA	United States of America
WBI	World Bank Institute

Chapter 1
Introduction

1.1 Introduction

In this chapter, Jordan's background and context, the Jordanian geography and climate, the Jordanian healthcare system, and the incidence of the two types of diabetes in Jordan and worldwide are discussed. This discussion provides background for the study. The remainder of the chapter introduces the research questions, the aim and objectives of this research, the deliverables, the academic challenge, the theoretical framework, the theoretical basis, the structure of the research contribution, the ethical procedures of the research, and a summary of this chapter.

1.1.1 The Jordanian Background and Context

1.1.1.1 Geography and Climate

Jordan is formally known as the Hashemite Kingdom of Jordan. Its capital city is Amman. Jordan is a Middle Eastern country that shares its borders with several neighbouring countries; as shown in Figure 1.1, the bordering countries are Syria, Saudi Arabia (which shares the longest border with Jordan), Iraq, and the West Bank and Israel. The country is located northwest of Saudi Arabia, east of the West Bank and Israel, south of Syria, and southwest of Iraq. The total calculated area of Jordan is 89,342 km^2, and of that its land represents 99.4% (88,802 km^2). The remaining area, which is comprised of water, represents 540 km^2. The land boundaries of Jordan reach 1,744 km.

Jordan dominantly has an arid desert climate, but a rainy season occurs in the west from November to April (Central Intelligence Agency, 2017). There are two main popular holiday destinations in Jordan. The first destination is the Gulf of Aqaba, which is located in the very southern part of Jordan, as shown in Figure 1.1. The second destination is the Dead Sea (the lowest part on Earth), which is also located in the southern part of Jordan, but in the middle part of Jordan (closer to the capital city 'Amman'), as also shown in Figure 1.1.

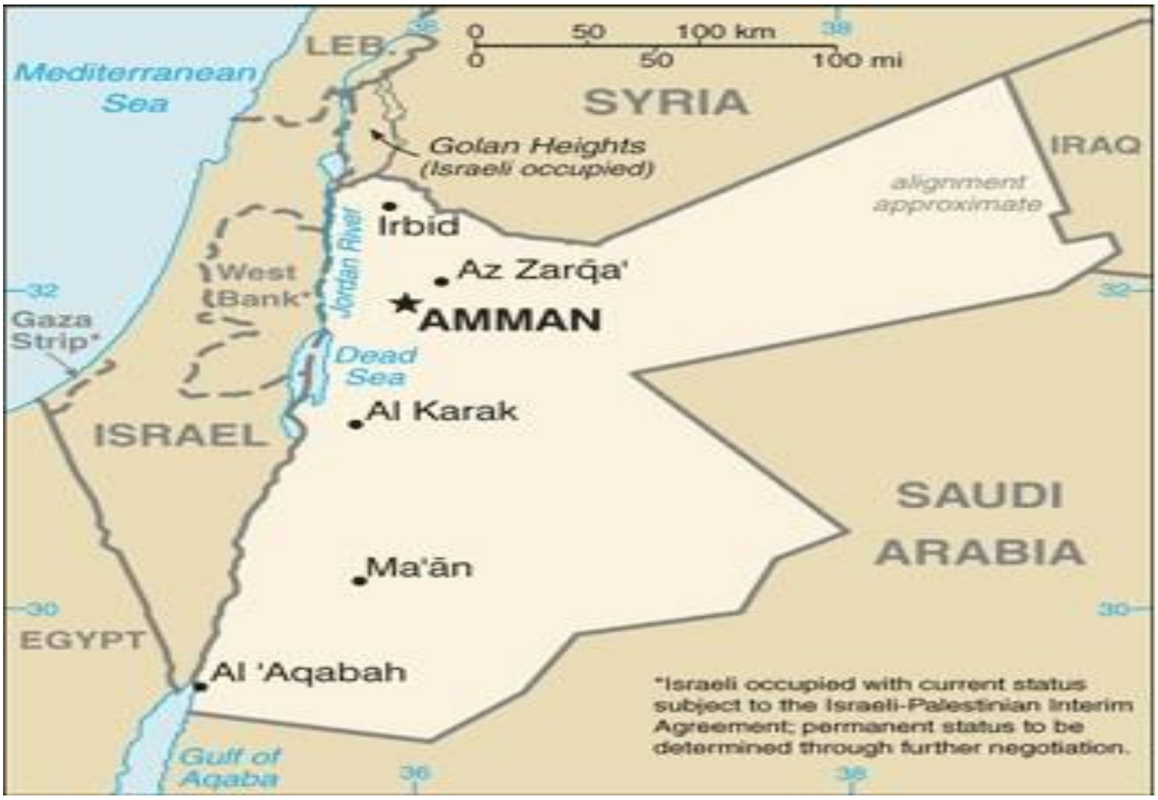

Figure (1.1): The map of Jordan (Central Intelligence Agency, 2017)

1.1.1.2 The Demographic Situation of Jordan

Jordan is a small country of limited natural resources with a high growth rate in its population, but with low growth rates in its income (The High Health Council, 2015). The majority of Jordanian citizens are Arabs, who represent 98% of the population. The rest of the Jordanian people are equally divided between Armenians and Circassians (Central Intelligence Agency, 2009). The official religion in Jordan is Islam, where 92% of the population represent Sunni Muslims, 6% represent Christians, and 2% represent other religious minorities, who are Druze and Baha'i (Central Intelligence Agency, 2009). The official language that is spoken in Jordan is the Arabic language. The English language is, however, widely spoken in Amman in many different sectors, such as education, government, health, and many other business sectors (Tubaishat, 2011).

A recent study by Ghazal (2016) shows that the latest estimation of the overall population in Jordan in the year 2016 stands at around 9.5 million, including 2.9 million guests from different nationalities. Figure 1.2 illustrates the current Jordanian demographic population for the year 2016, as reported by Ghazal (2016).

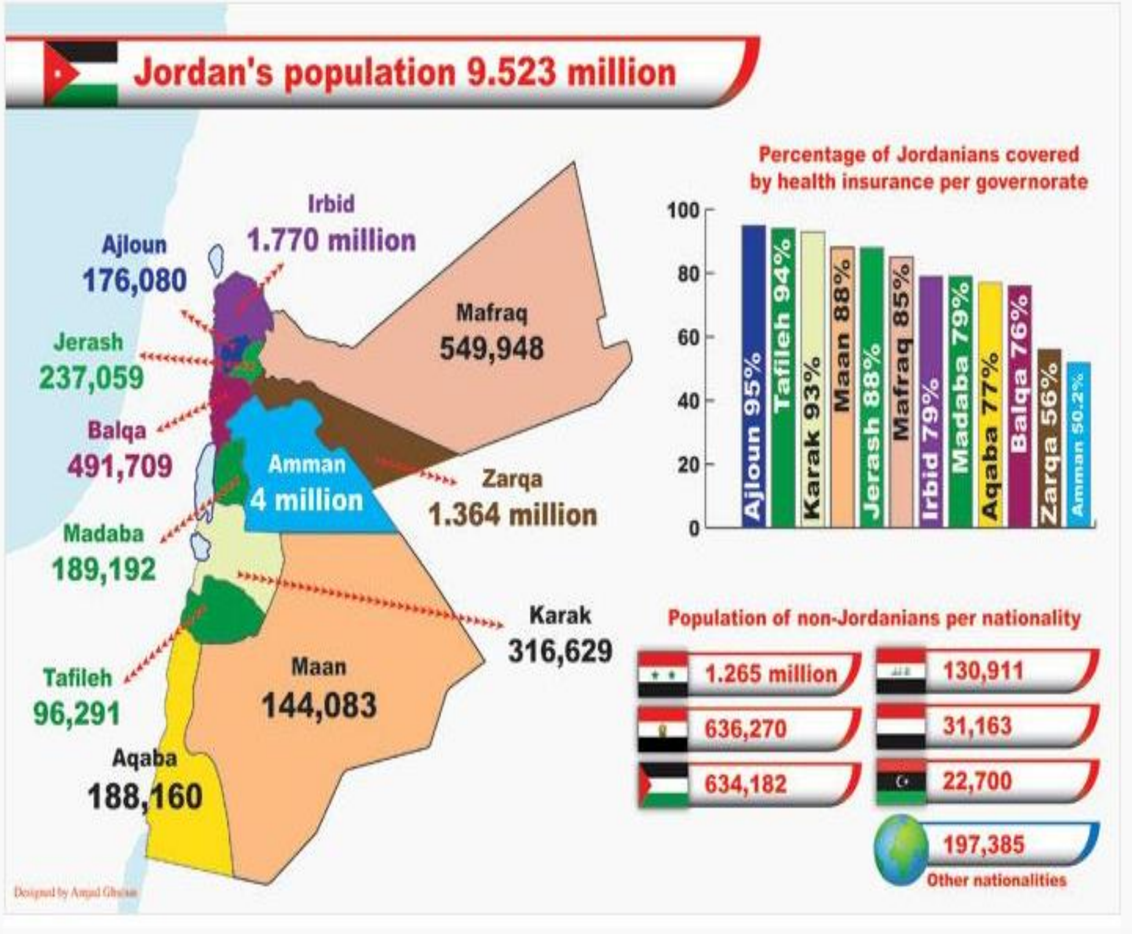

Figure (1.2): The current Jordanian demographic population (Ghazal, 2016)

The number of Jordanian citizens stands at around 6.6 million people, representing 69.4% of Jordan's overall population. The results that were declared by the general director, namely 'Qasem Zu'bi', of the Department of Statistics in Jordan, indicated that the number of people who are non-Jordanians residing in Jordan stands at around 2.9 million people of Jordan's overall population. These non-Jordanian people represent 30.6% of the overall population in Jordan. Syrian nationals represent 46% of the overall non-Jordanian population living in Jordan and 13.2% of the overall population in Jordan (Ghazal, 2016).

In terms of the governorates, the results shown in Figure 1.2 show that 42% (4 million people) are residing in Amman. It can also be seen from the information that 1.770 million people are living in Irbid. There are 1.364 million people living in Zaraqa governorate. In Mafraq governorate, there are 549,948 people. In Balqa governorate, there are 491,709 people. In Karak governorate, there are 316,629 people. In Jerash governorate, there are 237,059 people. In Madaba governorate, there are 189,192 people. In Aqaba governorate, there are 188,160 people. In Ajloun governorate, there are 176,080 people. In Maan governorate, there are 144,083 people. In Tafileh governorate, there are 96,291 people (Ghazal, 2016).

In terms of the distribution of the non-Jordanian people in Jordan, Syrian nationals represent 1.265 million people with a percentage of 13.2% of the overall population in Jordan. This is followed by Egyptian nationals, who represent 636,270 people with a percentage of 6.68% of the overall population in Jordan. Palestinian nationals represent 634,182 people with a percentage of 6.65% of the overall population in Jordan (Ghazal, 2016). The Iraqi nationals represent 130,911 people with a percentage of 1.3% of the overall population in Jordan. The Yemeni nationals represent 31,163 people with a percentage of 0.33%, of the overall population, and the Libyan nationals represent 22,700 people with a percentage of 0.24%. Additionally, many other different nationalities comprise 197,385 people with a percentage of 2.07% of the overall population in Jordan (Ghazal, 2016).

It is reported by Ghazal (2016) that the number of Syrian nationals, at 1.265 million people of the overall population in Jordan, is distributed in the Jordanian governorates as follows: 435,578 Syrian nationals are living in Amman; 343,479 Syrian nationals are living in Irbid governorate; 207,903 Syrian nationals are living in Mafraq governorate; and 175,280 Syrian nationals are living in Zarqa governorate. The rest of the Syrian nationals are distributed across other governorates of the country.

In 2011, the population in Jordan experienced an enormous increase according to the census, which comprised 1.977 million families. In the years 2004–2015, the annual population growth amounted to 5.3%. The result of this census reflected the increasing movements of refugees into Jordan. The average family size who were living in Jordan became smaller ranging from a percentage of 6.7% in 1979 to a percentage of 4.8% in 2015 (Ghazal, 2016).

The results in the bar charts located at the top right of Figure 1.2 show that most Jordanian nationals are highly covered by Jordanian health insurance, at a total average of 80% of the overall indicated Jordanian governorates. The percentage of Jordanian nationals who are covered with health insurance in Ajloun governorate reached 95%. It reached 94% in Tafileh governorate, 93% in Karak governorate, 88% in Maan and Jerash governorates, 85% in Mafraq governorate, 79% in Irbid and Madaba governorates, 77% in Aqaba governorate, 76% in Balqa governorate, 56% in Zaraqa governorate, and 50.2% in Amman governorate (Ghazal, 2016).

It is concluded from these bar charts in Figure 1.2 that there are lower percentages of healthcare insurance coverage among Jordanian nationals who are living in the capital city

Amman and Zarqa governorates, at percentages of 50.2% and 56% respectively, while the rest of the governorates show higher percentages of Jordanians who are covered with healthcare insurance. Additionally, it is deduced from Figure 1.2 that half of the overall population in Jordan is covered with health insurance (Ghazal, 2016).

1.1.1.3 The Context of the Jordanian Healthcare System

The Jordanian healthcare system is considered the best among the healthcare systems that are provided in the neighbouring Middle Eastern countries. Jordan is simultaneously considered one of the safest Middle Eastern countries, and it has developed effective medical projects aimed at delivering health as a significant part of its sustainable development goals. Remarkable development has been witnessed in the Jordanian health sector where many Jordanians enjoyed healthcare treatments in Jordan. The efficiency and quality of the delivered health services in Jordan have positively influenced the indicators of the general health (The High Health Council, 2015).

The current healthcare system in Jordan is divided into three service providers: the public sector, the private sector, and the international and charity sectors (The High Health Council, 2015). The public sector comprises the Royal Medical Services, the Ministry of Health, the National Center for Diabetes, Endocrinology and Genetics, and the university hospitals (King Abdullah University hospital and the University of Jordan hospital). The private sector comprises private hospitals, hundreds of private clinics, and diagnostic and therapeutic centres. In the international and charitable sectors, different medical services are provided based on the United Nations Relief and Works Agency (UNRWA) for charity association clinics, Palestinian refugees, the King Hussein Cancer Center, and the United Nations High Commissioner for Refugees (UNHCR). Most Jordanian patients are insured when treated. Accordingly, the insurance companies that deal with certain hospitals supply patients with information ID health cards so that patients pay lower or zero fees when admitted to these hospitals.

There are several factors that contribute to a major challenge for the Jordanian healthcare system (The High Health Council, 2015):

- Due to the continuous increasing growth in the Jordanian population and the diseases transformation in Jordan, the demand for health services is increasing. The diseases transformation occurring in Jordan means that there is high and low prevalence of non-communicable and communicable diseases, respectively.
- Many refugees are entering Jordan.
- The proportions of elderly and young Jordanians are expected to rise each year.

- The costs of the healthcare services and procedures are rising due to the bad Jordanian economic situation, and many economic and financial crises may be produced by this situation.

In the global healthcare environment, the most common illness is one that has been widely spread worldwide for a long time: diabetes mellitus (Longo et al., 2010). This disease progresses rapidly, such that an individual with diabetes requires lifelong care and support. This care necessitates an educational process that teaches patients how to effectively manage and control diabetes.

A person with diabetes has a high amount of glucose in their blood that is not expelled by the body efficiently (Smallwood, 2009). There exist two common types of diabetes mellitus (Smallwood, 2009; Diabetes Care, 2012). In Type 1 Diabetes Mellitus (T1DM), the beta cells of the pancreas are destroyed by an autoimmune process. In this case, a daily insulin injection is required as a treatment to combat the limited amount of insulin produced naturally. In Type 2 Diabetes Mellitus (T2DM), high levels of blood glucose are encountered due to the reduced function of beta cells and insulin resistance. According to Spencer et al. (2014), controlling the blood glucose is complicated in young people. Thus, T2DM is accompanied by hypertension, obesity, and hyperlipidaemia, and it can be treated by maintaining one's weight, increasing physical activity, and decreasing meals that are rich in fats and high in calories. However, sometimes insulin can be given in T2DM if needed for maintaining a better control.

1.1.1.4 The Incidence of Diabetes Mellitus Types 1 and 2 in Jordan and Worldwide

The incidence and prevalence of Type 1 Diabetes Mellitus (T1DM) are increasing worldwide each year (Longo et al., 2010; Habibzadeh, 2014). The incidence of this type of diabetes is rising even more rapidly in the Middle East (Habibzadeh, 2014). For instance, Habibzadeh (2014) mentions that the highest incidence of T1DM in Saudi Arabia was reported in the city of Al-Medina. In 2009, Brown et al. predicted that the number of Jordanians with diabetes would increase to 3 million by the end of the year 2050. Shortly after, Al-Nsour et al. (2012) reported an increased prevalence in diabetes, overweight, obesity, and hypertension in men and women of the Jordanian population. A more recent study by Al Emam (2016) reports that approximately 2 million of the Jordanians living in Jordan have diabetes. Al Emam notes that ‘Dietician Mohammad Abu Rayyan cited eating habits as a main contributor to obesity and diabetes among several other factors, noting that healthy eating and an active lifestyle help in both preventing and coping with non-communicable diseases’. Another recent study conducted by Alghadir et al. (2016) states that the prevalence and incidence of diabetes mellitus of both types have increased in Jordan to the point that they are now considered the highest in Jordan in comparison with the entire world. O'Meara (2016) states that Jordanian clinicians are researching how to cure patients of T1DM by working on their stem cells. The researchers hypothesise that a cure can be achieved for T1DM by transplanting stem cells of patients with T1DM into their own pancreas. This procedure can be also performed based on the modulation of the immune system in order to keep insulin-producing cells alive (O'Meara, 2016).

Despite the incidence rise of the two diabetes mellitus types in the Middle East, there is little research and information in these regions about the incidence of T1DM. Habibzadeh (2014) explicitly mentions the lack of studies on the incidence of T1DM across the Middle East. To the best knowledge of the researcher, most researchers have focused on the incidence and prevalence of Type 2 Diabetes Mellitus (T2DM), and there is little information about T1DM in Jordan. A study reported by the International Diabetes Federation (2015) indicated that 'Type 2 diabetes is the most prevalent form of diabetes and has increased alongside cultural and societal changes'. Similarly, the World Health Organization (2016) found that most people worldwide who have diabetes mellitus are affected with T2DM, not T1DM.

The incidence and prevalence of T2DM are increasing worldwide (Longo et al., 2010; Jordan and Jordan, 2012). Most people who have diabetes have T2DM (World Health Organization, 2017). In Jordan, the incidence and prevalence of T2DM are high and continuously increasing, with more than half of the Jordanian patients with T2DM suffering from lack of disease management (Ajlouni et al., 2008). Despite the fact that patients with this type of diabetes mellitus do not require insulin to survive, around one third of Jordanian patients with T2DM do require insulin to reduce their blood glucose (World Health Organization, 2017). It was reported by the International Diabetes Federation (2011) that in 2011, the prevalence of T2DM in Middle Eastern adults aged from 20 to 79 years old reached percentages of 19.2% in the UAE, 19.9% in Bahrain, 20% in Saudi Arabia, 20.2% in Qatar and Lebanon, and 21.1% in Kuwait. However, in 2008, the prevalence and incidence of T2DM have markedly increased in Jordan, reaching 14.9% in men and 12.5% in women, at a total percentage of 27.4% (Ajlouni et al., 2008; Al-Hassan et al., 2017). The increment of the T2DM prevalence in the year 2008 was thus greater in Jordan than in the previously mentioned Middle Eastern countries in the year 2011. Later in 2014, it was conveyed by Ghazal (2014) that the prevalence of T2DM percentage had increased to 34% in Jordanians who were 25 years old and older. A more recent study shows that an increased percentage of 46% of Jordanian people who are 25 years old and older have T2DM (JT, 2016). This fact was ensured and stated by Director Kamel Ajlouni, who is involved in the National Centre for Diabetes, Endocrinology and Genetics in Jordan (JT, 2016).

In Jordan, the increasing social and financial burdens of controlling diabetes mellitus and its complications (Gallagher et al., 2008; Al-Hassan et al., 2017). The complications of diabetes mellitus comprise retinopathy (World Health Organization, 2006), foot ulcers, amputation, neuropathy (Popescu et al., 2011), and renal failure (Abdallah et al., 2007). The impact of these complications is intensifying mainly because most Jordanian patients with diabetes are failing to fully adhere to the management of their diabetes self-care. Jordanian patients are also failing to perform Self-Monitoring of Blood Glucose (SMBG) regularly, neglecting physical exercises, failing to take the required medications on a regular basis, and failing to follow the guidelines for a therapeutic diet. Most of the Jordanian patients with diabetes mellitus lack due concern for adherence to diabetes self-care management because they lack motivation (i.e. intrinsic motivation). The fallout of these failures affects their health negatively leading to severe medical issues (García & Côté, 2003; Al-Hassan et al., 2017).

1.1.2 Research Background

In hospitals, medical staff are responsible for the daily management and care of patients with diabetes. To achieve the best quality of care for patients with this illness, medical staff must be kept updated on the latest medical knowledge, as that knowledge is likely to evolve rapidly over time. Nonetheless, medical staff might have insufficient time to pursue up-to-date information due to the large amount of information being disseminated to medical clinics, especially as some of the disseminated information may be kept tacitly in minds, duplicated, or rendered unnecessary (Nicolini et al., 2008; Delen & Al-Hawamdeh, 2009; Beath et al., 2012; Chen, 2013; Drus et al., 2013). Knowledge management and information overload are thus key concepts, since knowledge management organises the masses of unorganised information in medical and non-medical organisations. Knowledge management first evolved in the 1980s (Sharma et al., 2012). According to Mirza (2009), knowledge management uses a ‘knowledge system to manage the knowledge production resources in business or governmental organizations’. Mirza argues that organisations can be supported by capturing, creating, developing, storing, transferring, and applying knowledge in a way that allows them to manage their tasks properly. The main aim of the knowledge management process is to ensure the best and most appropriate use of all knowledge (Internet Archive Wayback Machine, 2016).

Many researchers have defined the terms *knowledge management* (Alavi & Leidner, 2001; Grudin, 2006; Kebede, 2010; Makkonen et al., 2011; Bordoloi & Islam, 2012; Pawlowski & Bick, 2012; Sharma et al., 2012; Bedford, 2013; Dalkir, 2013; Demirsoy, 2013; Toro et al., 2013; Leal-Rodríguez et al., 2013; An et al., 2013; An et al., 2017) and *information overload* (Simperl et al., 2010; Groff & Jones, 2012; Kadiri & Adetoro, 2012; Hoq, 2016). The researcher in this thesis defines the terms as follows: Knowledge management is a system that exploits and evolves knowledge by properly integrating and managing the knowledge production processes in organisations in order to achieve the objectives of these organisations, broadly speaking in order to produce better services and outcomes.

Information overload is an adverse situation that occurs when the amount of information is greater than what one can properly manage.

Preventing information overload in organisations requires development of a proper knowledge management framework, namely one which can ensure that knowledge is manifested into readable codified forms rather than hidden in employees' minds. In other words, one of the main aims of the knowledge management domain is to transfer knowledge from tacit to explicit knowledge. The knowledge management domain can be used for managing the large amount of information within different organisations. This management aims at transferring the knowledge that is kept in experienced individuals' minds into codified, documented, and understandable forms so that it can be easily stored and shared for further organisational purposes. This process, which is called externalisation, is only a single part of the whole SECI model of the knowledge conversion modes of Nonaka and Takeuchi (1995) (see Figure 1.2). Suitable technologies, processes, strategies, and tools are provided to decision makers when knowledge is transferred into an explicit form so that information and data can be converted into valuable knowledge assets (Wickramasinghe, 2010).

Knowledge management plays effective roles in many organisations, such as in hospitals, industries, educational institutions, governmental and business organisations, and many more (Stroetmann & Aisenbrey, 2012; Yusof & Bakar, 2012; Piorkowski et al., 2013; Ghosh & Mahanti, 2014; Demchig, 2015; Alawneh & Aouf, 2016). Due to its high importance, it plays an essential role in overcoming several issues encountered in different organisations. One of these issues is the information overload problem that has been until present affecting healthcare organisations in particular. Therefore, a few studies about the effects of knowledge management and its processes on healthcare organisations and information overload have been performed (Holzinger et al., 2007; Kim et al., 2007; Stroetmann & Aisenbrey, 2012).

The success of reducing information overload is based on effective storage and retrieval of the already codified information by the right people in the right place at the right time in the right quantity. Meanwhile, the success of knowledge management is based on effective creation, codification and sharing of the knowledge (Bouthillier & Shearer, 2002). The information cannot be effectively managed unless it is first codified by the knowledge management process. There is thus a strong relationship between knowledge management and the reduction of information overload. One of the major possible solutions to information overload is selecting the best knowledge management model (Strother & Ulijn, 2012).

Often the medical staff at medical organisations receive large amounts of information (Nicolini et al., 2008; Delen & Al-Hawamdeh, 2009; Beath et al., 2012; Chen, 2013; Drus et al., 2013). According to Delen and Al-Hawamdeh (2009), there exists “a vast amount of digital information and communication technologies, data explosion and information overload”. This immense amount of information comes from different sources, such as up-to-date scientific journals, areas of intensive knowledge and research findings. Some of this information is also kept tacitly in experts' minds instead of being documented into readable forms for the medical staff. Consequently, the medical staff faces issues such as lack of knowledge, improperly or poorly codified information, absence of important information, and excessive time demands when searching for required information. These issues imply that the medical staff will be acting on old information, as the staff might have insufficient time to absorb the continuously disseminated new medical knowledge, and this problem might result in severe problems for patients. The information overload problem was studied by Nicolini et al. (2008); Delen and Al-Hawamdeh (2009); Beath et al. (2012); Chen (2013); and Drus et al. (2013). In all these authors’ studies, the continuous large amounts of relevant and/or irrelevant information being frequently disseminated to medical clinics produced a data explosion. Therefore, the authors advised that a proper knowledge management framework should be developed to reduce information overload at these clinics, as the knowledge management process would enable the medical staff to manage the knowledge.

In the present thesis, the researcher focuses on the knowledge management domain. As established, knowledge management is highly important in the healthcare environment (Nicolini et al., 2008). As Wong and Wickramasinghe (2014) state, ‘Given that healthcare is an information-rich industry, it therefore lends itself to benefit from an application of KM tools, techniques, and strategies in order to affect superior healthcare outcomes'. In other words, knowledge management can be effectively integrated with healthcare. The originality of the thesis is that the diabetes clinics in Jordan are selected as a case study since no researcher has yet integrated the domains of knowledge management, information overload, and diabetes care together in Jordan. This originality adds importance to the thesis, which produces a novel knowledge management framework that will reduce the information overload that is affecting the diabetes clinics in the seven selected hospitals (A, B, C, D, E, F, G) in Jordan.

The nature of the researcher's initial interaction with the medical staff was as a patient. The researcher was once seriously ill sick at a particular hospital in Jordan. While at this hospital, the researcher observed some of the medical staff complaining about the large amounts of necessary new arising medical knowledge and unnecessary information that was continuously accumulating and affecting their clinics. After recovering, the researcher began to survey and enquire about the nature of the problem that was affecting local clinics. He was informed that information overload is continuously affecting the medical staff in hospitals, particularly in the diabetes clinics. The implication was that the amount of information being received was creating an issue of information overload. The medical staff informed the researcher about a number of ways in which information overload occurs in their diabetes clinics. These forms are comprised as follows based on medical staff's claims:

- The medical staff cannot keep updated with the new arising medical knowledge on a regular basis since they are extremely busy and have very little time to update themselves. The constantly accumulating newly emerging information causes information overload in the hospitals, where medical staff continue to act based on old information, causing severe issues with their patients.
- Diabetes clinics in Jordan require their medical staff to dedicate most of their time to providing the maximum care and treatments possible to patients with diabetes mellitus. This requirement keeps the medical staff very busy, preventing them from updating themselves on new medical knowledge, causing an accumulation of information (information overload).
- The right information does not go to the right medical staff in the right place at the right time in the right quantity. Accumulated information at the clinics thus causes information overload.
- Important new knowledge is missed.

- Necessary medical knowledge and unnecessary medical/non-medical knowledge are scattered and mixed together.
- Knowledge hoarding is present. In other words, new knowledge is kept in the minds of some medical staff, who fail to codify the knowledge for others.
- Limited time is available for conducting daily medical and scientific meetings with medical experts. Additionally, few sessions are held in their clinics such that the location of sessions are inconvenient. These reasons also lead to information overload, as most of the medical staff are deprived of new knowledge due to the time engagement and due to the few number of sessions that are held on an irregular basis at their clinics.
- The absences of some medical experts and some other medical staff for personal reasons prevent other existing medical staff from learning new medical information while performing medical tasks that were originally meant to be performed by the absent medical staff.
- Most of the medical staff in the diabetes clinics of the hospitals in Jordan have low morale due to the work pressure and/or other personal grounds. This low morale diminishes their enthusiasm about being updated with new medical knowledge, so new information accumulates, leading to information overload. The medical staff claimed that they lack strong guidance, affirmation, feedback, sympathy, and psychological support.

Based on the above claims, there is information about diabetes that the medical staff in diabetes clinics in Jordan need but do not have. Such information includes any new developments in overcoming this illness (e.g. new projects, new medical patents) and any updates on emerging medical equipment, new medications, new methods in facilitating treatments, or new methods for educating unmotivated patients with diabetes. When this thesis research and its focus were presented, the hospital representatives readily signed consent letters to allow the researcher to conduct a survey in their diabetes clinics. The Head Administrator of each hospital declared to the researcher that these hospitals would not have provided these letters if the clinicians in Jordan were not suffering from information overload with respect to keeping up to date with treatments of diabetes. When the researcher approached these clinics, the medical staff admitted that information overload is a problem in their clinics. This fuelled the researcher's motivation to conduct the survey.

1.2 Research Questions

Based on the information overload problem, identified in Section 1.1, the research questions of the research were as follows:

1. Why are the diabetes clinics of the hospitals in Jordan suffering from information overload?
2. How are the medical respondents experiencing such an issue in these clinics?
3. Can the knowledge management framework be developed to reduce information overload?

The research questions reflect the purpose of the research, while the objectives outlined in the following section measure the stages of achievement in pursuing the aim. The research questions are answered when the objectives are met. Consequently, when the objectives are met, the aim is achieved, ensuring that the research questions are answered. The evidence that the results of the thesis can be extended to other countries, or the generalisability of the research, is discussed in detail in Section 1.7. In brief, however, healthcare organisations are similar in their processes, structures, and operations, so the produced framework can be further refined for broader disciplines, permitting knowledge management and hence reducing the issues due to information overload.

1.3 Aim and Objectives

The aim of this thesis was to research the existing information overload issues in the diabetes clinics of the selected hospitals in Jordan and to propose and validate a knowledge management framework that can manage and reduce these issues. To achieve this aim, the objectives of the research were as follows:

1. To conduct a comprehensive literature search (secondary research) on the knowledge management, healthcare, and information overload domains.
2. To carry out the primary research (including the data collection and analysis of data findings) with a representative sample of the selected hospitals in Jordan in order to investigate the phenomenon of information overload in these hospitals.
3. To develop a new knowledge management framework that can manage and reduce the information overload problem encountered in the diabetes clinics of the selected hospitals in Jordan.
4. To conduct a validation process for the proposed framework.
5. To perform a critical evaluation of the research, to draw the conclusions, and to suggest the future research.

1.4 Deliverables

When the deliverables of a research are produced, the objectives of the research are satisfied. The following are the deliverables of this research such that each deliverable is connected to the achievement of an objective:

- A comprehensive literature review on the domains of knowledge management, healthcare, and information overload, a critical literature review that identifies the strengths and limitations of the previous related research, and a literature review of knowledge management and information overload models/frameworks that are related to the research.
- The analysis and the findings of results that are obtained from the primary research after data has been collected from the responses.
- A knowledge management framework that can reduce information overload in the diabetes clinics of the hospitals in Jordan and be used in the academic context and in the medical practice.
- Validation of the proposed framework based on the assessment of a subset of medical experts in the field from within these clinics.
- An investigated critical evaluation, discussion of conclusions, and suggestions for future research.

1.5 Academic Challenge

This challenging research is at a PhD level since it is the first of its type to be conducted in Jordan. To the best knowledge of the researcher, no prior research has combined knowledge management and information overload domains with the diabetes care domain in Jordan. The research will contribute to the academic discipline by providing a base that can be developed by other future researchers. Improvements of other applications to reduce information overload can be further investigated in healthcare domains other than diabetes care and in domains other than healthcare. The research will also contribute to the medical practice by practically organising the processes in the hospitals and thereby reducing the issues of information overload, ensuring that the right information is sent to the right people in the right place at the right time in the right quantity. The research also investigates the complexity of the issues encountered in the diabetes clinics of the seven selected hospitals in Jordan. This research explores the relationship among these occurring issues. Further, the research produces a new knowledge management framework that can manage and reduce the information overload encountered in these clinics. The produced framework is based on enhancement of the framework of Mirza (2009) in terms of the secondary research, and it is also based on development of issues identified from the primary research conducted in the selected hospitals.

1.6 Theoretical Underpinning

The theoretical framework and the theoretical basis (i.e. the underpinning theories) are distinct parts of research. The theoretical framework involves forming adopted medical factors that describes the current hospital phenomenon, and that will contribute to form the survey (questionnaires and interviews) to be conducted in the primary research. The theoretical basis involves integrating suitable underpinning theories together in order to provide a foundation on which to approach the question(s) that the research is attempting to answer. To clarify the academic underpinning of this work, this section highlights some key points of both the knowledge management and information overload domains and shows the relationship between them.

Many models exist in the domain of knowledge management. Such models include the knowledge management capability model (Gold et al., 2001; Hung & Chou, 2005; Mirza, 2009; Asvachaiporn & Prompoon, 2013; Demchig, 2015), Nonaka's model of the dynamics of knowledge creation (Nonaka & Takeuchi, 1995; Mirza, 2009; Bratianu & Orzea, 2010; Easa, 2012; Saadaoui & Mekkaoui, 2015), Boisot's knowledge management model, Skandia's Intellectual Capital (IC) model, and Demerest's knowledge management model (Hung & Chou, 2005; Mirza, 2009; Mohajan, 2017). These models play different roles in efficiently managing and contributing to the knowledge management process. However, the most common model being studied is Nonaka's model of the dynamics of knowledge creation (Nonaka & Takeuchi, 1995). This model underpins the present research since the preliminary literature review identified Nonaka's model as being particularly suitable compared to others to provide theoretical underpinning for the research. The model classifies tacit and explicit knowledge into four major processes, and it compares each process with the others. Figure 1.3 illustrates this model with its four processes according to Mirza (2009).

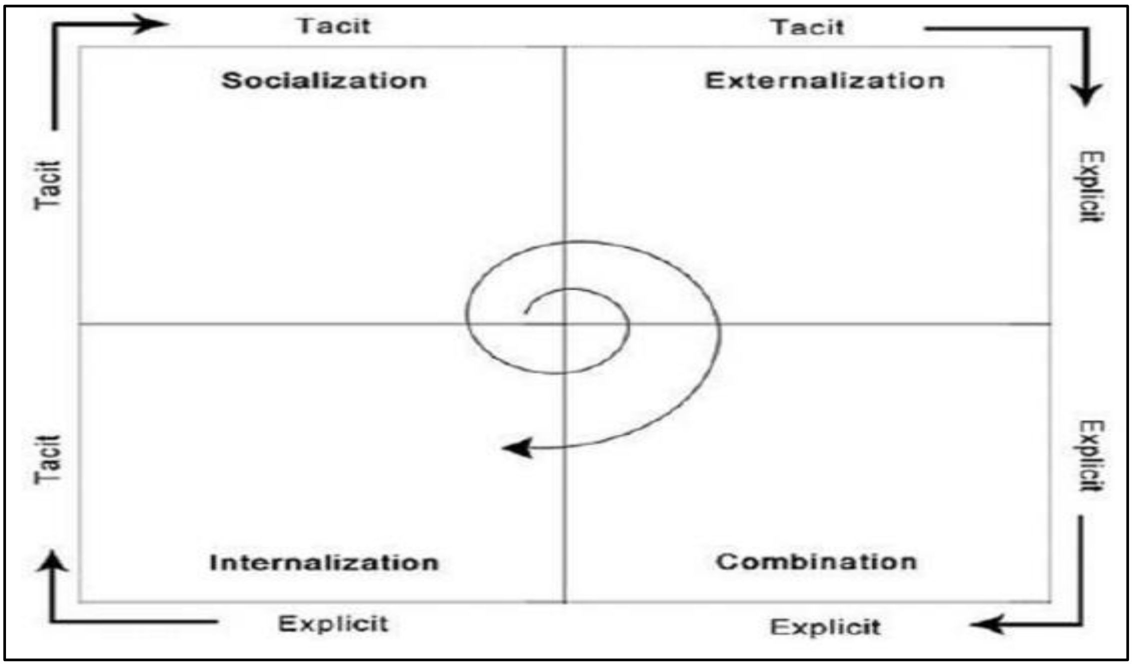

Figure (1.3): The SECI model (Nonaka's model of the dynamics of knowledge creation) (Nonaka & Takeuchi, 1995)

In the socialisation phase, knowledge is transferred from tacit to tacit form. Knowledge can be transferred in a verbal manner via demonstrations, conversations, and discussions. In the externalisation phase, knowledge is transferred from tacit to explicit form. This means that we can transfer our knowledge by codifying it after the knowledge was tacitly based in our minds, thereby formulating the knowledge so that it can appear in formal procedures. This phase involves intensive tasks. In the combination phase, knowledge is transferred from explicit to explicit form. This implies that once explicit knowledge has been codified, new knowledge can be created and codified accordingly. In the internalisation phase, knowledge is transferred from explicit to tacit form, which means that after being transferred and documented, it can be disseminated to others and again enter their minds in a tacit form. For instance, when one acquires already documented knowledge and acts on that knowledge frequently, he/she will not need to document the knowledge each time; rather a person would act upon that knowledge by drawing on experience, as the knowledge is already present in the mind.

In this research, the externalisation and the combination phases of this model are adopted since one of the concepts of knowledge management is that it aims at converting the knowledge from a tacit form to an explicit form by codifying and sharing the knowledge in terms of the externalisation phase. Namely, one key relevant issue in the clinics is that some of the information is still kept tacitly in the minds of the medical staff. The combination phase, wherein knowledge is converted from an explicit form to an explicit form, is also adopted in this research. The reason behind adopting this phase is that in the clinics, the already codified knowledge is explicit and shared with the right medical staff in codified forms in the right place at the right time in the right quantity. Consequently, information overload must be reduced to achieve a better performance in managing tasks within the organisations. Thus, the two phases are relevant to the research.

In the information overload domain, models include the standard retrieval interaction model, Berry-Picking model, Dervin's Sense-Making model, and Kuhlthau's model (Dervin, 1983). Although it has a few disadvantages, the most relevant and appropriate model to be integrated with Nonaka's model is Dervin's Sense-Making model (Dervin, 1983). There is a strong relationship between knowledge management and information overload, so both models interact with each other. The relationship between both models is discussed after the following outline of the steps in Dervin's Sense-Making model.

The followings are the steps of Dervin's (1983) model:

1. The model concentrates on the cognitive needs of the user as this user starts moving through time and space.
2. During this movement, the user makes sense of his/her environment and actions and of the inputs of the information system.
3. It is possible to move ahead when everything is assured to be meaningful.
4. However, cognitive gaps or stops (e.g. muddles, riddles, low morale, confusions, questions) might block this movement ahead.
5. In the case of obstructions, the user must identify either the cause of the stop or the gap's nature.
6. The gap can be bridged when information or tactics are determined by the user based on his/her assessment.

To the best knowledge of the researcher, the SECI and Dervin models are the most appropriate models to complement each other since Dervin's model is an information behaviour model that makes sense of information by selecting the information that is needed, thereby reducing information overload. When Dervin's model acts as an information behaviour guide, it can reveal the nature of a problem that is being faced (i.e. in this case, information overload). Dervin's model can then determine what information behaviour may bridge the gap of confusion or uncertainty, leading to the reduction of information overload. The SECI model is also an information behaviour model that makes sense of information by selecting the information that is needed and transforming that information into codified readable forms, converting knowledge from tacit to explicit forms and thereby reducing information overload. Therefore, the two models complement each other well. Information overload is reduced by increasing the information quality and decreasing the information quantity. Both models attempt to reduce information overload, further making them appropriate models to complement each other.

Another reason that these two models are so complementary is that in Step 2 of Dervin's model, the user is meant to make sense of the information system's input. This implies that this information is already a codified readable knowledge, as in the externalisation phase of the SECI model, and one of the aims of knowledge management is to codify and share the knowledge with the right people at the right place at the right time in the right quantity. However, some of the information in the clinics is still kept tacitly in the minds of some medical staff. Therefore, Dervin's model could not proceed further unless the inputs are codified via the information system based on Nonaka's model. According to Dervin (1983) herself, 'Dervin's sense making model is a human tool designed for making sense of a reality assumed to be both chaotic and orderly'. In other words, Dervin's model assumes a reality in which information overload exists and produces a mix of chaotic and orderly information. That assumption reflects the real environment of the current situation for the hospitals in Jordan. Dervin's model is designed to determine information behaviour by selecting the information that is needed, and that process leads to the reduction of information overload. All these mentioned reasons make the SECI and Dervin models appropriate models to complement each other.

The implementation of Dervin's Sense-Making model is based on four elements (Dervin, 1983) as shown in Figure 1.5, which is a modification of the model in Figure 1.4. The first element is the *situation* in time and space, or the context in which the information problems emerge and are defined. The second element is the *gap*, or the difference between the desired situation and the contextual situation. The third element is the *outcome*, or the consequences that arise from the sense-making process. The fourth element is the *bridge*, or the way in which the gap between the outcome and the situation is closed.

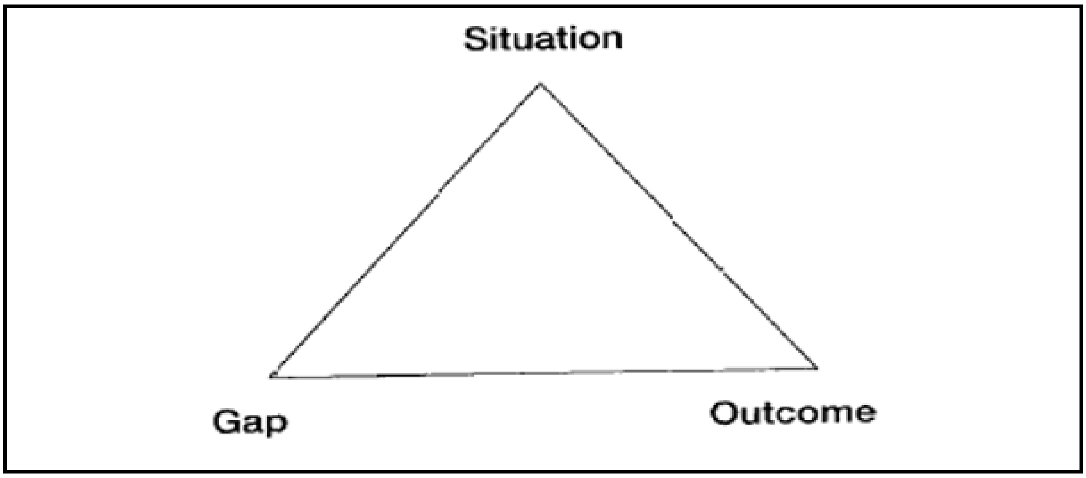

Figure (1.4): Dervin's Sense-Making model (Dervin, 1983)

Figure 1.4 shows Dervin's (1983) elements (situation, gap/bridge, and outcome) presented in a triangular shape. The *bridge* element is illustrated in a more direct way in Figure 1.5, which represents a modified framework of Dervin's Sense-Making model.

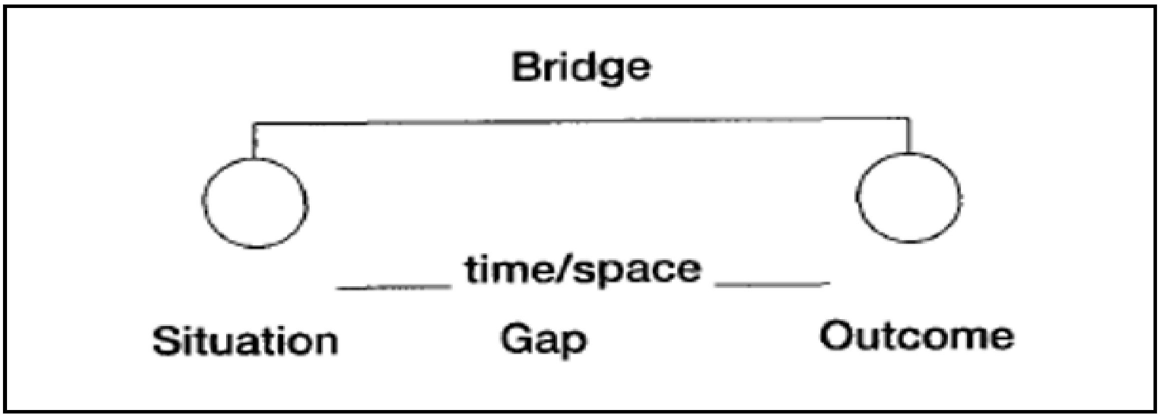

Figure (1.5): A modification of Dervin's Sense-Making model (Dervin, 1983)

The main strength of Dervin's Sense-Making model is based on the methodological consequences it encounters. Since this model guides information behaviour, it can reveal the nature of information behaviour problems and bridge the gap generated by confusion or uncertainty; the outcomes are the results of using the information (Dervin, 1983).

It is necessary to elaborate upon the relationship between Dervin's Sense-Making model and Nonaka's model of the dynamics of knowledge creation. In Step 2 of Dervin's Sense-Making model, the user makes sense of the information system's input. This step implies that the input is data that has already been codified and explicitly stored (codified) into the information system. In the externalisation phase of Nonaka's model, one of the aims of knowledge management is to codify and share the knowledge with the right people at the right place at the right time in the right quantity, as some of the information is still kept tacitly in the minds of the medical staff. Therefore, Dervin’s model could not proceed further unless the inputs are codified into the information system based on Nonaka’s model. Thus, the two models are highly related to each other, and hence, both models underpin this research.

Further, Dervin’s model attempts to reduce the information overload problem in the diabetes clinics of the seven selected hospitals in Jordan. For example, as per Step 1 of Dervin’s model, the medical staff of any healthcare clinic have a cognitive need to search for the appropriate information in the appropriate time through the clinic. (Specifically, in this example, new scientific or new medical knowledge includes the patients’ medical records, testing results, diagnoses, family history, etc.) According to Step 2 of this model, the medical staff make sense of their environment as the staff fulfil their roles as medical administrators, doctors, or nurses. Additionally, the medical staff make sense of their medical actions based on the environment in which they act. After that, the medical staff make sense of the information system’s inputs in order to locate the right information that is most suitable to them. In Step 3 of the model, as long as the right information and the right quantity are provided and explored by the right medical staff member at the right time, this member will continue on with this process properly. However, as anticipated in Step 4, other medical staff might encounter gaps (i.e. frequently unrelated information goes to the wrong medical staff member with the wrong quantity of information at the wrong time, causing continuous information overload). In this case, as in Step 5, such medical staff members must define the nature of this wrong information. The information might be related to other medical staff of different positions, or the information might be, for instance, unnecessary to any medical staff member, or unrelated to the healthcare clinic. After that, as in Step 6, the medical staff respondents assess the nature of this information and attempt to either bridge the gap or to skip over the unnecessary information, thereby speeding up the searching time. Attempting to overcome this gap reduces information overload. Consequently, the researcher deduces and suggests a proposition based on the two models, namely that information must be explicitly codified and shared with the right people in the right place at the right time in the right quantity.

Based on this proposition, which is central to the research, a novel conceptual knowledge management framework is produced in Chapter 9 for reducing the information overload that is affecting the diabetes clinics in the seven selected hospitals in Jordan. This framework is validated in Chapter 10 with the assistance of medical experts in the field.

1.7 Contributions

The contributions of the thesis can be identified broadly in six categories, which are its originality, context, contribution to the academic research, improvement of the practice research, generality, and insight.

In terms of originality, to the best knowledge of the researcher, no research has been performed that combines the domains of knowledge management, information overload, and, particularly, diabetes care. Consequently, the thesis contributes a unique focus on integrating these domains via a study conducted in Jordan. No researcher has ever before conducted a study combining the knowledge management and information overload domains with the diabetes care domain in Jordan. Hence, the research is challenging and of PhD standard, as it will propose a novel knowledge framework for reducing information overload in the diabetes clinics in hospitals in Jordan based on conducting secondary and primary researches.

In terms of context, the research explores a valid concept within the body of existing work. The importance of integrating the domains of knowledge management and healthcare together has been declared by researchers including Abidi (2008); Nicolini et al. (2008); Mirza (2009); Morr and Subercaze (2009); Wickramasinghe (2010); Bordoloi and Islam (2012); Chen (2013); Drus et al. (2013); and Wong and Wickramasinghe (2014). Furthermore, information overload has created problems within areas other than healthcare, as noted by Bernsen (1994); Meyer and Kieras (1997); Hanka and Fuka (2000); Kirschner (2002); Mayer and Moreno (2002); Rochat (2002); Eppler and Mengis (2003); Mayer (2005); Zheng (2009); Plass et al. (2010); Clark and Mayer (2011); Sandberg et al. (2011); Liu and Todd (2014); Mayer (2014); and Park et al. (2014, 2015). Hence, this research fits properly into either of these domains.

In terms of its contribution to the academic research, the research produces a framework that can be used and further enhanced by future PhD research students. In particular, other applications of the framework, namely to other areas where information overload is present (e.g. healthcare domains other than diabetes care or even domains other than healthcare), can be further investigated.

In terms of improvement of the practice research, the research can be applied in hospitals in Jordan and in other countries where the framework produced can help organise the processes in the hospitals by reducing information overload, ensuring that the right information is sent to the right people in the right place at the right time in the right quantity. Further, since information overload is a common problem in medicine (Nicolini et al., 2008; Delen & Al-

Hawamdeh, 2009; Beath et al., 2012; Chen, 2013; Drus et al., 2013), the framework can be also applied in other fields as such business and education. Once the contribution to academic research is further investigated, the research can be successfully applied and implemented in real-life environments where different organisations with similar processes and structures can benefit from it when managing information overload.

In terms of the generality of the research, knowledge management manages the works and processes in many organisations. As many organisations are similar in their processes, structures, and operations, the produced framework can be further refined for broader disciplines, so knowledge management can be implemented, leading to the reduction of information overload.

In terms of insight, the research provides a unique insight into the particular problems or gaps identified from the analysis of the conducted primary research in the diabetes clinics of the seven selected hospitals in Jordan.

1.8 Ethical Statement

The thesis is produced with reference to the regulations outlined by the Faculty Ethics Committee of Staffordshire University. In any research project, formulating the ethical basis on which the research project will be conducted is important. The primary research was conducted in the diabetes clinics of the seven selected hospitals (A, B, C, D, E, F, G) in Jordan. All participants of the survey were 18 years or older. Accordingly, the participants exclusively comprised the medical administrators, doctors, and nurses who took part in the questionnaires and interviews. These participants were not vulnerable (i.e. they were not likely to be affected negatively). This study did not deal with patients and does not affect patients directly. The ethical guidelines highlighted in the following subsections were respected in the thesis.

1.8.1 Informed Consent

The participants of the research were informed of the research’s procedures and aims, of their role in the research, and of their freedom to refuse to answer any question they did not wish to answer. They were also given the right to withdraw from the research at any time.

1.8.2 Anonymity

The participants were informed that their participation in the survey was voluntary and that their responses would be kept anonymous. Additionally, the participants were informed that the researcher would not publish any material that could be used to identify organisations or individuals without obtaining their consent.

1.8.3 Code of Practice

This research is liberal, outstanding, and innovative. The researcher has tried to live up to the international research standards. The researcher is committed to ensuring the academic research's probity and integrity. Consequently, performing this research is significant and fundamental. The research's results are disseminated in accurate and honest ways based on professional standards. To ensure that these principles are guaranteed, invoking any encountered misconduct in the academic research will be performed whenever necessary.

1.8.4 Academic Integrity

No results obtained from the research have been falsified or plagiarised. Others authors' works are referenced appropriately. In the primary research, the selected hospitals in Jordan were assured that the full university ethics procedure would be followed in the research, that no patients or confidential patient records would be involved, and that the normal guidelines on informed consent and anonymity would be followed, along with the usual University Code of Practice, as follows:

< http://www.staffs.ac.uk/academic_depts/fces/research/ethics/>.

1.9 Summary

This chapter introduced the research backgrounds and the overall content of the study. The chapter began with an introduction to the Jordanian background and demography and to the current healthcare system in the Jordanian context. The chapter introduced the domains of diabetes mellitus, knowledge management, healthcare, and information overload. The researcher showed the strong relationship among the domains of knowledge management, healthcare, and information overload. The research problem (i.e. the information overload problem) was also highlighted in the background of the research. This chapter thus clearly showed the importance and motivation of conducting this research. The aim of developing a new knowledge management framework to reduce information overload in the diabetes clinics of the seven selected hospitals in Jordan was described along with the involved research objectives. This thesis investigates this research problem area in order to provide an enhanced knowledge management framework for reducing this problem in these chosen clinics.

The aim and objectives, the deliverables, the academic challenge, the theoretical framework, the theoretical underpinning, the contributions, and the ethical statement were all presented in order to provide a solid comprehension on how the research was conducted. Chapter 2 will discuss the research methodology that forms the structural foundations of how the research was managed.

Chapter 2
Research Methodology

2.1 Introduction

This chapter presents the research methodology. The methodology defines the stages by which a research progresses and ensures that the research addresses the research questions. This chapter discusses the key aspects that are related to the research methodology. The aspects are the research philosophy, the research approach, the research strategy, the research reasons for choice of methods, the research time-frame (time horizons), the research techniques and procedures, the research sample selection criteria, the research design, the development and distribution of the research instruments, and the research limitations. Finally, a summary of this chapter is given.

2.2 Research Methodology

The research methodology of this research is mainly based on the research 'onion' developed by Saunders et al. (2009). Figure 2.1 highlights the research onion categories. The reason behind using the research 'onion' in this research is that, according to Saunders et al. (2009), the research onion describes the stages through which a researcher must pass in completing a research study. The research onion thus makes the methodology design process clear and understandable, allowing the researcher to easily know where and how specific aspects fit into the methodology.

This section explains different adopted aspects or approaches that are related to this research based on the research onion shown in Figure 2.1. The section continues with explanations of the research design, an overview of the development and distribution of research instruments, an analysis of the quantitative and qualitative approach, and an outline of the limitations of the research.

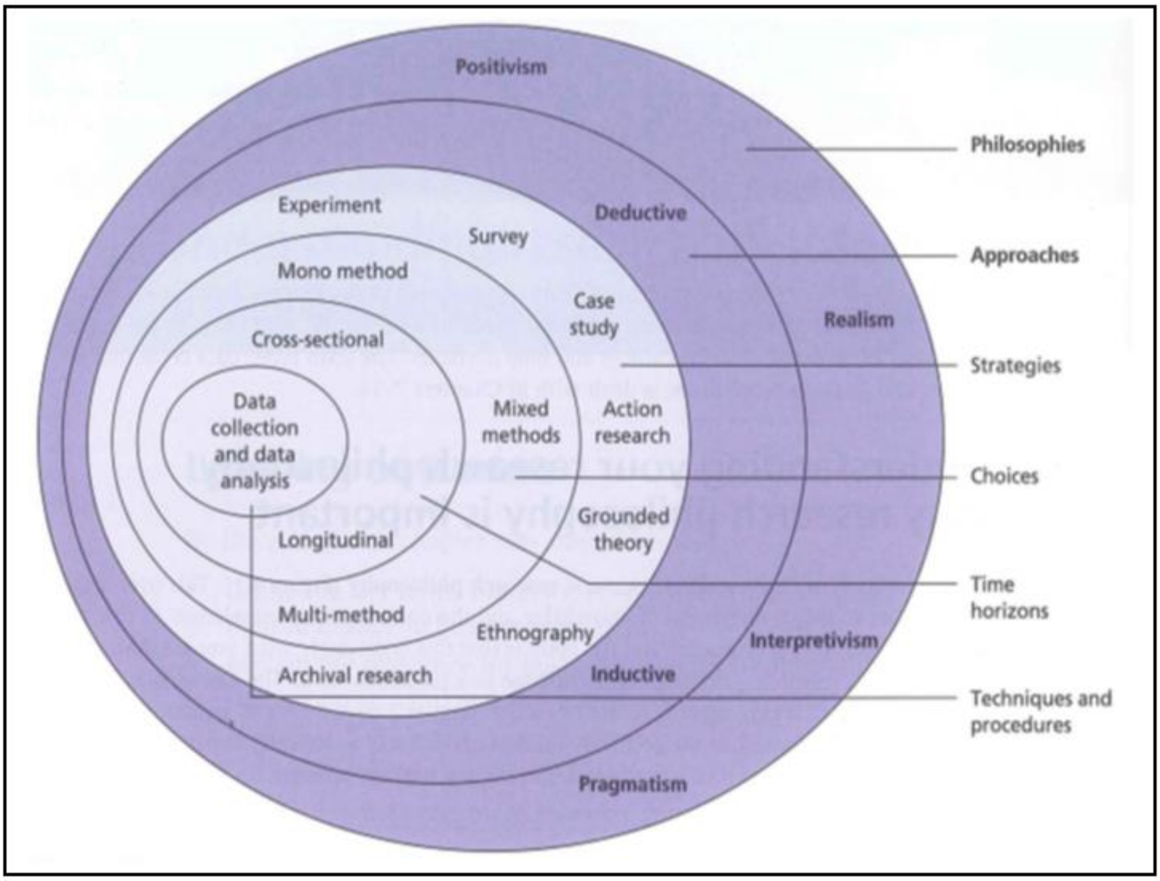

Figure (2.1): The research onion (Saunders et al., 2009)

The research ‘onion’ illustrated in Figure 2.1 shows how the methodology design process has several layers, each of which consists of different concepts or approaches that can assist the researcher in determining what concept or approach is most suitable for a particular research. As can be seen from Figure 2.1, the research onion comprises the research philosophy, the research approaches, the research strategies, the research choices, the time horizons, and the techniques and procedures. In the research onion, the researcher works inward, peeling each layer away as he works toward the centre, which involves forming the actual research questions.

This researches uses nine investigation elements of the methodology that are based on the research onion (see Figure 2.1). These elements are the research philosophy, the research approach, the research strategy, the research choice of methods, the time-frame (time horizons), the sample selection criteria (techniques and procedures), the research design, the development and distribution of the research instruments, the analysis of the quantitative and qualitative approach, and the limitations of the research. These elements are described in the following sub-sections.

2.2.1 Research Philosophy: Epistemological and Theoretical Stance

In the research onion, the outermost layer represents the research philosophy, which in turn describes the source and nature of the research knowledge (see Figure 2.1). According to Bryman (2012), the research philosophy is a set of beliefs that rely on identifying, investigating, and exploring the nature of reality in the real world. Selecting a research philosophy establishes assumptions that justify the way of conducting the research (Flick, 2011).

The researcher opted for the interpretivism research philosophy. Interpretivism is concerned with understanding phenomena that are occurring in the real world, where individuals' subjective experiences are observed and obtained during a phenomenon (Antwi & Hamza, 2015). In this research, interpretivism was the most appropriate approach. This philosophy allowed the researcher to conduct a case study strategy, and that strategy was important in understanding the phenomenon of the current situation that is occurring in the diabetes clinics of the selected hospitals in Jordan. The research complies with the meaning of interpretivism, namely that a phenomenon of a certain situation is explored, studied, and understood. Unlike positivism, which involves measurements, facts, and realities, interpretivism uses meaning-oriented methodologies such as observation of participants or interview; meaning-oriented methodologies are dependent on the subjective relationship between subjects and the researcher (Antwi & Hamza, 2015).

Based on the adopted interpretivism approach in the context of this thesis, the researcher attempted to determine and explain the relationship between the knowledge management framework currently in place in the diabetes clinics of the selected hospitals in Jordan and the resulting behaviours of the medical staff in these clinics. The interpretivism approach required the researcher to get close to the respondents in order to shed light on respondents' acumen toward the reality of the phenomena they are facing in their organisations. Other types of philosophical approaches would not have fit this research as well. For instance, the positivism approach is based on the views of scientists aiming to evaluate the social world based on objectivity rather than subjectivity (Cooper & Schindler, 2006). House (1991) emphasises that positivism is based on facts and data, which are the foundations of scientific propositions since the scientific paradigm is considered foundational by itself. This discoverable scientific knowledge represents a definite value, which is free from criteria that are imposed by subjective standards or values, and which is considered purely objective, and not subjective as in the interpretivism approach (Scotland, 2012). Therefore, the researcher selected the interpretivism approach since this approach is subjective and concerned with real phenomena, in this case, with what is occurring in the diabetes clinics of the selected hospitals in Jordan, and since it is based on objects, scientific facts, or realities.

One philosophy is not necessarily inherently better than the other is, but one of them may be preferred and favoured by a researcher compared to the other (Podsakoff et al., 2012). The research methodology justification is simply provided by a researcher. The nature of the observed phenomena should inform the choice in research philosophy.

Philosophers agree that there is no single best way to understand the entire world. Therefore, the researcher should clarify his choice in research philosophy to clarify, in turn, the main research problem (Saunders et al., 2009). Research philosophies achieve research goals in different ways, and their criteria in selecting the best methods can change based on the research objectives (Goddard & Melville, 2004). The type of investigated knowledge determines the research philosophy (May, 2011). Thus, the researcher selected the philosophical approach that suits the thesis best.

It is important to choose an appropriate paradigm for the research philosophy in any conducted research. Al-Somali (2012) highlighted several key features that depend on the paradigm. These features are the way reality is investigated, ontological assumptions, epistemological assumptions, methods and techniques for data collection, methodological problems, beliefs, various research approaches, and the roles of the research ethics and values. Johnson and Clark (2006) state the following:

> 'The importance of the choice process for the research philosophy cannot be over-emphasised, mainly because it will determine the research strategy and the method that will be chosen. The research philosophy assists the researcher in recognising what is being investigated'.

In terms of research ontology and epistemology, Crotty (1998) defines ontology as 'the study of being'. The assumptions of ontology concern what forms reality (e.g. assumptions about the nature of reality). Ontology is concerned with the structure of reality, the nature of existence, and the 'what is' (Crotty, 1998). Researchers must make decisions based on their views about how things are formed and how things act in reality (Scotland, 2012). In the case of this research, the way that information overload is affecting the diabetes clinics of the selected Jordanian hospitals was investigated by the researcher. Then a decision was made to propose a knowledge management framework that can reduce information overload.

Epistemology is defined by Cohen et al. (2007) as ‘the nature and forms of knowledge’. The assumptions of epistemology concern the ways in which knowledge can be created, obtained, and communicated (e.g. what does it mean ‘to know’ something, and what is knowledge?) (Scotland, 2012). The researcher in this case investigates the nature of information overload in the diabetes clinics of the selected hospitals in Jordan. This investigation is based on how information flows within the diabetes clinics of the selected Jordanian hospitals. Lincoln and Guba (1985) observe that when a question is being asked, epistemology is involved. Crotty (1998) defines epistemology as ‘how we know what we know’. Lincoln and Guba (1985) define the term as ‘the nature of the relationship between the knower or would-be knower and what can be known’. According to Lincoln and Guba (1985), the question that is asked in epistemology is ‘What is the nature of the relationship between the would-be knower and what can be known?’. Based on this question, epistemology explores the characteristics of knowledge, questioning the procedures and forms by which knowledge is generated and seeking ways to investigate and deliver knowledge properly (Alshamaileh, 2013).

The theoretical stance, or the theoretical perspective, is defined as

> ‘A set of assumptions about reality that inform the questions we ask and the kinds of answers we arrive at as a result. In this sense, a theoretical perspective can be understood as a lens through which we look, serving to focus or distort what we see’. (Crossman, 2017).

Based on this definition, the theoretical stance can be understood as a frame that controls what particular things are explored, determining what is included and excluded based on our views. This can be illustrated with reference to the field of sociology. In sociology, it is assumed that all social systems (e.g. the family and society, social structure, culture, statuses, and roles) are real and existing (Crossman, 2017). For example, the conducted study of this research assumes that the diabetes clinics of the selected Jordanian hospitals are social systems themselves that are real and existing in Jordan. Thus, the theoretical stance is significant for this research, as this research aims to organise ideas, views, and thoughts in order to make them clear and understandable for others. Multiple theoretical stances or perspectives are used by sociologists simultaneously to frame and form research questions, research designs, research methodologies, and analyses and findings of results (Crossman, 2017).

2.2.2 Research Approach

As illustrated in Figure 2.1, the research approach represents the next layer of the research onion. There are two main research approaches: the inductive approach and the deductive approach (Saunders et al., 2009). The inductive approach represents the collection of data and the development of a theory in order to form the underpinning philosophy of the research (Reichertz, 1995). It is connected to the interpretivism philosophical approach, wherein researchers are actively involved in data collection while the study is conducted. The inductive approach does not involve hypotheses formulation, but research questions are stated in this approach along with aims and objectives (Saunders et al., 2009). The deductive approach alternatively produces a hypothesis and a theory, such that the hypothesis is based on a strategy for a testing process for the hypothesis (Saunders et al., 2009). The deductive approach is connected to the positivism philosophical approach. Hypotheses, validity of assumptions, or theories are tested by the deductive approach, whereas generalisations and new theories are generated by the inductive approach (Saunders et al., 2009).

In this research, the inductive approach was chosen. The inductive approach was adopted from Reichertz (1995) and Saunders et al. (2009). The inductive approach was chosen because this research includes research questions, and the inductive approach is based on including particular research questions that are formed and expressed at the start of the conducted research along with the aim and objectives, and which are required to be answered in advanced stages of the conducted research (Research Methodology, 2016a). Selection of an approach is based on factors such as the research problem nature, the research philosophy, and the research study area (Research Methodology, 2016a).

2.2.3 Research Strategy

The researcher chose to use the 'case study' strategy to examine the diabetes clinics of the selected hospitals in Jordan. According to Zainal (2007),

> 'A case study method enables a researcher to closely examine the data within a specific context. Case studies, in their true essence, explore and investigate contemporary real-life phenomenon through detailed contextual analysis of a limited number of events or conditions, and their relationships'.

Simons (2009) defines the case study as 'an in-depth exploration from multiple perspectives of the complexity and uniqueness of a particular project, policy, institution, program or system in a "real life"'. Based on these two definitions, a case study enables researchers to explore, investigate, and comprehensively understand the complex issues of a phenomenon (Zainal, 2007). Previous researches have conducted extensive studies that apply the case study in the field of medicine (Taylor & Berridge, 2006), the field of sociology (Grassel & Schirmer, 2006), and the field of law (Lovell, 2006).

The reasons behind using the case study strategy in this research project refer to a number of reasons cited by Yin (1984):

- The first reason is that the case study allows the data examination to be carried out mostly within its usage in a context. Thus the data in this study is tested within the current situation of the diabetes clinics in the selected hospitals in Jordan.
- The second reason is that a case study allows both qualitative and quantitative data to be analysed in depth based on variations of collective, intrinsic, and instrumental approaches. The process and outcome of a phenomenon can thus be described by a case study through different analyses and observations of the investigated cases (Tellis, 1997).
- The third reason is that a case study containing qualitative data not only allows the researcher to explain and explore data incurred in the real-world environment, but also assists the researcher in exploring and describing the complexities that exist in the real-life situation. Such complexities can be extracted through a survey research or through an experimental research. By using the 'case study' approach, the researcher was able to gather in-depth and detailed comprehensive views of each participant's own experience. The researcher analysed each participant's view, and compared that view with all other participants' views.

The above reasons demonstrate that a case study provides a comprehensive and clear in-depth understanding of what is going on in a phenomenon in the real-life environment. Yin (1984) classifies three approaches in case study strategy: exploratory, descriptive, and explanatory case studies. Table 2.1, which is derived from Zikmund et al. (2012), illustrates the main distinctions among the three approaches.

Table (2.1): Comparison of the exploratory approach, the descriptive approach, and the explanatory approach (Zikmund et al., 2012)

	Exploratory approach	**Descriptive approach**	**Explanatory approach**
Amount of uncertainty characterising decision situation	Highly ambiguous	Partially defined	Clearly defined
Key research statement	Research question	Research question	Research hypotheses
When conducted?	Early stage of decision making	Later stages of decision making	Later stages of decision making
Usual research approach	Unstructured	Structured	Highly structured
Examples of this research after Zikmund et al. (2012)	The diabetes clinics in the hospitals in Jordan are affected by information overload. What kinds of information overload are medical staff experiencing in these clinics?	What roles do different positional types of medical staff practice in these clinics? What roles do hospital librarians practice in these clinics?	Will the proposed knowledge management framework reduce information overload in these clinics? Why are these clinics affected by information overload?

In exploratory case studies, collected data is used to explore the phenomenon in which the researcher is interested (Yin, 1984), and research questions and the problem's nature are explored (Research Methodology, 2016b). According to Yin (1984) and McDonough and McDonough (1997), an example of an exploratory study is a pilot study aimed at determining what protocol will be used.

Exploratory case studies offer a number of advantages (Universal Teacher, 2017). The first advantage is that exploratory case studies develop and increase the understanding and knowledge of the researcher on a given topic. The second advantage is that these studies make a full check of the research concept before allowing a research to be included in the marketplace. The third advantage is that such studies help researchers in exploring the causes behind a particular problem that has been identified and analysed by the decision makers. The fourth advantage is that such studies can provide flexibility in choosing the required resources (e.g. secondary resources for published literature). The fifth advantage is that such studies explore possible ways or tactics to achieve the goals of the decision makers. The sixth advantage is that such studies provide solutions to a costly research project. For example, when a research project is likely to be performed in another country, a researcher can obtain the primary data from the intended respondents through emails rather than travelling. Exploratory case studies also have some disadvantages (Research Methodology, 2016b). One of these disadvantages is that the information that is generated from the qualitative research might be biased. Another disadvantage is that a modest number of samples is used by exploratory case studies, which might yield an inadequate representation of a particular population (Research Methodology, 2016b).

In descriptive case studies, the natural phenomenon that occurs within the data in question is described (Yin, 1984). McDonough and McDonough (1997) suggest that descriptive case studies can be described as a narrative form. An example of a descriptive case study is a journalist-based explanation from two reporters of a water scandal (Yin, 1984). Another example of a descriptive case study is the study carried out by Pyecha (1988). In this study, Pyecha made use of the pattern-matching procedure to provide a special education for children.

According to Murphy (2017), one of the advantages of descriptive case studies is that a multifaceted approach is possible for data collection purposes. For instance, statistics of a situation can be provided by a survey, while at the same time, interviews can be performed to illustrate how people experienced that situation. Another advantage of descriptive case studies is they allow researchers to consider different life experiences based on many different resources as such personal accounts, reports, and newspapers. Descriptive case studies also entail some disadvantages (Murphy, 2017). The primary disadvantage is the weak confidentiality of descriptive case studies. In other words, during interviews, for example, participants are more likely to provide fake answers because the right answer may be too personal, or participants may not wish to provide answers to questions that seem too embarrassing or too personal for them. Another disadvantage is the greater possibility for subjectivity and error. For example, English grammar and spelling errors may be made when questionnaires are being designed by a researcher (Murphy, 2017).

In explanatory case studies, the data is closely examined at a surface level and at a deep level so that the phenomena can be described in data (Yin, 1984). Researchers have the opportunity to clarify what is going on in a phenomenon. An example of an explanatory case study is a researcher asking 'why a student uses an inferencing strategy in reading?' (Zainal, 2007). The researcher may accordingly develop a theory and perform a test to gain an answer (McDonough & McDonough, 1997).

Explanatory case studies have several advantages. The first advantage is that they allow ideas to be connected. They also give a detailed explanation of a phenomenon. Additionally, they help in determining the reasons behind the existence of many different processes. Another advantage is that explanatory case studies can provide replications for any research processes when necessary (Research Methodology, 2016c). One of the disadvantages of explanatory case studies is that they achieve low levels of certainty and thus may lead to improper conclusions. Secondly, when a correlation is found between two variables, in some cases, it is extremely difficult to determine which variable represents the impact and which variable represents the cause. The third disadvantage is that sudden coincidences in some situations may occur as cause-and-effect relationships (Research Methodology, 2016c). For instance, Punxatawney Phil, an American predictor, correctly predicted the winter duration for a period of five consecutive years. He had no forecasting powers, however; it was just a coincidence (Research Methodology, 2016c).

Other case study approaches mentioned by McDonough and McDonough (1997) are the interpretive and evaluative case study approaches. In interpretive case studies, the researcher interprets the data based on conceptual categories. The researcher then challenges any assumptions that are produced. In evaluative case studies, the phenomena that are found in the data are evaluated by the researcher.

The researcher in this thesis chose the exploratory case study approach since it would allow him to explore new ideas, to gain new knowledge and information of the occurring phenomenon, and to obtain new perceptions. The exploratory case study allowed the researcher to focus on exploring and observing the phenomenon in depth in the current situation of the diabetes clinics of the selected hospitals in Jordan. This focus provided a clear and comprehensive understanding of the phenomenon. Exploratory research also helps in exploring new ideas about a phenomenon. It attempts to explore research questions, and it assists in forming the research design, the sampling of the study, and the methods of data collection (Singh, 2007). The researcher also chose exploratory case study in this research project due to its advantages (Research Methodology, 2016b). One of these advantages is that exploratory case studies effectively assist in understanding a phenomenon in a research and assist in forming the suggested future research. Another advantage is that such studies are adaptable and flexible. Additionally, exploratory case studies can include many resources and save the researcher time when selecting the research types; saving time is significant at the beginning of the research project (Research Methodology, 2016b).

2.2.4 Research Reasons for Choice of Methods

The researcher employed mixed methods research (Saunders et al., 2009). The quantitative and qualitative methods were both employed since they produce different and potentially complementary responses. Mixed methods research was chosen for this research project due to the following reasons outlined by the Patient Centered Medical Home (PCMH) Research Methods Series (2013):

- **The mixed methods reflect the points of view of the involved participants.** They allow the researcher to study the participants' views comprehensively and ensure that the findings arising from the studies are based on the experiences of the participants.
- **The mixed methods collect comprehensive and rich data.** The mixed methods allow the integration of quantitative and qualitative information when data is collected. For example, a researcher may describe the demographic context of a healthcare system running in a particular country by listing some numerical quantitative data (e.g. percentages of the disease incidence, percentages of mortality) and integrate that data with the qualitative data (e.g. descriptions, figures, images, highlights, diagrams).
- **The mixed methods provide comparisons between the quantitative and the qualitative data.** Mixed methods are extremely beneficial in comprehending any

contradictions in the results or findings due to the combination of quantitative results and qualitative findings.

- **The mixed methods provide methodological flexibility.** Mixed methods are extremely appropriate, adaptable, and flexible methods for many studies, such as randomised trials and observational studies, where more information can clarify the results of quantitative research.
- **The mixed methods enhance scholarly interaction.** Mixed methods enable multidisciplinary team research, and the collaboration of quantitative, qualitative, and mixed methods scholars produces a breadth of knowledge.

The quantitative approach is based on statistical testing wherein selective information generated from the conducted questionnaires of this research is converted to numerical data (see Appendix (A)). The qualitative approach generates non-numerical data from the conducted interviews. This approach is known as a thematic approach (see Appendix (B)).

The generated data that is related to the adopted theoretical factors is scaled from 1 to 5, which means numerical data is obtained as well. Other types of the generated data, namely the demographic information data, are scaled using different numerical scales (see Appendix (A)).

The questionnaires involved in this research were adopted from Mirza (2009). The researcher developed his own additional questionnaires based on the findings obtained from the literature in Gustafson and Shuyler (2003); Kerr et al. (2007); Abidi (2008); Morr and Subercaze (2009); Beath et al. (2012); Chen (2013); and Drus et al. (2013). The interview that was used in the research was also adopted from Mirza (2009).

2.2.5 Research Time-Frame (Time Horizons)

Saunders et al. (2009) define the time horizon as the time framework in which the research must be completed. In this research, the researcher chose a cross-sectional time horizon since data was only distributed to the respondents once and only collected from them once within the specific time window of the primary research that was carried out in the diabetes clinics of the selected hospitals in Jordan. The principle of the cross-sectional time horizon is that data is not repeatedly distributed and collected, but distributed and collected only once within a particular determined period of time. This timing process is called ‘snapshot’ time, and it is selected when a research study on a specific phenomenon is carried out within a specific period of time (Flick, 2011). In this case, the researcher was given six months to conduct the primary research in Jordan. When he started to approach the diabetes clinics of the selected Jordanian hospitals, he formed a time frame in which his visits to these hospitals would be performed. Within this articulated time frame, he visited the selected hospitals sequentially (hospital by hospital). In each particular hospital, the researcher distributed the questionnaires once only to each volunteering respondent, and then the researcher collected the questionnaires once only from these respondents by a predetermined specific time (e.g. after a few weeks), thus completing a single hospital. Conversely, the researcher did not select the longitudinal time horizon since there were no repetitions in distributing the questionnaires to the respondents, and no repetitions in collecting the data from them. Additionally, the researcher had a specific period to complete the primary research. The objective of the longitudinal time horizon is to ensure that the data is repeatedly collected over an extended period of time (Goddard & Melville, 2004). This objective did not align with the primary research pertaining to this research. The longitudinal time horizon is chosen when a change in a significant factor or in several factors of the research is being tested over an extended time (Goddard & Melville, 2004). The longitudinal time horizon thus allows researchers to make use of the research study change in order to ensure its development. Some controls are allowed to be established over the research data variables that are being studied. The longitudinal time horizon does not rely on a particular research methodology or on a particular research approach (Saunders et al., 2009).

2.2.6 Research Techniques and Procedures

2.2.6.1 Secondary Research: Literature Review Methods

The secondary data (literature review) is related to the data and information type. Namely, secondary data has been published previously in books, journals, newspapers, magazines, online portals, or some other format (Research Methodology, 2016d). The purpose of the secondary research is to attempt to develop and define the research questions and, at the same time, to explore a suitable research method for collecting the data (Burns & Grove, 1997). The literature review assists in determining any encountered gaps in existing knowledge relevant to the research problem, and it reveals possible methods or solutions to reduce these gaps (Coughlan et al., 2007).

A literature review should provide in-depth and comprehensive knowledge with sufficient criticism around a topic. Most of the conducted studies referenced must be up-to-date (i.e. less than five years old). Exceptions are acceptable when there is a lack of research in an area that may necessitate citing references that are more than five years old. Exceptions may also include sources that are technically outdated but closely related to the topic under study (Coughlan et al., 2007). For instance, to the best knowledge of the researcher, only a limited number of studies have integrated the domains of knowledge management, healthcare, and information overload. However, each single domain has itself extensive literature in many disciplines other than healthcare. Therefore, most of the studies cited in this thesis are less than five years old.

The studies cited in literature reviews should be compared with each other in order to identify the weaknesses and gaps arising from them (Burns & Grove, 1997). Accordingly, the studies that this thesis reviews are efficiently criticised, and their strengths and limitations are highlighted and clearly described.

When the problem of the research is defined, and when the literature review is discussed and criticised, the theoretical framework should be introduced by the researcher (Bassett & Bassett, 2003). This implies that the definition of the research problem and the literature review be based on the theoretical framework. Theoretical frameworks can be a confusing concept for both experienced and novice researchers since defined theoretical frameworks are not used in all studies (Robson, 2002). Theoretical frameworks represent a conceptual approach that guides researchers throughout their studies (Dale, 2005). Theoretical frameworks might also be themes that have been derived from the literature research and are used to map and set the research boundaries (Miles & Huberman, 1994). The concepts and the relationships of themes can be identified by an efficient theoretical framework, but that theoretical framework has to be clearly defined and described for the reader.

In this research, the following steps were followed to collect information and studies from the literature:

- Identify the important research key domains in this research.
- Obtain the secondary data from different types of sources such as books, journals, magazines, conference papers, theses, white papers, electronic sources (e.g. web sources), and other resources obtained from the library of Staffordshire University.
- Narrow down the literature from generic themes to specific themes.

2.2.6.2 Primary Research: Data Collection Methods and Techniques

Primary data is data that did not exist prior to the study, or at least that had never been published before. Primary data is critically analysed to explore answers to the particular questions that are involved in a research that includes research questions (Research Methodology, 2016a). Data collection was an important part of conducting this thesis. According to the SearchCIO (2016), 'Data collection is the systematic approach to gathering and measuring information from a variety of sources to get a complete and accurate picture of an area of interest'. The research method that was used to collect the quantitative data in this research is the opinion-based research method, which was adopted from Sillars and Hallowell (2009). The reasons behind using this method are that it is considered low cost, simple, and fast. The opinion-based research method uses scales to gauge emotions and opinions, and the resulting data is used to solve the research problem. This type of research method is suitable for collecting quantitative data, as a sufficient amount of information can be collected within a short time (Shuttleworth, 2008; Sillars & Hallowell, 2009).

In terms of the qualitative data, this research used the qualitative research interview method, which was adopted from Gill et al. (2008). The reason behind using the interview method is that it is a useful method that can obtain detailed and in-depth information from interviewees based on their acquired experiences. Interview data can assist the researcher in exploring the experiences, motivations, views, and beliefs of participants in more detail (Gill et al., 2008). This type of research method is, however, more difficult to conduct than the other type since it is based on meaningful and factual descriptions that are required to be covered when conducting an interview.

The research technique that was used for the quantitative data is the questionnaire technique (Cyfar, 2017). This technique is a practical and a fast way to anonymously and easily collect and analyse data (Cyfar, 2017).

The research technique that was used for the qualitative data is the interview technique (Cyfar, 2017) since it encourages open-ended responses and prompts a clear and focused discussion (Cyfar, 2017). Interviews facilitate the comparison and analytical processes. The purpose of conducting an interview is to allow the researcher to investigate comprehensive and in-depth accounts of participants' experiences, opinions, views, motivations, and beliefs. Interviews support in-depth understanding of the current phenomenon; in contrast, the questionnaire technique related to the quantitative approach generates only numerical data without narrative details (Silverman, 2000; Gill et al., 2008). Interviews are ideal for observing and studying sensitive topics, especially if participants would prefer not to be interviewed in a group form, but individually; participants in individual interviews may feel more comfortable expressing more in-depth information (Gill et al., 2008).

The questionnaires involved in this thesis were adopted from Mirza (2009). The researcher developed his own additional questionnaires based on the findings obtained from the literature of Gustafson and Shuyler (2003); Kerr et al. (2007); Abidi (2008); Morr and Subercaze (2009); Beath et al. (2012); Chen (2013); and Drus et al. (2013). The interview format that was used in the research was also adopted from Mirza (2009).

There are three essential types of the interview technique, namely the structured, semi-structured, and unstructured interview (Gill et al., 2008). In structured interviews, the list of questions is fixed, predetermined, and verbally administered. These predetermined questions are asked to the interviewees by the interviewer, who is the only one allowed to steer the conversation. Administering such interviews is fast and simple. In this type of interview, certain responses to the predetermined questions must be clarified in more detail (Gill et al., 2008). This type of interview generates responses from the interviewees that are easy to analyse since there is no rich information given; only limited responses are obtained from the interviewees, and little to no depth is provided (Gill et al., 2008).

In semi-structured interviews, the list of questions is also fixed, predetermined, and verbally administered, but unlike structured interviews, semi-structured interviews allow both the interviewer and the interviewees to steer the conversation in order to provide more views that are valuable, more responses, and more ideas in detail (Britten, 1999; Gill et al., 2008). This type of interview, compared to structured interviews, provides richer information and supports exploring, identifying, discovering, and explaining the required areas in depth (Gill et al., 2008). The analyses of this type of interview can be, however, easily obtained responses from the participants since there are some other richer information provided, which are somehow not easily analysed since more depth in certain questions are provided (Gill et al., 2008).

Unstructured interviews do not have fixed questions, a list of predetermined questions, or even questions and ideas that were organised in advance (May, 1991; Gill et al., 2008). Unstructured interviews start with a simple opening question such as ‘Can you tell me more about what you experienced when visiting the diabetes clinics?’ The interviewees will respond based on that simple question. This type of interview is difficult to manage since it provides the richest information from the participants compared to the structured and the semi-structured interviews. It is also very time-consuming, sometimes lasting several hours. Additionally, the rich information obtained is unorganised in comparison with the information from the other two indicated types of interviews since there is no list of fixed and predetermined questions (Gill et al., 2008).

The researcher in this research chose to conduct semi-structured interviews due to some of the reasons mentioned by Gill et al. (2008):

- The first reason is that the semi-structured interview is the most widely used interview type in general and especially in the healthcare industry since it provides some instructions and guidance to the interviewees, it helps respondents to know what to talk about, it provides richer information, and it supports exploring, identifying, discovering, and explaining the required areas in depth (Gill et al., 2008).

- The second reason is that this type of interview allows both the interviewer and the participants to steer the conversation, which allows richer information to be obtained despite the use of listed questions. In short, the semi-structured interview allows both parties to explore and highlight in-depth and comprehensive ideas and views that are important and that have not been explored previously. According to Parahoo (2006), semi-structured interviews allow researchers to achieve substantial depth in exploring and investigating sensitive and complex problems related to important questions.

Based on these reasons, the researcher chose to conduct semi-structured interviews in this research to explore and investigate the research topic with greater understanding and detailed depth.

2.2.6.3 Data Collection Process

In this research thesis, consent letters were obtained from the diabetes clinics of seven selected hospitals (A, B, C, D, E, F, G) in Jordan. The hospitals agreed to this research study being conducted in their diabetes clinics. The researcher was informed upon approaching the hospitals that the number of medical staff was limited. Thus, the number of consenting hospitals was suitable for the researcher to conduct his primary research, as the number of results to be clarified would not be excessive.

The data collection process for the quantitative and qualitative data gathered from these clinics of the selected hospitals in Jordan progressed as follows:

- The questionnaires were disseminated to respondents with different educational levels at the diabetes clinics in person.
- The questionnaire data responses were collected from respondents from each hospital in person. The obtained sample size of respondents reached 327 respondents (i.e. 72 medical administrators, 115 doctors, and 140 nurses). Both male and female participants were all 18 years or older.
- In terms of the interview data collection, the researcher chose a subset of medical experts in the field (i.e. a subset of medical administrator experts, a subset of doctor experts, and a subset of nurse experts) from the overall resulted sample of 327 respondents. This selection took place after completing the quantitative data collection. The selection process of choosing a subset of medical experts in the field

was performed by selecting a minimum percentage of 10% of the respondents from the 327 respondents, with a minimum of 11 experts from each positional type (i.e. medical administrator experts, doctor experts, and nurse experts), reaching a total minimum of 33 experts. The number of experts who volunteered to participate in the interviews reached 40 respondents from the entire sample.

A smaller sample for interviews was chosen for two main reasons.

- Firstly, gathering in-depth qualitative data is more time-consuming as each expert provides in-depth information to what is really occurring in the current hospitals situation in Jordan.
- Secondly, the administrators of the selected hospitals in Jordan claimed that the number of experts from the diabetes clinics of the selected hospitals is limited.

In terms of the quantitative approach (i.e. the questionnaire), the information obtained comprised the demographic information of the medical staff and responses to the questions corresponding to the eight adopted factors of the research theoretical framework, which was derived from the literature as shown in Figure 2.6. Each of these factors corresponded to a maximum of five questions.

In terms of the qualitative approach (i.e. the interview), further in-depth information related to the interview was obtained from them via face-to-face documented comments. The interview that was carried out was documented via handwritten notes since the majority of the medical staff respondents refused to have their voices recorded and preferred to produce written answers to questions related to the interview. This information was obtained to explore in depth the problems arising from information overload within the respondents' medical environment.

2.2.6.4 Data Analysis Methods for Quantitative and Qualitative Data

According to Kalpesh (2013),

> 'Data analysis is a process used to inspect, clean, transform and remodel data with a view to reach a certain conclusion for a given situation. Data analysis is typically of two kinds: qualitative or quantitative. The type of data dictates the method of analysis'.

The analysis of the data is an integral part of the research since analysis allows the researcher to understand in depth the problems arising from the research problem in the current phenomenon. Data analysis can allow a researcher to obtain meaningful insights from a large amount of data. It can also assist in providing an organised structure of the research findings based on many different types of analysed data (Kalpesh, 2013). The analytical method of the quantitative data that was conducted in this research was the Statistical Package for the Social Sciences (SPSS) software method, where certain statistical methods, namely the mean, the standard deviation, the Pearson correlation, and the Alpha Cronbach's, were used in order to provide a thorough and efficient analysis for the collected data. These statistical tests are likely to be used in any research employing questionnaires, as they assist the researcher in understanding where the data are and how the data are represented within a particular study.

The analysis and findings of this research provide an investigational summary of the collected data. The results are presented in a way that highlights the likely most significant features obtained from the findings. This presentation also assists the researcher in understanding, based on the findings, how reliable and consistent are the integrated sets of data.

The analytical method employed in analysing the qualitative data in this research is the narrative analysis method, which is adopted from Bamberg and Cooper (2012). The reason for choosing this method in analysing the qualitative data was to reformulate the detailed responses that were obtained from the interviewees based on the interviewees' acquired experiences in order to make the responses narratively presentable in a revised shape and in a clear form for the reader (Bamberg & Cooper, 2012).

2.2.7 Sample Selection Criteria

In most researches that include a population of participants involved in a phenomenon that exists in the real-word, a researcher must select sampling criteria that will simplify the process of data collection. According to Fink (2003), 'a sample is a proportion or subset of a larger group called a population. A good sample is a miniature version of the population of which it is a part – just like it, only smaller'. Additionally, Field (2005) defines the sample as 'a smaller (but hopefully representative) collection of units from a population used to determine truths about that population'. The meaning that can be drawn from both definitions is that a number of individuals who are involved in a study can be selected such that they can represent a larger group (population) and the particular environment that group is involved in. The purpose of sampling is to collect data from a population in such a way that implications can be generalised to the population as a whole. Sampling also assists the researcher in determining which participants can provide the research with the required information.

The objective of research sampling is to reduce workload, time, and cost when conducting a research while ensuring that the obtained results will have a known accuracy that can be mathematically calculated (Sharma, 2015). Figure 2.2 illustrates the importance of performing the sampling in a research (Sharma, 2015).

Get information about large populations

↓ Less costs

↓ Less field time

↑ More accuracy i.e. Can Do A Better Job of Data Collection

↘ When it's impossible to study the whole population

Figure (2.2): The importance of sampling (Sharma, 2015)

2.2.7.1 Types of Sampling and Definitions

In the social and behavioural sciences, sampling is divided into two main categories: probability sampling and purposive sampling (Teddlie & Yu, 2007). There are, however, other types of sampling such as convenience sampling and Mixed Methods (MM) sampling (Teddlie & Yu, 2007). Probability sampling and purposive sampling are briefly explained as follows:

- ***Probability sampling*** includes techniques that are used in quantitative (QUAN) research studies (Teddlie & Yu, 2007). Probability sampling involves 'selecting a relatively large number of units from a population, or from specific groups (strata) of a population, in a random manner where the probability of inclusion for every member of the population is determinable' (Teddlie & Yu, 2007). The aim of probability sampling is to achieve representativeness with reference to the degree by which the entire population is accurately represented by the sample (Teddlie & Yu, 2007).
- ***Purposive sampling*** includes techniques that are used in qualitative (QUAL) research studies (Teddlie & Yu, 2007). In purposive sampling, units such as institutes, organisations, groups of individuals, and individuals are chosen according to particular purposes that are based on providing answers to questions related to the research study (Teddlie & Yu, 2007). According to Maxwell (1997), in purposive sampling 'particular settings, persons, or events are deliberately selected for the important information they can provide that cannot be gotten as well from other choices'. It is also called purposeful sampling, qualitative sampling, or nonprobability sampling. Tashakkori and Teddlie (2003a) mention that the techniques in purposive sampling 'involve selecting certain units or cases based on a

specific purpose rather than randomly'. The typologies of this type of sampling have been presented by researchers such as Kuzel (1992), LeCompte and Preissle (1993), Miles and Huberman (1994), Patton (2002), and Teddlie and Yu (2007).

There are four types of the probability sampling techniques (Teddlie & Yu, 2007): the random sampling technique, the stratified sampling technique, the cluster sampling technique, and the sampling using multiple probability techniques. These can be defined as follows (Teddlie & Yu, 2007):

- ***Random sampling technique*** grants each sampling unit an equal chance of being included in the sample.
- ***Stratified sampling technique*** divides the population into strata, or into subgroups, such that every unit to be sampled goes to a single group only (e.g. high salary group, medium salary group, low salary group), and the units are then selected from those groups.
- ***Cluster sampling technique*** has each sampling unit represent a group (a cluster) instead of an individual. The representations of groups normally occur in such populations as schools, neighbourhoods, classrooms, or hospitals.
- ***Sampling using multiple probability techniques*** employs multiple quantitative (QUAN) techniques in the same particular research study.

In terms of purposive sampling, there are four techniques (Teddlie & Yu, 2007): sampling to achieve representativeness or comparability, sampling special or unique cases, sequential sampling, and sampling using multiple purposive techniques. Each of these purposive sampling techniques branch into several further types of techniques as shown in Figure 2.3.

A Typology of Purposive Sampling Strategies

A. Sampling to Achieve Representativeness or Comparability
1. Typical Case Sampling
2. Extreme or Deviant Case Sampling (also known as Outlier Sampling)
3. Intensity Sampling
4. Maximum Variation Sampling
5. Homogeneous Sampling
6. Reputational Case Sampling

B. Sampling Special or Unique Cases
7. Revelatory Case Sampling
8. Critical Case Sampling
9. Sampling Politically Important Cases
10. Complete Collection (also known as Criterion Sampling)

C. Sequential Sampling
11. Theoretical sampling (also known as Theory-Based Sampling)
12. Confirming and Disconfirming Cases
13. Opportunistic Sampling (also known as Emergent Sampling)
14. Snowball Sampling (also known as Chain Sampling)

D. Sampling Using Combinations of Purposive Techniques

Figure (2.3): Classifications of the purposive sampling techniques (Kuzel, 1992; LeCompte & Preissle, 1993; Miles & Huberman, 1994; Patton, 2002; Teddlie & Yu, 2007)

These types of sampling techniques were derived from many researchers such as Kuzel (1992), LeCompte and Preissle (1993), Miles and Huberman (1994), Patton (2002), and Teddlie and Yu (2007). The definitions of the four broad purposive techniques are given as follows (Teddlie & Yu, 2007):

- ***Sampling to achieve representativeness or comparability*** is applied when a researcher must (1) choose a purposive sample that includes cases of a broader group as representatively as possible or (2) provide comparisons for various case types.
- ***Sampling special or unique cases*** is applied when a researcher views a particular group of cases or an individual case as representing a main concern, rather than an issue.
- ***Sequential sampling*** employs the gradual selection principle. This principle is used (a) when a conducted research aims to define themes or create a theory or (b) when the development of the sample occurs on its own at the same time as the collection of data is being performed. Flick (1998) defines gradual selection as 'the sequential selection of units or cases based on their relevance to the research questions, not their representativeness'.
- ***Sampling using multiple purposive techniques*** involves using multiple quantitative (QUAN) techniques for the same particular research study.

2.2.7.2 Comparisons between Probability and Purposive Sampling

The main differences in the characteristics of the probability sampling strategy and the purposive sampling strategy are introduced in Table 2.2, which is taken from Teddlie and Yu (2007). As can be noticed from Table 2.2, several similarities exist between the two sampling types, both of which are designed to answer the research questions being investigated by providing a sample that includes respondents in a particular phenomenon. It can also be seen in Table 2.2 that the purposive sample is aimed at selecting a small number of cases from which the richest information can result regarding a certain phenomenon. In the probability sample, a large number of cases (groups) are chosen such that the population of interest is representing this number of cases.

Table (2.2): Comparison of the characteristics of the purposive and probability sampling techniques (Teddlie & Yu, 2007)

Comparisons Between Purposive and Probability Sampling Techniques

Dimension of Contrast	Purposive Sampling	Probability Sampling
Other names	Purposeful sampling Nonprobability sampling Qualitative sampling	Scientific sampling Random sampling Quantitative sampling
Overall purpose of sampling	Designed to generate a sample that will address research questions	Designed to generate a sample that will address research questions
Issue of generalizability	Sometimes seeks a form of generalizability (transferability)	Seeks a form of generalizability (external validity)
Rationale for selecting cases/units	To address specific purposes related to research questions The researcher selects cases she or he can learn the most from	Representativeness The researcher selects cases that are collectively representative of the population
Sample size	Typically small (usually 30 cases or less)	Large enough to establish representativeness (usually at least 50 units)
Depth/breadth of information per case/unit	Focus on depth of information generated by the cases	Focus on breadth of information generated by the sampling units
When the sample is selected	Before the study begins, during the study, or both	Before the study begins
How selection is made	Utilizes expert judgment	Often based on application of mathematical formulas
Sampling frame	Informal sampling frame somewhat larger than sample	Formal sampling frame typically much larger than sample
Form of data generated	Focus on narrative data Numeric data can also be generated	Focus on numeric data Narrative data can also be generated

Another comparison can be seen in the methodological trade-off between the two types of sampling in terms of the size of sample. In purposive sampling, information is obtained in greater depth from a smaller number of cases. In probability sample, information is obtained with greater breadth from a larger number of selected and representative cases of the population (Patton, 2002).

Miles and Huberman (1994) mention that ‘just thinking in sampling-frame terms is good for your study’s health’. In purposive sampling, Mason (2002) defines the sampling frame as ‘a resource from which you can select your smaller sample’. Based on this definition, another difference can be picked from Table 1.2. The difference is that purposive sampling frames are considered informal, to be used as a supportive tool that allows the researcher to identify available resources, or to help chosen experts provide judgements of the research study. Probability sampling frames, however, are formal where a large number of units who provide observations is distributed.

2.2.7.3 The Choice of Sample Selection in the Research

The researcher in this research opted to select a combination of sampling techniques that are based on the probability sampling techniques and the purposive sampling techniques. This combination of choice is Mixed Methods (MM) sampling. It is defined by Tashakkori and Teddlie (2003b) as ‘a phase of study that includes three stages: the conceptualization stage, the experiential stage (methodological/analytical), and the inferential stage'. These stages can be of quantitative (QUAN) or qualitative (QUAL) strands of study. Transformation can also occur during the study by shifting from one type to the other. In Figure 2.4, an illustration of the purposive-mixed-probability sampling continuum technique is given.

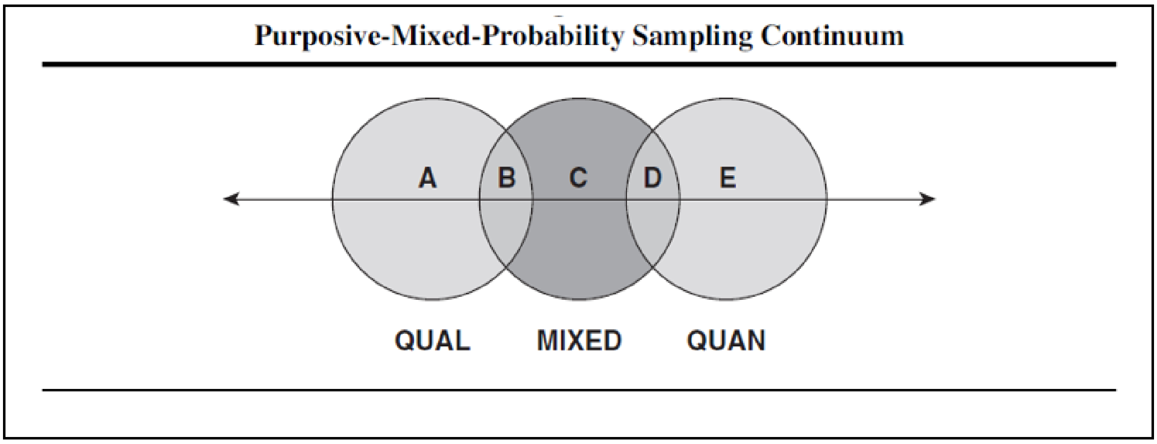

Figure (2.4): An illustration of the purposive-mixed-probability sampling continuum technique (Teddlie, 2005; Teddlie & Yu, 2007)

In Figure 2.4, Zone A represents qualitative research, which includes purposive sampling. Zone E represents quantitative research, which includes probability sampling. In Zone D, a primarily quantitative (QUAN) research is represented, but one with some components of the qualitative (QUAL) research. In Zone C, integrated Mixed Methods (MM) research and sampling are represented. The arrow is a means to introduce the purposive-mixed-probability sampling continuum technique. Toward the middle of the sampling continuum, a greater integration of the sampling and research methods is taking place. Toward the edges of the sampling continuum, the elements of QUAN and QUAL research are more distinct, or more separated.

The researcher chooses the purposive-mixed-probability sampling continuum technique that is adopted from Teddlie and Yu (2007). The reason behind this choice is due to the following points:

- Using the continuum can generate both numeric and narrative types of data, which supports the aim of the researcher in choosing mixed method data collection. Using the continuum, and thereby generating data that can complement each other, ensures that in-depth and comprehensive information can be gathered from the respondents.
- In a Mixed Methods study, there are many samples, and those samples can differ from each other in terms of size based on the research questions and strand (i.e. quantitative or qualitative). Samples can range from a small number of cases (groups of hospitals, schools, universities, etc.) to a large number of units (respondents)

(Teddlie & Yu, 2007). In this research, which uses a medical healthcare example, seven hospitals in Jordan agreed to have this study conducted at their diabetes clinics. The researcher gave the questionnaires to all the respondents from all the diabetes clinics of those hospitals, reaching 327 respondents at the end who had been randomly selected. This was followed by interviewing respondents of a subset of medical experts (medical administrators, doctors, and nurses) in the field. In total, 40 respondents were employed in the final stage of the interview process. This subset of 40 medical experts was chosen from the whole sample of 327 respondents by having at least a minimum of 10% of expert respondents in the field (i.e. a total minimum of 11 expert respondents from each of the three different positional types, or 33 expert respondents minimum in total).

2.2.8 Research Design

The research design combines the argument and the theory that inform the empirical data collection and the research (Frankfort-Nachmias & Nachmias, 2008). Thorpe et al. (2002) describe research design as organising the activity of the research, including the data collection, in such a way that the research aims of a research are likely to be achieved. The research objectives form a significant basis in determining the research design and the research methodology (Al-Rawajfah, 2010).

The selected design in a research must suit the particular research questions and research objectives. Based on that, Tharenou et al. (2007) suggest that beginning a research by defining the research questions and research objectives, then selecting the research design after that.

The primary advantage of the research design is that it assists a researcher in producing a general outline for the data collection and the data analysis of a conducted study (Iacobucci & Churchill, 2009). There were ten steps involved in this study's research design (see Figure 2.5).

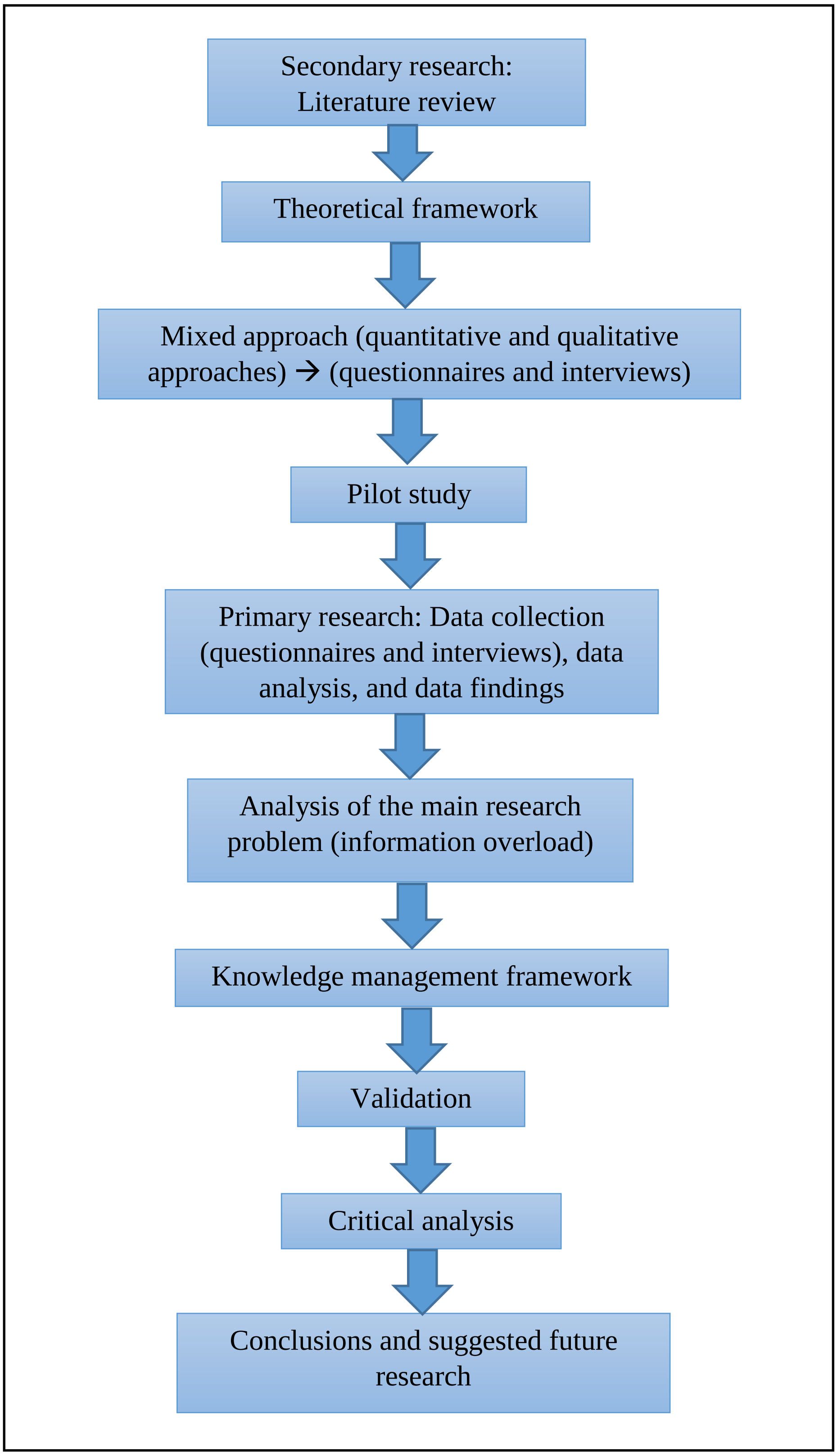

Figure (2.5): The research design

The first step was the secondary research (literature review); in this step, previous studies in the literature were critically examined. In the second step, the theoretical framework was derived from the literature review. In the third step, the questionnaires and interviews, which were both employed under the mixed approach in this research, were formed based on the theoretical framework. In the fourth step, a pilot study was performed to ensure good reliability of the questionnaires before the responses of the participants were analysed and assessed. In the fifth step, the primary research (i.e. the data collection, data analysis, and formation of data findings) was carried out. In the sixth step, the main research problem was thoroughly analysed and discussed, and some of the important research questions were answered as a result. In the seventh step, a new knowledge management framework was proposed. The framework's aim is to reduce the information overload that is arising in the diabetes clinics of the selected hospitals in Jordan. In the eighth step, the research validation was conducted. In the ninth step, a critical analysis and evaluation of the entire research was carried out. Finally, in the tenth step, the conclusions and suggested future research were outlined.

2.2.9 The Development and Distribution of the Research Instruments

2.2.9.1 An Overview of the Development of the Research Instruments

Obtaining suggestions and comments from a group of different appropriate experts should develop the validity of the instruments to the highest levels and produce the required alterations prior to conducting the pilot testing (Saunders et al., 2009). The instruments employed during the primary research in the clinics of the selected hospitals in Jordan were questionnaire and interview. The questionnaire and interview questions for this research were based on questionnaires and interviews originally designed by Jordanian expert lecturers in the field from Jordanian universities. The instruments, after modification by the researcher, were assessed by several experienced Jordanian lecturers from computing faculties in two different universities in Jordan. This number of Jordanian experienced lecturers was reached based on the availability of these lecturers and based on their consent to participate in the pilot study. Additionally, the number of selected universities was small due to the time limitation that affected the researcher. Detailed and comprehensive discussions of the instruments were conducted by these lecturers. The lecturers developed these instruments to ensure a high level of validity, correctness, comparability, and appropriateness. After that, comments, views, and opinions were given about the instruments in order to develop the instruments further to ensure that they would be clear and readable. Finally, approval was given by these lecturers.

The researcher employed the questionnaire and interview methods to explore in depth the problems arising from information overload (Nicolini et al., 2008; Delen & Al-Hawamdeh, 2009; Beath et al., 2012; Chen, 2013; Drus et al., 2013) within the particular medical environment. The instruments supported the data analysis. The data analysis, in turn, explored the gaps in knowledge about the causes behind the information overload in the diabetes clinics of the selected hospitals in Jordan. Exploring these gaps during the primary research made it possible to develop a knowledge management framework that could reduce information overload in these clinics. Therefore, these instruments were tested to ensure their validity and reliability. This testing prepared the instruments before they were efficiently distributed for the data collection stage. Using both methods together can produce different responses that complement each other (Harris & Brown, 2010). Both methods were thus used in this research. The respondents were approached in person since this enabled the researcher to more fully understand the problems related to information overload in the respondents' surrounding environment than simply requesting their responses online would have. The structure of the questionnaires was based on the developed factors (see Chapter 2, Figure 2.6).

2.2.9.2 The Contents of the Research Instruments

The research instrument used one set of questionnaires and one set of interviews. The set of questionnaires contains nine sections. This set was specifically designed for the medical respondents who are working in the diabetes clinics of the selected hospitals in Jordan. The set of interviews contains six questions, which were also designed for the same medical respondents in order to explore in-depth and comprehensive details about the involved study during the interview sessions. The questionnaires that were involved in this research were adopted from Mirza (2009). Additionally, the researcher developed his own additional questionnaires based on the findings obtained from Gustafson and Shuyler (2003); Kerr et al. (2007); Abidi (2008); Morr and Subercaze (2009); Beath et al. (2012); Chen (2013); and Drus et al. (2013). The interview that was used in the research was also adopted from Mirza (2009).

The set of questionnaires was divided into nine main sections of different questions derived from the literature. The first section (see Appendix A, Section A) requested the general demographic information of the respondents. The objective was to define the backgrounds of the respondents so that the researcher could have an idea of whom he was approaching. The second section (see Appendix A, Section B) was about the respondents' expertise with regards to the new medical knowledge in their clinics. The objective was to explore the extent of experience and knowledge gained by the respondents when new medical knowledge arises. The third section (see Appendix A, Section C) was about the regularity with which medical data is recorded into medical records. The objective was to investigate the extent of the regularity in recording the data by the respondents in their clinics. The fourth section (see Appendix A, Section D) was about how information is held and shared in the clinics. The objective was to determine the extent of sharing the right information properly on a regular basis and the extent of how the information is being held by the respondents in their clinics. The fifth section (see Appendix A, Section E) was about the improved working plan in these clinics. The objective was to investigate the extent of time management and working regularity in these clinics. The sixth section (see Appendix A, Section F) was about improving efficiency via enhancements to the clinics in light of the latest knowledge in the clinics. The objective was to learn the extent to which the efficiencies of the clinics could be enhanced regarding the new arising medical knowledge. The seventh section (see Appendix A, Section G) was about improvements in sharing the knowledge in the clinics. The objective was to learn the extent to which proper sharing of the new medical knowledge exists in these clinics. The eighth section (see Appendix A, Section H) asked about improvements to the process of dealing with the latest medical knowledge in these clinics. Finally, the ninth section (see Appendix A, Section I) comprised the improvement of the security in these clinics. The objective was to learn the extent of the security protection of the knowledge held in these clinics.

The set of the interviews consisted of six questions (see Appendix B). The objective of the first question was to learn about the type of knowledge that is drawn upon in the diabetes clinics when a patient with diabetes is being diagnosed. The objective of the second question was to learn about the way the clinics' knowledge strategy helps the respondents to improve their medical actions when dealing with their patients. The objective of the third question was to learn about the state-of-the-art technologies that are being used by the respondents to help them manage their knowledge. The objective of the fourth question was to obtain suggestions from the respondents about ways and methods of reducing the information overload in their clinics. The objective of the fifth question was to determine the satisfaction or dissatisfaction of respondents with each clinic's current knowledge management system, to identify the reasons behind respondents' satisfaction or dissatisfaction, and to learn about respondents' ideas and possible solutions for improving the system. Finally, the objective of the sixth question was to obtain the respondents' ideas about how to improve time management in the diabetes clinics of the selected hospitals.

2.2.9.3 The Content Validity and the Construct Validity of the Research Instruments

Validity in a conducted research refers to 'the view that it was essentially a demonstration that a particular instrument measures what it purports to measure' (Cohen et al., 2005). Validity is also defined by Hair et al. (2006) as 'the degree to which a measure accurately represents what it is supposed to measure'. The content and construct validity in this research ensured the validity of the questionnaires prior to the start of the data collection.

Content validity is defined by Bollen (1989) as ‘a qualitative type of validity where the domain of the concept is made clear and the analyst judges whether the measures fully represent the domain’. Based on this definition, Drost (2011) describes content validity in qualitative research as the assurance that indicators represent a concept meaning as defined by a researcher. Hardy and Bryman (2004) argue that the judgements of experts could be useful to create and ensure content validity in a research. Additionally, Straub et al. (2004) mention that the components of the content validity are the literature review and judges or a panel of experts. In this research, the content validity of the questionnaires was ensured via a comprehensive literature review that examined the domains of knowledge management, healthcare, and information overload and via the judgements of a number of academic experts who were chosen from two universities in Jordan. The content validity of the questionnaires in this research was assessed based on two ways adopted from Drost (2011):

- The researcher asked the academic experts a number of questions about the research instrument (questionnaire) in terms of readability and clarity and about the way the set of questionnaires is likely to be tested.
- The researcher asked the expert judges for their opinions in the chosen set of questionnaires in terms of meaningfulness, effectiveness, appropriateness, and usefulness.

Several issues arose during the assessment process regarding the content validity:

- Feedbacks and decisions on the final wording of the questionnaires were time-consuming due to the number of questions.
- Some experts were extremely busy and had to leave the hall in the middle of the session in order to perform other academic tasks.
- Judgement meetings had to be scheduled at other times on other days to accommodate the lecturers who left the questionnaire judgement in the middle of the session.

Rattray and Jones (2007) define construct validity as ‘how well the items in the questionnaires represent the underlying conceptual structure’. Construct validity thus concerns how well the construct is measured by the items (Straub et al., 2004). For this type of validity, the Cronbach’s alpha formula (Institute for Digital Research and Education, 2015) was used to measure the internal consistency (reliability), which is extremely common when there are questionnaires consisting of multiple questions of scale, and when testing whether these scales are reliable or not (Laerd Statistics, 2015). The Cronbach’s alpha values vary from 0 to 1, where values greater than or equal to 0.7 indicate that construct validity is acceptable (George & Mallery, 2003). The Cronbach's alpha reliability test was performed for the eight theoretical factors on which the questionnaires were based. It was found that all scales of the eight theoretical factors of the set of questionnaires resulted in values greater than 0.7, i.e. in a satisfactory Cronbach's alpha value for all items. A Cronbach's alpha value of 0.951 resulted overall, indicating an 'Excellent' reliability of the internal consistency. This assessment is in light of the acceptable value given by George and Mallery (2003). Additionally, the eight theoretical factors were confirmed by the literature review and by the expert judges.

The reasons behind conducting the Cronbach's alpha test were to identify the degree of clarity of the questionnaires, to investigate the questionnaires' relationships with each other, and to allow this study to ensure a clear understanding of the research validity.

Issues that might compromise construct validity include the following (Brown, 2000):

- Lack of a pilot test.
- Lack of a validity analysis.
- An insufficient number of items.
- Lack of reliability studies in the research.
- Poorly written items.
- Lack of procedures for item analysis.

2.2.9.4 The Distribution of the Research Instruments

The questionnaires and interviews were conducted by the researcher by approaching the respondents in person (face-to-face) in the diabetes clinics of the selected hospitals in Jordan. First, the questionnaires were distributed on paper sheets by the researcher to the respondents individually. The researcher attempted, however, to group the respondents in order to best use time, but unfortunately, the respondents preferred to participate in the questionnaires individually (privately) so that they can take their full convenience in sharing their opinions and views with the researcher. Additionally, the respondents were extremely busy with other required medical tasks in their clinics, which prevented the researcher from grouping them when conducting the survey. Second, the interview questions were distributed on paper sheets to the respondents in person and individually. Some respondents from each of the participating hospitals volunteered for the interview. Fewer respondents participated in the interview because, as noted, respondents were busy with important medical tasks; most respondents' schedules prevented them from participating in a qualitative research that required detailed and in-depth answers.

2.2.9.5 The Participants and Definitions of Their Roles

When the researcher approached the intended clinics of the selected hospitals in Jordan, the hospital administrators of each hospital defined the members who staff the working environment in these hospitals.

- **Medical administrators** in these hospitals are medical experts in the diabetes field (Head doctor and Charge nurse at the different hospitals). They are experienced in medical management, leadership, and communication skills within the medical organisation.
- **Doctors and outpatient doctors** in diabetes clinics of these hospitals are Endocrinologists.
- **Nurses** in these hospitals are normal employed nurses and undergraduate nurses. Nurses normally work in the hospitals or in outpatient clinics.

The administrators of these hospitals also gave the following definitions of these participants' roles in the diabetes clinics of the selected hospitals in Jordan:

- **Medical administrators' roles** are to provide supervision, management, and assistance to the normal nursing staff in emergency cases when treating patients. Their roles also involve providing care for patients with diabetes and delivering administrative support.
- **Doctors and outpatient doctors' roles** involve offering diagnosis and treatments for patients with diabetes and performing operations if required. Doctors and outpatient doctors are also involved in admitting and discharging patients from hospitals and prescribing medications. Additionally, they are involved in educating patients with diabetes about daily medical needs and healthy life styles.
- **Nurses' roles** involve providing care to patients with diabetes by monitoring, investigating, and observing patients' conditions, managing intravenous lines, and assisting and communicating with doctors, in particular by taking part in severe operations, maintaining patients' records, obtaining symptoms and family histories of patients with diabetes, and educating patients and their families to help patients to adopt a healthier life style aimed at disease prevention, and monitoring the progress and recovery of the patients.

2.2.9.6 Libraries in Certain Hospitals: The Roles and Services Provided by the Librarians in the Selected Jordanian Hospitals

Unfortunately, as pointed out by some administrators of the selected hospitals in Jordan, not all hospitals in Jordan have medical libraries. The researcher made a visit to the medical libraries in some of the selected hospitals in Jordan and found that the libraries are small in size, such that each room in particular hospitals can barely fit 10-15 persons. The administrators of some of these hospitals in Jordan informed the researcher that the librarians aim to do the following:

1) To disseminate the new medical knowledge in a particular time to the medical staff when this knowledge is received by the healthcare knowledge providers in the form of documents, journals, magazines, medical brochures, medical conferences, and most often through emails.
2) To collaborate with health knowledge providers in providing health education for patients.
3) To provide lists of attendees and absences for the employees who are working in their departments.
4) To provide reports to the management departments of the hospitals about new or upcoming medical conferences, etc.
5) To arrange agendas for doctors meeting with visiting doctors or for medical workshops (if any).
6) To control the information that is held in the hospitals' library and to protect the information from unauthorised persons.

According to the hospitals' administrators, the librarians in the selected hospitals in Jordan provide the following services:

1) Granting access to hospital information for any authorised medical staff.
2) Granting access to available medical conferences and journals.
3) Allowing the medical staff to access printing facilities at all times.
4) Providing medical educational magazines for the medical staff and patients.
5) Providing medical books and other medical materials for the medical staff.
6) Issuing medical cards and generating emails for any new medical staff to be hired in the hospitals.

Several disadvantages prevent the librarians in some of these clinics from fully or effectively complying with their responsibilities. The hospitals' administrators observed that these disadvantages are likely to perpetuate information overload in the clinics. These disadvantages comprise the following:

1) The librarians struggled to share new medical knowledge with the right people. According to the verbal claims of the hospitals' administrators, this struggle is due to the large amount of information that arrives to the library and to the

hospitals in unorganised ways and to the failure to organise and categorise that information on a regular basis.

2) In a few of the selected hospitals, there are some librarians who are not committed to their work duties. For instance, the researcher visited those libraries in order to ask for a particular assistance related to the primary research; the researcher had to wait a long time to see the librarians.
3) The hospitals' administrators also claimed that that newest medical knowledge is missing, and is mixed with unrelated information, and consequently, these led to information overload.
4) The hospitals' administrators claimed that medical staff rarely visited the library due to work pressure.
5) According to the claims made by the Head Medical Administrator in Jordan, there are insufficient librarians in the hospitals, and these librarians are not providing and disseminating new medical knowledge to the medical staff in these hospitals. The reason given by the Head Medical Administrator is that most of these librarians are extremely busy with other managerial tasks related to their hospitals. This affects most of the medical staff in these hospitals because they do not receive the new correct medical knowledge because it is not being disseminated from the librarians and resulting issues in information overload.

2.2.10 Theoretical Framework

Even empirical research must be based on sound theories. The theoretical framework of this research consisted of six factors based on the findings adopted from the literature reviews in Gustafson and Shuyler (2003); Kerr et al. (2007); Abidi (2008); Morr and Subercaze (2009); Beath et al. (2012); Chen (2013); and Drus et al. (2013). The theoretical framework of this research is illustrated in Figure 2.6. Six adopted factors formed the first phase of the theoretical framework, which is based heavily on secondary research (see Figure 2.6). The first factor, the resources factor, can be classified into three sub-factors: the expertise factor, the data factor, and the information factor. These three sub-factors are the basic integrated elements in any healthcare organisation where data must be converted into codified information by medical experts. Further, persons with expertise are themselves a resource since they are knowledge holders of the medical information. The second factor is the improved work ability planning factor. The third factor is the diabetes clinics' improved efficiency factor. The fourth factor is the improved knowledge conversion (externalisation) and sharing factor. The fifth factor is the improved organisations' process factor. The sixth factor is the improved organisations' protection factor. These factors are evaluated and analysed based on the primary research elaborated upon in Chapter 6. The theoretical factors obtained from the secondary research are further investigated in the analysis phase in Chapter 6. The primary research phase, which is the next phase as shown in Figure 2.6, involves carrying out a thorough data analysis and investigation where research findings are obtained accordingly. Finally, the last phase is contributing to the body of knowledge with a knowledge management framework that is at a PhD standard and based on the literature and the findings obtained from the primary research. This framework is elaborated upon in Chapter 9.

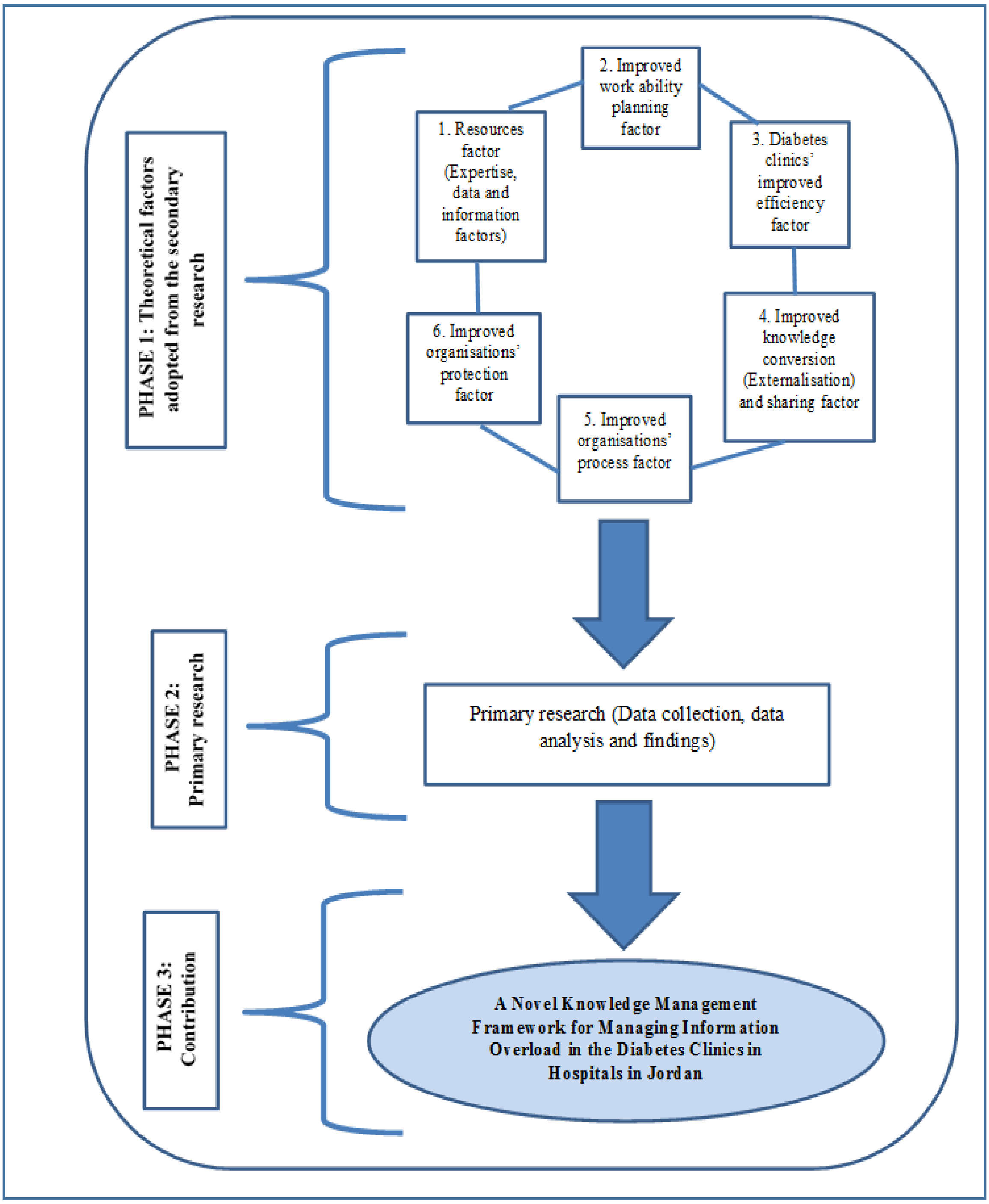

Figure (2.6): The theoretical framework of the research

2.2.11 Research Limitations

In this research, the researcher recognised some limitations and restrictions. The main restriction that was identified by the researcher during the primary research is that many hospitals in Jordan had policy-constraints that did not allow researchers to carry out surveys and research at their hospitals. This restraint affected the researcher negatively in terms of the time it took to find hospitals able to give consent.

One of the research limitations was that some of the respondents in the diabetes clinics of the selected hospitals in Jordan did not understand some of the questions given to them due to language difficulties. The questionnaires were, unfortunately, printed only in English, not Arabic, so some of the non-native English-speaking respondents, especially those with very weak spoken and written English, struggled to provide responses. The researcher was obliged in these cases to translate and explain every unclear question, phrase, or word for these respondents. It was noticed, however, that some other non-native English-speaking respondents had strong spoken and written English; these respondents easily answered all the questions of the questionnaire.

The second research limitation is that the results from the primary research only represented seven hospitals in Jordan, and consequently, did not represent all the diabetes clinics in hospitals in Jordan. Additionally, the results did not represent the entire medical staff even of just the selected hospitals in Jordan. From the selected hospitals, 327 responses were collected from staff in the diabetes clinics. A larger sample of respondents would have been preferred for this research study, but the constraints of the large number of other hospitals and the limited time given to the researcher forced the researcher to restrict the pool of respondents in this research study.

The third research limitation is that two of the seven agreeing hospitals in Jordan had delays in issuing the consent letters that allowed the researcher to conduct the study. These delays reached about 2–3 weeks. Fortunately, the other five agreeing hospitals provided a prompt response, issuing letters within 2–4 days maximum.

The fourth research limitation was the time limitation. Most of the respondents were extremely busy with important medical tasks, such as diagnosing normal and severe cases, dealing with emergency cases, etc., and their packed schedules produced delays for the researcher in obtaining the required responses. The reason behind this is that when the researcher approached the hospitals to conduct the research, most of the medical staff were extremely busy with other medical tasks. However, the researcher made effort in conducting the study when any medical staff was not busy.

2.3 Summary

This chapter outlined and justified the aspects of the research methodology in order to explain how the research fits properly with these aspects. The concepts in the research 'onion' adopted from Saunders et al. (2009) were approached. The researcher explained how some of the approaches in the research 'onion' were selected to underpin the thesis.

In this chapter, the research design was presented, and the most important stages of this thesis were thereby highlighted. The research limitations were discussed to highlight the difficulties that affected the researcher during the study.

In the following chapter, a comprehensive literature review is presented with backgrounds of information overload domain. Different approaches and frameworks of the related research are also investigated in order to provide an in-depth understanding of information overload and to explore the existing problems arising from this issue.

Chapter 3

Information Overload: A Literature Review (Part 1)

3.1 Introduction

The previous chapter discussed the research methodology aspects that are related to this study. The purpose of the present chapter is to review the first part of the literature through providing a comprehensive background of the domain of information overload. The reason behind this is to investigate the technical background of the subject to provide a clear understanding of this domain. The information overload domain is a significant part of this thesis. Hence, it is important to classify information overload into a single section to understand its nature, definitions, and importance throughout the literature and provide a clearer view of information overload being a major issue which is affecting different organisations. The chapter is divided as follows. First, it highlights the importance of the literature review itself. Next, the chapter presents a comprehensive background of the information overload domain. Then, a revision of the existing related research and approaches pertaining to this domain with critical views on these studies are all deliberated. The final section provides a summary of this chapter.

3.2 The Importance of the Literature Review

To achieve the purposes within any particular topic of a research domain, it is vital to produce an initial literature review and an in-depth literature search. Thus, the purpose of conducting a literature search, particularly in this study, is to explore different problems encountered in the knowledge management healthcare domain and gain a comprehensive understanding of a particular problem existing in the literature. This could be achieved by conducting an initial overview on the topic of discourse and analysing and the existing studies (Eppler & Mengis, 2003). Consequently, based on this secondary research, the topic is better clarified to effectively implement the primary research components of the study such as questionnaires and interviews.

The literature search contributes to this research by adopting previous studies to incorporate different integrated factors that will form the study’s theoretical framework. Proposing a theoretical framework is essential for each factor which is adopted from the literature and later represented in the primary research. Based on the literature, there are three particular domains that are taken into account, which comprise information overload, knowledge management and healthcare. The relationship between these domains is that information overload is being encountered by many healthcare centres, and thus, a proper knowledge management system is needed. Accordingly, these domains are highly related to each other.

3.3 Background of Information Overload

As mentioned in Chapter 1, information overload occurs when a large amount of information emerges suddenly in an organisation and it is greater than the organisation can manage. According to Gantz et al. (2009), the volume of information grows rapidly by more than 65% each year. This percentage of yearly growth occurs when paper and digital information is combined and created throughout different projects. Survey respondents spend 26% of their time managing information overload (Gantz et al., 2009). Figure 3.1 represents a group of industries, which are facing information overload, and Figure 3.2 illustrates the types of information, which cause information overload. Both are derived from Gantz et al. (2009).

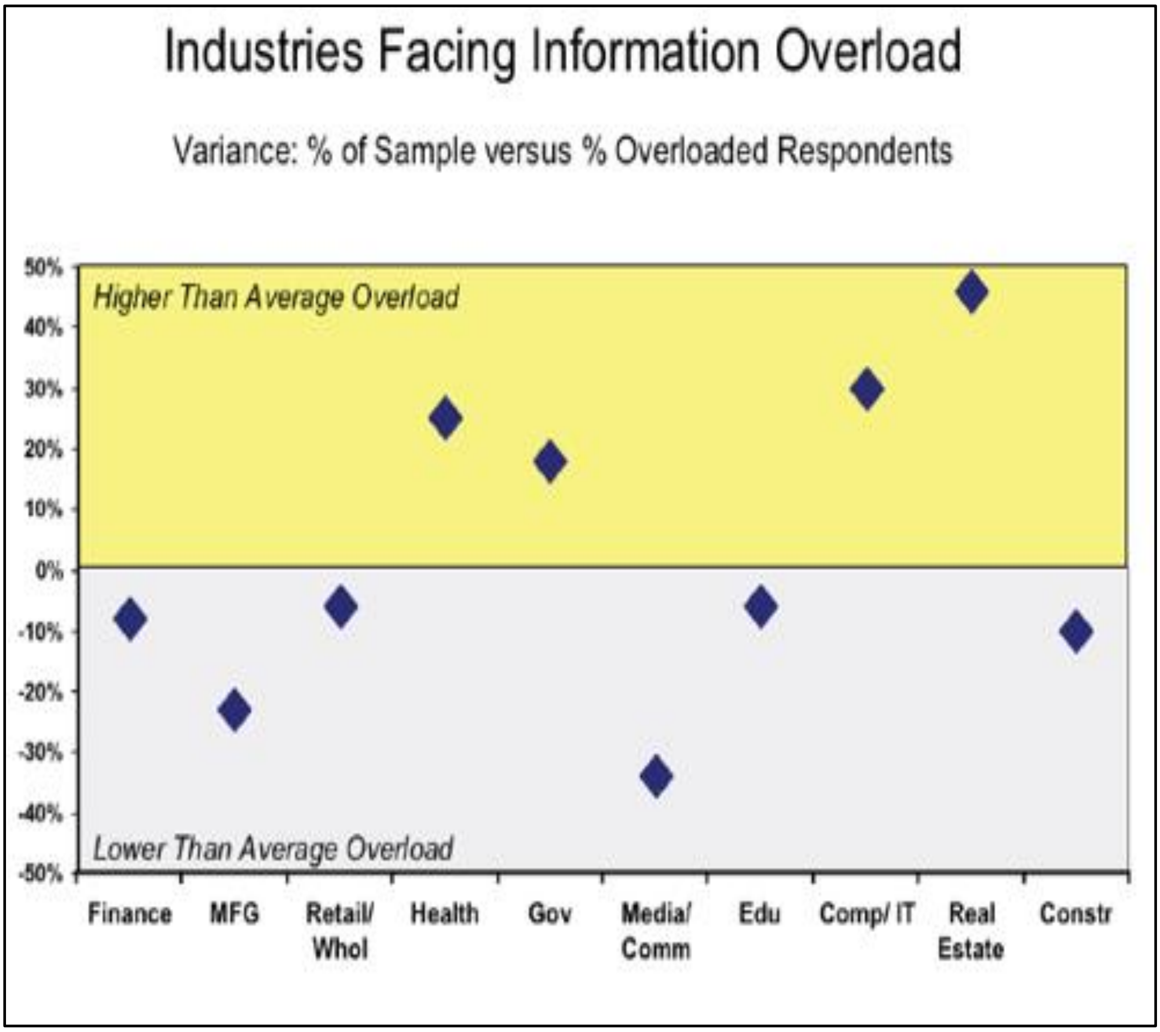

Figure (3.1): Industries facing information overload (Gantz et al., 2009)

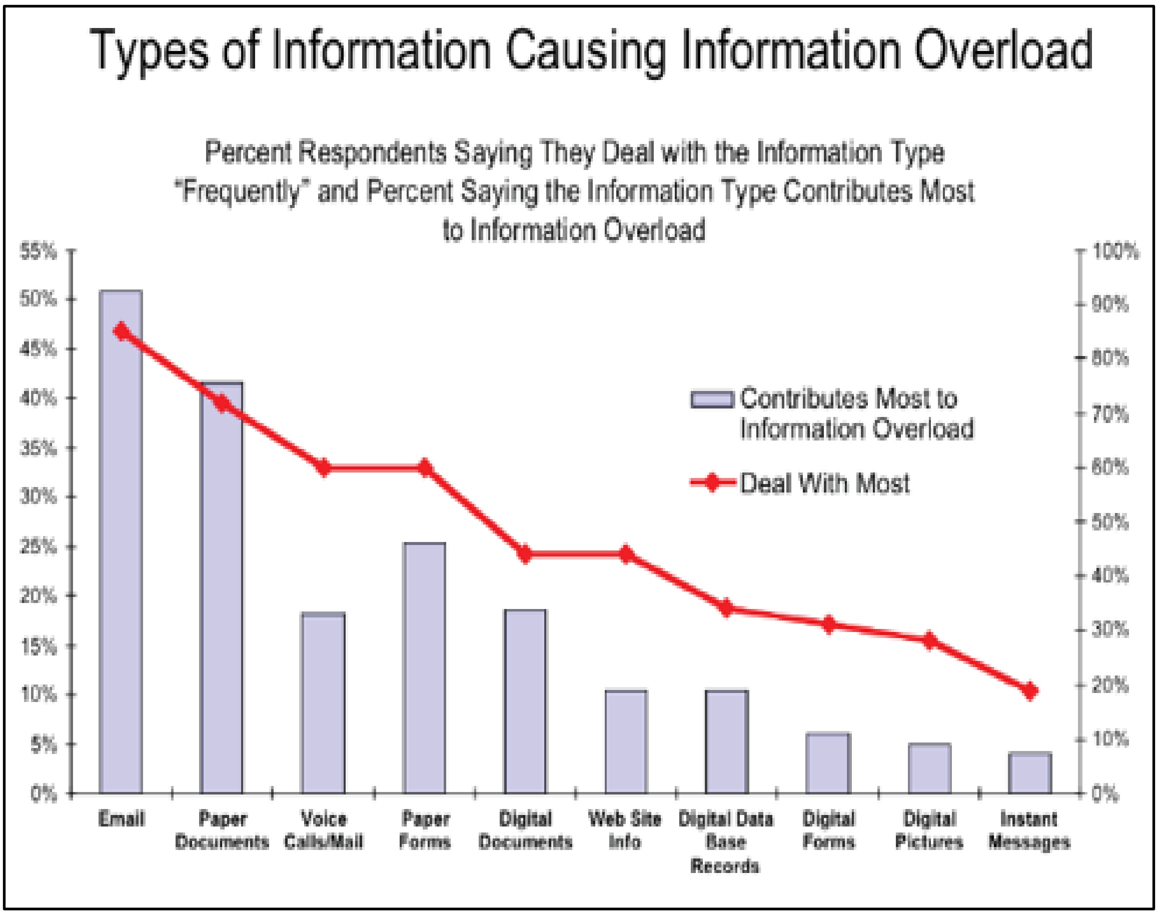

Figure (3.2): Types of information causing information overload (Gantz et al., 2009)

3.3.1 The Nature, History, and Significance of Information Overload

As of the writing of this study, the term *information overload* has existed for more than 50 years. In 1963, the US President's Scientific Advisory Committee (1963) published a report stating that 'We shall cope with the information explosion, in the long run, only if some scientists are prepared to commit themselves to the job of sifting, reviewing, and synthesizing information; i.e. to handling information with sophistication and meaning, not merely mechanically'. This term, which is also known as 'infoxication' or 'infobesity', was popularised by Alvin Toffler in the 1970s. He refers to the phenomenon as 'the difficulty a person faces when taking a decision in the presence of excessive information' (Toffler, 1970). Bawden et al. (1999) discuss that the first thing to be clarified in the literature about information overload is that 'of making many books there is no end; and much study is a weariness of the flesh'. They formulate the information overload concept as follows: 'information overload occurs when information received becomes a hindrance rather than a help when the information is potentially useful'. Wurman (1991) states that the writer George Simmel defines information overload as 'a phenomenon of urban life where people shield themselves from indiscriminate suggestibility to protect themselves from an overload of sensations, which results in an incapacity … to react to new situations with the appropriate energy'. Miller (1978) explains the concept of information overload based on a concept called 'information input overload', which he defines as 'when a living system at a given level is presented with more information that it can readily process'. Another perspective argued by Simpson and Prusak (1995) is that information overload is not based on an actual overload. They content that instead, information overload is based on the failure symptom in creating 'value added information' or 'high quality' from huge amounts of existing information. Wilson (2001) defines information overload at the individual level as 'a perception on the part of the individual (or observers of that person) that the flow of information associated with work tasks is greater than can be managed effectively, and a perception that overload in this sense creates a degree of stress for which his or her coping strategies are ineffective'. At the organisational level, Wilson (2001) defines information overload as a 'situation in which the extent of perceived individual information overload is sufficiently widespread within the organisation as to reduce the overall effectiveness of management operations'.

Although the existing literature addresses many definitions of the information overload problem within the context of the amount of information, it is observed that these definitions are defined differently based on the circumstances of continuous loads of information affecting particular practical situations. Therefore, it is important to understand the nature of information overload so that possible solutions can be developed to manage and reduce the amount of information that is likely to affect different business organisations.

Casey (2003) indicates that in year 1255, Dominican Vincent of Buauvais criticised information overload indirectly as 'the multitude of books, the shortness of time and the slipperiness of memory'.

When the movable printing machine was invented in the 15th century, there was a rapid increase in the production of books and a substantial decrease in their cost. It was heralded by the European Renaissance that knowledge was (and still is) widely appreciated by many learners and audiences (Hall & Walton, 2004). In 1598, the first truly public library was founded, and the continuous distribution of knowledge and information was facilitated for larger masses (Tidline, 1999).

In the 18th and 19th centuries, a large amount of information and knowledge was generated by the industrial revolution and many innovations. This abundance of knowledge blocked the economic, social, and cultural progress that was later made in the 20th century (Tidline, 1999).

In the mid-20th century, great improvements in computer technology took place. As a result, the entire world truly became part of an information-driven society (Tidline, 1999). According to Bawden (2001), Feather stated that 'The technical developments of the last 50 years have made more information, more available to more people than at any other time in human history'. When new ideas emerge, it is considered important to document them. Throughout history, innovative actions, expressions and thoughts have been recorded in many different ways. With the deployment of new methods of recording information that are based on invention and literacy, the creation and accumulation of knowledge among the masses began to increase. This negatively affected the public in terms of limited time and resources (Hoq, 2016).

In the middle ages, many realised that the spread of new innovations and literacy formed a significant role in identifying suitable information. It was also viewed that the use of proper information would lead to better decision-making and better selections. The proper use of information can result in achieving the best possible performance within an organisation (Hoq, 2016).

In the 21st century, new techniques and tools emerged to assist in creating and spreading information throughout the world. For example, an internet connection and computer allow users to disseminate their messages and information globally. Despite the emergence of these new technologies, the influx of information adds tremendous pressure to professionals such as information managers, information searchers, librarians, information aggregators (e.g. medical staff in healthcare organisations). These professionals tend to face difficulties in capturing, cataloguing, codifying, sorting, storing, retrieving, preserving, sharing, and classifying the information (Hoq, 2016).

3.3.2 Current Definitions of Information Overload

The term *information overload* is also defined by many current studies. For instance, Kadiri and Adetoro (2012) define information overload as 'A perception by a person (observer) that the information associated with tasks is greater than can be managed effectively and that such overload can create a degree of stress for which effective coping strategies are necessary'. Melinat et al. (2014) define information overload as 'information overflow'. A later definition for information overload is given by Hakim et al. (2015), who contend that 'The exponential growth of the data may lead us to the information explosion era, an era where most of the data cannot be managed easily'. Hoq (2016) define information overload, as 'an overabundance of information' and 'a major cause of concern for general information users, researchers and information managers'.

It can be drawn from these definitions that the current information overload phenomenon is growing such that an individual cannot manage the load of different information from different sources that might continuously affect an organisation. Thus, overcoming this issue is significant so that organisations can effectively cope with the necessary information.

One of the formal definitions for information overload is provided by Whelan and Teigland (2011) as the 'dilemma of having more information than one can assimilate or being burdened with a large supply of information, only some of which is relevant, is generally what is meant by information overload'. Another definition for information overload is given by Sevinc and D'Ambra (2010): 'Information overload occurs as the volume of information received by the individual surpasses their ability to process it'.

It can be observed that there are clear differences between the definitions of information overload given by Whelan and Teigland (2011) and Sevinc and D'Ambra (2010). Whelan and Teigland's (2011) definition shows that it contains different aspects, such as the general problem of delegating more information in comparison with a normal or limited amount of information. The definition also indicates the importance of distinguishing between the unnecessary and valuable information. In contrast, the definition provided by Sevinc and D'Ambra (2010) is more specific and concise compared with the general definition given by Whelan and Teigland (2011). It can perhaps be argued that Sevinc and D'Ambra's (2010) definition is not accurate comparison that given by Whelan and Teigland (2011). However, their definition highlights the main idea related to information overload. Additionally, the definition of information overload provided by Sevinc and D'Ambra (2010) can be called clearer than the one provided by Whelan and Teigland (2011), since it provides a concise and essential idea of information overload. In contrast, Whelan and Teigland (2011) approach the issue in a more generic manner.

Hong et al. (2010) refer to information overload as the challenge of managing the continuous flow of information overload that is being disseminated from many different sources. Such examples of these sources include 'email messages sent by colleagues and friends, news stories related to topics of interest, new tweets posted to Twitter, and status updates in Facebook and LinkedIn'. Similarly, Cherubini et al. (2010) refer to the overwhelming nature of the high loads of changeable information as 'Facebook fatigue'.

Referring to the information overload problem in the healthcare environment, Klerings et al. (2015) argue, 'The rapidly growing production of healthcare information – both scientific and popular – increasingly leads to a situation of information overload affecting all actors of the healthcare system and threatening to impede the adoption of evidence-based practice'. Based on the context of this thesis, particularly in the diabetes clinics of the selected hospitals in Jordan, information overload can be defined as the large amount of medical and non-medical information that continuously affects the medical staff within these clinics. This definition is structured based on primary research which involved approaching the medical staff of these clinics and inquiring about the issues, types, causes, and likely effects of information overload experienced on a daily basis.

It can be concluded that these definitions are similar to each other in terms of encountering high amounts of information. However, they are different in terms of conciseness and generality. All of these definitions focus on the impressions of overload that are affected by the existence of many different media. Nevertheless, a new kind of information overload was ushered in by social networks, in which the volume of flow and change in information is considered critical and must be reduced.

3.3.3 The Rationale of Information Overload in Healthcare Organisations

In many different fields, a large amount of information is generated by human activity which leads to occurrence of information overload at a faster rate. Referring to the healthcare environment, *Nature* magazine by the US National Academies (2009) released a report in 2009 which introduced the era of petabyte science worldwide. This report highlighted geneticists who processed large amounts of DNA data within a week in which multiple sequences were mixed together in an unorganised manner. This led to information overload. An excess of data was also noted by the literature (Kolusu, 2015).

In healthcare organisations, there is constant and abundant new information. These high levels of innovation lead to an information overload which can prevent communications from performing effectively. Effective patient care is achieved when the appropriate information is easily accessed when needed and is not overwhelming when care is required (Kolusu, 2015).

Davidoff et al. (1995) indicate that an individual must read 17 articles per day for 365 days a year to remain informed in internal medicine.

Today, many different types of Clinical Decision Support Systems (CDSS) and search engines exist through which physicians and medical staff are overwhelmed by an explosion of large amounts of medical articles (Kolusu, 2015).

3.3.4 The Types and Sources of Information Overload

The types of information overload can vary from one organisation to another. Such organisations include those in the business field (Edmunds & Morris, 2000; Eppler & Mengis, 2003), governmental organisations (Clarke & O'Brien, 2012), technology (Delen & Al-Hawamdeh, 2009; Kadiri & Adetoro, 2012; Strother et al., 2012), education (Institute of Education, 2017), and healthcare (De Lusignan et al., 2002; Hall & Walton, 2004; Holzinger et al., 2007; Kim et al., 2007; Kolusu, 2015).

In the context of this thesis, the types of information overload that affect diabetes clinics in selected hospitals in Jordan (according to the medical staff) can be divided into three types. These comprise the large amount of new medical information derived from external sources, non-medical (unnecessary, irrelevant, or unimportant) information derived from external sources, and much of the available patient records and information (diagnosis, family history, etc.) for those who visit frequently. The origin of the first two types of information, as claimed by medical staff, is attributed to medical magazines, scientific journals, conferences, books, emails, televisions, people, newspapers, and electronic gadgets (e.g. computers, cell phones).

According to the staff interviewed, the medical staff who are most continuously and adversely affected by the problem of information overload include medical administrators (charge nurses), doctors, outpatient doctors, and nurses. Guided by this information, the researcher chose these types of medical staff for primary sources of information, as they can provide in-depth insight into the information phenomenon that is affecting them and their clinics.

The researcher was informed by the medical staff of these clinics that the amount of information flowing into their clinics is high and is increasing. Therefore, they informed him that the quantity of this increasing amount of information is not quantitatively measured currently, as it is unorganised, scattered, overwhelming, imprecise, accumulating, and distributed from one place to another. The medical staff interviewed argued that they knew that this amount of data is information overload, because they were sure that they are facing more information than one could normally manage. Thus, for the purposes of this study, the reduction of information overload is measured based on an increase of information quality and a decrease in information quantity. In some ways, the quality of information can be measured by the ease and speed of making decisions and the quality of the outcomes of those decisions. Inevitably, the quality of such results depends on the amount of information needed to make the decision.

According to medical staff, forms of distributing information within these clinics include the following:

- A large number of emails being sent to medical staff (e.g. medical journals or conferences).
- Verbal conversations with medical staff, such as formal conversations (e.g. conference videos) and informal conversations (e.g. oral face-to-face conversations concerning medical information between clinicians).
- The distribution of printed documents (e.g. brochures, laboratory results, new medical magazines, medical newsletters, or medical reports) and documents from clinicians from other medical departments (e.g. renal, cardiac, orthopaedics, neurology, or optometry departments).
- Patient medical records (e.g. loads of records regarding diagnosis, family history, or laboratory results). Medical staff indicated that these records are distributed in an unorganised manner, such that they are found in different locations such as shelves, cupboards, scattered over different tables, or distributed over different unrelated rooms.

3.3.5 Causes of Information Overload in an Organisation and in Healthcare

The causes of information overload vary from the view of one researcher to another. Different researchers identify different causes and different aspects of those causes. The reason for these differences in classifying the divisions of information overload causes is that each researcher has identified the causes based on their own specific study and based on their own particular proposed analytical model or frameworks. However, some causes of information overload do broadly overlap.

For instance, Ruff (2002) defined the five causes of information overload in an organisation as people, technology, the organisation itself, processes and tasks, and information attributes. Similarly, Eppler (2002) categorised the causes of information overload into five types, such that information overload is a result of no single factor, but of a group of factors occurring together. These five types of Eppler (2002) comprised people, technology, the organisation itself, tasks and process, and information attributes. Eppler (2002) and Ruff (2002) argue that information overload is not due to any single cause (factor); hence, a continuous development and refinement management cycle is needed that considers multiple information overload causes. Figure 3.3 illustrates the analytical model of information overload, which is adopted from Ruff (2002).

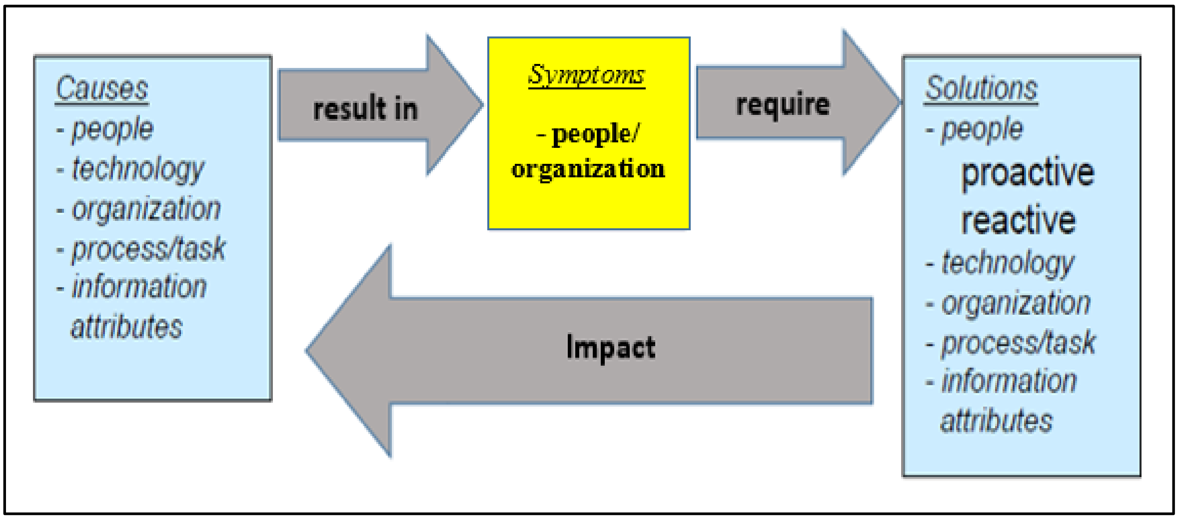

Figure (3.3): Information overload analytical model (Ruff, 2002)

The causes and solutions of the model shown in Figure 3.4 are divided into five categories: people, technology, the organisation, processes/tasks, and information attributes (see Figure 3.4). In terms of the solutions, people are classified into proactive and reactive strategies. The objective of proactive strategies is to prevent the occurrence of information overload, while the objective of reactive strategies is to overcome information overload when it emerges. All the symptoms are categorised under people or organisation since these are the two essential causes of information overload. Other causes are explored by Hoq (2016), who divided the causes of information overload into five causes as well, but from different aspects (see Figure 3.4).

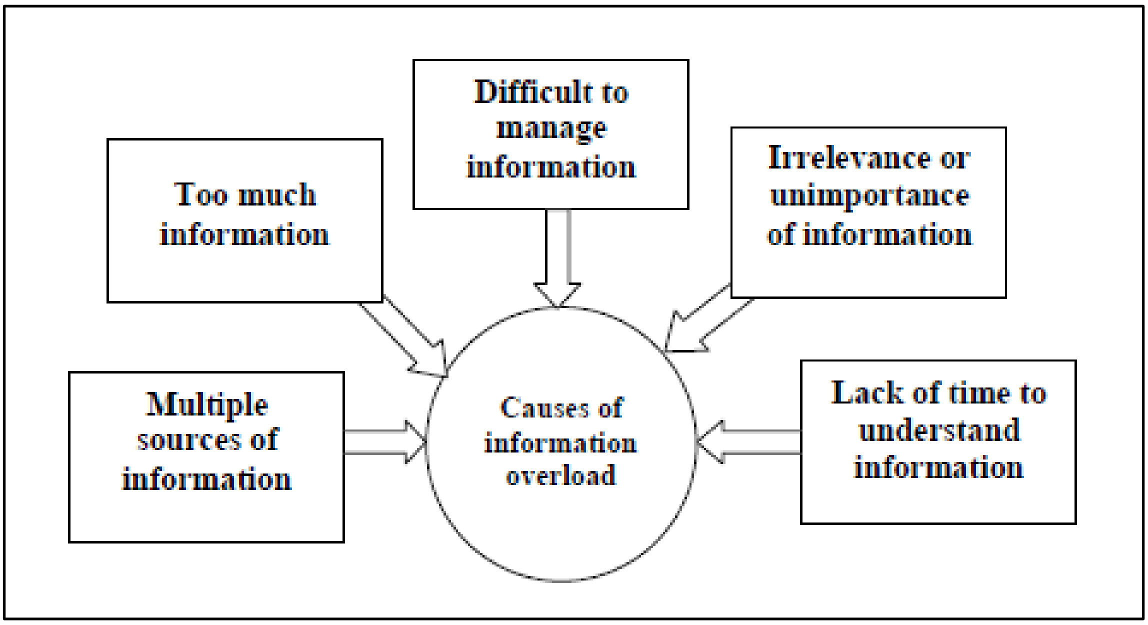

Figure (3.4): Causes of information overload (Hoq, 2016)

Figure 3.4 shows that the usual causes of information overload, according to Hoq (2016), comprise multiple sources of emerging information, excess information, difficulty in managing the information, irrelevant or unimportant information, and insufficient time for understating the information (Hoq, 2016). These causes are likely to occur in any organisation that cannot manage a large information overload in a proper manner.

Drus et al. (2013) mention several major causes that are likely to occur in the healthcare organisation environment, for instance, in rehabilitation centres in particular:

- Difficulties in searching for the required information.
- Difficulties in modifying the information.
- Storage is taking up a large amount of space when there is a large amount of overloaded information that still needs to be stored.

In the context of this thesis, several causes of information overload were experienced in the diabetes clinics of the selected hospitals in Jordan according to the medical staff. The causes of information overload that were obtained from the medical staff within these clinics were found to form a combination of several information overload causes cited by Eppler (2002); Ruff (2002); Drus et al. (2013); and Hoq (2016). The causes that were experienced in these clinics by the medical staff that are related to this thesis and in line with the causes noted by Eppler (2002); Ruff (2002); Drus et al. (2013); and Hoq (2016) comprised the following:

- *People*: The medical staff claimed that information overload is caused here due to the knowledge hoarding among most of the medical staff in these clinics. This implies that either new knowledge is not shared properly or knowledge is transferred from a tacit form to a tacit form among only some medical staff. For example, medical staff may have conversations with each other without codifying the knowledge into a readable and a proper form.
- *Missing information*: Most of the medical information was lost or at best very difficult to find at the required time.
- *Lack of proper technology*: There is a need for an efficient computerised data system in most of these clinics, according to the claims of the medical staff. Without such a system, the clinic cannot store the large amount of overloaded information.
- *Insufficient time to understand the information*: The medical staff complained that there is very little time for them to manage the emerging information and update themselves on new medical knowledge. Most of their time is occupied performing necessary medical tasks.

- *Unimportant or irrelevant information*: Most of the medical staff complained that most of the information that reaches them is distributed to the wrong people at inappropriate times.
- *Lack of concern regarding the medical opinions provided by some of the medical staff to others*: Frustration and low morale issues incurred in the medical staff are resulting from information overload.

It can be concluded from the causes highlighted above that information overload could lead to severe issues that would affect not only healthcare organisations, but also any other type of organisation. However, causes of information overload do differ by quantity and types based on the involved organisation and based on the effectiveness and performance of a working organisation.

3.3.6 The Effects of Information Overload in an Organisation and in Healthcare

Information overload has many negative effects on individuals. For example, an investigation by Fuat et al. (2003) into the barriers in the primary care environment to accurate heart failure diagnosis identified the cause as stress, and particularly stress due to information overload. Fuat et al. (2003) also found that fear of the emergence of information overload was present. According to Melinat et al. (2014), information overload causes many problems for people and organisations as a whole. Such problems include mistakes in decision making, psychological stress, and ignorance of relevant and significant information.

It can be deduced in the light of these researchers that the effects of information overload reduce the concentration of people towards managing their work effectively within an organisation. Consequently, it is significant to understand these effects in order to tackle information overload when managing any organisation.

In the healthcare organisation environment, the effects of information overload are observable (Kolusu, 2015). Healthcare data is increasingly accumulating and rapidly growing, and the resulting big data is a challenge that is extremely difficult to overcome (Kolusu, 2015). The practitioners of the public health environment are affected by information overload as they attempt to make critical medical decisions based on a large amount of continuously growing information. Interactive digital systems based on knowledge management can be a solution to handle such an issue (Kolusu, 2015). When the amount of emerging information in the healthcare environment is overwhelming, unorganised, and imprecise, patients can suffer. Medical staff will not have time to be updated on the new medical knowledge and will continue operating based on old medical knowledge. Such a case would negatively affect the health of the patients who are in need of advanced medical treatment.

The case study of this thesis examines the information overload in the diabetes clinics of selected hospitals in Jordan. Information overload occurs when a large amount of information is spread in an unorganised way, such that the amount of information exceeds what the clinics can effectively manage. The effects of information overload in these clinics are similar to the effects that are mentioned by Hall and Walton (2004). These effects are negatively affecting the medical staff in the diabetes clinics of the selected hospitals in Jordan. The effects of information overload, as based on Hall and Walton (2004), that are particularly affecting these clinics comprise the following:

- A decrease in the social life of the medical staff.
- High tension, stress, and lack of concern among the medical staff toward the tasks. being given to them in their working environment when the right information does not reach the right people at the right time in the right place in the right quantity.
- Suffering personal relationships.
- Longer periods of given working hours.
- Illness and exhaustion.
- Low morale.

These information overload effects are causing severe problems to patients with diabetes, as medical staff are acting on old medical information. For instance, the medical staff are likely to be engaged with other important medical tasks, and this constant engagement prevents them from getting up to date on new and continuously emerging medical knowledge. The medical staff might have low morale due to the existence of the large amount of new medical knowledge or due to other personal reasons, which could also negatively affect them and prevent them from being updated on new medical knowledge and from completing other necessary medical tasks, leading to severe medical problems with their patients. This shows that information overload is a phenomenon that does exist in these clinics according to what was verbally claimed by these medical respondents.

3.3.7 The Control of Information Overload

Many organisations and individuals are seeking solutions to control the issues of information overload. Information specialists and librarians in different organisations are also attempting to control the emergence of the issue. The daily addition of information to the body of knowledge is causing many problems for employees within different organisations (Hoq, 2016). Thus, controlling this issue is key to ensuring that necessary information can be retrieved efficiently when required. The right information should be delivered to the right people in the right place at the right time in the right quantity.

Specialists agree that information professionals and information users must acquire an efficient level of information literacy in order to retrieve relevant information. This ability, for instance, reduces information overload when an individual or an organisation obtains an information that is of relevance (Kurbanoglu et al., 2013).

In the context of this thesis, information overload was managed based on two phases adopted from the SECI model (Nonaka & Takeuchi, 1995), namely the externalisation phase (tacit to explicit knowledge) and the combination phase (explicit to explicit knowledge). Additionally, the SECI model complemented Dervin's sense-making model (Dervin, 1983), as both models act as information behaviour that help reduce information overload. Additionally, it was argued by Mohajan (2017) that when information is being employed in any organisation, the employees sense the information within the environment in order to produce new knowledge, and to take necessary decisions based on that provided knowledge. Thus, the proposed knowledge management framework in this thesis attempted at reducing the information overload within these clinics.

3.4 Information Overload Related Research: Existing Frameworks and Models

The previous section provided comprehensive discussions and background around the information overload domain. A number of studies have been made to understand the nature of the information overload domain in different disciplines. Many of these studies have focused on finding ways and approaches to overcome information overload, as is the case in the present research. Many researchers across a variety of disciplines have conducted studies and proposed methods within the domain of information overload. This section discusses these existing related researches along with the limitations that were explored and deduced from the previous studies. The researcher analyses and criticises the previous studies in different disciplines in the information overload domain.

Studies have been conducted on information overload in areas other than healthcare, such as accounting, library and information science, marketing, organisation science, and management information systems. However, Melinat et al. (2014) note that there is a little number of publications that are related to the information overload domain (see Figure 3.5). Nevertheless, Melinat et al. mention that this domain has a wide range of topics in that many different concepts are touched upon within the domain of information overload. Figure 3.5 depicts the number of papers that were published in the domain of information overload from

2006 to 2013. In the first three years, it can be seen that there is a straight decrease in the number of publications that are related to this domain, where two papers and zero papers were published in 2006 and in 2008, respectively. A sudden increase in the number of papers related to this domain occurs from 2009 to 2011. However, another decrease was experienced in 2012 and 2013. The research study of Melinat et al. (2014) was limited to the years 2006–2013.

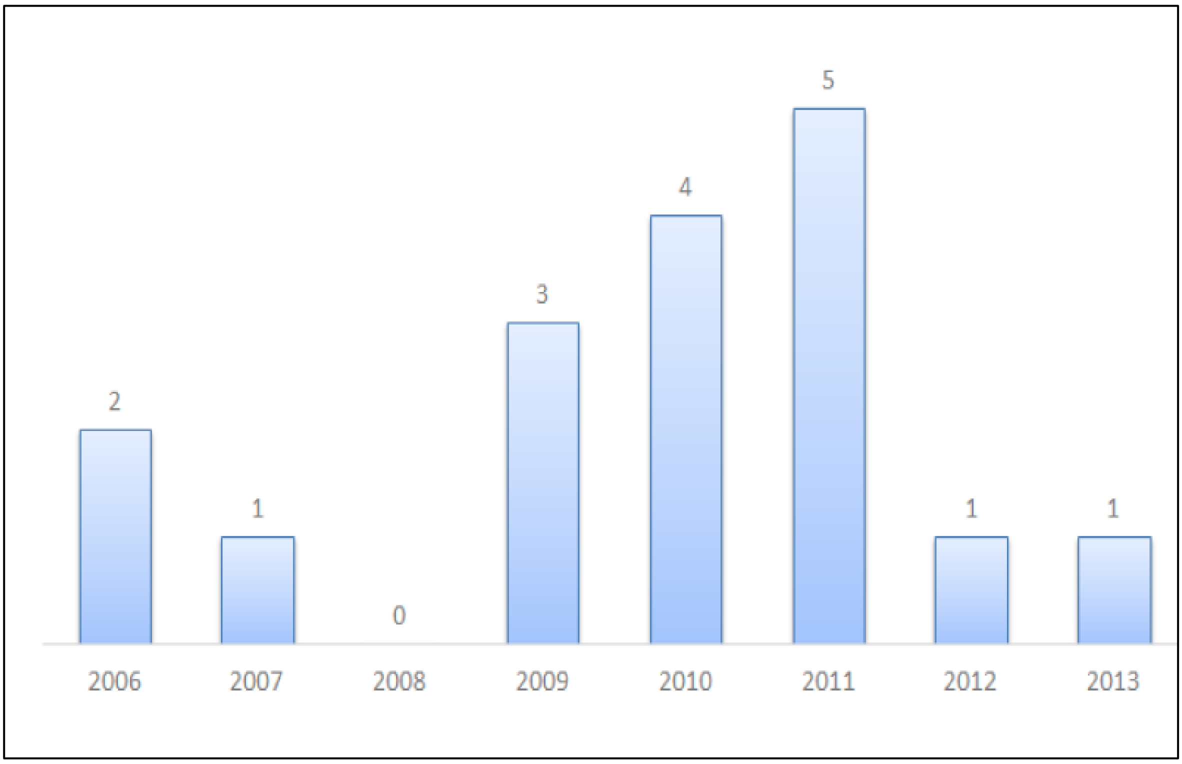

Figure (3.5): The distribution of information overload domain in the period 2006–2013 (Melinat et al., 2014)

Information overload papers were also published before the year 2006 and have been published since the year 2013. For instance, before 2006, Hanka and Fuka (2000) proposed an enhanced tool called the WaX tool for ensuring access to relevant information when it is needed at a particular time. This tool solved the information overload problem encountered in their research. The main idea behind their research is that the internet revolution is generating information overload. Hanka and Fuka focused on three factors – the technical factor, the organisation's infrastructural factor, and the productive culture factor – for managing medical knowledge explicitly. These factors contribute to reducing information overload in their research. The research study of Hanka and Fuka (2000) was limited to the technological aspect and did not focus on the conceptual aspect of reducing information overload. Another limitation included the lack of improving the searching ability for more documents. That limitation was due to a failure to simply integrate the documents with other resources to provide a searching method that could perform efficiently.

In the same context, Rochat (2002) proposed that generated information overload increases pressure on users when dealing with tasks. Rochat (2002) focuses on two essential types of factors: the primary factors (e.g. the consequent stress factor, the loss of job satisfaction factor, the procrastination factor, the time wasting factor, and the physical ill health factor) and the secondary factor (i.e. the business costs factor). Similar to the study of Hanka and Fuka (2000), the research study of Rochat (2002) was also limited to the technological aspect only and did not focus on the conceptual aspect in reducing the information overload problem. Further, Eppler and Mengis (2003) developed a framework that highlights the causes of information overload in organisations. The main idea behind their research was to present an overview of information overload in management-related academic publications where the information overload's theoretical basis could be further evaluated. The research study of Eppler and Mengis (2003) was limited to concentration on the personal factor, the information characteristics factor, the task and process parameters factor, the organisational design factor, and the information technology factor. These factors contribute to producing solutions for managing information overload. Additionally, their research study was also limited to reducing information overload in an implicit manner only based on the 'decease' metaphor related to the domain of information overload.

Based on the view of the researcher, it can be concluded that the above researchers have similar focuses in terms of concentrating on solving the information overload problem occurring in different organisations. Nonetheless, each of them focuses on different theoretical factors for the research they are conducting. One or more theoretical factors of certain researchers align with some factors of other researchers. For example, one of the factors taken into consideration by Hanka and Fuka (2000) is the technical factor. Similarly, Eppler and Mengis (2003) focus on the information technology factor, which involves the technical factor, whereas one of the factors considered by Rochat (2002) is the consequent stress factor (the personal factor), which is similar to the focus of Eppler and Mengis (2003) on the personal factor. Another limitation that can be found in these researchers' work is that their study related to the domain of information overload was limited to the technological aspect and did not focus on the conceptual aspect.

Another study focused on information overload was conducted by Edmunds and Morris (2000) on business organisations. Their study was concerned with understanding the literature and attempting to review possible methods of reducing information overload within these organisations. They concluded that information overload could be reduced when information literacy is increased.

The multimedia learning cognitive theory pertaining to cognitive overload was proposed by Meyer and Kieras (1997). This theory assumes that processing information requires individuals to obtain dual channels, namely a verbal channel and a visual channel. The research of Meyer and Kieras (1997) was limited to the capacity assumption that is the basis of this theory. However, according to Meyer and Kieras (1997); Mayer and Moreno (2002); Mayer (2005); Plass et al. (2010); Clark and Mayer (2011); Mayer (2014); Park et al. (2014, 2015), this assumption states that these channels have limited capacity, so cognitive overload and poor timing might occur. Hence, both channels should include as many separate presentations as possible. These researchers note that their research study was limited to the capacity assumption of that theory. Their research study was also limited to the poor time constraint available for them. In the same context, Mayer (2005) declares that this limitation is due to the fact that each channel can manage to include a limited quantity of information that can be processed by a learner at a time. The information might not be processed by a learner if a large amount of information is being included at a time. Kirschner (2002) and Zheng (2009) call this case cognitive overload since the cognitive processing capacity is exceeded to the point that the inability of learners to concentrate on the learning direction will affect learners negatively.

Further, Bernsen (1994); Sandberg et al. (2011); and Liu and Todd (2014) studied the modality theory to ensure effective exchange of information between students and mobile devices based on selecting the most appropriate media where this media is mapped by particular information.

In the domain of information overload, most studies have been limited to the technological aspect and have not focused on the conceptual aspect of this domain. Some of the research studies of other researchers have been limited to the conceptual aspect of this domain. It can also be seen that although some of these researchers propose different systematic and technological tools for reducing information overload, these tools fail to efficiently reduce the issue. In addition, though there are more researches in this domain on technology, there are few up-to-date researches in the context of technology. A wide range of the conceptual research context had explored the phenomenon of information overload, as seen in such researchers as Elson (1999); Farhoomand and Drury (2002); Carlson (2003); Shenk (2003); Feldman et al. (2005); Janssen and Poot (2006); Bawden and Robinson (2009); Gantz et al. (2009); Huvila (2011); Kadiri and Adetoro (2012); Strother et al. (2012); and Hoq (2016).

In summary, the domain of information overload is an essential issue from the view of many research studies. Therefore, some researchers have proposed and developed some methods for managing information overload at different organisations. These methods are costly and inefficient. From the point of view of the researcher, it is better to focus on better ways of providing low cost, convenient, and efficient methods that not only focus on technological solutions when managing information overload, but also focus on management strategies solutions. Additionally, highlighting, understanding, analysing, and evaluating different solutions proposed by different researchers for managing the problem of information overload assists in providing a comprehensive and clear understanding of this problem. All these actions assist in producing a knowledge management framework for managing the information overload problem in the diabetes clinics of the seven selected hospitals in Jordan as explained in Chapter 8.

3.5 Summary

In this chapter, a comprehensive review was conducted for the information overload domain. The review considered different disciplines to fully and efficiently comprehend this domain. The related research on the domain of information overload was presented and discussed to provide an in-depth understanding of how this domain showed significance in different fields. In Chapter 4, an in-depth literature review is performed for the domain of knowledge management.

Chapter 4

Knowledge Management: A Literature Review (Part 2)

4.1 Introduction

The previous chapter introduced the Jordanian context and its healthcare system along with important aspects of the research background and its structure. The purpose of this chapter is to review the second part of the literature by providing a comprehensive background on the domain of knowledge management. The chapter aims to investigate the technical background of knowledge management in order to provide a comprehensive understanding of this domain. Knowledge management by itself has been widely studied and investigated in different areas. Hence, it is important to classify knowledge management into a single chapter. The outline of the chapter is as follows. The importance of the literature review itself is highlighted. The following sections provide backgrounds of the knowledge management domain. The researcher then reviews existing approaches, frameworks, and models of this domain and offers his own critical views on these studies. Finally, a summary of this chapter is presented.

4.2 Background of Knowledge Management

Due to the multi-disciplinary nature of knowledge management, and since this concept is being expanded and already considered broad in many fields, different definitions of knowledge management have been proposed by many researchers (Yuan, 2011). Karadsheh (2009) defines knowledge management in general as a clarification of information. Diverse disciplines contribute to the significance of this concept in managing organisations such as healthcare organisations, educational institutions, business companies, and so on. These diverse disciplines, as adopted from Dalkir (2005) and Yuan (2011), are illustrated in Figure 4.1. The disciplines are database technology, collaborative technologies, help desk systems, organisational science, cognitive science, electronic performance support system, artificial intelligence, document and information management, web technologies, and library and information science.

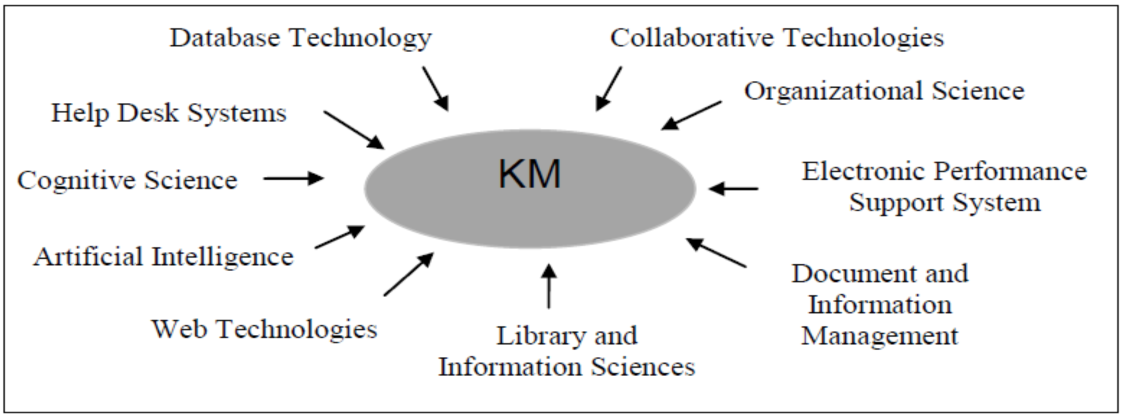

Figure (4.1): Disciplines that contribute to knowledge management (Dalkir, 2005; Yuan, 2011)

The disciplines illustrated in Figure 4.1 have affected the concept of knowledge management in terms of theory and practice (Yuan, 2011). Although knowledge management is studied in various fields and disciplines, it is also an approach that can be critically and effectively comprehended in the business field outside of the management field (Mentaz, 2004; Yuan, 2011).

4.2.1 Knowledge Management Types

Knowledge management can be categorised into two types: tacit knowledge and explicit knowledge management (Nonaka & Takeuchi, 1995; Hahn & Subramani, 2000; Evans & Lindsay, 2005; Nonaka, 2007; Mirza, 2009; Ahmed & Ahsan, 2014; Mohajan, 2017). Both types of knowledge assist in forming a knowledge management based approach. The researcher used both concepts, and defined the concepts based on researchers such as Nonaka and Takeuchi (1995); Hahn and Subramani (2000); Evans and Lindsay (2005); Nonaka (2007); Mirza (2009); Ahmed and Ahsan (2014); and Mohajan (2017). The researcher used these concepts to propose a new knowledge management framework that can reduce the information overload in the diabetes clinics of the selected Jordanian hospitals. Tacit knowledge is defined as the knowledge that is kept in a person's mind, which makes it difficult to codify and share with others (Nonaka & Takeuchi, 1995; Hahn & Subramani, 2000; Evans & Lindsay, 2005; Nonaka, 2007; Mirza, 2009; Ahmed & Ahsan, 2014). This type of knowledge can be obtained from persons based on their beliefs, behaviours, experiences, and values. In contrast, explicit knowledge is defined as knowledge that is extracted from a person, codified into a readable form, and shared with the right people (Nonaka & Takeuchi, 1995; Hahn & Subramani, 2000; Mirza, 2009). This type of knowledge can be obtained from documented readable sources such as databases, documents of scientific journals, and many other documented forms of media (Evans & Lindsay, 2005).

The medical staff in the diabetes clinics in the selected hospitals in Jordan claimed that most of the medical knowledge is being shared in a tacit manner and is rarely shared. In the context of the thesis, relying only on sharing knowledge only tacitly is not advantageous in reducing information overload; rather, one of the aims of knowledge management is to ensure that knowledge can be managed by relying on tacit and explicit knowledge (Nonaka & Takeuchi, 1995; Ferlie et al., 2012; Hau et al., 2012; Nonaka et al., 2014). Relying only on tacit knowledge does not fit with the aim of reduction of information overload in the thesis, but relying on tacit and explicit knowledge does fit with that aim. Thus, it would be beneficial if the clinics could efficiently convert tacit knowledge to codified explicit knowledge.

Also in the healthcare environment, Nonaka and Takeuchi (1995) propose the idea of knowledge conversion by articulating tacit knowledge and converting it into explicit readable forms. Thus, Nonaka and Takeuchi (1995) suggest four types of knowledge conversion (see Chapter 1, Figure 1.3). These types comprise socialisation, combination, externalisation, and internalisation (see Chapter 1, Section 1.7). Many organisations have benefited from the high significance of employing both tacit and explicit knowledge (Ferlie et al., 2012; Hau et al., 2012; Nonaka et al., 2014). One knowledge management aim is to combine the aspects of both types of knowledge together. Combining these aspects would contribute to the reduction of information overload, which is the major phenomenon in this thesis. Having readable codified forms of knowledge will support efficiently managed knowledge such that information can be acquired properly when needed, and thus, it will reduce information overload (Dalkir, 2005). Haldin-Herrgard (2000) mentions that it is difficult to manage tacit knowledge since most of it is stored in the minds of people. The two main difficulties in sharing knowledge are difficulties with perception and language (Haldin-Herrgard, 2000). In this case, it can be deduced that the difficulty of managing the tacit knowledge can adversely affect organisations with large amounts of information (Tang et al., 2007). Namely, when most knowledge is tacitly shared with other people without documenting knowledge properly, the knowledge is not available when others require it, and it could be difficult to understand the unknown context of knowledge if that knowledge has not been efficiently captured when given tacitly by others (Tang et al., 2007). Information overload occurs when knowledge goes unexplored and is allowed to accumulate tacitly (Tang et al., 2007). Consequently, ensuring that the right information will be available when needed can prevent the occurrence of information overload (Tang et al., 2007).

Many researchers have applied different fields and proposed various approaches to make use of both tacit and explicit knowledge and to transfer tacit knowledge to explicit knowledge.

For example, Cheng and Jiang (2008) produced a knowledge interactive platform that supports decision making in enterprises. Lu and Yang (2015) propose a similar approach that is based on a job rotation and aims to help tacit knowledge to be transferred in enterprises. Wieneke and Phlypo-Price (2010) applied the field of Artificial Intelligence (AI) in order to convert knowledge from a tacit form to an explicit form. Razmerita and Philips-Wren (2016) argue that tacit knowledge could be transferred at low cost based on social networks via the Enterprise Social Network (ESN). The above studies apply to this thesis in terms of reducing information overload. All these mentioned studies aim at converting knowledge from tacit to explicit forms so that knowledge can be readable and obtained when required. However, the thesis focuses not only on converting knowledge from tacit to explicit forms, but also on converting the codified knowledge to a new explicit form (i.e. from explicit to a new explicit form). This effort is in line with the research of Nonaka and Takeuchi (1995), who claim that organisations should pursue creation and use of new knowledge based on previously obtained and documented knowledge.

The above studies' idea of transferring knowledge from tacit to explicit forms supports this research, in which one of the challenges is to use tacit and explicit knowledge together. Using both types of knowledge is exploited by converting the tacit knowledge to an explicit knowledge in order to support decision making when managing information overload in the diabetes clinics of the selected hospitals in Jordan.

4.2.2 Knowledge Management Strategies

There are two identified strategies of knowledge management within organisations: personalisation and codification (Hahn & Subramani, 2000). In the personalisation strategy, a transformation of the knowledge is performed via direct interpersonal communication. This type of strategy is based on tacit knowledge. In the codification strategy, the extraction and storage of the knowledge can be accomplished with a database. The personalisation strategy does not fit with this thesis in terms of reducing information overload since it relies exclusively on tacit knowledge and excludes explicit knowledge (Năstase et al., 2009). The codification strategy does fit this thesis, and it gives the thesis an advantage since it contributes to reducing the information problem by converting knowledge from a tacit form to an explicit, readable form (Hau et al., 2012). Efficiently codifying knowledge into readable forms is advantageous for reducing information overload in the diabetes clinics of the selected Jordanian hospitals.

Furthermore, there are three categories of knowledge management strategy according to Nicolas (2004). These comprise the socialisation strategy, the technological strategy, and the personalisation strategy. The socialisation strategy combines both personalisation and technological strategies, while the technological strategy is considered a codification strategy by which explicit knowledge is managed based on usage of an information system. The researcher in this thesis adopts the technological strategy (i.e. the externalisation phase of the SECI model) and the combination phase of the SECI model (Nonaka & Takeuchi, 1995) to help reduce the information overload due to the following reasons:

- The technological strategy provides a codification strategy that aims at transferring the knowledge from a tacit form to an explicit form based on the use of an information system.
- Having a reduced information overload in the diabetes clinics of the selected hospitals in Jordan is involved in different steps of decision-making. In these steps, both tacit-to-explicit and explicit-to-explicit knowledge transformations are applied at different levels based on the adoption of the externalisation and the combination phases of the SECI model (Nonaka & Takeuchi, 1995). The externalisation phase ensures that the knowledge is transferred from tacit to explicit forms, while the combination phase ensures that the knowledge is transferred from one explicit form to another new explicit form (Nonaka & Takeuchi, 1995). Thus, decision making on reducing information overload is applied into different levels in this research.

4.2.3 Knowledge Management Elements

Knowledge management includes two major elements: the first is people and information; the second is communication technology (Biloslavo & Zornada, 2004). Both of these elements combine between human-oriented research and technology. This combination respects the high importance of linking knowledge to people since knowledge and people are two complementary elements in an organisation. This combination also implies that new knowledge cannot be created in an organisation without the existence of people. Additionally, disposable knowledge cannot be used by an organisation in an efficient manner if the right technology does not exist (Biloslavo & Zornada, 2004). These two elements of knowledge management relate to reducing information overload since relying only on people without technological support is insufficient for acquiring the new knowledge. Most people are likely to share knowledge in tacit forms only, but the right technology allows to obtain the new knowledge that is already codified by people properly. The proper codification of knowledge can in return reduce information overload when the right needed information goes to the right person in the right place at the right time in the right quantity. Thus, both elements are significant. Benselin and Ragsdell (2016) mention that using technology to gain knowledge can increase information overload among young people since they lack the skills to manage knowledge efficiently and since young people would use the technology for different purposes other than managing it for future reuse. Benselin and Ragsdell (2016) conversely argue that technology would reduce information overload among older people due to their lower reliance on and usage of technology. In the context of the thesis, the technological aspect cannot be beneficial for the thesis since many medical staff claimed that large amounts of related and unrelated knowledge are spread and scattered widely and frequently through emails and different unorganised websites. This implies that relying only on such technological tools (i.e. computers, mobiles, notebooks) for seeking the required knowledge can also be overwhelming in these clinics. The reason behind this is that most of the medical staff respondents claimed that they have no time to keep up to date with newly arising medical knowledge since they are extremely busy with other necessary tasks. As argued by Elwert (2013), technology is considered the current cause of information overload in many organisations since many people lack the skills to manage the information electronically (Wellmon, 2012). Thus, this thesis would not benefit from the reliance of technology.

Evans (2003) argues that the theory of communication relies on the exponential increase in the benefit of the network potential with the expansion of the number of nodes. When building a network that turns to be stoked by people, more opportunities are being explored that can create new knowledge and apply that knowledge in an organisation. In contrast, this creation aims at building reliability within an organisation (Biloslavo & Zornada, 2004). The capability of building a network in any organisation is considered significant. This capability is based not only on sustaining a socialisation process throughout knowledge creation, but also on identifying a concept that will compel creative individuals or micro-communities to convince decision makers to support their work even at the advanced stages within an organisation (Biloslavo & Zornada, 2004).

Information and Communication Technology (ICT) stores explicit knowledge that is meaningful and valuable for the future. It can store a large amount of information and ensure that the information is shared properly when required without any restrictions. Proper sharing of the valuable knowledge within an organisation means that the length of the transformation cycle of this knowledge is reduced (Biloslavo & Zornada, 2004). Bollinger and Smith (2001) and Alhawari et al. (2012) argue that organisations remain competitive and business challenges are met when effective mechanisms are developed for exploiting the knowledge within an organisation. The research studies of these researchers are in relation to the thesis when aiming to reduce information overload since the studies rely on sharing knowledge properly within an organisation when it is needed and thereby on reducing information overload (Tang et al., 2007). ICT is divided into three groups according to Biloslavo and Zornada (2004):

- *Technology for knowledge codification and storage*: This technological group includes knowledge-based decision support systems and knowledge repositories. In this type of technology, software agents allow information to be searched from different repositories. The searching process that is performed by these agents does not depend on data mining tools or on the user to search for the required information from huge volumes of data.
- *Communication technology*: In this type of technology, transferring knowledge is supported regardless of user operating system, format, or communication protocols. Knowledge maps are also included in this type of technology. The maps act outside or inside an organisation as pointers to knowledge providers.
- *Collaborative technology*: In this type of technology, person-to-person collaboration is improved and it either occurs in a different or in the same place, or at a different or the same time.

Selection of a group of ICT is based on an organisation’s context, which is formed by the knowledge strategy, businesses, orderliness, and disposable assets of an organisation (Biloslavo & Zornada, 2004). None of the three groups relate properly to this thesis. The researcher’s effort to reduce information overload was reliant on the conceptual aspect of knowledge management, namely on proposing a knowledge management framework. The researcher did not focus on the use of the technological aspect when proposing the framework but in theoretical and conceptual aspects. The reason behind this focus is that most of the medical staff respondents in the diabetes clinics in the selected hospitals in Jordan claimed that they are very busy with medical tasks. Therefore, technology was not a possible solution since the medical staff are apart from using computers for codifying and sharing knowledge in a proper manner. The new framework for reducing the information overload problem in this thesis could not rely on improvement of technological methods. Medical staff are at all times busy with other required medical tasks, and have insufficient time in acquiring, organising, and managing the knowledge electronically. Thus, the researcher focused on the conceptual aspect of attempting to reduce information overload, since technology would likely cause information overload in organisations as shown by some researchers (Wellmon, 2012; Elwert, 2013; Benselin & Ragsdell, 2016).

4.2.4 Knowledge Management Processes and Their Goals in Organisations

King (2009) identifies the processes of knowledge management as knowledge acquisition, creation, refinement, storage, transfer, sharing, and utilisation. Within an organisation, these processes are operated by the knowledge function. Different systems and methodologies are developed to support the process. With this development, people are motivated to participate in these processes within an organisation (King, 2009). In the context of reducing information overload, these processes are beneficial since they aim at creating and managing the new knowledge in an efficient manner so that it can be retrieved easily when required. Knowing that the success of information overload is based on efficient management, storage, and retrieval of the already created and codified knowledge, information overload can be reduced when knowing that knowledge can be shared and retrieved easily once required by others (Bouthillier & Shearer, 2002). Hence, these processes can be advantageous to this thesis in attempting to reduce information overload in the diabetes clinics of the selected hospitals in Jordan.

Staples et al. (2001) mention that the objective of knowledge storage is to convert people's insights, documents, and many other different artefacts into forms that can simplify the sharing and retrieval processes without losing the knowledge meaning. It is important to ensure that knowledge is readable and transferrable when required by other people. This achieves effective knowledge management within an organisation.

Biloslavo and Zornada (2004) declare that all the processes involved in knowledge management can be rendered useless if improper knowledge is applied within an organisation. Thus organisations should focus on applying suitable ways of sharing the right knowledge with the right people in the right place at the right time in the right quantity. The strategy of knowledge management can thereby be performed properly within an organisation. All processes of knowledge management can be performed by managers, but knowledge management is an activity that focuses on how managers can perform all the processes of knowledge management to achieve goals (King, 2009).

According to King (2009), knowledge management goals include developing the knowledge assets of an organisation, obtaining the benefits of handling the knowledge, gaining developed behaviours from an organisation, acquiring better decisions when required, and improving the performance in an organisation. Any organisation would attempt to achieve these goals in order to obtain the best quality of knowledge management.

The studies of Staples et al. (2001), Biloslavo and Zornada (2004), and King (2009) relate properly with the reduction of information overload in this thesis and are advantageous to the researcher as they aim at ensuring that knowledge should be codified and shared in a proper and efficient manner within organisations. Therefore, information overload can be reduced when knowledge is organised properly between people of an organisation (Alavi & Leidner, 1999; Bock et al., 2008).

A model of the cycle of knowledge management processes is shown in Figure 4.2. This model organises the processes that are performed in knowledge management. The model makes use of knowledge management terminology that is generally accepted. The model also uses alternative paths in the cycle to reveal significant differences (King, 2009).

The starting phase of Figure 4.2 is either the creation process or the acquisition process (King, 2009). In the knowledge creation process, existing knowledge is replaced with a new knowledge context, which is also developed by the creation process (Nonaka, 1994). The knowledge creation process involves four modes, as shown in Figure 4.2, which are adopted from Nonaka and Takeuchi (1995). These modes are socialisation (the process of converting knowledge from a tacit form to a new tacit form based on social creation), externalisation (the process of converting knowledge from a tacit form to an explicit form), combination (the process of converting existing knowledge from an explicit form to a new explicit knowledge form), and internalisation (the process of creating new knowledge that is tacit from knowledge that is explicit).

In the context of this thesis, the reduction of information overload is based on the externalisation and combination phases. This basis is employed because proper sharing of knowledge relies on converting knowledge not only from tacit to explicit forms, but also from explicit to new and more organised explicit forms (Nonaka & Takeuchi, 1995).

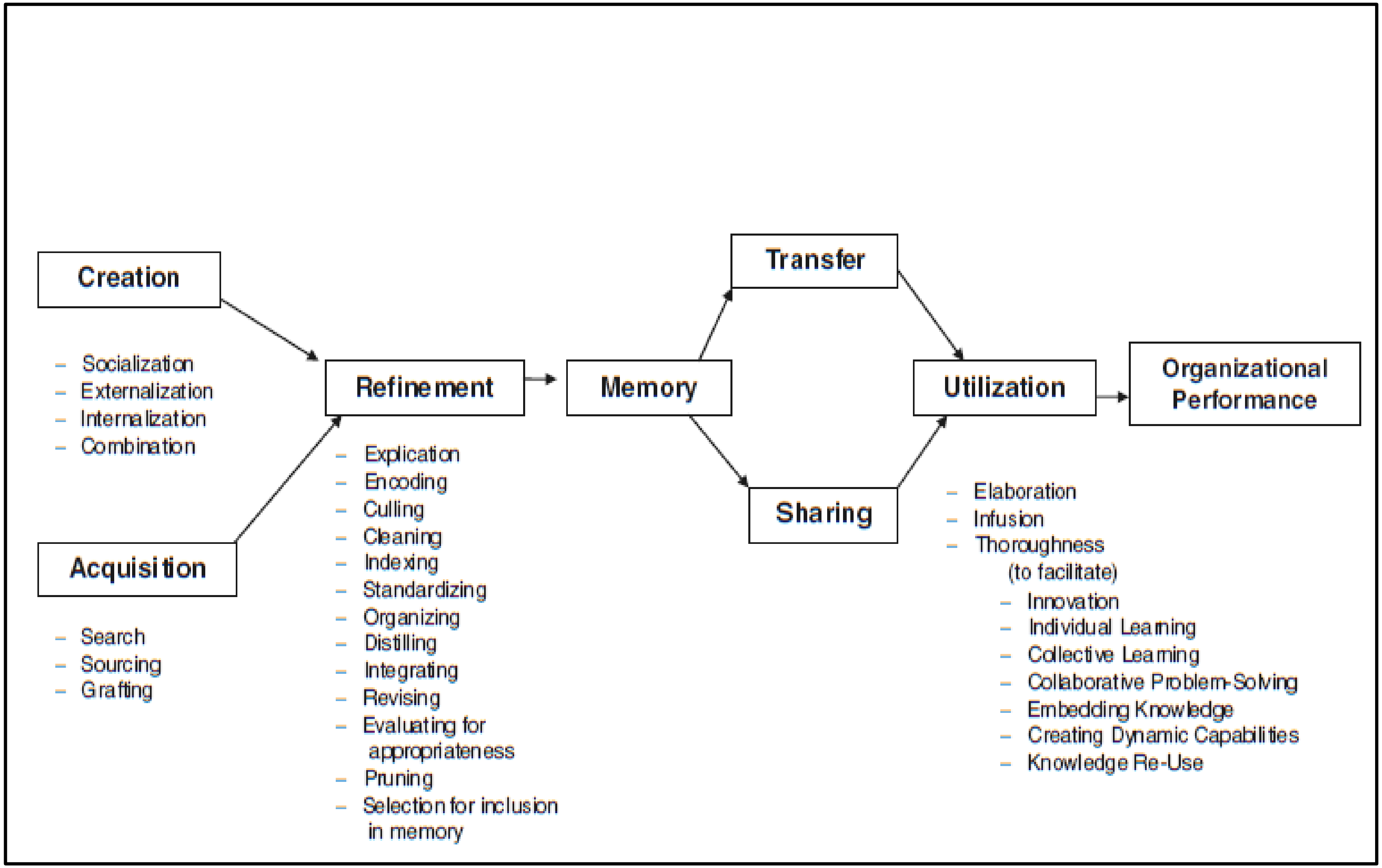

Figure (4.2): The knowledge management processes cycle model (King, 2009)

Knowledge acquisition involves understanding how to recognise valuable knowledge (Huber, 1991). In the acquisition process, several sub-processes may be employed to gain knowledge from external resources. These sub-processes comprise a searching process (e.g. searching the internet) (Menon & Pfeffer, 2003), a sourcing process (in which a specific source is selected for usage) (King & Lekse, 2006), and a grafting process (in which a person with the required valuable knowledge is sent to an organisation) (Huber, 1991). When the new knowledge is either created or acquired, the preparations of adding the knowledge mechanisms into the memory of the organisation takes place so that the effect of the new knowledge can be reused for a long term (King, 2009). This process can be applied to effectively reduce the information overload in the diabetes clinics of the selected hospitals in Jordan related to this thesis. Hence, it can be observed from King (2009) that knowledge can be frequently reused when it is created, stored, and shared properly within an organisation. Additionally, it can be observed that knowledge management exists to ensure effective creation, codification, and sharing of knowledge (Bouthillier & Shearer, 2002).

The objective of the processes under the refinement process of Figure 4.2 is to convert tacit knowledge to a codified, evaluated, and organised form of knowledge so that the knowledge can enter the memory of the organisation. Cross and Baird (2000) identify three components of the organisational memory:

- The storage of the knowledge in the minds of the participants within an organisation.
- The storage of the knowledge in electronic repositories that allow teams or groups to acquire the knowledge via business processes.
- Services or products and their relationships with partners, suppliers, and customers.

It can be deduced from these components that it is important to ensure that an organisation has codified and appropriate knowledge that is likely to be stored and requested by individuals within the working team when required.

The processes of transferring and sharing appropriate knowledge comprise the following phase of the organisational memory as shown in Figure 4.2. These processes have a wide impact on an organisation. In the transferring process, knowledge communication that is purposeful and going from a sender to an identified receiver takes place (King, 2006a). In the sharing process, disseminating the knowledge is less focused (e.g. within a repository) and knowledge is often shared with individuals who are unknown to the knowledge sharer (King, 2006b). A combination of the transferring and sharing processes comprises groups, individuals, or organisations, which are considered either senders or receivers (King, 2009).

In the utilisation process, when knowledge is either shared or transferred to other people, knowledge can be used in one of three ways as suggested by King and Ko (2001). These ways are as follows:

- The use of knowledge through clarifications, where many different interpretations are improved.
- The use of knowledge through thoroughness, where multiple understandings and interpretations by different groups or individuals are improved.
- The use of knowledge through infusion, where underlying issues are identified.

King (2005) argues that these ways assist in facilitating and developing collective learning, collaborative problem solving, innovation, and individual learning.

The last phase of this processing cycle involves how an organisation's performance is affected by knowledge. The value of knowledge initiatives is arbitrated by organisations based on the enhancements that they offer to the effectiveness of an organisation (King, 2009). Many worthy efforts at knowledge management processes fail to be performed. This is due to the fact that many experts of knowledge management do not consider the efforts to support the organisation's goals, which are based on developed revenues, profits and return on investment, and productivities within the organisation (King, 2009). It can be deduced from King (2009) that failure to effectively enact knowledge management, and hence failure to reduce information overload, can negatively affect the performance of any organisation.

4.2.5 Knowledge Management Organisational Learning

In Organisational Learning (OL), an organisation's capacity is continuously enlarged to preserve the organisation's sustainability (Senge, 2006). The concepts of OL and knowledge management are closely related. However, defining the relationship between the two concepts is considered an issue (Mishra & Bhaskar, 2011). For instance, Easterby-Smith and Lyles (2003) and King (2009) distinguished this relation by identifying that knowledge management is based on the content of the knowledge, while OL is based on the process of the knowledge. In comparison, a more recent study conducted by Mishra and Bhaskar (2011) declares that knowledge management is based on a way of building and making use of the process of learning the knowledge, while OL is based on a way of managing this type of process within an organisation.

It can be observed from the above researchers' definitions that knowledge management and OL are highly related to each other. Both provide different aspects that complement each other in attempting to build, manage, and make effective use of knowledge in an organisation. Both concepts can also relate to the reduction of information overload since knowledge management is based on the content of the knowledge and OL is based on the process of knowledge. Reducing information overload necessitates reducing the amount of unnecessary and unrelated knowledge and ensuring appropriate content. At the same time, reducing information overload requires an efficient process of knowledge dissemination so that the relevant knowledge can be effectively retrieved when needed by others within an organisation (Delen & Al-Hawamdeh, 2009; Drus et al., 2013). Thus, the proposed framework in this thesis involves the concept of knowledge management and keeps open the possibility of involving OL too, since OL also relates to how the proper knowledge should be managed and used effectively. This decision is aimed at the goals of building, managing, using, and transferring the right information to the right people in the right place at the right time in the right quantity within these clinics.

Additionally, Rowley and Gibbs (2008) argue that working on OL may lead to innovation on many aspects within an organisation. Innovation involves new tangible activities, infrastructure, and new tools and techniques that can be used by the employees in their organisation when carrying out their required work (Rowley & Gibbs, 2008).

There are two main styles of OL as identified by Rowley and Gibbs (2008). These comprise single loop learning and double loop learning. Single loop learning is based on responding to the occurring changes of an organisation without changing the organisation's standards (Rowley & Gibbs, 2008). This style of learning is considered a low-level approach that can prompt and enhance incremental innovation (Scott & Vessey, 2000). Double loop learning is based on responding to changes occurring in an organisation and/or its standards (Rowley & Gibbs, 2008). Unlike single loop learning, double loop learning is considered an approach that is based on high-level learning wherein intermittent innovation occurs according to a strategic change (Scott & Vessey, 2000). In the context of the thesis, double loop learning can best contribute to reducing the information overload in the diabetes clinics. The researcher in this thesis proposes a knowledge management framework that attempts to reduce the information overload in the diabetes clinics in two respondent ways:

- By responding to the occurring changes in the clinics (e.g. changes in the roles of respondents when they are exchanging knowledge with each other).
- By responding to the changes in the standards of the clinics (e.g. changes in the assignments of new special medical administrators, who can be put in charge of sharing relevant knowledge with the right people in the right place at the right time in the right quantity within these clinics).

These two respondent approaches comply with the double loop learning style, which aims at responding to changes occurring within organisations and/or their standards. Single loop learning, in contrast, is insufficient by itself to support this thesis since its style is based only on the changes occurring in organisations; single loop learning does not take into account changes in standards (Scott & Vessey, 2000; Rowley & Gibbs, 2008).

It can be concluded from both OL styles that it is important for any organisation to be able to identify the types of changes that are occurring within the working environment so that a suitable style of learning can be efficiently implemented. Thus the best quality of learning possible can be ensured in an organisation, and that learning can assist in reducing information overload.

4.2.6 The Enterprise of Knowledge Management Sharing

Knowledge sharing is considered an essential part of knowledge management (Shaohua & Fan, 2008). Knowledge sharing can be defined as the transference of knowledge from an individual or a group of individuals to other people (Lee, 2001). Friesl et al. (2011) argue that knowledge sharing is a process that can occur from enterprise to enterprise or from person to person. Figure 4.3 illustrates a model of knowledge sharing. The model includes a combination of personal knowledge, external knowledge, and internal knowledge.

The collaboration of knowledge holders, which involves combining internal, external, and personal knowledge, improves the process of knowledge sharing (Li et al., 2009). There are different types of technologies that are useful and supportive in sharing knowledge between enterprises and people. Examples of these supporting technologies are enterprise social networks and the Web 2.0 (Hau et al., 2012; Zhao & Chen, 2013).

Knowledge sharing is an essential process that contributes to the reduction of information overload. This is due to the fact that the normative notion of sharing knowledge requires that information must freely move throughout all levels of organisations, so that any individual at any level within an organisation can access the required information when it is needed (Veld, 2010; Abrahamson & Goodman-Delahunty, 2014). In the context of the thesis, achieving proper knowledge sharing is therefore important. Knowledge sharing is needed to ensure that the required and relevant medical knowledge will flow freely in the diabetes clinics of the hospitals in Jordan when required by the medical staff. Information overload is reduced when medical staff can access relevant knowledge at the right time in the right quantity in the right place within these clinics.

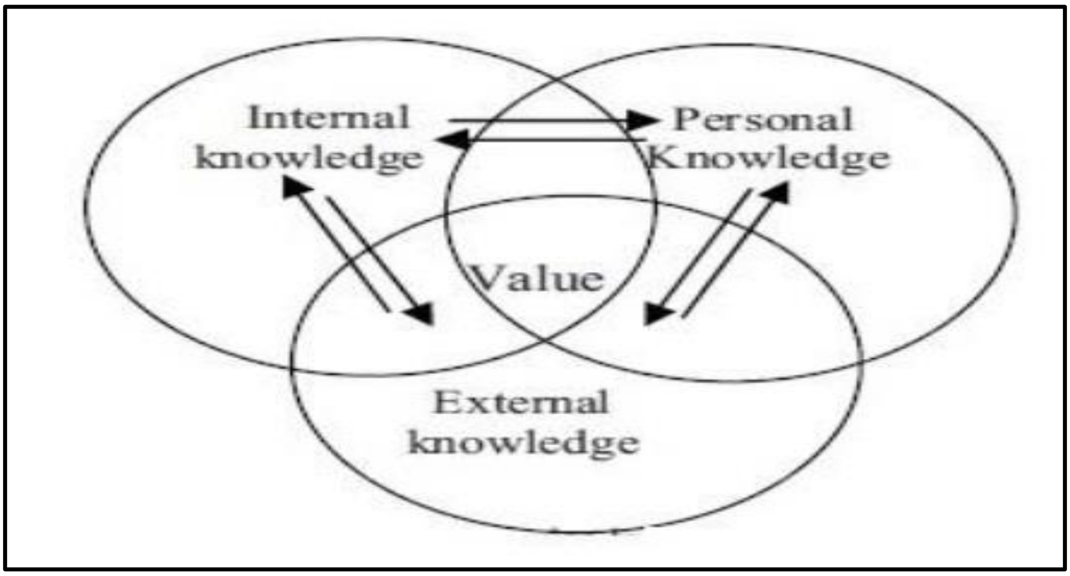

Figure (4.3): The model of knowledge sharing (Song & Chu, 2012)

4.2.7 Knowledge Management Basis in Decision-Making

There are different ways of generating knowledge to exploit in decision making. These methods involve scenarios, feasibility studies, and organisational publications (Simonen et al., 2009; Giebels et al., 2015). McKenzie et al. (2011) state that both internal and external knowledge are currently required for decision making. The authors argue that today's changes and challenges are continuous, rapid, and complex. Decision making can be related to information overload, which affects decision making adversely (Buchanan & Kock, 2001). In the organisational context, for administrators who are in charge of managing different types of information from many different sources, and who must make decisions based on these types of information, increases in information can be intense and even overwhelming (Sephton, 2013). Thus, processing overwhelmingly large amounts of information can assist in achieving decisions within high-quality standards (Lakudkar & Patil, 2002). This point can be useful for the current phenomenon of this thesis, since the diabetes clinics of the selected hospitals can reduce information overload if internal and external knowledge arising from different sources is managed effectively.

Zhong (2008) defines decision-making knowledge as 'the recognition, understanding of the world and facts, a set of rules, modes and approaches which can help an individual or an organization make decisions'. Nicolas (2004) emphasises that different levels of decision making tend to make use of both knowledge types, namely tacit and explicit knowledge. The study of Nicolas (2004) can be related to the information overload problem since the increasing types of information would create information overload where decision makers of different information and decision levels encounter high uncertainty about knowledge

(Jamieson & Hyland, 2006). This is because the decision makers are unsure of what information is the most relevant to their decision-making process, and they are unsure of the outcomes of their decisions. These points can be useful for the context of this thesis since the best decision making would be based on effectively managed information in the diabetes clinics of the selected hospitals in Jordan; specifically, decision making would improve if both types of knowledge – tacit and explicit knowledge – are exploited by the right people within and across these clinics. Courtney (2001) and Nicolas (2004) identified three phases that are involved in the decision-making process. These comprise the conception or design, the selection or choice, and the intelligence phases. In the conception phase, new solutions are designed. In the choice phase, an evaluation of different alternatives and solutions is performed for a specific context. In the intelligence phase, the problem is investigated (Nicolas, 2004). In the context of this thesis, the intelligence phase introduced by Courtney (2001) and Nicolas (2004) is the most relevant phase to the domain of the information overload problem since this phase attempts to investigate a problem to achieve better decision making within an organisation. This is in the light of the information overload phenomenon that is currently occurring in the diabetes clinics of the selected hospitals in Jordan where the best decisions on sharing the medical knowledge should be taken, and thus avoiding information overload.

In the literature, there are three decision-making levels: strategic, management (tactical), and operational (Courtney, 2001; Nicolas, 2004). The strategic planning is a process that affects an enterprise in terms of its goal and overall mission; the objective of an organisation must be changed (Courtney, 2001). The strategic level makes use of tacit knowledge at most times, while the management level makes use of both tacit and explicit knowledge. The operational level uses mainly explicit knowledge (Yim et al., 2004).

Casadesus-Masanell and Ricart (2010) argue that strategic decisions are decisions about which appropriate business model to select. Casadesus-Masanell and Ricart (2010) define a business model as an explanation of the way an enterprise will function. Parakala and Udhas (2011) argue that strategic decisions are related to the transformation of a business within an organisation. In the view of these researchers, many different enterprises consider IT as their backbone, making the IT selection a type of strategic model itself. IT is not always useful for the reduction of information overload. Technology causes an increase in the amount of information in many organisations, and many employees lack the skills to manage information electronically (Wellmon, 2012; Elwert, 2013). In the context of this thesis aimed at reducing the information in the diabetes clinics of the selected hospitals in Jordan, the research was based on the conceptual aspect and not on the technological aspect. Thus, the strategic decision-making level that is based on technological aspects is not useful for this thesis since it causes information overload in many organisations (Wellmon, 2012; Elwert, 2013). Additionally, the strategic decision-making level is also not useful for this thesis since it is based on using only tacit knowledge at most times, and this thesis uses both tacit and explicit knowledge to reduce information overload.

In the management (tactical) decision-making level, the enterprise is guided by decisions so that the organisation's strategic goals can be achieved (Courtney, 2001). Furthermore, Casadesus-Masanell and Ricart (2010) state that tactical decisions are made once alternatives have determined via a selected business model. Additionally, Parakala and Udhas (2011) contend that adoption roadmaps, as well as technical and financial evaluations, are likely to be related to the tactical level. To that end, these researchers' major focus is revealed to be on determining what decisions could achieve the strategic goals based on different available resources within the business environment. In this thesis, the management decision-making level can be related to the reduction of information overload since this decision-making level concentrates on combining both tacit and explicit knowledge for different uses; namely, the management decision-making level aims to allow access to tacit and explicit knowledge when they are required and to ensure efficient sharing of both types of knowledge when decision situations arise (Năstase et al., 2009). This decision-making level is in line with the researcher's choice of the externalisation phase (tacit to explicit knowledge) pertaining to the SECI model (Nonaka & Takeuchi, 1995). Therefore, the management decision-making level can be useful in the diabetes clinics of the selected hospitals in Jordan where different tacit and explicit knowledge could be managed within these clinics by supporting proper decisions based on efficiently shared medical knowledge. Consequently, information overload can be reduced within these clinics.

In the operational decision-making level, a particular task to be conducted is taken into consideration (Courtney, 2001). Tasks usually include low-level decisions (e.g. the specification of a product) (Dandache & Claude, 2009). A well-defined knowledge with a specific scope is required for tasks at the operational level. The scope might, however, be more general and broad at the tactical level in order to cover the entire involved organisation. The tasks of the operational level might also involve migration, maintenance, planning, and implementation (Parakala & Udhas, 2011). In the context of this thesis, the combination decision level can be useful to reduce information overload since the researcher uses the combination phase (explicit to explicit knowledge) of the SECI model (Nonaka & Takeuchi, 1995), in which codified knowledge is efficiently shared with others to form new readable knowledge. This share complies with the objective of the combination decision-making level in that it makes use of the explicit knowledge at all times within an organisation.

In the context of the proposed knowledge management framework in this thesis, it is concluded that the research was based on a mix of decision levels that combine the management (tactical) and the operational decision-making levels for solving the issue of information overload in the diabetes clinics of the hospitals in Jordan. The reason behind these choices is that the management level is based on using both tacit and explicit knowledge, and the proposed framework in this thesis converts the medical knowledge of the diabetes clinics in the selected hospitals in Jordan from tacit to explicit forms (see the externalisation phase of the SECI model in Chapter 1). Additionally, the operational level is based on using only explicit knowledge; the level is therefore useful because the proposed framework in this thesis also converts the codified medical explicit knowledge to new codified medical explicit knowledge (see the combination phase of the SECI model in Chapter 1) by sharing and transferring it to others when necessary. These levels thus both support the aim of ensuring that the right information goes to the right people in the right place at the right time in the right quantity.

4.3 Knowledge Management Related Research: Existing Frameworks and Models

The previous sections showed the importance of conducting a literature search and provided comprehensive discussions and background around the domain of knowledge management. A number of attempts at improving the performance of the knowledge management domain have been made in different disciplines. These improvements and suggestions have led many researchers to propose their own frameworks within the knowledge management of individual disciplines. This section discusses these existing frameworks along with the limitations that other researchers' work has exposed and deduced about them. The researcher analyses and criticises the existing knowledge management frameworks and models of previous research that has been conducted in different disciplines.

Several studies have been carried out exclusively in the knowledge management domain, such as in Information and Communication Technology (ICT), education, business, and industries. The reason behind this is that this domain is attracting remarkable attention due to its importance as a research field and within the business context (Iqbal & Mahmood, 2012). However, these studies share a limitation in that they focus on developing knowledge management frameworks to properly organise the surrounding work environment, but only in a particular domain; the studies rarely focus on developing frameworks for more than one domain at a time. In contrast, other studies have focused on domains other than knowledge management. However, most of the proposed frameworks in the domain of knowledge management in the literature are nearly identical, distinguished only by subtle differences in certain aspects and perspectives. In the governmental context, Misra et al. (2003) propose a framework for creating and sustaining a knowledge management initiative for setting up government organisations. Their framework defines a set of guiding principles. The framework's implementation relies on four supportive elements: People, Process, Technology, and Management (PPTM). The only limitation that can be observed with the research carried out by Misra et al. (2003) is that it only addresses the issue of knowledge management initiatives that are likely to be encountered when setting up a government environment.

The following subsections discuss many of the knowledge management frameworks that have been proposed and developed by researchers based on aspects other than those aspects that are related to the governmental domain. These aspects include technology, organisational business, industry, and education.

4.3.1 Technology

In the context of technology, quite a number of frameworks have been conducted in the domain of knowledge management. For instance, Ahmed and Ahsan (2014) propose an Integrated Organisational Knowledge Management Framework (IOKMF) for knowledge creation and usage in organisations that are working on projects involving software tools. The main idea of their framework process is to develop the flow of information and knowledge throughout the whole process of the software improvement in order to achieve effective management for the software project. It was found that their research was limited once their developed framework was partially implemented in particular organisations.

In the same context, Maccanti et al. (2016) propose a knowledge management framework for software reuse. The process of their framework included the storage, organisation, and management of the knowledge in order to facilitate reuse of the framework in technical disciplines. It was observed that their research was limited because their proposed frameworks were only partially implemented.

It is deduced from the proposed frameworks of Ahmed and Ahsan (2014) and Maccanti et al. (2016) that these authors' frameworks could be related to the issue of information overload since the frameworks use knowledge in their creation, storage, usage, organisation, and management processes. These frameworks thus comply with the fact that knowledge management can be successfully developed based on applying effective creation, codification, sharing, and organisational processes for the knowledge (Bouthillier & Shearer, 2002; Năstase et al., 2009). Information overload can be successfully reduced based on effective storage and retrieval of existing codified knowledge, as these features allow knowledge to be shared with the right people in the right place at the right time in the right quantity (Bouthillier & Shearer, 2002). This is in line with the fact that a large amount of information cannot be effectively managed and reduced unless it is first codified in different organised repositories and shared properly between employees. Therefore, information overload is highly related to knowledge management. In the context of this thesis, their frameworks can be useful to reduce information overload in the diabetes clinics of the selected hospitals in Jordan since the frameworks' objective is to create, store, codify, organise, and share the knowledge properly.

Although Ahmed and Ahsan's (2014) and Maccanti et al.'s (2016) frameworks aim at providing the best performance within software organisations, these proposed frameworks are only partially structured and implemented. For example, there were some issues encountered with the knowledge management framework of Maccanti et al. (2016) since the framework needs to be fully implemented in order to overcome any arising issues in the future. Issues that were faced by Maccanti et al. (2016) included the following:

- Gap analysis inadequacy.
- Gap analysis schedule inconsistency.
- Requirements discrepancies.
- Reuse fallacy risks.
- Poor hardware and software management.

Another research that focused on software applications was the proposition of a Semantic Knowledge Management System (KMS) framework architecture by Kabir (2015). The KMS framework aimed to transfer the knowledge in the knowledge repositories of organisations to mobile devices for users to interact with. His proposed knowledge management framework was based on many different techniques such as the use of semantic technologies, data processing, the distribution of knowledge storage, artificial intelligent agents, and tools that are related to the area of machine learning. It can be deduced that the proposed knowledge management framework of Kabir (2015) can contribute to the reduction of the information overload problem since the framework transfers knowledge into different knowledge repositories, but at one place (into mobile devices), rather than at different repositories in multiple places (Bouthillier & Shearer, 2002). In the context of the thesis, Kabir’s (2015) framework is not useful for the diabetes clinics of the selected hospitals in Jordan since the framework is based on the technological aspect, while the research of this thesis is based on the conceptual aspect in reducing information within these clinics. Additionally, Kabir’s (2015) framework attempts at grouping the knowledge into one place, so knowledge is not categorised; this manner of organisation might lead to information overload in the diabetes clinics in Jordan when specific knowledge is required by a medical staff.

Based on the limitations that were drawn from Ahmed and Ahsan (2014) and Maccanti et al. (2016), it was found that one of the limitations of the research that was carried out by Kabir (2015) was the partial performance of the implementation of his proposed knowledge management framework. Another included limitation was the lack of evaluation regarding the effectiveness of the knowledge processes and the effects of the framework on the performance of different technological organisations.

Similar to the above researchers, Alawneh and Aouf (2016) did not fully apply their knowledge management framework in IT organisations. Alawneh and Aouf (2016) developed their framework to increase the success of the information systems involved in IT organisations. The process of their proposed framework is based on integrating the processes of knowledge management, which comprise discovery, planning, execution, and closing-down. These knowledge management processes are performed during the phases of project management information systems. One more limitation that was noticed from their framework was its failure to improve the exchange and transfer of experience and knowledge among IT team members within their organisations. Overcoming this failure would improve the success rate of technological projects related to information systems. It can be inferred that the proposed framework of Alawneh and Aouf (2016) has the possibility of reducing information overload since the knowledge management domain of their framework contributes to discovering knowledge, planning how to store it, and executing it to be shared when it is required by the right person. These organised processes of knowledge management, namely the effective storage and retrieval of knowledge, can reduce information overload (Alavi & Leidner, 1999; Rasooli & Albadvi, 2007; Bock et al., 2008; Veld, 2010; Abrahamson & Goodman-Delahunty, 2014). The framework of Alawneh and Aouf (2016) can be useful for this thesis for the diabetes clinics of the selected hospitals in Jordan, since their framework attempts at making efficient use of the knowledge management processes, which can in turn reduce information overload in these clinics.

Another technological aspect for which knowledge management is used is social media. Jalonen (2014) proposes a theoretical knowledge management framework for managing fundamental problems in knowledge based on the use of social media. The first processes of the framework are the identification and comprehension of the epistemological differences between the problems within the knowledge. The next process is the improvement of the guidelines that are related to social media for achieving knowledge management purposes. It can be deduced from the proposed framework of Jalonen (2014) that the framework can be related to reducing information overload since it attempts at identifying different problems that are affecting the arising knowledge. One of the aims of the knowledge management domain is to identify and manage complex problems related to knowledge from different aspects. One of these complex problems that is managed by knowledge management is the information overload problem (Dalkir, 2005). Thus knowledge management leads to the reduction of information overload. In the same context, the framework of Jalonen (2014) can be useful for this thesis in reducing information overload in the diabetes clinics of the selected hospitals in Jordan since the framework identifies different issues that are adversely affecting the emerging knowledge. In the view of the researcher, Jalonen's (2014) framework can assist in identifying different problems associated with the information overload as different medical knowledge keeps flowing into these clinics. It was observed from the research carried out by Jalonen (2014) that the proposed framework is limited to a particular type of media. This implies that the limitation of Jalonen's (2014) proposed framework is the lack of implementation of the framework to more types of social media. Thus, there is more research to be done, according to Jalonen (2014), in this regard. Additionally, the research of Jalonen (2014) is limited due to its lack of validation research for his proposed knowledge management framework.

It can be concluded from the knowledge management frameworks that have been proposed in this subsection that most of these developed frameworks are similar to each other in that they all rely on the domain of knowledge management. It was also noticed that the technological context is an active research area in which the domain of knowledge management is involved. However, one of the limitations found in the cited research is that the proposed frameworks were limited to the context of technological systems. Additionally, there has been limited evaluation of the proposed knowledge management frameworks. This implies that the impact of such frameworks is still largely unknown. It is necessary to provide evaluations in systems related to the domain of knowledge management in order to effectively improve the performance of any involved technological organisation. Another limitation that can be drawn from the above researchers was the lack of full implementation and application of some of their proposed knowledge management frameworks into selected organisations. Such incomplete implementations led some of these proposed frameworks to encounter issues due to their partial structure. Hence, it is significant to deduce that the domain of knowledge management requires a fully structured framework. Finally, it can be observed from these researchers that their research does fit properly in this thesis in terms of the knowledge management aspect. Moreover, the researcher viewed that their frameworks could have the possibility of being involved in the reduction of the information overload problem within the diabetes clinics of the selected hospitals in Jordan. However, their proposed frameworks do not fit with this thesis in terms of the technological aspect since these researchers developed knowledge management frameworks in the technological context based on software tools. In contrast, the researcher in this thesis proposes a knowledge management framework in the healthcare and information overload contexts.

4.3.2 Organisational Business

In the context of business in organisations, there has also been a number of proposed frameworks that are based on the knowledge management domain. Similar to the technological context, the organisational business context is an active research area within the knowledge management domain. Ahuja and Novelli (2011) argue that it is significant to create effective knowledge within any organisation based on external and internal partners or firms. In the same context, Ghosh and Mahanti (2014) suggest that knowledge can be obtained by employing new experts through networking with different organisations and even competitor firms. Delen and Al-Hawamdeh (2009) propose a holistic knowledge management framework for managing knowledge discovery for disseminating knowledge from tacit knowledge to explicit (codified) knowledge within an organisation. The main idea of their research is that information overload negatively affects the management of knowledge discovery. This means that most of the knowledge is kept tacitly in minds rather than being codified properly, and hence, the authors focus on a main factor, which is the knowledge dissemination factor. The proposed knowledge management framework of Delen and Al-Hawamdeh (2009) contributes to reducing information overload as it attempts to manage knowledge by converting it from a tacit form to an explicit codified form. The framework thus implies that knowledge management deals with knowledge that is yet to be codified or with knowledge that is still tacit (Dalkir, 2005). The framework of Delen and Al-Hawamdeh (2009) can be useful for the current phenomenon of the diabetes clinics in Jordan of this thesis since it could be applied to convert the tacit medical knowledge known by different medical staff into new explicit medical knowledge within these clinics. A similar attempt was made by Barbosa et al. (2009), in which they focus on distributing knowledge from tacit to explicit knowledge. They propose a conceptual knowledge management framework that can manage distributing knowledge from tacit to explicit forms on the basis of supporting the Brazilian oncology network and hospitals in Brazil. The knowledge management of their research thus concentrated on the healthcare domain. The main idea of their research is that healthcare organisations consider knowledge management to be an important concept. The researchers focus on three theoretical factors: the security environment factor, the personal factor, and the knowledge dissemination (tacit to explicit knowledge) factor. These factors, each of which related to their proposed conceptual framework, aim at improving the diagnosis and the quality of data when the data is used in studies related to epidemiology. It is deduced that the proposed knowledge management framework of Barbosa et al. (2009) could also reduce information overload. The reason behind this deduction is that one of the factors of Barbosa's et al. (2009) proposed framework is the dissemination of the knowledge properly from a tacit form to an explicit form. Accordingly, one of the aims of knowledge management is to create transferable and reusable forms of knowledge that can be advantageous because it allows the relevant codified knowledge to be shared with the right people. In contrast, when a codified knowledge can be easily retrieved, information overload is reduced (Năstase et al., 2009). Equally, Delen and Al-Hawamdeh's (2009) framework is also useful for the diabetes clinics of the selected hospitals in Jordan since it could be used in efficiently disseminating the medical knowledge within these clinics to the medical staff.

From the perspective of the researcher, the researchers Barbosa et al. (2009) and Delen and Al-Hawamdeh (2009) have similar aims for knowledge discovery (i.e. converting knowledge from tacit to explicit). This similarity can be seen in the researches' mutual emphasis on the knowledge dissemination factor. However, it was observed that the research study of Barbosa et al. (2009) was limited to the domains of knowledge management and healthcare domain only and did not consider the information overload domain along with them as Delen and Al-Hawamdeh (2009) have. Conversely, the research study of Delen and Al-Hawamdeh (2009) was limited to the domains of knowledge management and information overload; the authors did not consider the healthcare domain in their research.

From the context of the conceptual research aspect, Lin et al. (2013) produced a conceptual knowledge management framework that can transfer knowledge. The researchers designed this framework to explore the relationship between knowledge transfer and the similarities within an organisation. This relationship was explored in Multinational Enterprises (MNEs). The researchers aimed to determine how the two variables could benefit from each other when required. The conceptual framework of their research was based on organisational culture, strategic role, technology capability, and organisational structure. Their proposed framework can be related to reducing information overload since their framework transfers knowledge. The benefits of this transfer are based on sharing knowledge with people when required. This ability to share information effectively reduces information overload. Proper sharing of knowledge provides the advantage of encouraging people to search and explore the required information more actively; when people know that they can find the information that exactly fits their needs and when they can control how much information they retrieve, people are more motivated to seek out information (Ruff, 2002). This advantage would be beneficial in this thesis in contributing to reducing information overload in the diabetes clinics of the selected hospitals in Jordan as it can have the possibility to be used for sharing the medical knowledge with the medical staff efficiently when it is needed. It was also found that their research framework was limited to the conceptual aspect only when involving the domain of knowledge management. It did not consider other aspects.

In the same context, another conceptual knowledge management framework is proposed by Overall (2015) for understanding the relationship quality of innovation and performance within business organisations. It was observed that the research conducted by Overall (2015) was limited due to many significant problems that were affecting the managers who were involved in organisations. Additionally, similar to the research aspect of Lin et al. (2013), it was observed that the research of Overall (2015) was limited to the conceptual aspect when involving the knowledge management domain. This is similar to the aspect followed in this thesis where the researcher relied on the conceptual aspect when attempting to reduce information overload in the diabetes clinics of the selected hospitals in Jordan. Another limitation that was also observed is that the research of Overall (2015) was limited due to lack of understanding of what other influences can contribute to the quality of the relationship between innovation and performance. Similar to this point, it was shown from the literature that other researchers as Eisingerich et al. (2009) and Gronum et al. (2012) have argued that the quality of the relationship pushes a focus on an organisational innovation and on attempts at strengthening the performance within an organisation. In the context of this thesis, the research studies of Eisingerich et al. (2009); Gronum et al. (2012); Lin et al. (2013); and Overall (2015) could be related to the reduction of information overload since their research investigates comprehensive investigations into how to achieve the best performance and innovation in different organisations. Hence, the researcher in this thesis deduces that when the diabetes clinics in Jordan have the best management performances, it is certainly possible to have a reduced information overload, because the best management performance ensures that the best sharing of knowledge possible is applied within these clinics.

Based on the context of the systematic research aspect, Goepp et al. (2013) develop a systematic knowledge management framework that aims at designing a knowledge management system for eco-design. Similarly, another systematic knowledge management framework was developed by Ghosh and Mahanti (2014) in order to assist in capturing the tacit knowledge from a particular aspect who can represent a future customer related to a wealthy managerial firm based on many products and services. The proposed framework of Ghosh and Mahanti (2014) can be related to the issue of information overload since the capture of tacit knowledge is difficult (Tang et al., 2007), while the proposed framework of Goepp et al. (2013) attempts at exploring and codifying tacit knowledge and making use of it efficiently for eco-design. In the context of this thesis, the framework of Ghosh and Mahanti (2014) is insufficient since their framework relies on capturing only tacit knowledge, which is difficult sometimes to efficiently capture and thus causes information overload (Tang et al., 2007). In terms of the current situation of the diabetes clinics of the selected hospitals in Jordan, the researcher does not only rely on tacit knowledge when proposing his framework, but relies on converting the medical knowledge within these clinics from tacit to explicit forms, and from explicit to explicit forms. Therefore, the framework of Ghosh and Mahanti (2014) is not useful in reducing information overload in this thesis.

It can be contended that the research of Goepp et al. (2013) was limited by the partial completion of their knowledge management framework. Another limitation that can be drawn from their research is the lack of comprehensive studies on the improvement of their knowledge management framework performance. In contrast, it was found from Ghosh and Mahanti (2014) that their proposed knowledge management framework was limited to applications that involve information technology; their framework did not consider active suggestions and solutions for the advisor within an organisation. Another limitation was that an enterprise system was not designed. Such an enterprise system could be based on the use of fewer knowledge inputs for predicting any arising organisational risks that could be solved by improving suitable financial products for the prospect of an organisation. However, both Goepp et al. (2013) and Ghosh and Mahanti (2014) share a similar research limitation in that their proposed research framework was limited to the analytical approach. In comparison, the research conducted by Barbosa et al. (2009); Lin et al. (2013); and Overall (2015) produced frameworks that were based on the conceptual approach.

It can be concluded from the literature in this subsection, which is particularly based on the organisational business context, that some researchers have produced different knowledge management frameworks, and these frameworks are limited to either conceptual or systematic approaches. This limitation in fact depends on the approach toward improvements that is suitable for a particular organisation. While some business organisations might be improved based on appropriate conceptual approaches, other organisations might be improved based on systematic approaches. For instance, the frameworks proposed in Barbosa et al. (2009); Lin et al. (2013); and Overall (2015) were limited to their research since their frameworks were based only on the conceptual aspect of where knowledge management can be interacted with certain applications to be developed. This focus implies that this aspect of their proposed frameworks was based on a methodological system or a fixed plan. In contrast, it was observed that the proposed frameworks in Goepp et al. (2013) and Ghosh and Mahanti (2014) were based only on a systematic aspect of how knowledge management interacts within particular applications to be improved. Despite the two different approaches each being limited to particular researches in the literature within the context of business organisations, it can be deduced that the final objective is to improve the business organisation based on exploiting the importance of integrating knowledge management in the business field. Another limitation that was detected from their overall conducted research within the business organisation context is that their frameworks needed to be further improved upon in different aspects. The reason behind this need for improvement is that these researchers were encountering some gaps that were not comprehensively filled in their research and that still need to be filled further.

4.3.3 Industry

Similar to the previous research contexts, there has also been a number of studies for developing frameworks in the context of industry when the domain of knowledge management was involved. Maturity knowledge management frameworks based on the industrial context have been studied and developed in order to provide improvements for supply chains in industries (Capó-Vicedo et al., 2011; Samuel et al., 2011; Wu & Pagell, 2011; Liu et al., 2013). However, it is observed that these frameworks are limited to their learning capability and implementation platform. This limitation implies that their frameworks do not consider a full implementation of their developed frameworks. Learning capability can relate to the reduction of information overload as learning capability indicates that within an organisation, employees can reorganise redundant and irrelevant information by filtering it (Hülsmann & Windt, 2007), for example, by performing data cleaning. In the context of the thesis, this point is useful as the proposed knowledge management framework at a particular step attempts at performing data cleaning for the redundant and irrelevant information in order to reduce information overload in the diabetes clinics of the selected hospitals in Jordan (see Chapter 9, Figure 9.2).

From different industrial aspects, Piorkowski et al. (2013) represent a dynamic knowledge management framework that assists in motivating employees to increase profits within their companies by developing products related to their company at a high manufacturing value. The idea of this framework could be related to the issue of information overload. For instance, if employees within an organisation have low morale or feel confused or stressed due to the high amount of information or due to other personal reasons, their attitudes towards increasing the performance of their organisation will likely be adverse (Bock et al., 2008). Such adverse attitudes can affect employees by reducing their insights into how the system of their organisation is being useful, and employees' satisfactions are likely to be reduced further due to a large amount of arising information (Bock et al., 2008). This point is significant since it clarifies that, even when the best performance and the best management of information are being achieved in an organisation, employees with low morale due to the impact of information overload can weaken the organisation's performance (Bock et al., 2008). In the context of the primary research of this thesis, many of the respondents claimed that the information overload in their clinics is leading to low morale and stress. The respondents claimed that the information overload demotivates them, compounding their frustrations due to other reasons (e.g. heavy load of medical tasks, personal reasons, different misunderstandings when communicating with their colleagues). It is important that medical staff be kept highly motivated about keeping updated on arising medical knowledge. Medical staff need to be motivated to achieve their best in performance and quality of care. It was found that the study of Piorkowski et al. (2013) was limited to value of product only; it did not consider other significant aspects such as normalising employees' data in terms of time. Additionally, their research study was limited due to the difficulty of identifying the decision maker in an organisation. Their research was also limited due to lack of a video history that includes the contents of previously held meeting within an organisation. The lack of video history adversely affects the organisational learning to take the proper decision making of particular decisions held in an organisation (Piorkowski et al., 2013).

In a later study, Fivaz and Pretorius (2015) developed a knowledge management framework in order to contribute to improving the environment of manufacturing firms in South Africa. This development was followed by identifying the type of knowledge management activities in which the creation, transfer, and use of knowledge are supported. The development can be related to the reduction of information overload since the success of knowledge management development and the reduction of information overload is to have an effective creation, storage, transfer, and retrieval, and use of knowledge within an organisation. Consequently, information overload is reduced when ensuring that the organisation and management of knowledge within an organisation is effectively being performed (Bouthillier & Shearer, 2002). A similar observation was made in this thesis regarding the diabetes clinics of the selected hospitals in Jordan. The researcher during the primary research was informed by the medical staff in these clinics that the main reason why the staff are affected by information overload is the improper management of knowledge storage and sharing within and across their clinics. Therefore, it is important to have organised management of the knowledge in these clinics in order to reduce the issue of information overload that is currently affecting the clinics. The limitations in the conducted research of Fivaz and Pretorius (2015) included problems that were affecting their proposed framework in terms of its strategy, performance, and requirement. However, it was observed that these problems affected only some parts of their framework; the problems did not affect their complete framework. Hence, their framework was not fully implemented to support the full improvement of the manufacturing firms. Additionally, their research was limited to one country only where there was a need to further improve their research in other countries of other manufacturing firms than South Africa. In the same perspective, Yusof and Bakar (2012) introduce a knowledge management framework in order to enhance the performance of the constructive companies. The researchers acknowledge that their research did not consider the empirical studies for understanding and improving the relationship between the growth performance and knowledge management. Hence, their research lacked this improvement and considered it as an essential aspect that must be further taken into consideration. In contrast, it was seen that their frameworks could be related to the reduction of information overload since they aim at improving the performance growth of an organisation and the way knowledge is managed in an organisation. These improvements would lead to the reduction of information overload when knowledge is managed effectively, and thus, to the best performance of an organisation.

It can be inferred that most of the above researchers in the context of industry focus on a particular aspect of the industrial side, while other researchers focus on other particular sides. For instance, Capó-Vicedo et al. (2011); Samuel et al. (2011); Wu and Pagell (2011); and Liu et al. (2013) are concerned with developing knowledge management frameworks that can enhance firms in terms of the supply chain domain. In contrast, Yusof and Bakar (2012) and Fivaz and Pretorius (2015) are concerned with developing knowledge management frameworks that can enhance the performance of the manufacturing firms; they do not consider the improvements of the supply chain aspect. Most of these researchers comprehensively implement their proposed frameworks, and this limited their research. This limitation implies that the researchers implemented their frameworks in particular aspects rather than expanding their implementation into more aspects. Despite these facts, all of the researchers who were working within the industrial context attempted to achieve effective improvements when the domain of knowledge management was the basis for developing the industrial needs. It was perceived that the studies of these researchers in this subsection could contribute to the reduction of the information overload problem. The reason behind this potential is that the authors' proposed frameworks were suitable to reduce information overload in some aspects such as learning capability (Hülsmann & Windt, 2007). Another aspect is improving the motivation of employees so that they can enthusiastically focus on the improvement of their performance and profits for their organisations (Capó-Vicedo et al., 2011; Samuel et al., 2011; Wu & Pagell, 2011; Liu et al., 2013; Piorkowski et al., 2013). Similar perceptions were detected in the thesis for reducing information overload in the current situation of the diabetes clinics in the selected hospitals in Jordan where the learning capability of knowledge is a solution for performing data cleaning of the redundant and irrelevant information within these clinics. From another aspect, increasing the morale of the medical staff in these clinics was an important aspect that was taken into consideration when proposing the knowledge management framework in this thesis.

4.3.4 Education

A number of studies have attempted to produce knowledge management frameworks based on the context of education. Sinha et al. (2012) propose a knowledge management framework in order to build a knowledge management platform in institutions of higher education. Similarly, Liu (2012) studies the knowledge management concept for developing a framework in a higher education institute. Liu (2012) proposes an enhanced student centred knowledge management system for a higher education institution. This system aims at approaching MSc students in the field of computing by exploring the knowledge they need to gain. Finally, this proposed system of Liu (2012) was validated with the assistance of these students. The validation checked the correctness of this system in terms of whether the system can work in an educational institution in practice. In the same context, a later study was conducted by Demchig (2015). The study aimed to provide an assessment of the capability performance of the knowledge management domain and to identify the maturity position pertaining to this domain in higher involved educational institutions in Mongolia.

The research studies of Sinha et al. (2012), Liu (2012), and Demchig (2015) can be possibly related to the issue of information overload within the education aspect. This relation can be seen from some studied researches (Kear & Heap, 2007; Chen et al., 2011a; Shrivastav & Hiltz, 2013) where the issue of information overload was addressed in the educational institutions. The issue is affecting not only teachers and lecturers, but also students in their attempt to explore knowledge for their studies. For example, redundant and multiple information are effects that are likely to affect students in different educational institutions leading to them getting confused and not being able to focus in their studies due to the overwhelming of knowledge they are exploring from different sources (Shrivastav & Hiltz, 2013). In the context of the thesis, the researcher was informed by the medical staff of the diabetes clinics of the selected hospitals in Jordan that they are experiencing different sources of unorganised medical knowledge, such as from libraries, journals, conferences, tacit knowledge from other medical staff, patients' medical records from their multiple visits, and other different repositories. Therefore, it is important to organise the load of medical information arising from different sources.

The carried out research by Liu (2012) and Sinha et al. (2012) was limited to a particular type of an educational organisation and did not consider other educational types as such universities, colleges, schools, etc. Additionally, the research study of Demchig (2015) was limited to one country only (i.e. Mongolia only) and did not consider other countries of other higher institutions for assessing the knowledge management performance.

It can be concluded from all the previous studies that the research that has been conducted in the context of the knowledge management domain fits with the research of this thesis in terms of the conceptual aspect, and not in the systematic aspect. The reason behind this is that the produced knowledge management framework in this thesis contains a framework that is based on conceptual underpinning information theories that aim to reduce the information overload that is currently affecting the diabetes clinics of the selected hospitals in Jordan. However, it can be deduced from the research studies that no matter what aspect any knowledge management framework is based on, the significance of the study is based on whether the study can find ways to reduce the effects of information overload in any organisation. Additionally, their research partially fits with the research in this thesis since they considered the domain of knowledge management only and did not consider this domain with the domain of information in the healthcare environment. In return, it can be shown that their research studies could be related to the problem of information overload since information overload affects different educational institutions as was declared by different researchers (Kear & Heap, 2007; Chen et al., 2011a; Shrivastav & Hiltz, 2013).

4.4 Summary

In this chapter, a comprehensive review was conducted for the domain of knowledge management into different disciplines in order to gain an in-depth understanding of this domain. The relationship of the different knowledge management aspects and different knowledge management frameworks in this chapter showed that they could be highly related to the domain of information overload and its reduction within different types of organisations. Additionally, different existing frameworks of the related research were highlighted and discussed for the domain of knowledge management in order to provide a comprehensive understanding of how this domain is important in many different aspects. In Chapter 5, the last part of the literature review discusses healthcare. The discussion is based on a combination of the knowledge management, information overload, and healthcare domains. Additionally, a debate around the possibility of having a literature that combines the domains of knowledge management and information overload within the diabetes domain is given.

Chapter 5

Healthcare: A Literature Review (Part 3)

5.1 Introduction

Chapters 3 and 4 presented a comprehensive literature review. The review included the existing frameworks related to the domains of knowledge management and information overload, respectively. Thus, the third part of the literature review, which takes place in this chapter, is based on the combination of the healthcare domain with the knowledge management domain and on the combination of the information overload, knowledge management, and healthcare domains. Classifying the literature review into three separate chapters (i.e. Chapters 3–5) allowed each chapter to study a different area by itself. The outlines of the chapter are as follows. A comprehensive background of the information overload domain is presented. A revision of existing approaches, frameworks, and models pertaining to this domain with critical views on these studies are all discussed. The final section gives a summary of this chapter.

5.2 Knowledge Management in the Healthcare Domain: Related Research

Several studies have focused on integrating the knowledge management domain with the healthcare domain. The concept of knowledge management is currently emerging in the healthcare sector (Kothari et al., 2011; Quinn et al., 2014). Orzano et al. (2008) argue that patients and physicians could benefit from the development of applying knowledge management strategies between organisations and family practices, and among family practices themselves. In the same context, Chen et al. (2011b) declare that it is beneficial to adopt the strategies of the knowledge management domain in the healthcare sector particularly for medical staff, patients, public health, and organisations. For example, infectious diseases can be managed by an efficient knowledge management within the environment of hospitals (Chen et al., 2011b). It can be inferred from these researchers that their studies could have potential effects on information overload. This potential is assured by Klerings et al. (2015), who claim that many healthcare organisations are likely to experience continuously growing amounts of information, including both popular and scientific information. Additionally, when there are many different sources of information, adverse effects are likely to be encountered (Kolusu, 2015). A similar observation was found in the context of the thesis. In the current situation of the diabetes clinics in the selected hospitals in Jordan, the medical staff reported encountering a large amount of information in their clinics. Thus, the researcher in this thesis proposes a knowledge management framework in order to reduce the effect of information overload within these clinics. This framework can enhance the performance of these clinics when medical knowledge is being effectively managed and retrieved by others when required.

It can also be observed from the above researchers that their research studies are limited to the benefits of knowledge management in healthcare in general. Their studies do not consider the benefits of knowledge management in other particular types of illnesses. Additionally, their research studies within the knowledge management domain are limited to the benefits of improved health practices that are provided to patients and physicians in hospitals and do not fully focus on the barriers that are likely to affect any healthcare organisation. However, despite the benefits being delivered to hospital patients and staff, some researchers have mentioned that there are likely barriers that would affect hospitals from achieving an effective performance (Hofstede, 2001; Weir & Hutchings, 2005; Andreeva & Ikhilchik, 2011). Such barriers involve poor IT infrastructure, the lack of existing effective teamwork, political conflicts, and cultural barriers.

It was also contended by Karamitri et al. (2015) that medical organisations nowadays such as hospitals are considered complex in their systems and processes. These organisations have many characteristics that are unique due to the heterogeneous orientation of medical professionals in health environments. Accordingly, Karamitri et al. (2015) suggest that the barriers of limited skills of medical staff and time restrictions are the two most essential barriers that are likely to prevent efficient implementation of knowledge management within healthcare organisations. In the same context, a later study carried out by Almuayqil et al. (2015) identifies the key barriers that are affecting the E-health system in Saudi Arabia (see Figure 5.1). It can be seen from the barriers introduced by these researchers that there is possibility of having many healthcare organisations be affected with the issue of information overload when some or many barriers are emerging within these organisations (Moahi, 2000; MacDonald et al., 2011). In the context of this thesis, the researcher was informed by the medical staff about some barriers that contributed to the emergence of information overload in their diabetes clinics. Some of these barriers included the human barrier, the technological barrier, the low morale among medical staff barrier, knowledge sharing barriers, knowledge hoarding barriers, and cultural barriers.

Figure (5.1): E-health barriers in Saudi Arabia (Almuayqil et al., 2015)

In the same context, Almuayqil et al. (2015) propose a framework that highlights the barriers adopted from Hofstede (2001); Weir and Hutchings (2005); and Andreeva and Ikhilchik (2011). The framework is based on four components: the business component, the human component, the technology component, and the financial component (see Figure 5.2). These components are defined as follows (Almuayqil et al., 2015):

- The *business component* is focused on how different barriers in organisations can be extracted and controlled. Failures to uphold medical safety standards and the services of health information are concerns.
- The *human component* highlights the barriers of a human based on the technology usage of the healthcare medical staff and based on the views of patients in terms of cultural barriers.
- The *technology component* includes computer skills, privacy issues, technical expertise, and security issues, all of which are non-connectivity issues. Training addresses the lack of professionals, specialists, healthcare medical staff, and patients who are skilful in the use of computers.
- The *financial component* involves the policies and constraints in monitoring, maintaining, and implementing the services of healthcare information.

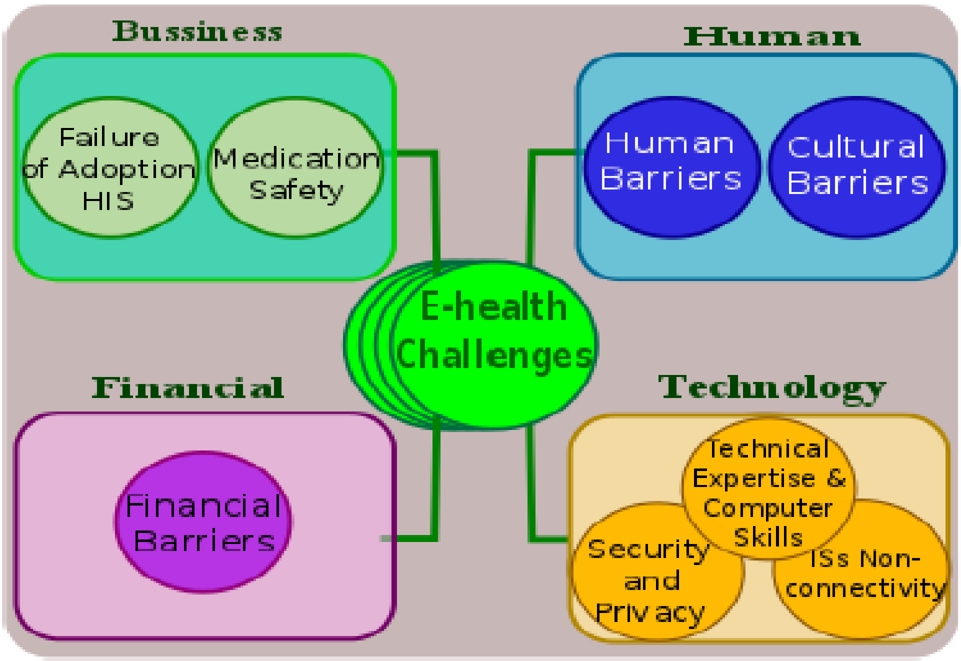

Figure (5.2): Components of E-Health knowledge management system (Almuayqil et al., 2015)

It was observed that the research study conducted by Almuayqil et al. (2015) was limited to the diabetes mellitus illness and did not put full focus on other illness types within the healthcare context. It was also found that their research study was also focused on only one country (i.e. Saudi Arabia). Further, the framework of their research study was limited due to a lack of comprehension of the challenges and issues that are affecting specialists in Saudi Arabia in the field of Information Technology (IT).

Nevertheless, the advantage of their research study is that their proposed framework contributes to developing the national healthcare of Saudi citizens effectively. The contribution is due to the design of the framework, which has the potential to support the current government initiatives. Furthermore, it is significant to point out that the research study performed by Almuayqil et al. (2015) fits properly to the research study of this thesis in comparison with the study of the above researchers. One of the reasons behind this fit is that the research of Almuayqil et al. (2015) focuses on the domains of knowledge management in relation to diabetes mellitus, which is similar to the domain aspects that are focused upon in this thesis.

Additionally, Almuayqil et al. (2015) consider the issue of information overload in some particular points within the knowledge management and the healthcare contexts. Similarly, the main issue studied in this thesis is the information overload problem that is currently occurring in the diabetes clinics of the selected hospitals in Jordan. Despite the similarity between the research by Almuayqil et al. (2015) and this thesis, it is also noted that the research study of Almuayqil et al. (2015) is carried out in Saudi Arabia, while the researcher in this thesis carries out the study in Jordan. Nevertheless, it can be observed that information overload problems and the spread of diabetes mellitus are present in Saudi Arabia as well. As Boutayeb et al. (2012) note, Arab populations have many common and similar cultures, habits, languages, religions, social habits, structures, and processes. Therefore, it is likely to encounter diabetes mellitus within the Arabic culture, and different types of information can also be overloaded within the Arabic healthcare organisations (Almuayqil et al., 2015). Furthermore, the significant point that was indicated by Almuayqil et al. (2015) in terms of the reduction of information overload is that knowledge management could help assist many healthcare experts in coping with the distributed and fragmented nature of the continuous medical knowledge. This assistance is followed by the effect of information overload. Namely, information overload causes many challenges within the healthcare environment, and highlights the importance of accessing and sharing knowledge in order to make the best decisions possible (Nicolini et al., 2008; Almuayqil et al., 2015).

Gustafson and Shuyler (2003) conduct a case study that develops a nursing curriculum by enhancing technology-based educational approaches when the sciences of learning are applied to these approaches. Although their research study improves the role of nurses in the healthcare environment, it cannot assist in reducing information overload as their research study relies on the technological aspect. This aspect is mainly the main effect of causing information overload, as was declared by Wellmon (2012) and Elwert (2013). Therefore, in the context of the thesis, the technological aspect was not considered when structuring the proposed knowledge management framework for reducing the problem of information overload in the diabetes clinics of the selected hospitals in Jordan, but the conceptual aspect was considered. It can be seen that their research study was limited to the curriculum of the nursing role within the medical environment. It did not concern other curriculums of other types of medical roles such as doctors and medical administrators. The study of their research was also based on the technological aspect, not the conceptual aspect. In contrast, Hussain and Raza (2004) argue that a technological aspect by itself is insufficient to improve the healthcare industry; the conceptual aspect is too significant to ignore, as the perceptions and experiences of the medical staff are extremely relevant. Hussain and Raza (2004) propose a knowledge management framework that aims at exploring tacit knowledge and at using it with the knowledge that is explicitly stored in clinical practice guidelines. Their proposed framework could be related to the reduction of information overload since one of the aims of knowledge management is to ensure that knowledge can be managed properly when converting it from a tacit form to an explicit readable form (Nonanka & Takeuchi, 1995;

Ferlie et al., 2012; Hau et al., 2012). Hence, when knowledge is efficiently converted to explicit readable and understandable forms, it would be available when others are in need of it and information overload in this way is reduced (Tang et al., 2007). This point is useful for the context of the thesis since the researcher proposes a knowledge management framework that can reduce the issue of information overload in the diabetes clinics in the selected hospitals in Jordan. The reason behind this issue in these clinics is most of the medical staff within these clinics claimed that one of the reasons of emerging information overload in their clinics is that most of the medical knowledge is only shared tacitly, and is interpreted in a difficult manner.

Unlike the research study of Gustafson and Shuyler (2003), the research study carried out by Hussain and Raza (2004) was limited to the conceptual aspect and did not focus on the technological aspect. Hussain and Raza (2004) showed that the technological aspect is also important but that the conceptual aspects that are based on the views and practises of the medical staff in the healthcare environment cannot be excluded. Similar to the work of Gustafson and Shuyler (2003), a nursing knowledge management system is developed by Hsia et al. (2006), but in the latter case by proposing an integrated model of the nursing KMS design. Further, Mirza (2009) proposes a clinical knowledge management system in order to highlight the processes and impact of knowledge management on the clinical healthcare organisations. The aim of his proposed framework is to improve the healthcare delivery within two developed countries (i.e. the USA and Sweden) with a smaller number of medical staff respondents. It was disclosed that the research studies performed by Hsia et al. (2006) and Mirza (2009) were limited due to the incomplete structure of their knowledge management framework. Later researchers such as Sharma et al. (2012) have taken a similar focus as Hussain and Raza (2004) and Mirza (2009), focusing entirely on exploring tacit knowledge and how to make use of it with the codified explicit knowledge in healthcare. This implies that their focus was on the externalisation phase of the whole SECI model of Nonaka (Nonaka & Takeuchi, 1995). Additionally, it can be observed that Mirza's (2009) research study was limited to a smaller sample of clinical staff respondents and did not consider a larger sample of respondents. However, Mirza (2009) conducted the study in two developed countries, namely the USA and Sweden. While Sharma et al. (2012) conducted the same study in one country, the researchers had a larger sample of clinical staff respondents compared to the sample in Mirza's (2009) research study.

In the same context, Arshad et al. (2016) propose a phased and a comprehensive knowledge management framework where many different processes are streamlined and integrated in a phased manner in order to assist in collecting the knowledge, analysing it, and managing it properly. The process knowledge creation of their framework aims at supporting effective decision-making within the systems in the Pakistani healthcare industry. The proposed frameworks of Hsia et al. (2006), Mirza (2009), and Arshad et al. (2016) could be related to the reduction of the information overload problem within the healthcare environment. This is because their frameworks aim at highlighting the processes of knowledge management. These processes in turn aim at organising knowledge efficiently so that it can be shared with others when needed and then support effective decision-making without information overload (Năstase et al., 2009). In the context of the thesis, when the right medical knowledge in the diabetes clinics is shared with the right medical staff in the right place at the right time in the right quantity, information overload is reduced, as was claimed by the medical staff of these clinics. The research study of Arshad et al. (2016) was limited to one country only (i.e. Pakistan). Additionally, their research was also limited in that the researchers did not develop a more enhanced knowledge management model that could be integrated to provide advanced improvements for the Pakistani healthcare industry.

According to the view of the researcher, there are several points that can be concluded from the review of the above researchers pertaining to this section.

- Some research studies were limited to the technological aspect, and other studies were limited to the conceptual aspect.
- Some research studies were limited to knowledge management as it interacts with the general healthcare domain, while other studies were limited to how knowledge management interacts with a particular type of illness.
- Some studies were limited to one country, while other studies were carried out in more than country.
- Some of these studies were limited to the investigation of the benefits of improving knowledge management in healthcare industries and did not focus on the barriers and consequences that are likely to occur within these industries. Other studies took the barriers and consequences into consideration, as these issues are likely to affect any healthcare organisation.
- While some conducted frameworks do combine both knowledge management and healthcare, these frameworks were only partially completed and lacked a full structure.

Despite all these mentioned limitations, these studies showed importance in that they integrated the domains of knowledge management and healthcare together within the environment of the medical organisations. It can be concluded from these studies that the aim of this significant integration of knowledge management and healthcare is to improve the effectiveness of any healthcare industry in order to provide proper and efficient healthcare services to any medical organisation.

5.3 Knowledge Management and Information Overload in the Healthcare Domain: Related Research

As explained previously, the relationship of the three integrated domains (i.e. knowledge management, information overload, and healthcare domains) is that information overload is affecting many healthcare clinics where a proper knowledge management system is needed. Thus, these three domains are highly related to each other. Accordingly, there have been quite a few studies and researches conducted that integrate these domains together. Nevertheless, to the best knowledge of the researcher, there has been no research that integrates knowledge management and information overload with the particular case of diabetes care in Jordan. Consequently, the researcher considers this case as having the originality to stand at the PhD standard. Hall and Walton (2004), Kim et al. (2007), and Holzinger et al. (2007) conducted survey studies related to supporting and managing information overload in the healthcare organisations based on the knowledge management concept.

In healthcare environments, getting the right information to the right people in the right place at the right time in the right quantity is extremely challenging and complex due to the large amounts of knowledge that are emerging in the healthcare industries over time (Stroetmann & Aisenbrey, 2012). Medical administrators, research scientists, clinicians, and industry managers are all affected by the continuous growing body of knowledge that they have to routinely access, absorb, and apply (Wickramasinghe & Geisler, 2007). New research fields, such as genetics and bionanotechnology, are emerging and growing nowadays (Wickramasinghe, 2008). Every 17 years, the volume of information associated with medical knowledge doubles (Stroetmann & Aisenbrey, 2012). Many different formats of different medical knowledge, and the various disparate sources related to medical knowledge, are also issues that affect many medical organisations where knowledge management is highly required to tackle such issues (Stroetmann & Aisenbrey, 2012). It was declared by Metaxiotis (2011) that the industry of healthcare is currently attempting to represent a knowledge-based community that combines clinics, hospitals, patients, physicians, and pharmacies, each of which must possess a proper share of medical knowledge. Metaxiotis (2011) mentions that developing a knowledge-based community leads to develop the quality of care in medical organisations, and to decrease administrative expenses. Bose (2003) argues that healthcare organisations can be successful when they are based on sharing knowledge in organisational boundaries or on exchanging different types of knowledge across organisations such as by exchanging billing, utilisation, and clinical information.

It can be observed from the above researchers that their research was limited to addressing the state-of-the-art features of the domains of knowledge management, information overload, and healthcare. Their research did not mention any proposed frameworks that can reduce the issue of information overload in healthcare organisations. However, the researches were focused on highlighting the importance of knowledge management in healthcare industries, which are facing a large volume of continuously arising medical information. In contrast, few researchers propose frameworks and tools to tackle the issue of information overload in healthcare organisations. For instance, Fuka et al. (2000) propose a knowledge management tool, called the 'WaX' tool, to manage the overloaded information in healthcare organisations and to provide support for the codification strategy. It is found that the research study of Fuka et al. (2000) was limited due to lack of existing new methods for semantic text analysis that can improve the relevance of the searching results. Additionally, their research was limited to the technological aspect in reducing the information overload problem in the healthcare environment; the study did not consider the conceptual aspect for reducing this problem. However, the researchers' new proposed tool supports the strategy of codifying medical knowledge. Their proposed tool was also limited due to its partial completion. In the same context, De Lusignan et al. (2002) proposed a knowledge management model in order to provide management for information overload and to ensure the implementation of the clinical practice. The strength of the produced model is in its simplicity in reducing information overload when recognising that physicians' skills are required to address the complex information that is related to their visiting patients. Nevertheless, De Lusignan et al.'s (2002) research study is limited due to the absence of a broader approach when working in a clinical environment. Their research was also limited to the conceptual aspect when reducing the issue of information overload in their clinics; the technological aspect was not considered. Similar to Fuka et al. (2000), De Lusignan et al. (2002) proposed a model that was limited by partial completion. The reason behind this partial completion of the methods of these researchers is that some further enhancements need to be integrated into their methods. In turn, a lack of evaluation in terms of acceptability and effectiveness was observed in the proposed model of De Lusignan et al. (2002) in comparison to the proposed method of Fuka et al. (2000). However, the methods of these researchers attempted at reducing the issue of information overload within the healthcare environment. Based on the view of the researcher, it can be concluded that the methods of these researchers ensured an effective share of medical knowledge within the healthcare environment for healthcare learning purposes, and ensured a codification strategy support.

A later study is investigated by Kim et al. (2007) in order to explore predictors of the issue of information overload among the seekers of cancer information who are affected by information overload. The study of Kim et al. (2007) involved performing socio-demographic characteristics for the cancer information seekers along with obtaining their health information and communication environments and their health status. In their study, the authors propose a conceptual model for health information seeking (see Figure 5.3). Their proposed model was developed based on testing the cancer information seeking and the issue of information overload that occurs within the healthcare environment of the US National Cancer Institute.

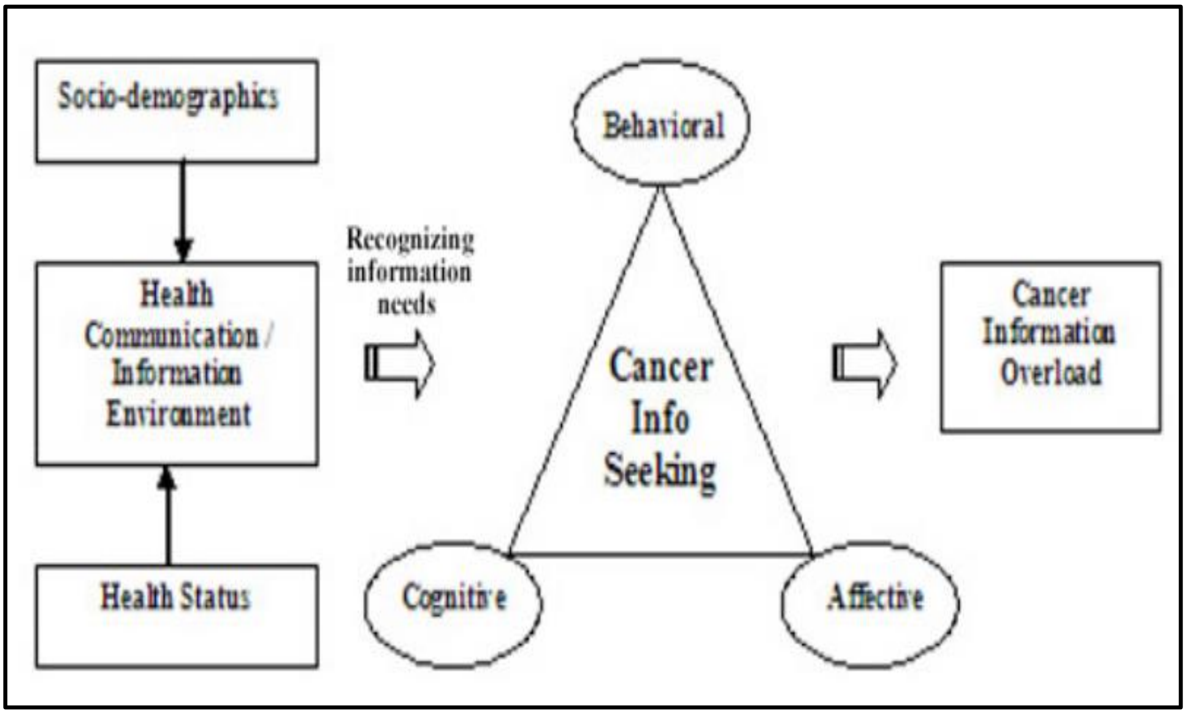

Figure (5.3): Conceptual framework for depicting the potential predictors of cancer information overload (Kim et al., 2007)

The research study of Kim et al. (2007) was limited to the conceptual aspect and did not focus on the technological aspect. Their research was also limited in their failure to adopt more empirical research studies and in their failure to produce improved measurements that can be effectively applied to the contexts of general health, including complex chronic diseases such as cancer. Another limitation that can be observed from their study is that it lacked the context of studying the issues of information overload in multiple chronic diseases. This implies that patients suffering from multiple medical conditions are more likely to experience conflicting information in healthcare organisations such that they are exposed to the need of more relevant information regarding their medical conditions.

It can be concluded, to the best knowledge of the researcher, that there is very little research carried out in which the three domains of knowledge management, information overload, and healthcare are involved. The reason behind this lack of integration is likely in part that most of the few researchers within these three domains discussed the issue of information overload within the healthcare environment in a general conceptual manner in the literature and/or the importance of involving the domain of knowledge management. Very few researchers actually attempted to propose conceptual and technological methods related to the knowledge management domain in order to reduce the information overload problem in the healthcare industry. Furthermore, different observations related to the research limitations of the above researchers can be highlighted as follows:

- Some of the studies of the above researchers relied only on the technological aspect when reducing information overload in healthcare organisations, while other studies relied only on the conceptual aspect.
- The proposed methods are only partially completed and are not completely developed despite the fact that they attempt to reduce the issue of information overload within the healthcare environment.
- To the best knowledge of the researcher, no research has yet combined the particular diabetes mellitus disease with the domains of knowledge management and information overload. Thus, this thesis is original and at the PhD level since it is the first of its type and, as a result, the first to conduct such a study in Jordan.

In conclusion, these studies involved the phenomenon and significant need of integrating the domains of knowledge management and healthcare together to solve the issue of information overload within healthcare organisations. The combination of the knowledge management, information overload, and healthcare domains improves the effectiveness of any healthcare industry. This combination, in short, ensures that proper, relevant, and efficient healthcare information is relayed to the right people. This efficiency increases the quality of care for patients and enhances different medical services in many medical organisations by supporting physicians, doctors, nurses, and medical administrators. Hence, the combination of the three mentioned domains fits properly with the context of this thesis since the thesis focuses on proposing a knowledge management framework that can reduce the issue of information overload in the diabetes clinics of the selected hospitals in Jordan.

5.4 Summary

A comprehensive background and literature search of the domains of knowledge management and healthcare themselves, as well as a combination of the two domains with the information overload domain, were highlighted and discussed in this chapter. The related research was presented and discussed for the two domains in order to provide an in-depth understanding of how both of these domains showed significant interactions with the healthcare industry. The researcher divided the literature of this chapter into two parts. The first part discussed a comprehensive background of the knowledge management and healthcare domains in the light of other related researches. This part included the related research being studied by other researchers in the healthcare domain based on the knowledge management domain. The second part explained the related studies based on the combination of the knowledge management domain, the healthcare domain, and the information overload domain. Additionally, a debate around the possibility of having a literature that combines the domains of knowledge management and information overload within the diabetes domain is given.

Critical evaluations were highlighted in the two parts of the literature division (i.e. in the background and in the related research part) in order to show the important observations, missing gaps, and/or advantages and limitations if applicable of the previous conducted studies related to the knowledge management, healthcare, and information overload domains. Additionally, it was discussed how these noticeable observations fit or do not fit appropriately with this thesis. In Chapter 6, the analytical results obtained from the primary research are thoroughly discussed in order to explore the problems in depth encountered from the findings based on these obtained results.

Chapter 6

Primary Research Data Collection and Data Analysis

6.1 Introduction

In Chapters 3–5, a comprehensive secondary research was carried out in the domains of information overload, knowledge management, and healthcare. These reviews of these three domains form the basis of the contribution of the thesis to the body of knowledge.

This chapter presents the pilot study of the research, the primary research data collection, and the analysis of this PhD research. The chapter starts with a preliminary description on how the survey, i.e. the questionnaires and interviews, was first conducted in the diabetes clinics of the seven selected hospitals in Jordan. The chapter describes the sample size of the total number of respondents, including the number of each type of these respondents, i.e. medical administrators, doctors, and nurses. A detailed description is given of the way the data was collected from these respondents while distributing the questionnaires and conducting the interviews. Afterwards, an investigation of the primary research analysis is presented.

6.2 The Pilot Study of the Research

Prior to the construction of the final form of a survey, carrying out a pilot study is considered an important and useful step toward enhancing internal validity (Simon, 2011). The pilot study of a questionnaire is considered a process that identifies errors, validity, and reliability (Brace, 2013). A pilot study is a 'small scale version or trial run in preparation for a major study' (Polit et al., 2001). According to Baker (1994), the purpose of frequently using a pilot study is to try out or to pre-test the instrument of a research. Baker (1994) found that a sample of 10-20% taken from the whole sample size that is related to the actual study is a reasonable number of respondents for the pilot enrolment. However, the researcher in this thesis approached academic experts in order to assess and provide feedback on the constructed questionnaire. While a percentage of 10-20% was not chosen from the entire healthcare sample as a criterion for piloting the study, the academicians were randomly selected since they are themselves experts in assessing academic matters in terms of research and the structure of a survey, etc.

The followings were the objectives of conducting the pilot study in this research:

- To determine whether the English content was well written, easily understood, and clear.
- To determine whether the research contents of the questionnaires and interviews were constructed properly or not.
- To identify any difficulties that the questionnaires might pose to the respondents when the data collection began.
- To ensure that the instructions of the questionnaires were comprehensively written.
- To estimate the time that would be needed for completing the questionnaires.
- To ensure that the validity and reliability of the questionnaires were efficient.
- To obtain any suggestions or feedback on what should be amended on the questionnaires.

In this research, a pilot study was carried out in three stages. The first stage of the pilot study was to approach a number of lecturers from two universities in Jordan who have experience in designing, analysing, and improving questionnaires. Several Jordanian expert participants agreed to participate in the pilot study from two different universities' school of computing. The involvement of experienced Jordanian lecturers for this participation was based on their availability and agreement to participate in the pilot study. The second stage of the pilot study included distributing the questionnaires to those participants and testing their understandings of the given questionnaires by asking them to read and complete the questionnaires. In the third stage of the pilot study, participants were asked to provide feedback (e.g. to report any inappropriate language or wording for any items) and suggestions for improvements that could be made for the questionnaires in order to ensure that the questionnaires were clear and readable. In the fourth stage of the pilot study, feedback was provided to the researcher. Based on the respondents' judgements, the questionnaires had clear and understandable words and question structure. However, some improvements and changes were suggested by the pilot group to give the questions more clarity and readability.

The reliability and factor analysis of the questionnaires were tested after conducting the pilot study of the questionnaires. In a conducted research, reliability is the accuracy with which a measurement measures what it aims to measure. Reliability also includes the consistency degree for any measurement to be tested (Seliger & Shohamy, 1989; Gay & Airasian, 2000). In this research, the Cronbach's alpha was used to measure the internal consistency (reliability). The Cronbach's alpha was calculated with the Statistical Package for the Social

Sciences (SPSS) software. The resulted value from the Cronbach's alpha indicated 'Excellent' reliability of the internal consistency based on the Cronbach's alpha values and their internal consistencies adopted from George and Mallery (2003).

6.3 Data Collection

In this research project, the survey was based on a mixed approach combining both questionnaires and interviews (i.e. quantitative and qualitative approaches). These tools targeted the respondents (i.e. medical administrators, doctors, and nurses) of the diabetes clinics of the seven selected hospitals in Jordan. Only seven hospitals (A, B, C, D, E, F, G) in Jordan allowed this study to be conducted in their diabetes clinics. A large number of hospitals was used for data collection since the number of diabetes clinicians for each involved hospital is small. Additionally, the number of respondents per diabetes clinic of the selected hospitals is limited. Thus, even though the researcher has quite a number of hospitals included, the number of results to be clarified is not excessive.

At the first stage, the questionnaires were disseminated in person to the respondents from different educational levels of the diabetes clinics at these hospitals. After distributing this survey to them, the questionnaire data responses were collected in person. The obtained sample size was 327 medical staff respondents (i.e. 72 medical administrators, 115 doctors, and 140 nurses) with both male and female participants. All respondents were 18 years or older.

In terms of the quantitative approach (i.e. the questionnaires), the type of information obtained comprised the demographic information of the medical staff and the responses regarding the six adopted factors of the research's theoretical framework derived from the literature (see Chapter 2, Figure 2.6). Each factor contained a maximum of five questions. In terms of the qualitative approach (i.e. the interviews), in-depth information was obtained. The interview was carried out on a written basis since the majority of the medical staff respondents refused to have their voices recorded and preferred to produce written answers to questions related to the interviews. This detailed information was obtained to explore in depth the problems arising from information overload within their medical environment.

6.4 Data Analysis

The data obtained from the respondents was analysed using the SPSS statistical tool. The purpose of analysing the data of this research project was to identify the main problems encountered within the area of diabetes care in different diabetes clinics of the hospitals in Jordan. The purpose was to find out also about the type of information that is going to be held. The analysis helped in developing the knowledge management framework by providing information about the way that knowledge is used in the clinics; the way that knowledge is produced, stored and shared; and the problems that emerge due to the information overload problem. In practice, this analysis thus helped to determine what should go into the produced knowledge management framework and how the framework should be used. The following sub-sections present figures depicting the information collected. Specifically, the figures illustrate the collected demographic information of the respondents and the collected data from the questions related to the six adopted theoretical factors.

6.4.1 Nationality Distribution

The nationality distribution of the sample drawn from the diabetes clinics of the seven selected hospitals in Jordan is illustrated in Figure 6.1. The majority (89.3%) of respondents were Jordanian medical staff. The other 10.7% of the medical staff respondents were of different nationalities.

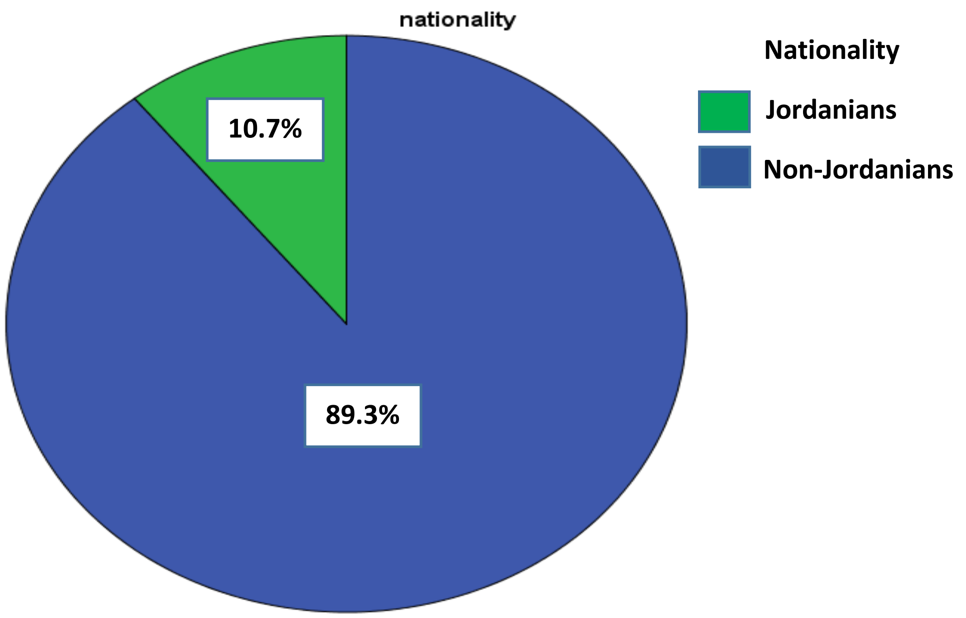

Figure (6.1): The nationality sample

It is concluded that the majority of the medical staff respondents were likely Jordanian because the particular hospitals are located in Jordan, where Jordanians are given priority to work compared to other nationalities.

6.4.2 Age Distribution

The distribution sample illustrated in Figure 6.2 is based on the age groups of the respondents. It can be seen from Figure 6.2 that the participants of the age group 26–33 years old represent the highest percentage at 50.2% among the age groups.

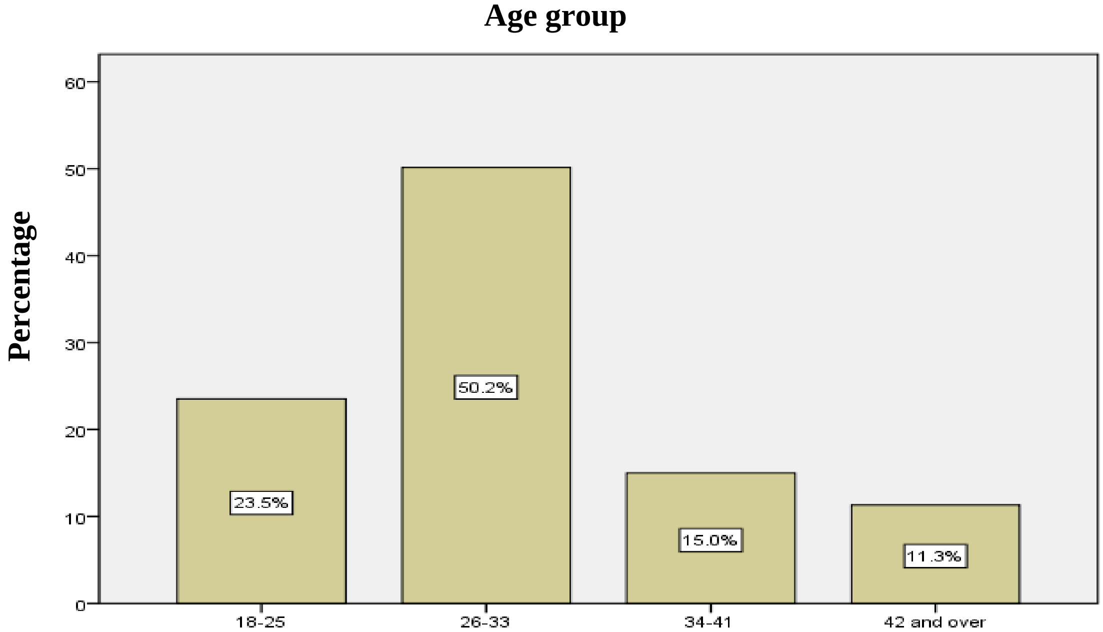

Figure (6.2): The age groups sample

The participants of the age group 18–25 years old represent the next highest percentage at 23.5%. The participants of the age group 42 years old and over represent the minimum percentage at 11.3%. This age distribution is likely due to the hospitals in Jordan preferring to hire fresh graduates or younger people looking to take part in medical training during their studies with the hope of obtaining employ afterwards.

6.4.3 Education Level Distribution

In Figure 6.3, the distribution based on the education level of the medical staff respondents is shown. It is observed from Figure 6.3 that the majority (64.2%) of respondents have a bachelor's degree. The next largest groups are at the master's and diploma levels at a percentage of 15% and 14.7%, respectively. Following are those at the PhD level and at the American Board level at a percentage of 4% and 1.5%, respectively.

Education level

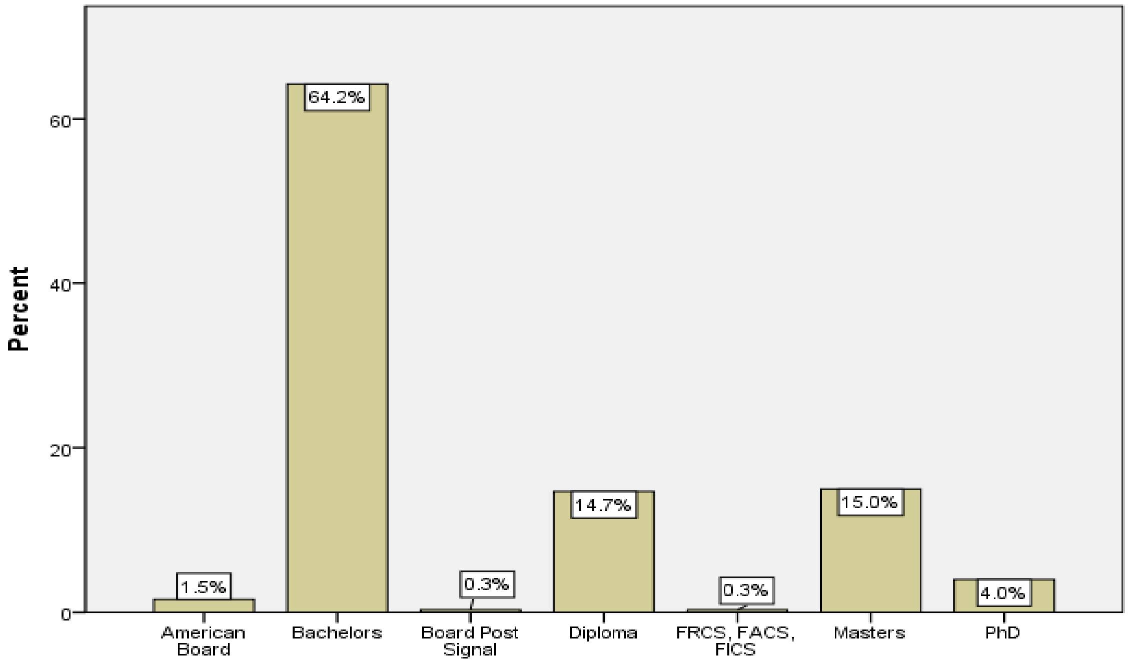

Figure (6.3): The education level sample

The minimum numbers were at the Board Post Signal level and the FRCS, FACS, FICS levels, with both levels at a percentage of 0.3%. It is concluded from Figure 6.3 that the number of respondents decreases as the level of education, starting from the bachelor's education level, increases. This is because the highest levels of education beyond the bachelor's level take a long time to obtain. Meanwhile, the hospitals urgently need fresh undergraduates to assist in medical services and emergency cases and cannot wait for all undergraduates to complete their higher educational levels.

6.4.4 Work Experience Distribution

In Figure 6.4, the distribution of the work experience of the medical staff respondents is presented. It is shown from Figure 6.4 that 1–3 years' work experience was the most common amount of work experience among respondents at 31.2%. Next was more than 5 years' work experience at 21.4%. Both the 6 months to 1 year and the 3–5 years' work experience durations were at 20.2%. Respondents with less than 6 months' work experience represented only 7% of the sample. In conclusion, respondents with 1–3 years' work experience were most common, while respondents with less than 6 months' work experience were least present. The reason for this is that medical staff respondents with 3–5 years' or more than 5 years' experience are more likely to complete their higher medical education abroad, which means fewer highly experienced medical staff are present in hospitals compared to fresh graduates. This implies that risk of information overload increases when fewer highly experienced medical staff respondents are present.

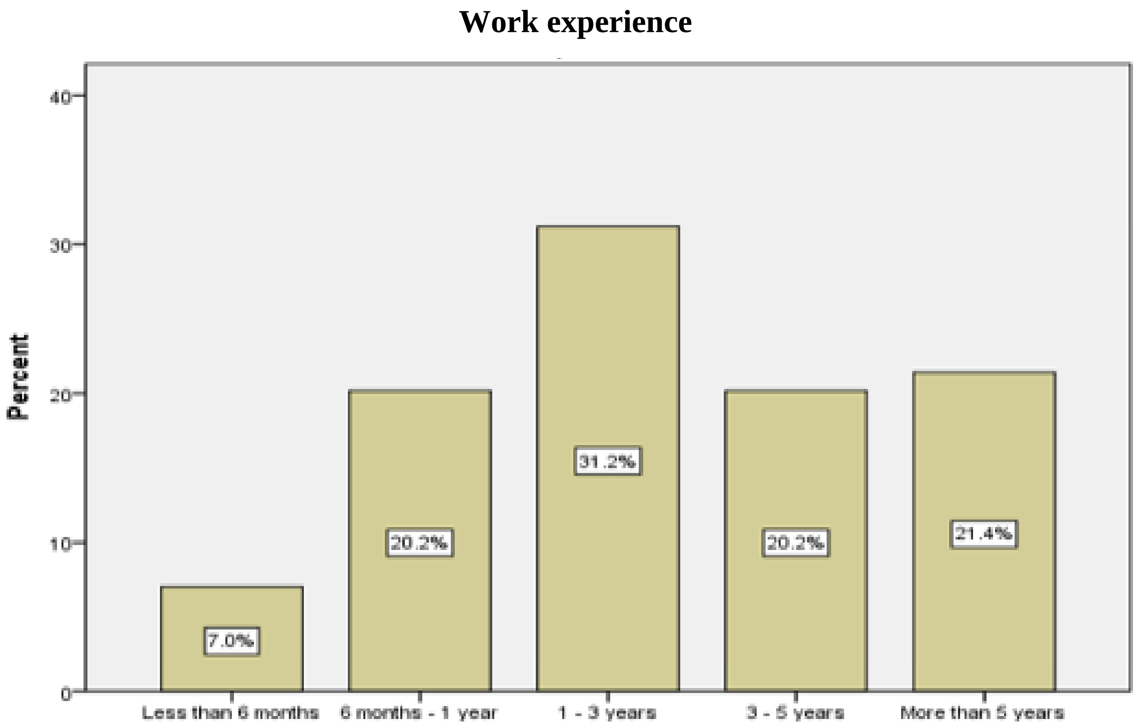

Figure (6.4): The work experience sample

In Section 6.4.3, Figure 6.3 shows that most of the medical staff respondents were educated only to the bachelor's level. Accordingly, since most respondents are educated to this level, Figure 6.4 shows that most respondents had only a few years of experience. Indeed, 1–3 years' work experience, 6 months to 1 year of experience, and less than 6 months' work experience representing percentages of 31.2%, 20.2%, and 7%, respectively, with a total percentage of 58.4%. Comparatively, those with 3 or more years' experience represent 41.6%.

6.4.5 Job Category Distribution

In Figure 6.5, the distribution based on the job category of the medical staff respondents is illustrated. It is found from Figure 6.5 that nurses were the largest job category at 42.8%. The next largest job category was the doctor job category at 35.2%. The smallest job category was the medical administrator job category at 22%. In conclusion, the majority of medical staff respondents were nurses, and the smallest minority of respondents were medical administrators. The reason behind this is that the hospitals need as many available nurses as possible since they are the most to provide practical and medical assistance for patients with diabetes. For instance, in many severe and emergency cases, when doctors are busy with other patients or abroad attending scientific conferences, medical administrators are less likely to deal with emergency cases than are nurses and doctors.

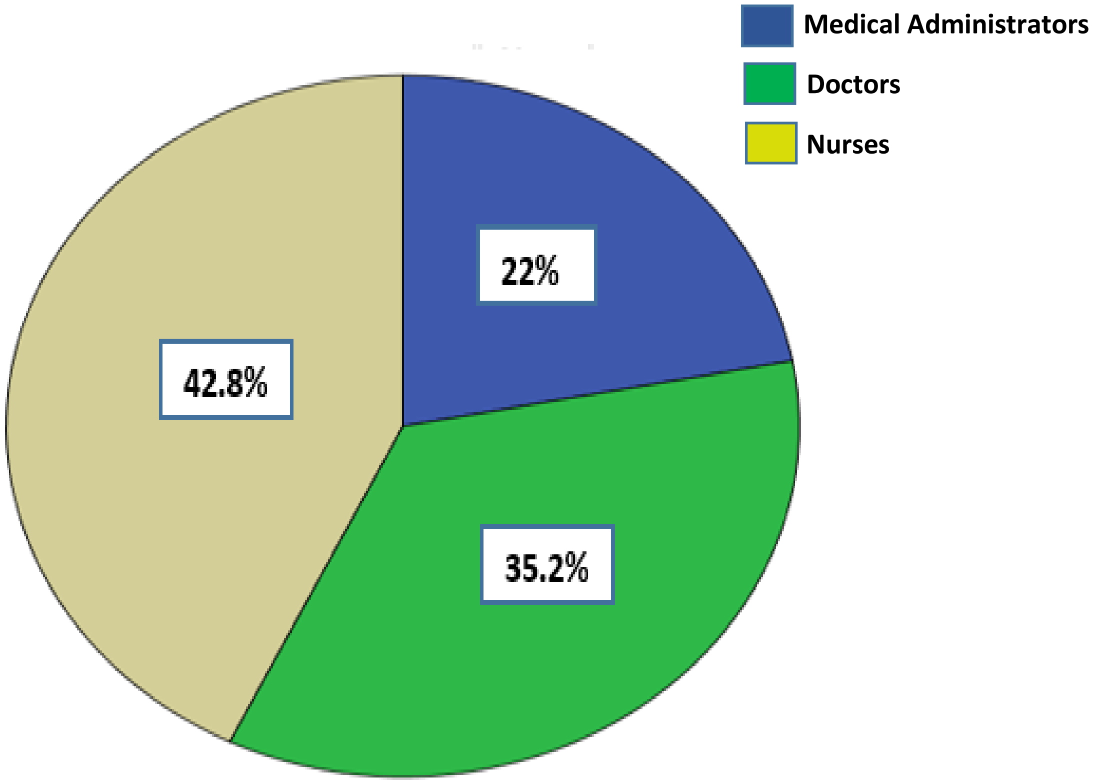

Figure (6.5): Roles of participants

6.4.6 The Sample of the Types of Work Medical Administrators are Taking Part in the Diabetes Clinics of the Seven Selected Hospitals in Jordan

Figure 6.6 represents the distribution of the types of work that medical administrators of the seven selected hospitals in Jordan do most frequently and spend most of their time on. It can be seen from Figure 6.6 that 'managing subordinate administrative staff' is the most common responsibility of medical administrators at 44.4%. 'Observing, recording and sharing the new obtained medical knowledge whenever possible' and 'representing their organisations at investor meetings or governing boards' are the second two most common types of work that medical administrators of these hospitals are involved in, both at 2.8%.

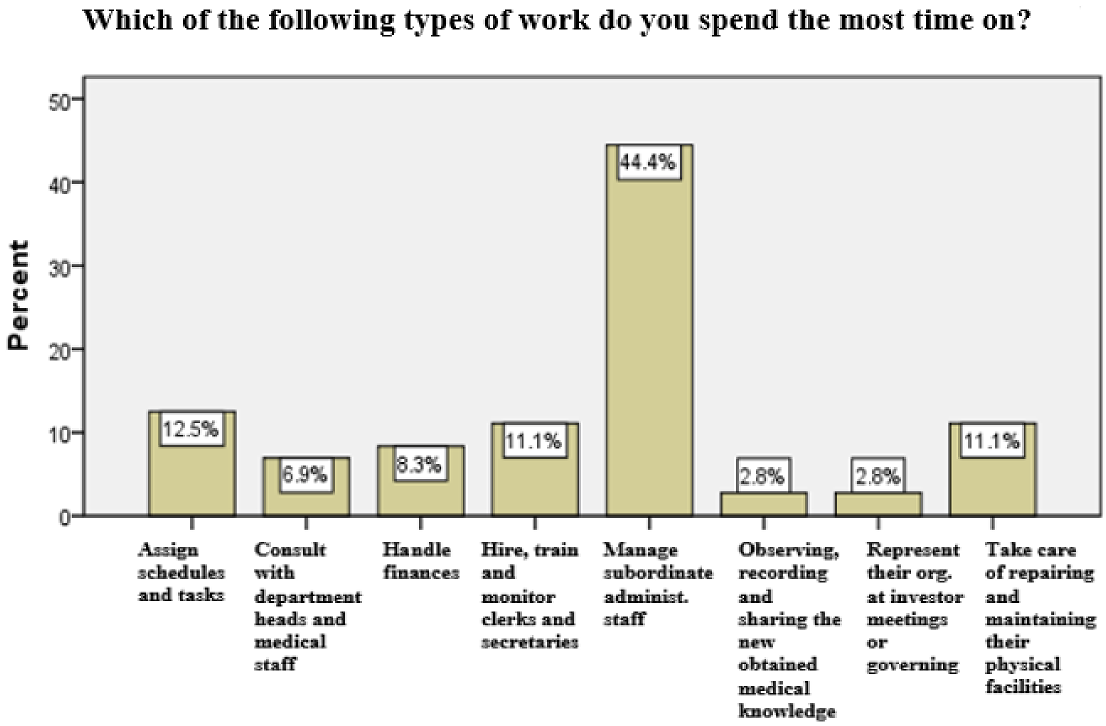

Figure (6.6): The sample of the types of work medical administrators are taking part in the diabetes clinics of the seven selected hospitals in Jordan

Conclusively, it can be found from the results that the medical administrators of these hospitals are least likely to concentrate on codifying and disseminating medical knowledge whenever possible; they are much more concerned with managing subordinate administrative staff. Consequently, the information overload problem is affecting the hospitals. The respondents thus face severe problems while treating their patients, as knowledge is not codified or shared properly when needed. Hence, staff will continue acting based on old medical information, exposing patients with diabetes to harm.

6.4.7 The Sample of the Types of Work Doctors are Taking Part in the Diabetes Clinics of the Seven Selected Hospitals in Jordan

Figure 6.7 presents the distribution of the types of work that the doctors of the seven selected hospitals in Jordan do most frequently and spend most of their time on. It can be seen from this Figure 6.7 that 'monitoring and treating patients with severe cases in the hospitals' is the type of work that the doctors perform most frequently and most of the time at 35.7%.

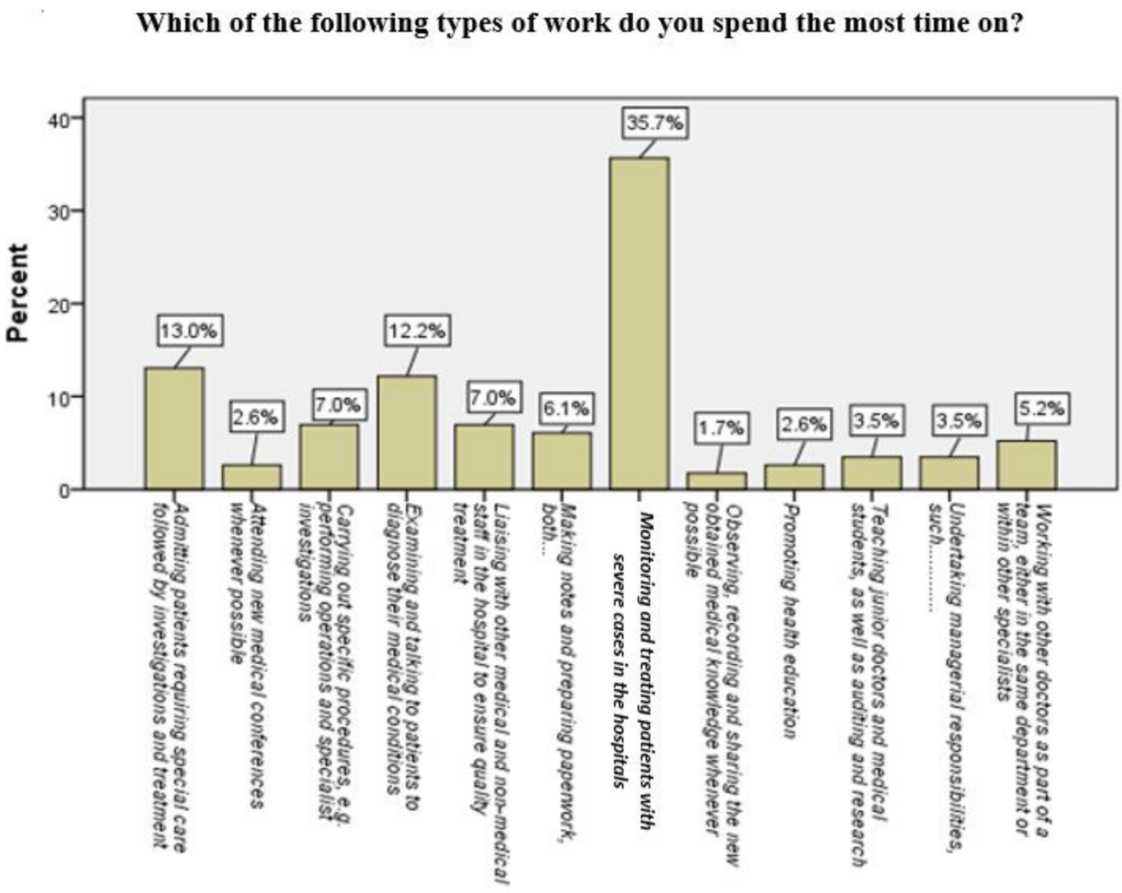

Figure (6.7): The sample of the types of work doctors are taking part in the diabetes clinics of the seven selected hospitals in Jordan

‘Attending new medical conferences whenever possible’, ‘promoting health education’, and ‘observing, recording and sharing new obtained medical knowledge whenever possible’ are the types of work that the doctors are involved in least frequently and for the least amount of time at 2.6%, 2.6%, and 1.7%, respectively. In conclusion, these results indicate that the doctors are least likely to concentrate on gaining new knowledge via attending medical conferences whenever possible, contributing to health education, and sharing medical knowledge. Thus, information overload is likely to affect their medical organisation, and severe problems might affect their patients as a result.

6.4.8 The Sample of the Types of Work Nurses are taking part in the Diabetes Clinics of the Seven Selected Hospitals in Jordan

Figure 6.8 presents the distribution of the types of work that the nurses of the seven selected hospitals in Jordan do most frequently and spend most of their time on.

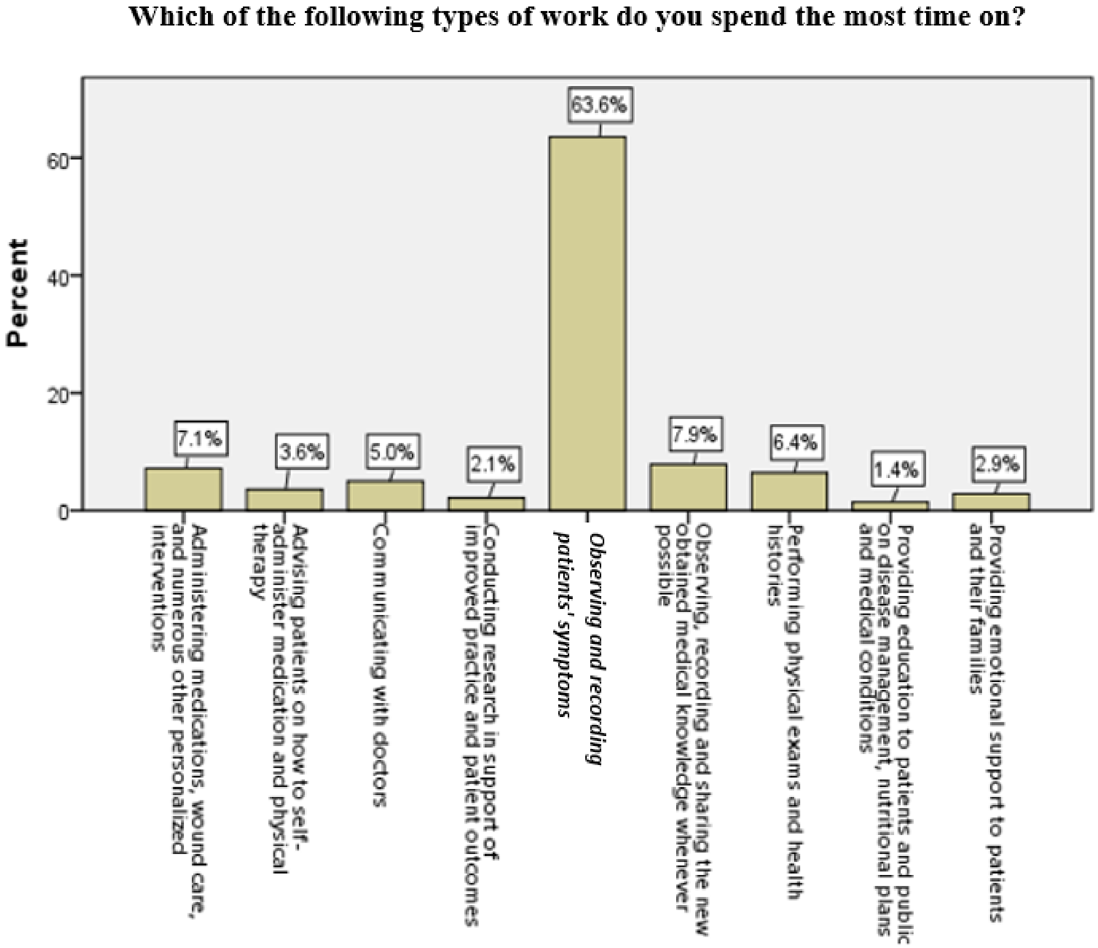

Figure (6.8): The sample of the types of work nurses are taking part in the diabetes clinics of the seven selected hospitals in Jordan

It can be seen from Figure 6.8 that 'observing and recording patients' symptoms' is the type of work that the nurses do most frequently and spend most of their time on at 63.6%. 'Communicating with doctors', 'conducting research in support of improved practice and patient outcomes', 'observing, recording, and sharing new medical knowledge whenever possible', and 'providing education to patients and public on disease management, nutritional plans, and medical conditions' represent very low percentages at 5%, 2.1%, 7.9%, and 1.4%, respectively. Thus, it can be concluded from these results that the nurses are least likely to concentrate on obtaining the benefit of sharing new medical knowledge. As described in the previous sections, this neglect may fuel the information overload problem. New medical knowledge will emerge and accumulate over time. Ignoring that new knowledge may cause severe problems for patients, as nurses may continue acting based on old medical information.

6.4.9 The Types of Information Employed in the Diabetes Clinics of the Seven Selected Hospitals in Jordan

Figure 6.9 presents the distribution of the types of information that respondents of the seven selected hospitals in Jordan are using the most in their hospitals. Figure 6.9 makes it obvious that the majority (38.8%) of respondents are most often using medical information. The types of information these respondents are using the least in their hospitals are financial information (e.g. patient billing information) and pharmacy information (e.g. pharmacy ordering information), with both at 5.2%.

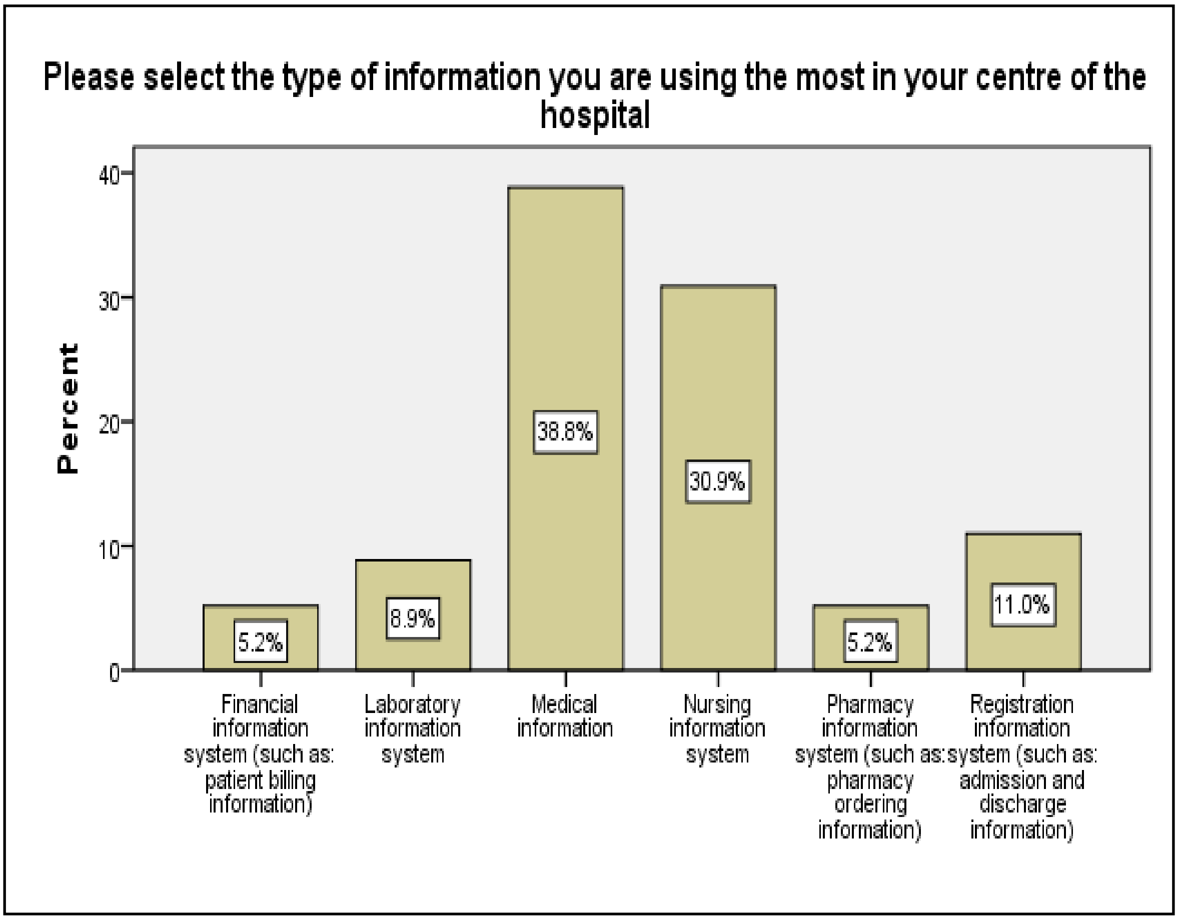

Figure (6.9): The sample of the types of information used the most in the diabetes clinics of the seven selected hospitals in Jordan

In conclusion, it is found from Figure 6.9 that the highest number of respondents uses medical information most often. Hence the respondents are most often using medical information for treating their patients. However, as the previous results demonstrate, these respondents are still facing information overload despite using medical information more often than any other type of information in their clinics. Additionally, respondents claimed that most of the medical information that they are using to treat their patients is outdated.

6.4.10 Daily Hours of Computer Usage by the Respondents in the Diabetes Clinics of the Seven Selected Hospitals in Jordan

Figure 6.10 presents the daily hours of computer usage by the respondents in the seven selected hospitals in Jordan. It can be found from Figure 6.10 that the vast majority (70%) of respondents use the computers less than 2 hours per day. The minority, at just 0.6% of respondents, used the computer more than 14 hours per day.

This result implies that, as verbally claimed by most respondents, the medical staff have very little time available to use the computers to gain new medical knowledge. The respondents claimed that they are extremely busy most of the time with their patients, who need continuous diagnosis, care, and treatment. This situation was especially true for respondents who are required to accept severe or emergency cases. Additionally, these respondents claimed that diabetes is an illness that is more demanding to treat than other types of illnesses. For instance, patients with diabetes need to be more medically educated compared to patients with other types of illnesses. The lack of available time heavily contributed to the high percentage (i.e. 70%) of respondents who are using computers for less than 2 hours a day during their work hours.

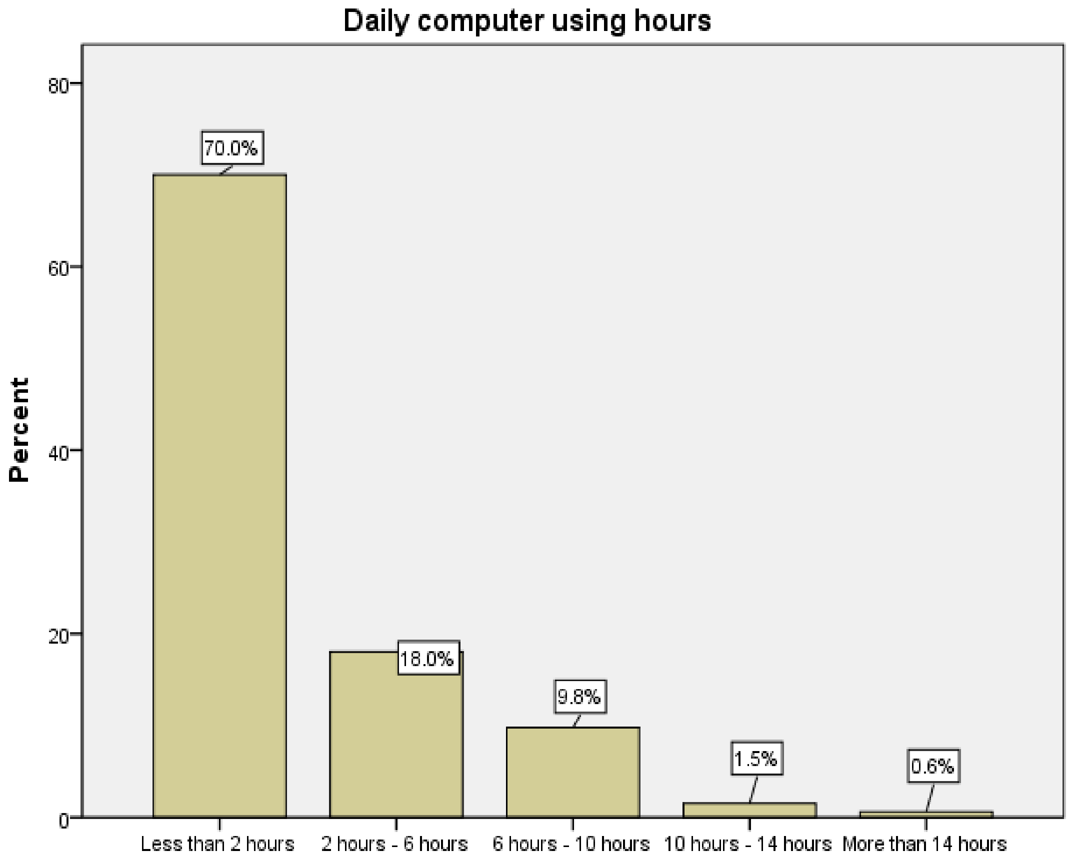

Figure (6.10): The sample of the daily computer use of by the medical staff respondents in the diabetes clinics of the seven selected hospitals in Jordan

6.4.11 Quality of Diabetes Information in the Diabetes Clinics of the Seven Selected Hospitals in Jordan

Figure 6.11 presents the distribution of respondents' rating of the quality of the diabetes information in the seven selected hospitals in Jordan. It can be illustrated from Figure 6.11 that a majority (66.6%) of respondents were satisfied with the validity of the diabetes information in their clinic. A slightly lower majority (65.8% in all cases) were satisfied with the objectivity, integrity, and uniqueness of the information. Only 59.3% of respondents were satisfied with the timeliness of the information.

It is concluded from Figure 6.11 that most respondents rated their satisfaction with the overall information quality as moderate or neutral. These results are, statistically reaching, average, indicating to some concerns being taken into consideration in these hospitals. Further, it can be seen from Figure 6.11 that the information quality in terms of timeliness represented the lowest rating. This implies that the medical staff have time management concerns. Poor timeliness of information will definitely cause information overload when new medical knowledge emerges in these hospitals.

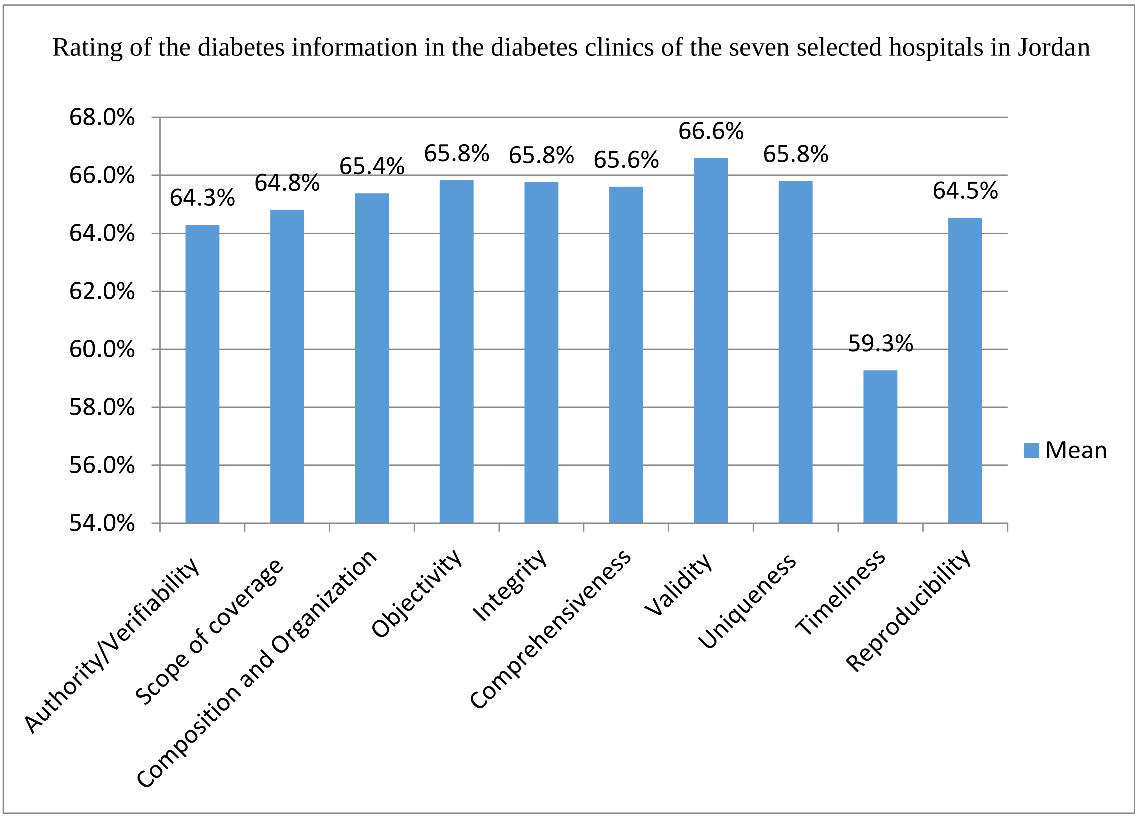

Figure (6.11): Rating of the diabetes information in the diabetes clinics of the seven selected hospitals in Jordan

6.4.12 The Theoretical Factors

The distribution of the responses regarding the theoretical factors (i.e. the expertise factor, the data factor, the information factor, the improved work ability planning factor, the diabetes clinics' improved efficiency factor, the improved knowledge conversion (externalisation) and sharing factor, the improved organisations' process factor, and the improved organisations' protection factor) are all analysed in this section. Each factor consists of its own particular maximum of five criteria adopted from the literature. Each figure in this section illustrates the results of the particular five criteria related to that single factor. In practice, the five criteria in each factor represent five corresponding questions related to each factor. These questions were disseminated via questionnaires to the respondents in the diabetes clinics of the seven selected hospitals in Jordan (see Appendix (A)). The responses of these respondents to these questions are analysed in the results accordingly.

In Figure 6.12, the sample results of the five criteria related to the expertise factor are represented. According to the five criteria of this factor, most of the medical staff respondents 'Agree' with this factor (the resulted percentages from Criterion 1 to Criterion 5 are 35.5%, 34.3%, 33%, 31.8%, and 31.5%, respectively). Table 6.1 shows a clarification of the five criteria of the first factor (the expertise factor). Each of the five criteria represents one of the five questionnaire questions related to this factor.

Table (6.1): The five criteria of Factor 1 (the expertise factor)

Factor 1 (the expertise factor)	
Criterion 1	Patients' charts are updated according to any new knowledge received from your daily medical meeting discussions.
Criterion 2	During each meeting discussion in your hospital's diabetes clinic, clinical experiences are observed and recorded.
Criterion 3	Lessons about newly obtained medical knowledge are learnt properly from clinical experts after each meeting discussion.
Criterion 4	The clinical experts of your clinic provide you with new medical knowledge via clinical workflows to support decision making based on the knowledge.
Criterion 5	The clinical experts of your clinic provide the best external evidence available in diabetes research.

The respondents of medical staff who either 'Strongly agree' or 'Agree' with the five criteria of this factor represent 46.5%, 39.2%, 38.2%, 36.7%, and 37% of respondents, respectively, as shown in Figure 6.12. The respondents who 'Strongly disagree' or 'Disagree' with the five criteria of this factor represent 27.8%, 30.6%, 29.7%, 33%, and 33.6%, respectively. In conclusion, these results show that for each criterion, the total percentage of respondents who ‘Strongly agree’ or ‘Agree’ is higher than the percentage of respondents who ‘Strongly disagree’ or ‘Disagree’. However, these percentages of agreement are approaching the average, and they do not represent higher percentages of agreement than would normally be expected. This indicates that the expertise factor is rated as average and hence needs to be further improved.

The potential reasons behind these results vary. For instance, most respondents verbally claimed that medical meeting discussions are not being held daily by their medical experts, which lowers their ability to update themselves on and learn lessons from new medical knowledge. The medical experts spend most of their time involved in emergency cases. They have little to no time to provide new medical knowledge via clinical workflows to support the decision-making knowledge of other medical staff.

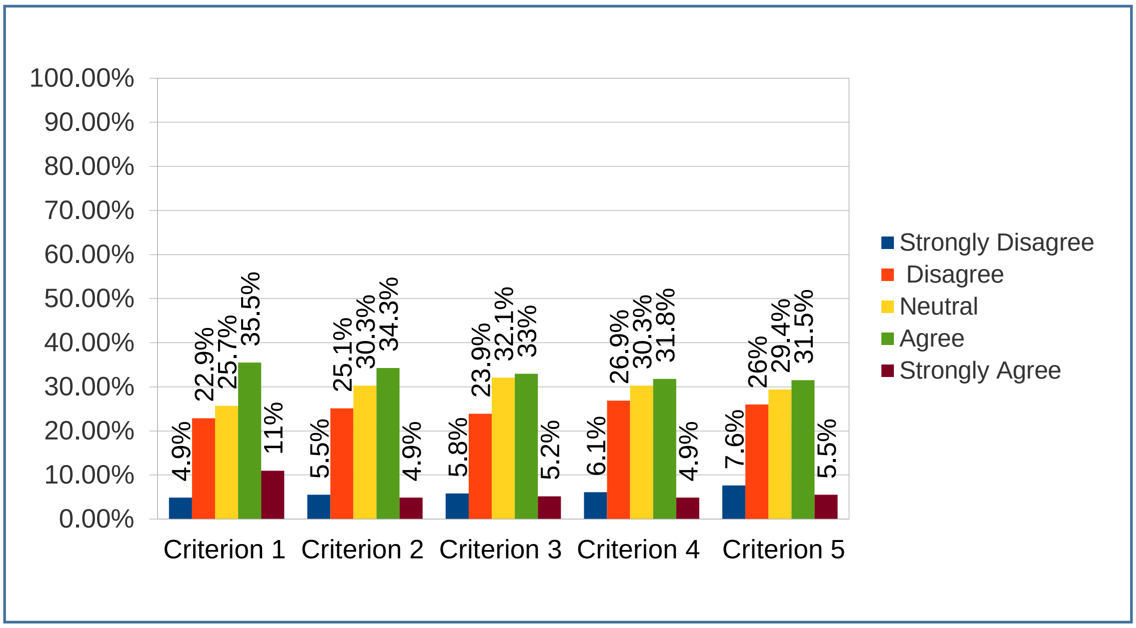

Figure (6.12): The samples of Factor 1 (the expertise factor)

The second factor (the data factor) sample results shown in Figure 6.13 also hovered at the average mark. ‘Strongly agree’ and ‘Agree’ choices were the most commonly selected choices among the respondents for all the criteria of this factor as well.

Table 6.2 states the five criteria of Factor 2 (the data factor).

Table (6.2): The five criteria of Factor 2 (the data factor)

Factor 2 (the data factor)	
Criterion 1	In your hospital's diabetes clinic, the results of the data that are derived from diagnostic tests, clinical observations, and therapeutic treatments are regularly recorded in medical records.
Criterion 2	The information from the medical data is stored in knowledge bases.
Criterion 3	Your hospital's diabetes clinic faces a growing amount of unstructured and unorganised data.
Criterion 4	As data is continuously acquired from different medical sources, it is presented in a structured format to aid in decision making.
Criterion 5	Decision making is aided by structured data, and afterwards information is organised and shared properly.

The factor in Figure 6.13 represented a total agreement percentage for each criterion of 43.7%, 40%, 44.6%, 33%, and 36.1%, respectively. These results are rated as average as well. However, compared to the results of agreement as illustrated in the previous figure (i.e. Figure 6.12), some of the criteria in this factor showed a slight decrease in agreement (i.e. lower percentages of 'Strongly agree' and 'Agree' for some criteria). For instance, the total percentages in agreement with Criteria 1, 4, and 5 of this factor were 43.7%, 33% and 36.1%, respectively; the total percentages in agreement with Criteria 1, 4, and 5 of the previous factor (the expertise factor) were 46.5%, 36.7%, and 37%, respectively.

These results imply that most of the respondents were engaged most of the time in other medical cases, such as in emergency cases, and thus had little time to record medical data results into medical records on a regular basis. Additionally, there was less time available for these respondents to codify the newly obtained medical data into knowledge basis. The large amount of information is affecting the diabetes clinics daily, according to these respondents. This problem usually arises when medical data is kept tacitly in minds instead of being codified properly into knowledge bases to inform other medical staff who do not have the knowledge in their minds. Consequently, the problem still needs to be addressed.

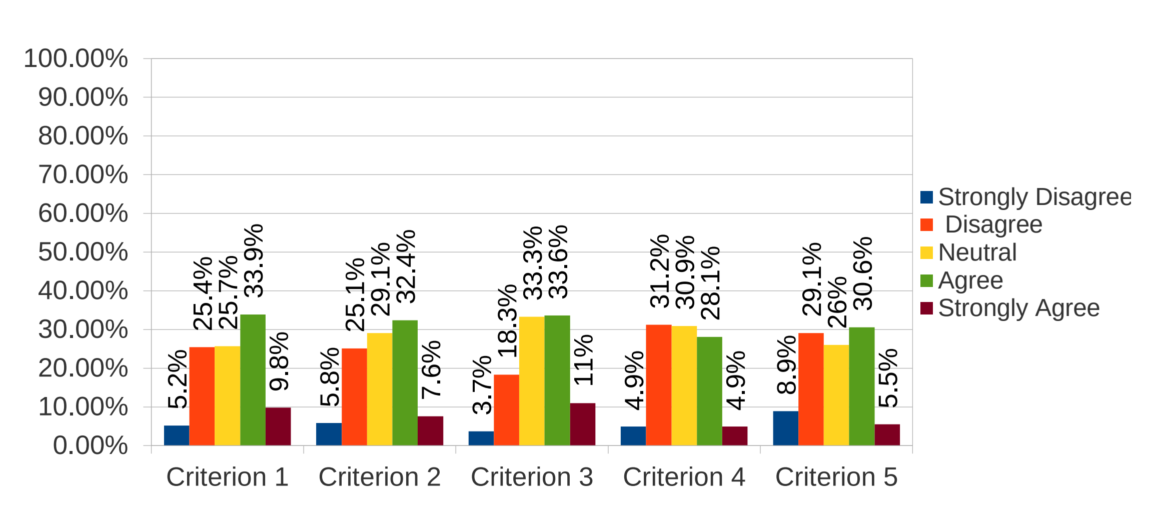

Figure (6.13): The samples of Factor 2 (the data factor)

Similarly, the third factor (the information factor) is also statistically rated as an average problem according to the obtained sample results represented in Figure 6.14. The five criteria of Factor 3 (the information factor) are clarified in Table 6.3.

Table (6.3): The five criteria of Factor 3 (the information factor)

Factor 3 (the information factor)	
Criterion 1	Your hospital's diabetes clinic follows the new information and knowledge flows within the hospital properly (i.e. the information flows from one source to another).
Criterion 2	The information is codified (reported) immediately when received and is shared fairly among your hospital's diabetes clinic in organised ways
Criterion 3	When making decisions about diagnostic and treatment interventions at your clinic, you are always up to date on the medical resource information and the knowledge.
Criterion 4	The right information is provided to the right people in the right place at the right time, and your clinic ensures a professional, cultured, and receptive community when information or knowledge is shared.
Criterion 5	The spreadsheet system of your clinic is unable to store a large amount of information.

It can be found from Figure 6.14 that most of the respondents were 'Neutral' with regard to most of the criteria of this factor (i.e. Criteria 1, 4, and 5) at percentages of 33%, 30.6%, and 31.8%, respectively. Most respondents (32.4%) 'Disagree' with Criterion 2, and most respondents (34.9%) 'Agree' with Criterion 3.

The 'Agree' results (at 34.9% overall) are still not high. This is likely due to such problems as the commitment of the respondents to other important medical tasks and respondents' absences for personal and/or illness reasons. Another reason is that some of these respondents claimed that when the new knowledge is received, the knowledge is kept tacitly in the minds of only some respondents, and hence it is not shared fairly with the many other remaining respondents. Consequently, some respondents continue to operate based on old medical information, which is likely to cause severe medical cases for visiting patients.

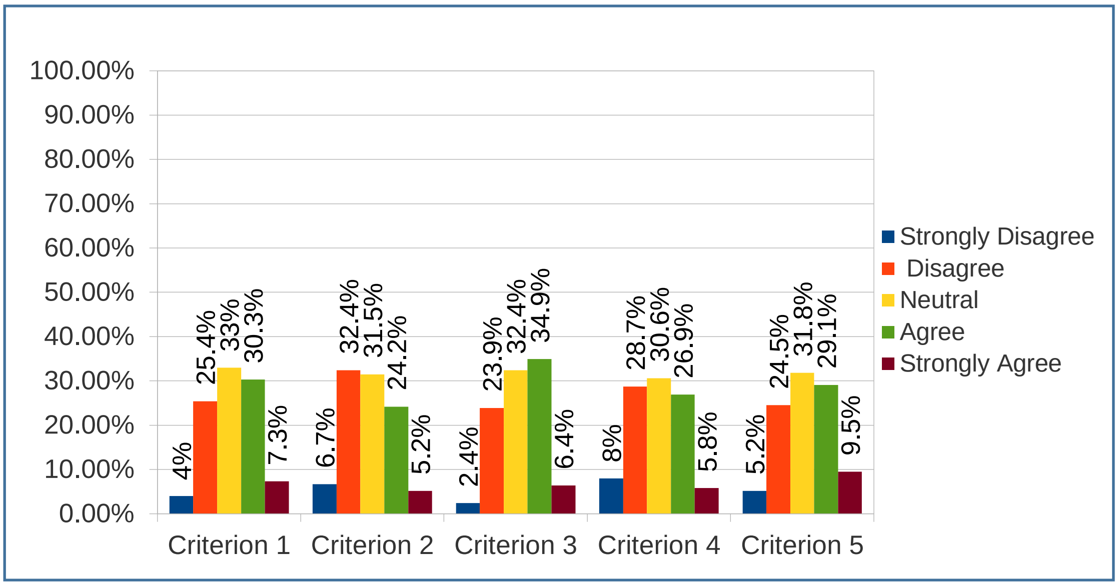

Figure (6.14): The samples of Factor 3 (the information factor)

Many respondents also claimed that unnecessary knowledge is typically mixed with necessary medical knowledge, perpetuating the information overload problem at their hospitals. Further, when respondents are engaged with other medical duties, they are prevented from showing due concern to storing the large amounts of information that they receive. These respondents, who cannot access computers frequently due to their involvement in other medical tasks, can simply become bored and frustrated with the task of storing large amounts of information on a regular basis. Moreover, several respondents noted that troubleshooting of their medical systems often occurs, tying up their computers and preventing their spreadsheet system from storing the large amount of emerging information. Consequently, there is a need for further improvements to this issue.

In the fourth factor (the improved work ability planning factor), most of the medical staff respondents ‘Agree’ with this factor as shown in Figure 6.15, with percentages of ‘Agree’ quite similar to those resulted in Factors 1 and 2. In Table 6.4, the five criteria of Factor 4 (the improved work ability planning factor) are clarified.

Table (6.4): The five criteria of Factor 4 (the improved work ability planning factor)

Factor 4 (the improved work ability planning factor)	
Criterion 1	Your hospital's diabetes clinic improves time management and the organisation's overall working ability.
Criterion 2	Your hospital's diabetes clinic is helpful in improving diagnosis and extra patients' timing appointments and ensures good relations with patients.
Criterion 3	Your hospital's diabetes clinic has well-defined rules and regulations about medical services and process knowledge.
Criterion 4	Your hospital's diabetes clinic facilitates working cooperation with other knowledgeable persons in your clinic.
Criterion 5	Your hospital's diabetes clinic maps different types of medical knowledge so that knowledge can be retrieved easily.

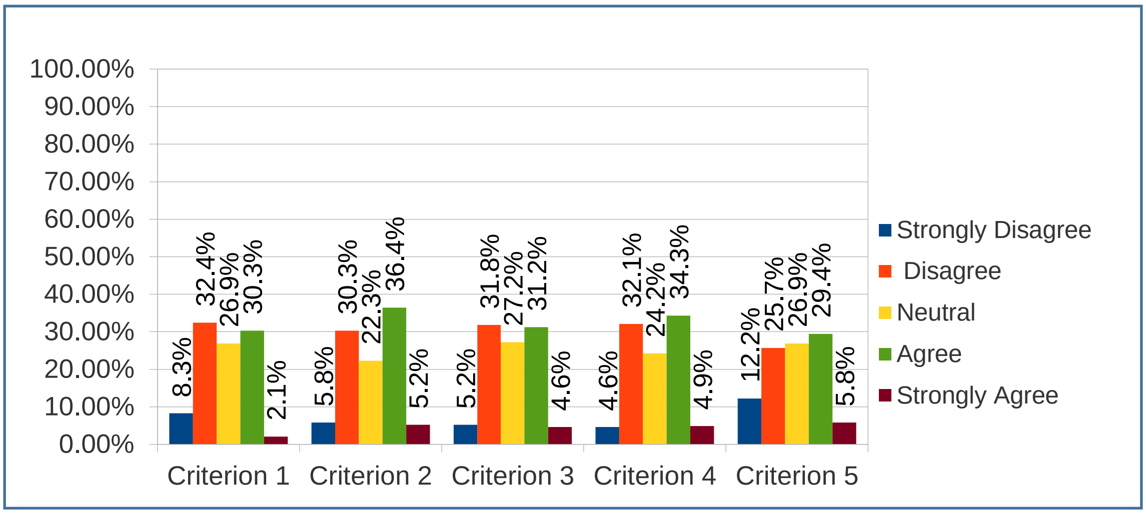

Figure (6.15): The samples of Factor 4 (the improved work ability planning factor)

Figure 6.15 shows that most respondents 'Agree' with the all the criteria in Factor 4. Respondents who 'Agree' are in the majority for three criteria in total (i.e. Criterion 2, Criterion 4, and Criterion 5 at 36.4%, 34.3%, and 29.4%, respectively). For the remaining two criteria (i.e. Criterion 1 and Criterion 3), respondents most often selected other choices (i.e. Criterion 1 with 'Disagree' at 32.4% and Criterion 3 with 'Disagree' at 31.8%).

Similar to the results obtained in Factor 3, the results for Factor 5 (the diabetes clinics' improved efficiency factor) had the 'Neutral' choice as the highest resulted choice based on the responses obtained from the respondents of medical staff as illustrated in Figure 6.16. Table 6.5 clarifies the five criteria of Factor 5.

Table (6.5): The five criteria of Factor 5 (the diabetes clinics' improved efficiency factor)

Factor 5 (the diabetes clinics' improved efficiency factor)	
Criterion 1	In the past few years, your hospital's diabetes clinic has enhanced its efficiency in pointing out the latest medical services trends.
Criterion 2	In the past few years, your hospital's diabetes clinic has enhanced its efficiency in finding new opportunities for medical services.
Criterion 3	In the past few years, your hospital's diabetes clinic has enhanced its efficiency in adopting quick medical knowledge changes.
Criterion 4	In the past few years, your hospital's diabetes clinic has enhanced its efficiency in checking the results of new services.
Criterion 5	In the past few years, your hospital's diabetes clinic has enhanced its efficiency in fulfilling its responsibilities towards patients' needs.

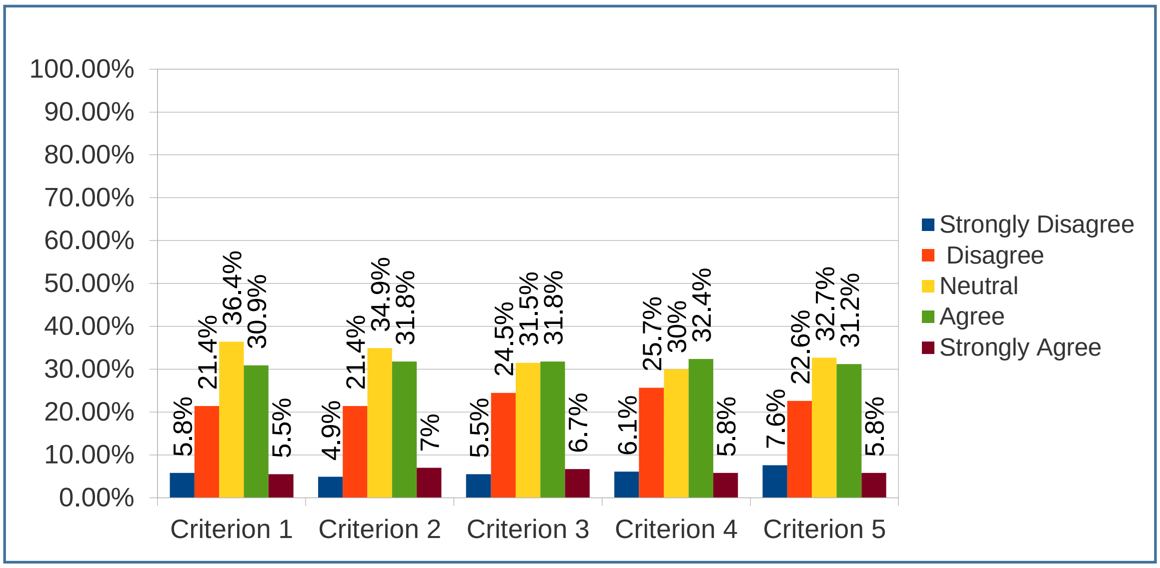

Figure (6.16): The samples of Factor 5 (the diabetes clinics' improved efficiency factor)

It is found from Figure 6.16 that there is a total number of three criteria with the 'Neutral' choice percentage as the highest (i.e. Criterion 1 with 36.4%, Criterion 2 with 34.9%, and Criterion 5 with 32.7%). The remaining two criteria have the 'Agree' choice percentage as the highest (i.e. Criterion 3 with 31.8% and Criterion 4 with 32.4%). However, Figure 6.16 also shows that Criterion 3 of Factor 5 has a percentage of 31.5% for the 'Neutral' choice, which is the second highest obtained percentage for that criterion and nearly equivalent to the 31.8% obtained for the 'Agree' choice. Hence, both percentages are still statistically rated as average.

In conclusion, the results for Factor 4 and Factor 5 are statistically approaching the average, despite the 'Agree' choice in Factor 4 representing the highest percentage of respondents. The average rating for both of these factors was due to the following reasons:

- Most of the respondents are constantly involved in important medical tasks, such as dealing with emergency cases. Work pressure prevents them from having much time to record medical data results into medical records on a regular basis. Further, their medical tasks are also preventing respondents from giving due concern to effectively organise the large amount of data.
- The medical information is kept tacitly in some respondents' minds instead of being codified properly, preventing other respondents who do not have the knowledge in their minds from accessing the knowledge. Many respondents verbally claimed that most new medical knowledge is kept tacitly in the minds of some other respondents, who fail to share the knowledge when other respondents need it.
- Most respondents claimed that most of the medical knowledge received is unnecessary and mixed in with the necessary medical information. The unnecessary knowledge causes information overload. Thus, there is a need to reduce unnecessary information. The new knowledge management framework proposed in Chapter 7 contributes to managing this problem.
- The urgent absences of some respondents for undisclosed reasons forces other respondents to take over unattended medical tasks.

Finally, in Figures 6.17–6.19, the obtained results from Factor 6 (the improved knowledge conversion (externalisation) and sharing factor), Factor 7 (the improved organisations' process factor), and Factor 8 (the improved organisations' protection factor) are highlighted in order. Tables 6.6–6.8 illustrate the five criteria for each of the three factors in order: Factor 6 in Table 6.6, Factor 7 in Table 6.7, and Factor 8 in Table 6.8.

Table (6.6): The five criteria of Factor 6 (the improved knowledge conversion (externalisation) and sharing factor)

Factor 6 (the improved knowledge conversion (externalisation) and sharing factor)	
Criterion 1	In your hospital's diabetes clinic, departments are structured to share more and more knowledge by involving respondents in group discussions rather than in individual discussions.
Criterion 2	In your hospital's diabetes clinic, medical processes are facilitated by knowledge exchange, and there are no limitations for knowledge creation.
Criterion 3	In your hospital's diabetes clinic, medical staff's efforts to gain more knowledge are facilitated with materials.
Criterion 4	In your hospital's diabetes clinic, staff are encouraged to acquire, share, and discuss knowledge with each other when others need their assistance.

Criterion 5	In your hospital's diabetes clinic, the higher-level staff place importance on newly created knowledge, so the value of sharing knowledge exceeds its cost.

Table (6.7): The five criteria of Factor 7 (the improved organisations' process factor)

Factor 7 (the improved organisations' process factor)	
Criterion 1	Your hospital's diabetes clinic has a process to facilitate gathering knowledge about patients' symptoms and checking the results of tested treatments for improvements.
Criterion 2	Your hospital's diabetes clinic has a process to facilitate staff's efforts to devote themselves to delivering the best services possible.
Criterion 3	Your hospital's diabetes clinic has a process for acquiring new knowledge's sources and types, for replacing old knowledge with newly created knowledge, for structuring and updating knowledge for medical services, and for sharing knowledge among the medical staff.
Criterion 4	Your hospital's diabetes clinic has a process for quickly implementing new knowledge and taking into account the advantages of this implementation.
Criterion 5	Your hospital's diabetes clinic has a process to facilitate providing new knowledge to the desired staff at the right time and for using new knowledge from better knowledge sources to solve newly encountered problems.

Table (6.8): The five criteria of Factor 8 (the improved organisations' protection factor)

Factor 8 (the improved organisations' protection factor)	
Criterion 1	Your hospital's diabetes clinic ensures knowledge security by avoiding unauthorised access within the clinic.
Criterion 2	Your hospital's diabetes clinic ensures knowledge security by avoiding unauthorised access outside the clinic.
Criterion 3	Your hospital's diabetes clinic provides knowledge access under some authentications.
Criterion 4	Your hospital's diabetes clinic does not allow its staff to share the clinic's information with irrelevant persons.
Criterion 5	Your hospital's diabetes clinic clarifies the knowledge protection rules in the clinic.

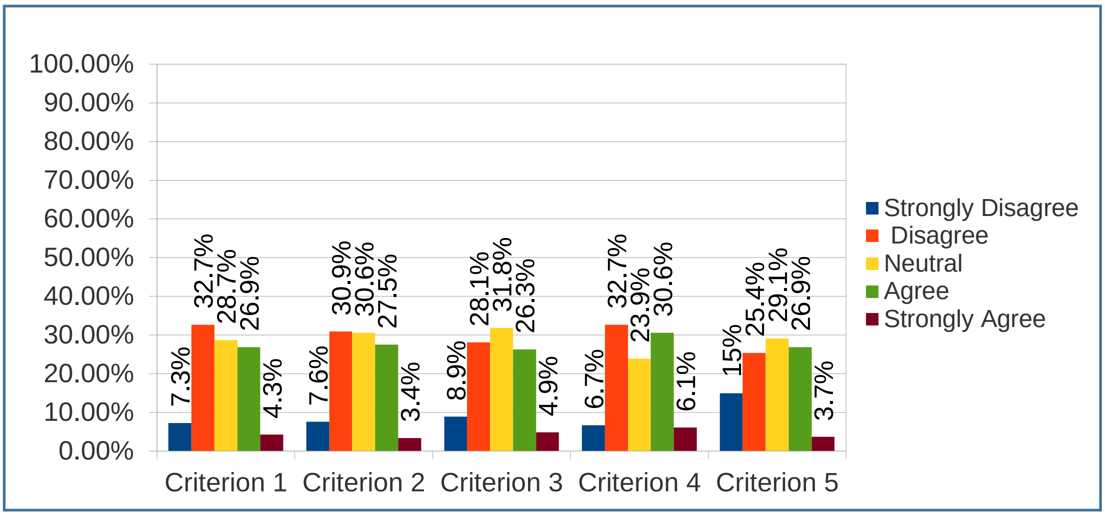

Figure (6.17): The samples of Factor 6 (the improved knowledge conversion (externalisation) and sharing factor)

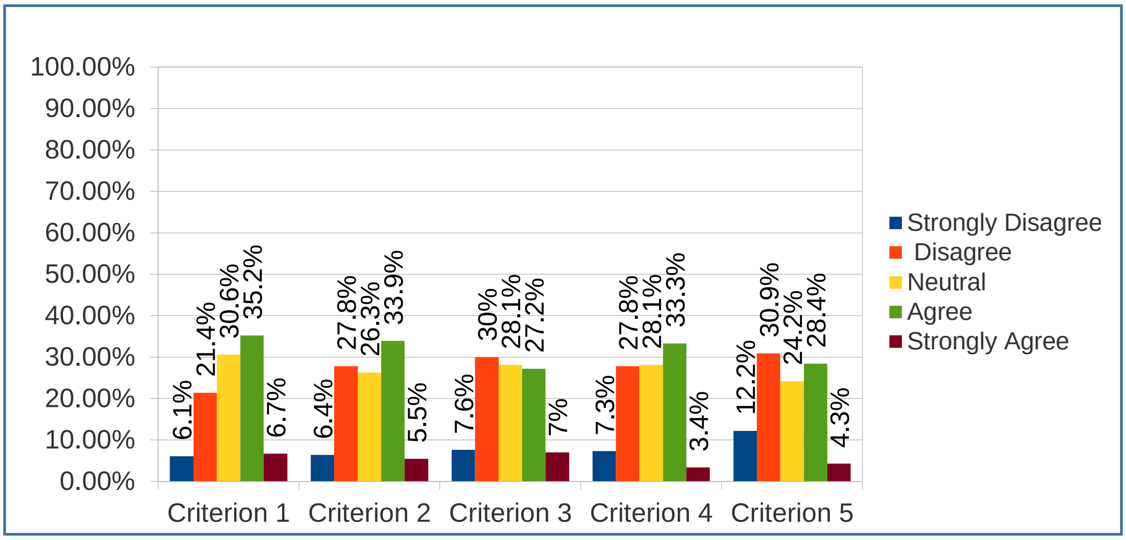

Figure (6.18): The samples of Factor 7 (the improved organisations' process factor)

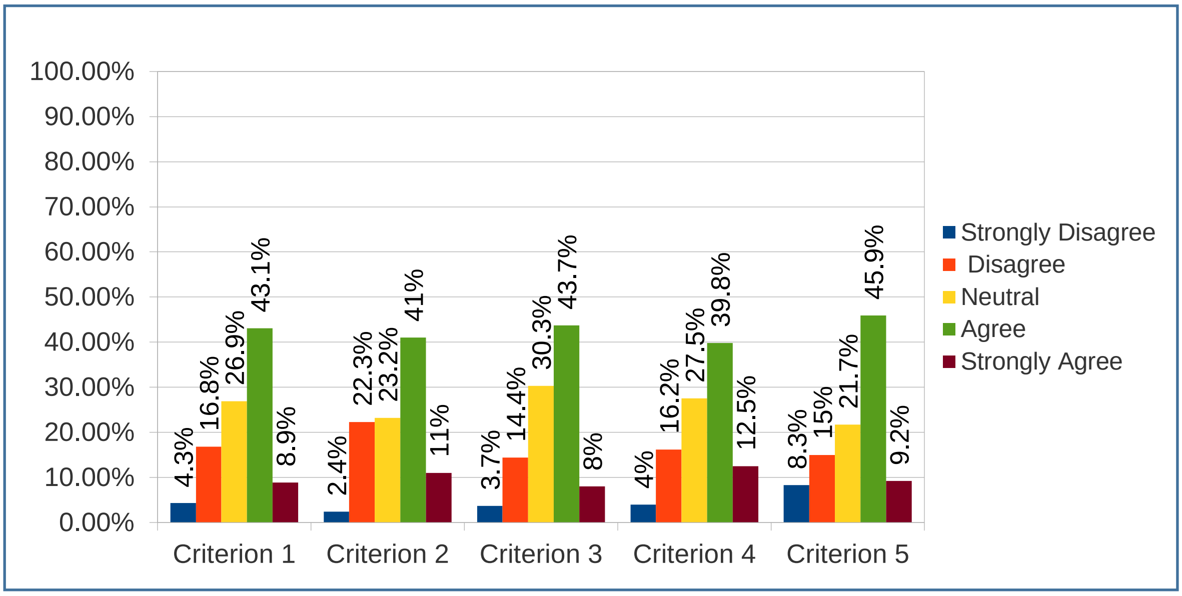

Figure (6.19): The samples of Factor 8 (the improved organisations' protection factor)

Figure 6.17 shows that most of the respondents 'Disagree' with Factor 6. Three criteria have 'Disagree' as the highest percentage (i.e. Criteria 1, 2, and 4 with percentages of 32.7%, 30.9%, and 32.7%, respectively).

In contrast, most respondents 'Agree' with Factor 7, as shown in Figure 6.18, and with Factor 8, as shown in Figure 6.19. Figure 6.18 of Factor 7 shows that most respondents selected the 'Agree' choice for three out of the five criteria (i.e. for Criteria 1, 2, and 4 with percentages of 35.2%, 33.9%, and 33.3%, respectively). Figure 6.19 of Factor 8 represents the 'Agree' choice as having the highest percentage for all five criteria (i.e. Criteria 1–5 at 43.1%, 41%, 43.7%, 39.8%, and 45.9%, respectively). To re-state, although for both Factors 7 and 8 the 'Agree' choice produced the highest percentage overall, only three criteria in Factor 7 had 'Agree' as the highest percentage compared to all five criteria for the same choice in Factor 8.

The clarified results obtained from Factors 6–8 are statistically approaching average (i.e. rated as an average problem) due to the following reasons:

- Most knowledge is kept tacitly in the minds of some respondents of medical staff.
- Respondents are almost constantly committed to medical tasks, especially in emergency cases.
- Information protection problems occurred due to the carelessness of some respondents. Medical information should be more proactively preserved.
- Some medical staff exhibited selfishness or hoarding regarding emerging medical information.
- Too little time is available to attend daily medical and scientific meetings with medical experts.
- The absences of some medical experts and some other respondents of the medical staff for personal reasons prevent other respondents from capturing new medical information when they are performing medical tasks that were originally assigned to the absent respondents.

In summary, it is significant to point out that Factor 8 showed a slightly higher agreement choice percentage compared to the agreement choice percentage for the other factors (i.e. Factors 1–7). As can be seen from Figure 6.19, most of the 'Agree' type of choice percentages exceeded 40%; in the other seven factors, as shown in Figures 6.12–6.18, the highest percentages of the 'Agree' choice were below 37%. The reason for this is that Factor 8 is based on the security of the medical information protection process, which the seven selected hospitals in Jordan show more concern. However, this increase is still slight, and this factor is thus statistically rated as average, and also in need of being taken into account for further improvements.

6.5 The Test and Retest

To perform the test and retest of the correlation, the questionnaires were first applied to a small sample of respondents from outside the completely original large sample (i.e. the 327 respondents). The number of respondents that were involved for the test and retest was 15 respondents. The purpose of conducting these tests of correlation was to identify the degree of clarity for the questionnaires, the questionnaires' relationships with each other, the ability of this study to give exact meaning, and the ability of this study to extract initial pilot indicators for the sincerity of the involved questionnaires. Hence, the same questionnaires were reapplied in the same diabetes clinics, but with a sample of respondents who had not been in the original sample and after an exploratory period of three weeks. The Pearson correlation coefficients were calculated between the two applications such that this correlation amounted to a total score of (0.86). According to the theoretical factors, the correlation was calculated as shown in Table 6.9.

Table (6.9): The calculations of the Pearson correlation for the eight theoretical factors

No.	Factor	Pearson correlation
1.	The resources factor (The expertise factor)	0.810*
2.	The resources factor (The data factor)	0.872*
3.	The resources factor (The information factor)	0.815*
4.	The improved work ability planning factor	0.768*
5.	The diabetes clinics' improved efficiency factor	0.870*
6.	The improved knowledge conversion (externalisation) and sharing factor	0.819*
7.	The improved organisations' process factor	0.828*
8.	The improved organisations' protection factor	0.847*
Total		**0.86***

*** The correlation is significant at the 0.01 level** *

In conclusion, it can be inferred from the results of Table 6.9 that the total Pearson correlation of all eight factors reached 0.86. This implies that there is a strong relationship between the questionnaires conducted for the test (15 respondents) and the same questionnaires conducted after an exploratory period of three weeks for the retest (the same 15 respondents).

6.6 Critical Evaluation of the Analysis

The analysis of this research project was efficiently carried out and investigated on 327 respondents of medical staff (i.e. 72 medical administrators, 115 doctors, and 140 nurses) from both male and female participants of seven selected hospitals (A, B, C, D, E, F, G) in Jordan. This investigation was conducted to explore in depth the problems arising from information overload within these clinics.

As shown in Figure 6.11, most of the respondents felt ‘Neutral’ about the qualities of the diabetes information in these hospitals. These opinions on a statistical basis were approaching the average as shown from Figure 6.11. This finding is in line with the analytical results of the eight adopted theoretical factors that were afterwards obtained as represented in Section 6.4.11, which comes after Sections 6.4.1–6.4.10, which in turn pertained to the demographic information analysis.

Despite the fact that the resulting percentage level of the ‘Agree’ choice was higher in some factors than the resulting percentage level of the ‘Neutral’ choice of some other factors, the ‘Agree’ choice is still statistically rated as average, and is not high as would normally be intended.

The implications of the obtained results for the eight adopted factors were statistically approaching the average. Consequently, this resulted in an average problem affecting the diabetes clinics of these hospitals. In practice, this average problem occurred due to many reasons mentioned previously, such as the unfairness of medical knowledge sharing, the involvement of the medical staff respondents in emergency cases, and the absences of some of these respondents, particularly when some of the medical experts go abroad from time to time.

Furthermore, it is deduced from the previous results that there were slightly higher percentages in the agreement choice (i.e. the ‘Agree’ choice) among the respondents for some factors compared to other factors. For instance, according to these results, the highest agreement was given for Factor 8, the information security protection factor, as shown in Figure 6.19. In other words, Factor 8 had the highest percentages of the ‘Agree’ choice for each criterion compared to all the other percentages of the same agreement choice for all the other criteria of all the other factors, as shown from Figures 6.12–6.18.

Factor 8, as shown in Figure 6.19, had the highest percentage of the ‘Agree’ choice for Criterion 5 (45.9%). The highest percentages of the ‘Agree’ choice for each the remaining factors are identified below. The list of the highest percentages per factor identifies the criterion with that highest percentage and presents the items in descending order according to percentage:

- Factor 4 in Figure 6.15 reached 36.4% for Criterion 2.
- Factor 1 in Figure 6.12 reached 35.5% for Criterion 1.
- Factor 7 in Figure 6.18 reached 35.2% for Criterion 1.
- Factor 3 in Figure 6.14 reached 34.9% for Criterion 3.
- Factor 2 in Figure 6.13 reached 33.9% for Criterion 1.
- Factor 5 in Figure 6.16 reached 32.4% for Criterion 4.
- Factor 6 in Figure 6.17 reached 30.6% for Criterion 4.

Although the encountered problems were statistically near to the average per the obtained results, there is still a need for further enhancements in order to comply with the needs of the respondents of these hospitals and to ensure better effectiveness. These improvements can be achieved by codifying the knowledge properly, reducing the encountered information overload problem, and providing convenient and well-organised spare time for gaining more new medical knowledge, and for sharing it properly on a regular basis.

6.7 Interview Analysis

In this section, the qualitative data that was collected by conducting interviews with the respondents during the primary research in the diabetes clinics of the seven selected hospitals (A, B, C, D, E, F, G) in Jordan is analysed thoroughly. The researcher chose a subset of medical experts in the field (i.e. a subset of medical administrator experts, a subset of doctor experts, and a subset of nurse experts) from the overall resulted sample (i.e. 327 respondents). This selection took place after completing the quantitative data collection. The selection process of choosing a subset of medical experts in the field was performed by selecting a minimum percentage of 10% of respondents from the 327 respondents, at a minimum of 11 experts from each positional type (i.e. medical administrators' experts, doctors' experts, and nurses' experts), reaching a total minimum of 33 experts. The number of experts who volunteered to participate for the interviews reached 40 respondents out of the 327 respondents. The analysis of the interview results highlights the encountered problems in these clinics based on written responses obtained from these respondents, namely from the medical administrators, doctors, and nurses. The interview consisted of six research questions adopted and deduced from Mirza (2009). It can be analysed from the obtained responses of the conducted interview that the respondents have answered the questions in a way that can assist in exploring in depth the existing problems. Suggestions about solutions for the information overload in the diabetes clinics of these hospitals are given as well.

Q1: What types of knowledge do you exchange when you carry out diabetes diagnosis?

Table 6.10 shows that most of the respondents declared that the type of knowledge that is the most exchanged when patients with diabetes are being diagnosed is the patient's family medical history. Most respondents claimed that this type of knowledge is extremely significant and can be easily obtained. Information on genes of close relatives, for example, can be easily conveyed to public health clinics via the patients with diabetes.

Table (6.10): The types of knowledge exchanged between respondents and patients in the diabetes clinics of the seven selected hospitals in Jordan when patients with diabetes are being diagnosed

No.	Types of exchangeable knowledge when diagnosing patients with diabetes	Frequency
1.	Reasons of the diabetes occurrence	1
2.	Information on monitoring diabetes cases	3
3.	New medication	2
4.	Methods and peripherals of health education	4
5.	Scientific diabetes medical knowledge	14
6.	Diabetes nutrition (Diet)	14
7.	Insulin types	14
8.	Diabetes types	9
9.	Symptoms and complications	2
10.	Life style	14
11.	Patient's medical history	11
12.	Information on the patient's retina	1
13.	Haemoglobin A1C (Diagnosis)	1
14.	Information on the patient's fundus	1
15.	Patient's family medical history	16
16.	Special precautions	1
17.	Management of the patient's medical treatments (Injury, foot ulcer, etc.)	5
18.	Medicine types being taken	6
19.	Clinical examinations	3
20.	Laboratory and radio investigations	3
21.	Neuropathy	1
22.	Patient's symptoms	1
23.	Self-care and self-treatment	1
24.	Patient's readings	1
25.	Obesity information	1
26.	Discharging notes	1
27.	Financial information (Medical prices)	1
28.	Family's care of the particular patient	1

Q2: What knowledge strategy is used that assist you in improving your practice and patient dealing?

Table 6.11 shows that most of the respondents identified the knowledge strategy that most assists them with developing their patient dealings and practices as ‘daily questioning and experiencing achieved by holding frequent meetings and regularly communicating with patients’. Most of the respondents who highlighted this strategy pointed out that, as medical staff, they are likely to be engaged with many average and severe patients face to face; respondents have to question patients, communicate with patients whilst taking their symptoms, and so on.

Table (6.11): The types of knowledge strategies that help the respondents in the diabetes clinics of the seven selected hospitals in Jordan to improve their practices and patients’ dealings

No.	Types of knowledge strategies that help the respondents in the diabetes clinics to improve their practices and patients dealings	Frequency
1.	Daily questioning and experiencing achieved by holding frequent meetings and communication skills with patients	23
2.	Dealing with daily cases, trainings and practices	10
3.	Acquired knowledge materials and maintaining up-to-date with the latest medical knowledge	4
4.	Scientific lectures	1
5.	Sharing medical knowledge with other respondents of medical staff	1

Q3: What types of current technologies are you using to manage your knowledge?

Table 6.12 shows that most of the respondents stated that the type of current technology that they use most often to manage their medical knowledge is the internet (via computers/mobiles). Most of these respondents argued that computers and mobiles are the most seamless devices available. These devices enable respondents to surf easily and rapidly for the required new medical knowledge through the internet if respondents have the time to spare. However, these respondents also claimed that there is still insufficient time for them to use the computers/mobiles in order to surf for the new medical knowledge since they are most likely to be engaged in other urgent medical tasks.

Table (6.12): The types of current technologies that respondents are using in the diabetes clinics of the seven selected hospitals in Jordan to manage their knowledge

No.	Types of current technologies that respondents are using in the diabetes clinics to manage their knowledge	Frequency
1.	Internet (computers/mobiles)	35
2.	Magazines and journals	7
3.	Medical books	14
4.	Procures	2
5.	Medical conferences	1
6.	Other applications (e.g. videos / touch screen applications / new medical equipment / data show / ultrasound for retina investigations	7

Q4: What suggestions can you offer about your hospital's management of your diabetes clinic for the sake of reducing and overcoming the current information overload problem that is frequently affecting your clinic? Please explain.

Table 6.13 shows that the majority of the medical staff respondents proposed that, to reduce information overload in the diabetes clinics of the seven selected hospitals in Jordan, the hospitals should focus on 'categorisation of the right medical knowledge and assignment of the right tasks to the right members of the medical staff'. The main reason behind this preference in suggestion was that unnecessary and necessary medical and non-medical information is currently accumulated together at the same time, causing medical staff respondents to get lost and/or confused. These respondents are unable to obtain the right new medical knowledge, so the knowledge does not get to the right member of the medical staff. Additionally, they also claimed that the right tasks most often are not assigned to the right medical staff member. Both issues perpetuate information overload. Often medical staff have to do unnecessary or unrelated medical/non-medical tasks and hence lose the chance to exploit that time for pursuing with the right necessary new medical knowledge.

Table (6.13): The suggested solutions provided by respondents in the diabetes clinics of the seven selected hospitals in Jordan for reducing the issue of information overload

No.	Suggested solutions for reducing information overload	Frequency
1.	Categorisation of the right medical knowledge and assignment of the right task to the right member of medical staff	26
2.	Time management and organisation	11
3.	Holding daily/weekly lectures, sessions, or workshops outside of workday hours (during staff's spare time)	12
4.	Meeting up with the right medical experts	2
5.	Distributing medical procures	4
6.	Dealing with new medical cases from time to time	1
7.	Changing the hospitals' policies from time to time	2
8.	Storing (codifying) the medical knowledge into electronic built databases	2
9.	Sharing medical knowledge outside of working hours on a daily or a weekly basis	5
10.	Reducing the working times and increasing the number of medical staff respondents	2
11.	Providing more experienced managers for organising tasks and a chairman reference to be available at any time	3
12.	Providing summarisations, diagrams, and guidelines for the new medical knowledge	1
13.	Using an intelligent automated system to have a unified data structure	1
14.	Referring to medical experts in spare time	1
15.	Selecting particular sites for gaining an accurate new medical knowledge	1
16.	Providing small notebooks with recent medical knowledge	1

Q5: Are you quite satisfied with the functionality of the knowledge management system that is currently being used in your organisation? Why? How do you think it could be improved?

Most of the medical staff respondents (29 out of the 40 respondents) were unsatisfied with the functionality of the knowledge management system currently in place in their clinics. Only 7 respondents were satisfied out of the 40 respondents, and 4 respondents out of the 40 respondents did not respond to this particular question. The 29 respondents attributed their dissatisfaction to the following issues:

- Improper medical system.
- Poor time management.
- Information overload encountered in their clinics.

- Lack of proper medical knowledge sharing.
- Knowledge hoarding (e.g. tendency among other staff members to keep knowledge in their own minds without sharing it with others when required).
- Lack of sessions/lectures, insufficient medical specialists (experts) to give medical lectures on a regular basis, and insufficient time to attend existing sessions/lectures.
- Lack of a new computerised data system for managing the proper codification of the new medical information system and resulting need for the respondents to work manually most of the time.
- Random dissemination of medical knowledge due to lack of a proper dissemination system.
- Psychological issues.

The 29 respondents suggested that these issues could be improved by:

- Categorising the medical knowledge properly.
- Improving the time policy matter by establishing proper time management (e.g. scheduling lectures outside of workday hours).
- Holding continuous medical education on a regular basis.
- Increasing the input information and filtering the output information in proper systematic ways.
- Providing an organised, computerised data system.

Q6: How do you think that time management can be improved to help being updated with the new knowledge and reduce the occurrence of information overload that is affecting your clinic?

The suggestions provided by the respondents for reducing the information overload encountered in their clinics are summarised as follows:

- Use the right database for accessing the required information.
- Connect patients with the clinics.
- Collaborate with other medical staff.
- Provide summarised medical guidelines.
- Hold medical lectures/sessions outside of workday hours.
- Categorise the medical knowledge.
- Educate multiple groups simultaneously at an optimum time (do not try to educate staff members individually).
- Provide a properly organised knowledge management system.

- Establish proper time management.
- Assign the right tasks to the right medical staff member at the right time and in the right place.
- Employ additional medical staff to help with the many different important medical tasks, thereby freeing higher numbers of medical respondents to gain and benefit from new medical knowledge.
- Seek out effective ways to address the psychological issues that are affecting most of the respondents within these clinics.

6.8 Summary

In this chapter, the analysis and results of the primary research were investigated to explore in depth the gaps and issues occurring in the diabetes clinics of the seven selected hospitals in Jordan. The data obtained (questionnaires and interviews) from a total number of 327 medical staff respondents involved in these hospitals was analysed in detail. In particular, this analysis included a demographic analysis, a questionnaire analysis, an interview analysis, and a test and retest of the correlation analysis.

The analytical results showed that the problem is statistically approaching the average. Hence, there is a need for further enhancements. The new knowledge management framework is proposed as a way to reduce the information overload problem outlined in the analysed results of the primary research. Further, the interview analysis has been presented to highlight more details of and better explore the encountered problems and gaps related to information overload. Chapter 7 summarises the obtained analysis of the primary research of Chapter 6 into a clearer view.

Chapter 7

Primary Research Data Findings

7.1 Introduction

In Chapter 4, the method of data collection and analysis was investigated in detail. The results of the previous analysis of Chapter 6 statistically approached the average.

This chapter presents the findings based on the analysis that was carried out in the previous chapter. The findings in this chapter summarise the analysis of the collected data as elaborated in the previous chapter, and thus, this chapter aims at providing a clear understanding of the summarised results.

The reliability coefficients for the eight theoretical factors are highlighted in Section 7.2. Section 7.3 introduces the findings of the demographic information general characteristics of the respondents of medical staff. In Section 7.4, the findings of the data analysis related to the eight theoretical factors are summarised by illustrating the mean, the standard deviation, the rank, and the degree level of agreement for each criterion of a single factor based on the obtained mean of the criterion. Finally, Section 7.5 summarises this chapter.

7.2 The Reliability Coefficients

In this section, the reliability coefficients of the eight theoretical factors based on the calculated Cronbach's alpha value are highlighted in Table 7.2, and are discussed accordingly. This value is also called the coefficient of reliability (or consistency). According to the UCLA: Statistical Consulting Group (2015), 'Cronbach's alpha is a measure of internal consistency, that is, how closely related a set of items are as a group. It is considered to be a measure of scale reliability'.

In particular, it is a coefficient of consistency (Reliability) and is not considered to represent a statistical test. Based on the Institute for Digital Research and Education (2015), the standardised formula of the Cronbach's alpha is

$$\alpha = \frac{N \cdot \bar{c}}{\bar{v} + (N-1) \cdot \bar{c}}$$

Where

N denotes the number of items,

$\bar{c}$ denotes the average inter-item covariance among the items, and

$\bar{v}$ denotes the average variance.

This formula is considered to perform a measurement of the internal consistency (reliability). This step is extremely common when there are questionnaires consisting of multiple questions with scales and when testing whether these scales are reliable or not (Laerd Statistics, 2015). Table 7.1 illustrates the Cronbach's alpha different values with their adjacent internal consistencies based on George and Mallery (2003).

Table (7.1): The Cronbach's alpha values and their internal consistencies (George & Mallery, 2003)

Cronbach's alpha	Internal consistency
$\alpha \geq 0.9$	Excellent
$0.8 \leq \alpha < 0.9$	Good
$0.7 \leq \alpha < 0.8$	Acceptable
$0.6 \leq \alpha < 0.7$	Questionable
$0.5 \leq \alpha < 0.6$	Poor
$\alpha < 0.5$	Unacceptable

Table 7.2 illustrates the eight theoretical factors based on the calculated Cronbach's alpha values, which contain the reliability coefficients.

Table (7.2): The reliability coefficients of the eight theoretical factors

No.	Factors	No of items	Cronbach's alpha values
1	The expertise factor	5	0.874
2	The data factor	5	0.765
3	The information factor	5	0.702
4	The improved work ability planning factor	5	0.890
5	The diabetes clinics' improved efficiency factor	5	0.906
6	The improved knowledge conversion (externalisation) and sharing factor	5	0.907
7	The improved organisations' process factor	5	0.891
8	The improved organisations' protection factor	5	0.910
All		**40**	**0.951**

It is observed from Table 7.2 that the scales overall were found to have a satisfactory Cronbach's alpha value (i.e. a Cronbach's alpha value greater than 0.9). Based on Table 7.1, the resulted value of 0.951 indicates ‘Excellent’ reliability of the internal consistency. This shows that there is a high reliability among the eight theoretical factors.

7.3 The General Characteristics of the Respondents’ Demographic Information in the Diabetes Clinics of the Seven Selected Hospitals in Jordan

In this section, the characteristics of the demographic information of the medical staff respondents are summarised based on the analysis in the previous chapter. The demographic information of the medical staff respondents comprises nationality, gender, age, educational levels, work experience, job category, types of work in each job category medical staff spend most of their time on in the diabetes clinics, types of information that are most frequently used in these clinics, the daily number of hours of computer usage, and the diabetes information quality ratings. Table 7.3 represents a summary of the general characteristics of the medical staff respondents’ demographic information as was analysed in Chapter 6.

Table (7.3): The demographic information of the group of respondents in the diabetes clinics of the seven selected hospitals in Jordan

Variable		Frequency	Percentage
Nationality	Jordanian	292	89.3%
	Non-Jordanian	35	10.7%
Gender	Male	182	55.7%
	Female	145	44.3%
Age	18 – 25	77	23.5%
	26 – 33	164	50.2%
	34 – 41	49	15%
	42 and over	37	11.3%
Educational levels	American Board	5	1.5%
	Bachelors	210	64.2%
	Board Post Signal	1	0.3%
	Diploma	48	14.7%
	FRCS, FACS, FICS	1	0.3%
	Masters	49	15%
	PhD	13	4%
Work experience	Less than 6 months	23	7%
	6 months – 1 year	66	20.2%
	1 – 3 years	102	31.2%
	3 – 5 years	66	20.2%
	More than 5 years	70	21.4%
Job category	Medical administrator	72	22%
	Doctor	115	35.2%
	Nurse	140	42.8%

It can be seen from Table 7.3 that most of the respondents (292 respondents or 89.3%) were Jordanian in nationality. Non-Jordanian employees represented the minority of nationalities with a frequency of 35 and a percentage of 10.7%.

In terms of gender, the male respondents were in the majority with a frequency of 182 male medical staff respondents and a percentage of 55.7%. The female respondents represented a frequency of 145 female medical staff respondents with a percentage of 44.3%.

In terms of age, most of the respondents were in the age group 26–33 years old with a frequency of 164 medical staff respondents and a percentage of 50.2%. The second age group of 18–25 years old represented a frequency of 77 medical staff respondents and a percentage of 23.5%. The third age group of 34–41 years old represented a frequency of 49 medical staff respondents and a percentage of 15%. The smallest age group of 42 years old and over represented a frequency of 37 medical staff respondents and a percentage of 11.3%.

With regards to educational levels, the majority of respondents were at the bachelor's level with a frequency of 210 medical staff respondents and a percentage of 64.2%. The next highest educational level was the master's level, which represented a frequency of 49 medical staff respondents and a percentage of 15%. The third level was the Diploma level representing a frequency of 48 medical staff respondents and a percentage of 14.7%. The fourth level was the PhD level showing a frequency of 13 medical staff respondents and a percentage of 4%. The fifth level was the American Board level representing a frequency of 5 medical staff respondents and a percentage of 1.5%. The last two levels were the Board Post Signal level and the FRCS, FACS, FICS levels, both of which represented the same frequency and percentage at 1 and 0.3%, respectively.

Regarding work experience, most of the respondents had 1–3 years' experience with a frequency of 102 medical staff respondents and a percentage of 31.2%. The following highest number of medical staff respondents had more than 5 years' experience with a frequency of 70 respondents and a percentage of 21.4%. The groups with 6 months to 1 year of experience and with 3–5 years' experience had the same frequency (66 medical staff respondents) and percentage (20.2%). The smallest group in terms of work experience had less than 6 months' experience, with a frequency of 23 respondents of medical staff and a percentage of 7%.

In terms of job category, most of the respondents were nurses with a frequency of 140 nurses and a percentage of 42.8%. The next largest group was comprised of doctors with a frequency of 115 doctors and a percentage of 35.2%. Finally, there were 72 medical administrators at a percentage of 22%.

Table 7.4 represents a summary of the types of work of medical administrators in the diabetes clinics of the seven selected hospitals in Jordan, as was analysed in Chapter 3.

Table (7.4): Summary of the types of work that medical administrators in the diabetes clinics perform

Medical Administrators' Roles	Frequency	Percentage
Assign schedules and tasks	9	12.5%
Consult with department heads and medical staff on their administrative needs	5	6.9%
Handle finances	6	8.3%
Hire, train and monitor clerks and secretaries	8	11.1%
Manage subordinate administrative staff	32	44.4%
Observing, recording, and sharing the newly obtained medical knowledge whenever possible	2	2.8%
Represent their organisations at investor meetings or governing boards	2	2.8%
Take care of repairing and maintaining their physical facilities	8	11.1%
Total	**72**	**100%**

It is observed from Table 7.4 that the work that is most frequently undertaken by the medical administrators of the seven selected hospitals in Jordan is to 'manage subordinate administrative staff'. This type of work represented a frequency of 32 medical administrators with a percentage of 44.4% of all the medical administrator respondents from these hospitals. Medical administrators next most frequently 'assign schedules and tasks'; this type of work represented a frequency of 9 and a percentage of 12.5%. Medical administrators are least frequently 'observing, recording and sharing the newly obtained medical knowledge whenever possible' and 'represent their organisations at investor meetings or governing boards'. Both of these types of work represented the same frequency and percentage at 2 and 2.8%, respectively.

The analytical results indicated that the medical administrators of these hospitals are least likely to concentrate on the importance of codifying and disseminating the medical knowledge whenever possible (refer to the medical administrators' roles at the types of work that are of percentages of 2.8% as shown in Table 7.4). Rather, most medical administrators (44.4%) are concerned with managing subordinate administrative staff. Consequently, the information overload problem is affecting the hospitals where severe problems might affect their patients when new medical knowledge is neither codified nor shared properly between medical staff keeping the doctors with outdated medical knowledge while the new medical knowledge is accumulating. Hence, respondents keep acting on old medical information despite knowing that medicine is being improved over time.

Tables 7.5 and 7.6 illustrate a summary of the types of work that doctors and nurses are taking part in the diabetes clinics of the seven selected hospitals in Jordan as was also analysed in Chapter 6. From Tables 7.5 and 7.6, it can be seen that the types of works that are the most frequently undertaken by the doctors and nurses of these hospitals are the ‘monitoring and treating patients with severe cases in the hospitals’ and ‘observing and recording patients’ symptoms’, respectively. Both of these types of works for the doctors and nurses represented frequencies of 41 and 89 with percentages of 35.7% and 63.6%, respectively.

Table (7.5): Summary of the types of work that doctors in the diabetes clinics perform

Doctors’ Roles	Frequency	Percentage
Admitting patients requiring special care followed by investigations and treatment	15	13%
Attending new medical conferences whenever possible	3	2.6%
Carrying out specific procedures, e.g. performing operations and specialist investigations	8	7%
Examining and talking to patients to diagnose their medical conditions	14	12.2%
Liaising with other medical and non-medical staff in the hospital to ensure quality treatment	8	7%
Making notes and preparing paperwork, both as legal record of treatment and for the benefit of other healthcare professionals	7	6.1%
Monitoring and treating patients with severe cases in the hospitals	41	35.7%
Observing, recording, and sharing the newly obtained medical knowledge whenever possible	2	1.7%
Promoting health education	3	2.6%
Teaching junior doctors and medical students, as well as auditing and research	4	3.5%
Undertaking managerial responsibilities, such as planning the workload and staffing of the department, especially at more senior levels	4	3.5%
Working with other doctors as part of a team, either in the same department or within other specialists	6	5.2%
Total	**115**	**100%**

Table (7.6): Summary of the types of work that nurses in the diabetes clinics perform

Nurses' Roles	Frequency	Percentage
Administering medications, wound care, and other numerous personalised interventions	10	7.1%
Advising patients on how to self-administer medication and physical therapy	5	3.6%
Communicating with doctors	7	5%
Conducting research in support of improved practice and patient outcomes	3	2.1%
Observing and recording patients' symptoms	89	63.6%
Observing, recording, and sharing the newly obtained medical knowledge whenever possible	11	7.9%
Performing physical exams and health histories	9	6.4%
Providing education to patients and public on disease management, nutritional plans and medical conditions	2	1.4%
Providing emotional support to patients and their families	4	2.9%
Total	**140**	**100%**

In Table 7.5, the type of work that is the next most frequently taken on by the doctors is 'admitting patients requiring special care followed by investigations and treatment', with a frequency and a percentage of 15 and 13%, respectively. The type of work that is the next most frequently undertaken by the nurses as shown in Table 7.6 is 'observing, recording, and sharing newly obtained medical knowledge whenever possible'; however, the result shows a low frequency and percentage of 11 and 7.9%, respectively. The type of work that is the least frequently undertaken by the doctors as shown in Table 7.5 is 'observing, recording, and sharing newly obtained medical knowledge whenever possible', with a frequency of 2 and a percentage of 1.7%. Table 7.6 shows that the least frequent type of work that is undertaken by the nurses is 'providing education to patients and public on disease management, nutritional plans and medical conditions', with a frequency and a percentage of 2 and 1.4%, respectively.

The analytical results of Table 7.5 show that the doctors are least likely to concentrate on gaining new knowledge, with low percentages for attending medical conferences whenever possible (2.6%), promoting health education (2.6%), and sharing new medical knowledge (1.7%). Thus, the information overload problem is likely to affect these doctors' medical organisation. It can be also shown from the results of Table 7.6 the nurses are also less likely to concentrate on obtaining the benefits of sharing new medical knowledge (refer to the nurses' role at the type of work that is of a percentage 7.9% as shown in Table 7.6). In conclusion, it was claimed by the medical respondents that this may cause information overload. Table 7.7 summarises the types of information that are being used the most in these hospitals.

Table (7.7): Summary of the types of information that are most used in the diabetes clinics of the seven selected hospitals in Jordan

Type of information that is used the most	Frequency	Percentage
Financial information (e.g. patient billing information)	17	5.2%
Laboratory information	29	8.9%
Medical information	127	38.8%
Nursing information	101	30.9%
Pharmacy information (e.g. pharmacy ordering information)	17	5.2%
Registration information (e.g. admission and discharge information)	36	11%
Total	**327**	**100%**

Table 7.7 indicates that the type of information that is used the most in these hospitals is medical information, which represents a frequency of 127 and a percentage of 38.8%. Nursing information represented the next type of information most used, with a frequency of 101 and a percentage of 30.9%. In contrast, the types of information that are being used the least in these hospitals are financial information (e.g. patient billing information) and pharmacy information (e.g. pharmacy ordering information). Both represent the same frequency and percentage of 17 and 5.2%, respectively. Table 7.8 summarises the daily hours of computer use in these hospitals.

Table (7.8): Summary of the daily hours of computer usage in the diabetes clinics of the seven selected hospitals in Jordan

Daily hours of computer usage	Frequency	Percentage
Less than 2 hours	229	70%
2–6 hours	59	18%
6–10 hours	32	9.8%
10–14 hours	5	1.5%
More than 14 hours	2	0.6%
Total	**327**	**100%**

From Table 7.8, it is observed that most of the respondents in these hospitals are using the computers for less than 2 hours daily, with a frequency of 229 and a percentage of 70%. The number of hours of daily computer use that exceeded the 2 hours represented fewer medical staff respondents with frequencies of 59, 32, 5, and 2, and percentages of 18%, 9.8%, 1.5%, and 0.6%, respectively.

In particular, it can be inferred from these results that most of the medical staff respondents are extremely busy with important medical tasks and have insufficient time to use the computers. Table 7.9 summarises the sample rates of the diabetes information quality in the diabetes clinics of the seven selected hospitals in Jordan.

Table (7.9): Summary of the quality ratings of the diabetes information in the diabetes clinics of the seven selected hospitals in Jordan

No.	The sample rates of the diabetes information quality	Mean	Standard Deviation	Rank
1.	Authority/Verifiability	64.3%	16.2%	9
2.	Scope of coverage	64.8%	15.8%	7
3.	Composition and Organisation	65.4%	15.8%	6
4.	Objectivity	65.8%	16.5%	2
5.	Integrity	65.8%	16.2%	4
6.	Comprehensiveness	65.6%	16%	5
7.	Validity	66.6%	16.5%	1
8.	Uniqueness	65.8%	16.3%	3
9.	Timeliness	59.3%	19.7%	10
10.	Reproducibility	64.5%	16.9%	8
Overall average assessment		**64.8%**	**16.6%**	**-------**

It is noticed from this table that there is a data convergence of the quality of information assessment related to diabetes. The average assessment percentages had a wide range. At the top of the range was 66.6% with a standard deviation of 16.5% and a rank of ‘1’ for validity. At the bottom of the range was the mean percentage of 59.3% with a standard deviation of 19.7% and a rank of ‘10’ for timeliness. In general, the overall average assessment of the mean is 64.8%, and the overall average assessment of the standard deviation is 16.6%.

7.4 The Findings of the Theoretical Factors

In this section, the findings of the theoretical factors are summarised based on the analysis that was discussed in the previous chapter. In particular, each of Tables 7.10–7.17 in this section illustrates the results of the five criteria related to the particular single factor. Additionally, the mean, the standard deviation, the rank, and the degree of agreement are all represented for each of the five criteria of each particular factor.

This research gives degrees for the types of answers pertaining to the questions about the theoretical factors. A degree of (1) indicates the answer selection ' Strongly disagree'. A degree of (2) indicates the answer selection 'Disagree'. A degree of (3) indicates the answer selection 'Neutral'. A degree of (4) indicates the answer selection 'Agree'. Finally, a degree of (5) indicates the answer selection 'Strongly agree'. Hence, the following steps are given for the purposes of clarifying how the levels of degree of agreement (low, average, and high) are determined based on the calculated mean:

- Subtract the value of degree (1) (i.e. 'Strongly disagree') from the value of degree (5) (i.e. 'Strongly agree') such that (5 – 1 = 4). This assists in assigning the levels of degree of agreement by limiting the process to the three suggested levels: low, average, and high degree of agreement. Each of the three levels has a numerical range category so that the degree of agreement is based on the mean and can be clearly identified as shown in the following step.
- Divide the length measurement by the number of degree agreement levels (i.e. 4 / 3 = 1.33). The result is the length of each degree of agreement level such that the levels of degree of agreement are based on the mean and categorised according to this length as follows:
  1) The first range starts from the value '1'. The length '1.33' is added, yielding the mean range (1–2.33), which indicates a low level of agreement.
  2) The second range category starts from the value '2.34'. The length '1.33' is added, yielding the mean range (2.34–3.67), which indicates an average level of agreement.
  3) The third mean range is thus (3.68–5) and indicates a high level of agreement.

Tables 7.10–7.12 presented below summarise the previous investigated results of each of the five criteria related to each of the expertise factors, namely the data factor and the information factor, respectively.

Table (7.10): Summary of the analysed results of the expertise factor

No.	Criteria	Mean	Standard Deviation	Rank	Degree of agreement
1.	Patients' charts are updated according to any new knowledge received from your daily medical meeting discussions	3.25	1.08	1	Average
2.	During each meeting discussion in your hospital's diabetes clinic, clinical experiences are observed and recorded	3.08	1.00	2.5	Average
3.	Lessons about newly obtained medical knowledge are learnt properly from clinical experts after each meeting discussion	3.08	1.00	2.5	Average
4.	The clinical experts of your clinic provide you with new medical knowledge via clinical	3.02	1.01	4	Average

	workflows to support decision making based on the knowledge				
5.	The clinical experts of your clinic provide the best external evidence available in diabetes research	3.01	1.05	5	Average
Grand mean		**3.09**	**0.84**	**-----**	**-----**

Table (7.11): Summary of the analysed results of the data factor

No.	Criteria	Mean	Standard Deviation	Rank	Degree of agreement
1.	In your hospital's diabetes clinic, the results of the data that are derived from diagnostic tests, clinical observations, and therapeutic treatments are regularly recorded in medical records	3.18	1.08	2	Average
2.	The information from the medical data is stored in knowledge bases	3.11	1.05	3	Average
3.	Your hospital's diabetes clinic faces a growing amount of unstructured and unorganised data	3.30	1.01	1	Average
4.	As data is continuously acquired from different medical sources, it is presented in a structured format to aid in decision making	2.97	0.99	4	Average
5.	Decision making is aided by structured data, and afterwards information is organised and shared properly	2.95	1.08	5	Average
Grand mean		**3.10**	**0.75**	**-----**	**-----**

Table (7.12): Summary of the analysed results of the information factor

No.	Criteria	Mean	Standard Deviation	Rank	Degree of agreement
1.	Your hospital's diabetes clinic follows the new information and knowledge flows within the hospital properly (i.e. the information flows from one source to another)	3.12	1.00	3	Average
2.	The information is codified (reported) immediately when received and is shared fairly among your hospital's diabetes clinic in organised ways	2.89	1.02	5	Average
3.	When making decisions about diagnostic and treatment interventions at your clinic, you are	3.19	0.95	1	Average

	always up to date on the medical resource information and the knowledge				
4.	The right information is provided to the right people in the right place at the right time, and your clinic ensures a professional, cultured, and receptive community when information or knowledge is shared	2.94	1.05	4	Average
5.	The spreadsheet system of your clinic is unable to store a large amount of information	3.13	1.05	2	Average
Grand mean		**3.05**	**0.69**	**-----**	**-----**

It is seen from Table 7.10 that Criterion 1, i.e. 'Patients' charts are updated according to any new knowledge received from your daily medical meeting discussions', represents the highest level of agreement for the expertise factor; the criterion is ranked '1', with a mean of 3.25 and a standard deviation of 1.08. Criterion 2, i.e. 'During each meeting discussion in your hospital's diabetes clinic, clinical experiences are observed and recorded', and Criterion 3, i.e. 'Lessons about newly obtained medical knowledge are learnt properly from clinical experts after each meeting discussion', both represent the next rank of '2.5', have a mean of 3.08, and have a standard deviation of 1.00. Criterion 4, i.e. 'The clinical experts of your clinic provide you with new medical knowledge via clinical workflows to support decision making based on the knowledge', represents a rank of '4' with a mean and a standard deviation of 3.02 and 1.01, respectively. Criterion 5, i.e. 'The clinical experts of your clinic provide the best external evidence available in diabetes research', has a rank of '5', representing the lowest level of agreement for the expertise factor, where the given mean is 3.01, and the standard deviation is 1.05. In conclusion, Table 7.10 shows an above average level of agreement for the expertise factor with overall average answers (i.e. an average grand mean of 3.09 and a standard deviation for all criteria of 0.84).

Tables 7.11 and 7.12 show that Criterion 3 in both tables represents the highest level of agreement for the data factor and for the information factor, with a rank of '1' and with means of 3.30 and 3.19 and standard deviations of 1.01 and 0.95, respectively. In Table 7.11, Criterion 1 represents the second rank '2' with a mean of 3.18 and a standard deviation of 1.08. In Table 7.12, Criterion 5 represents the second rank '2' with a mean of 3.13 and a standard deviation of 1.05. The lowest level of agreement is indicated for Criterion 5 in Table 7.11 and for Criterion 2 in Table 7.12. Both criteria have a rank of '5' with means of 2.95 and 2.89 and standard deviations of 1.08 and 1.02, respectively. In summary, as with Table 7.10, Tables 7.11 and 7.12 show that there are also above average levels of agreement for the data factor and for the information factor (i.e. average grand means of 3.10 and 3.05 and standard deviations for all criteria of 0.75 and 0.69, respectively).

Tables 7.13–7.17 summarise the rest of the factors of the previously investigated results of each of the five criteria related to the improved work ability planning factor, the diabetes clinics' improved efficiency factor, the improved knowledge conversion (externalisation) and sharing factor, the improved organisations' process factor, and the improved organisations' protection factor, respectively. In particular, these tables also represent the mean, the standard deviation, the rank, and the degree of agreement for each of these remaining factors.

Table (7.13): Summary of the analysed results of the improved work ability planning factor

No.	Criteria	Mean	Standard Deviation	Rank	Degree of agreement
1.	Your hospital's diabetes clinic improves time management and the organisation's overall working ability	2.86	1.01	5	Average
2.	Your hospital's diabetes clinic is helpful in improving diagnosis and extra patients' timing appointments and ensures good relations with patients	3.05	1.05	1	Average
3.	Your hospital's diabetes clinic has well-defined rules and regulations about medical services and process knowledge	2.98	1.01	3	Average
4.	Your hospital's diabetes clinic facilitates working cooperation with other knowledgeable persons in your clinic	3.03	1.02	2	Average
5.	Your hospital's diabetes clinic maps different types of medical knowledge so that knowledge can be retrieved easily	2.91	1.13	4	Average
Grand mean		**2.96**	**0.87**	**-----**	**-----**

Table (7.14): Summary of the analysed results of the diabetes clinics' improved efficiency factor

No.	Criteria	Mean	Standard Deviation	Rank	Degree of agreement
1.	In the past few years, your hospital's diabetes clinic has enhanced its efficiency in pointing out the latest medical services trends	3.09	0.99	3	Average
2.	In the past few years, your hospital's diabetes clinic has enhanced its efficiency in finding new opportunities for medical services	3.15	1.00	1	Average
3.	In the past few years, your hospital's diabetes clinic has enhanced its efficiency in adopting quick medical knowledge changes	3.10	1.02	2	Average
4.	In the past few years, your hospital's diabetes clinic has enhanced its efficiency in checking the results of new services	3.06	1.03	4	Average
5.	In the past few years, your hospital's diabetes clinic has enhanced its efficiency in fulfilling its responsibilities towards patients' needs	3.05	1.04	5	Average
Grand mean		**3.09**	**0.86**	**-----**	**-----**

Table (7.15): Summary of the analysed results of the improved knowledge conversion (externalisation) and sharing factor

No.	Criteria	Mean	Standard Deviation	Rank	Degree of agreement
1.	In your hospital's diabetes clinic, departments are structured to share more and more knowledge by involving respondents in group discussions rather than in individual discussions	2.88	1.02	3.5	Average
2.	In your hospital's diabetes clinic, medical processes are facilitated by knowledge exchange, and there are no limitations for knowledge creation	2.88	1.01	3.5	Average
3.	In your hospital's diabetes clinic, medical staff's efforts to gain more knowledge are facilitated with materials	2.90	1.04	2	Average
4.	In your hospital's diabetes clinic, staff are encouraged to acquire, share, and discuss knowledge with each other when others need their assistance	2.97	1.07	1	Average

5.	In your hospital's diabetes clinic, the higher-level staff place importance on newly created knowledge, so the value of sharing knowledge exceeds its cost	2.79	1.11	5	Average
Grand mean		**2.88**	**0.90**	**-----**	**-----**

Table (7.16): Summary of the analysed results of the improved organisations' process factor

No.	**Criteria**	**Mean**	**Standard Deviation**	**Rank**	**Degree of agreement**
1.	Your hospital's diabetes clinic has a process to facilitate gathering knowledge about patients' symptoms and checking the results of tested treatments for improvements	3.15	1.03	1	Average
2.	Your hospital's diabetes clinic has a process to facilitate staff's efforts to devote themselves to delivering the best services possible	3.04	1.05	2	Average
3.	Your hospital's diabetes clinic has a process for acquiring new knowledge's sources and types, for replacing old knowledge with newly created knowledge, for structuring and updating knowledge for medical services, and for sharing knowledge among the medical staff	2.96	1.08	4	Average
4.	Your hospital's diabetes clinic has a process for quickly implementing new knowledge and taking into account the advantages of this implementation	2.98	1.02	3	Average
5.	Your hospital's diabetes clinic has a process to facilitate providing new knowledge to the desired staff at the right time and for using new knowledge from better knowledge sources to solve newly encountered problems	2.82	1.11	5	Average
Grand mean		**2.99**	**0.88**	**-----**	**-----**

Table (7.17): Summary of the analysed results of the improved organisations' protection factor

No.	**Criteria**	**Mean**	**Standard Deviation**	**Rank**	**Degree of agreement**
1.	Your hospital's diabetes clinic ensures knowledge security by avoiding unauthorised access within the clinic	3.35	1.00	4	Average

2.	Your hospital's diabetes clinic ensures knowledge security by avoiding unauthorised access outside the clinic	3.36	1.02	3	Average
3.	Your hospital's diabetes clinic provides knowledge access under some authentications	3.38	0.95	2	Average
4.	Your hospital's diabetes clinic does not allow its staff to share the clinic's information with irrelevant persons	3.41	1.03	1	Average
5.	Your hospital's diabetes clinic clarifies the knowledge protection rules in the clinic	3.33	1.10	5	Average
Grand mean		**3.37**	**0.88**	**-----**	**-----**

Similar to Tables 7.10–7.12, Tables 7.13–7.17 demonstrate that the degree of agreement for each of the five criteria of each factor is 'Average'. This finding is in line with the grand mean of all the factors, which is statistically approaching the average. Further, it is shown from Tables 7.13–7.17 that the highest levels of agreement represent the first rank '1' of different criteria with different highest means of 3.05, 3.15, 2.97, 3.15, and 3.41, respectively. Additionally, it is also noticed from these tables that the standard deviations of the highest levels of agreement related to the highest means are 1.05, 1.00, 1.07, 1.03, and 1.03, respectively.

It is seen from the same tables (i.e. Tables 7.13–7.17) that the lowest levels of agreement represent the fifth rank '5' of different criteria with different means of 2.86, 3.05, 2.79, 2.82, and 3.33, respectively. The standard deviations of the same tables for the lowest levels of agreement and for the lowest means are 1.01, 1.04, 1.11, 1.11, and 1.10, respectively. Consequently, it may be concluded from these tables that there are above average levels of agreement for the improved work ability planning factor, the improved knowledge conversion (externalisation) and sharing factor, the improved organisations' process factor, the diabetes clinics' improved efficiency factor, and the improved organisations' protection factor (i.e. average grand means of 2.96, 3.09, 2.88, 2.99, and 3.37, and standard deviations for the entire criteria of 0.87, 0.86, 0.90, 0.88, and 0.88, respectively). In short, it is concluded from Tables 7.10–7.17 that the agreement levels are statistically approaching the average, thus indicating an 'Average' degree of agreement.

7.5 Summary

In this chapter, a summary of the findings resulted from the analysis phase in Chapter 3 was presented. In particular, a summary of the demographic information related to the medical staff respondents who are involved in the diabetes clinics of the seven selected hospitals in Jordan was highlighted. The findings of the eight theoretical factors were also discussed based on the calculations of the mean and the standard deviation, along with the representations of the rank and the degree of agreement for each of the five criteria belonging to each particular theoretical factor.

In conclusion, it can be inferred from the findings that the summarised obtained results are statistically approaching the average, as the degree of agreements shown from the previous tables indicated an 'Average' degree according to the calculated mean for each of the five criteria of each theoretical factor. In Chapter 8, a detailed discussion on the analysis of the current situation in the diabetes clinics of the seven selected hospitals in Jordan is given. This discussion clarifies how and where information overload occurs in these hospitals.

Chapter 8
Analysis of the Current Hospitals Situation

8.1 Introduction

In Chapters 6 and 7, the analysis and findings indicated a problem with information overload in the diabetes clinics of the seven selected hospitals in Jordan. In this chapter, the current situation encountered in these hospitals is thoroughly investigated. The chapter is organised as follows. Firstly, an analysis of the research problem is presented, followed by a detailed description on the current information flow in the sampled hospitals. An 'as is' modelling of the situation in these hospitals is then presented. A Fishbone diagram is used to highlight the causes and effects of the problem. Finally, a summary of the chapter is provided.

8.2 Analysis of the Research Problem

As elaborated in Chapter 1, one of the aims of knowledge management is to transfer knowledge from a tacit form to an explicit form, a process referred to as codifying. This transference ensures that effective processes and tools can be integrated to provide valuable knowledge assets when information is being codified on a regular basis.

Further, the secondary research in Chapter 5 integrates the healthcare domain with the knowledge management domain, emphasising the important links between them (Wong & Wickramasinghe, 2014). However, there is still a large amount of medical information and unnecessary data that affects many hospitals and medical clinics worldwide (Nicolini et al., 2008; Delen & Al-Hawamdeh, 2009; Beath et al., 2012; Chen, 2013; Drus et al., 2013). This study is based on the observation that clinicians in Jordan suffer from information overload in keeping up to date with the treatment of diabetes. The following observations motivated the study:

- When the proposed research was presented to these clinicians, consent letters were obtained from the hospitals for the survey to be conducted in their diabetes clinics. These hospitals would not have agreed to participate if the problem did not exist (refer to Appendices C, D and E). The hospitals' administrators verbally confirmed that the problem exists in their clinics, particularly, in the diabetes clinics.
- Additionally, when the researcher approached these clinics, the medical staff admitted that this type of problem does exist in their clinics.

Therefore, a proper knowledge management framework is proposed in Chapter 9 that will reduce the information overload in the diabetes clinics of the seven selected hospitals in

Jordan. The proposed framework is an enhancement of the knowledge management framework proposed by Mirza (2009) and developed from the analysis and findings obtained from Chapters 6 and 7. Thus, before beginning the discussion of the proposed framework, it is necessary to discuss the information flow and the data modelling process currently used in the hospitals. The aim is to clearly understand where and how information overload occurs in the diabetes clinics before highlighting the proposed framework in Chapter 9. Section 8.3 presents the information flow diagrams currently used in the diabetes clinics.

8.3 The Information Flow Diagram of the Current Diabetes Clinics System of the Seven Selected Hospitals in Jordan

To form the proposed framework, it is important to first discuss the current situation in the diabetes clinics. Subsection 8.3.1 describes the information flows used in these clinics. This description will illustrate how information overload occurs.

The information flow diagram is a 'UML behaviour diagram, which shows an exchange of information between system entities at some high levels of abstraction, at early design stages' (UML Diagrams, 2017). The usefulness of the information flow diagram is that it assists in describing the movement of information within a system based on a representation of model aspects (UML Diagrams, 2017). An information flow is represented as an open arrow with a dashed line which points from the source of information to the destination or targeted location in a particular system (UML Diagrams, 2017).

In the context of the thesis, the first step in representing the information flow in the current situation is to represent the context diagram in relation to these clinics (see Section 8.3.1). Figures 8.2–8.5 use four types of symbols, as described below (UML Diagrams, 2017) and shown in Figure 8.1. The key symbols used are defined as follows:

- The 'actor' key represents a system, a human or a subsystem in an external entity. It is a source or destination of data.
- The 'class' key represents the departments or entities that interact with the actors in a system.
- The 'information item' key is used for representing the information that flows within a system prior to the design of the organisation's realisation details. The name of the information item is shown adjacent to the associated <<flow>> dashed line.
- The 'information flow' key concerns the unidirectional 'information channel' that transmits information from its source to its final destination. Information flow must include the keyword <<flow>> below or above the attached dashed line.

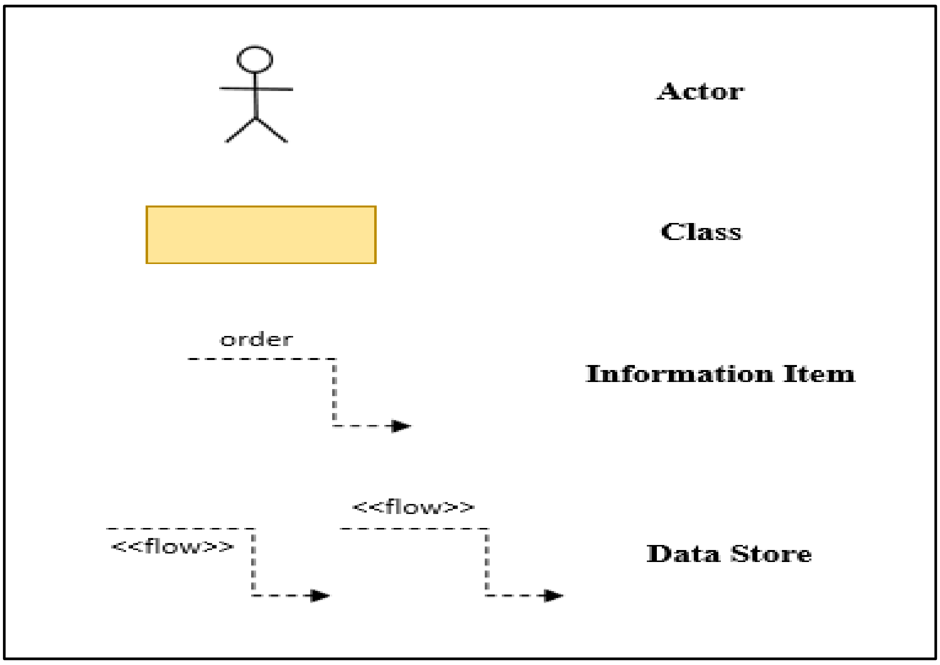

Figure (8.1): The information flow diagram key symbols

8.3.1 The Context Diagram of Information Flow in the Diabetes Clinics of the Seven Selected Hospitals in Jordan

The context diagram in Figure 8.2 below shows the entire information system used in the diabetes clinics of the seven selected hospitals in Jordan.

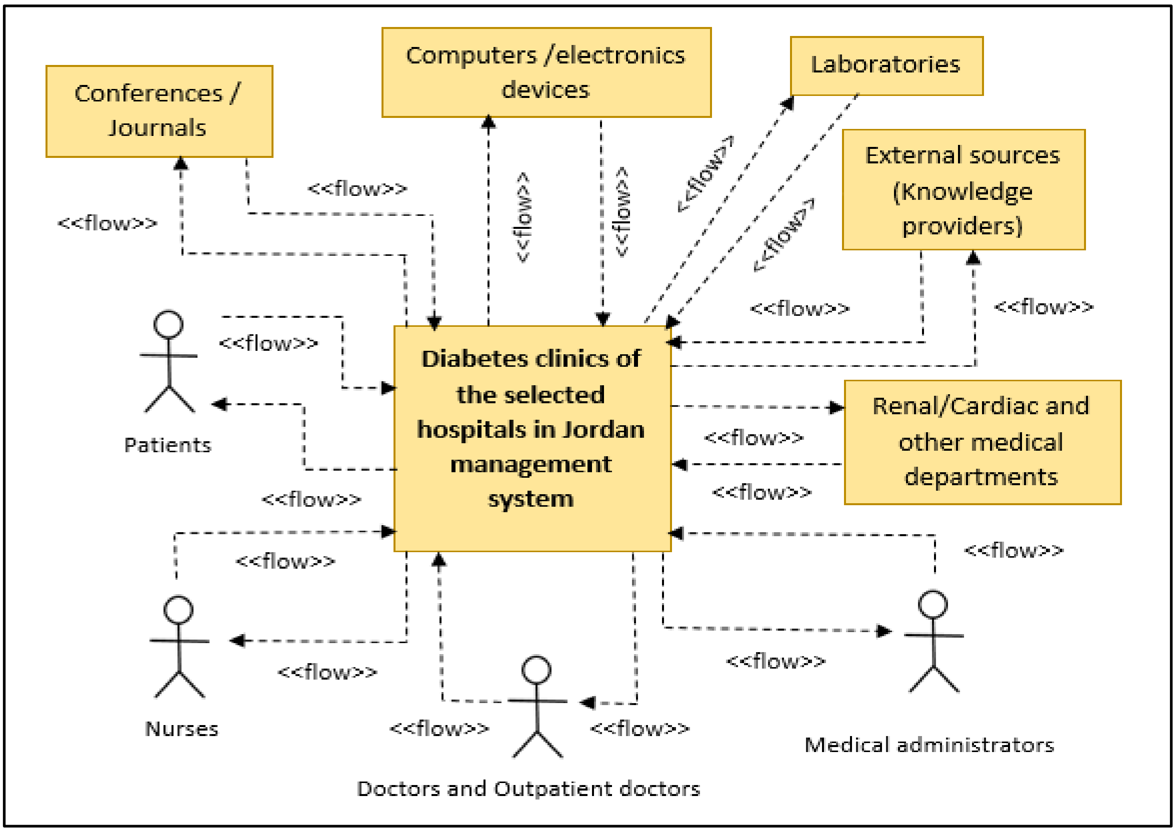

Figure (8.2): The context diagram of information flow in the diabetes clinics of the seven selected hospitals in Jordan

Figure 8.2 shows the overall healthcare management system and illustrates the internal and external entities involved in the healthcare management system in these clinics. The internal entities include four actors: patients, nurses, doctors and outpatient doctors, and medical administrators as well as other related entities (classes): conferences and journals, computers and electronic devices, laboratories, external sources (knowledge providers) and the physical structures of the clinics (Renal/Cardiac and other medical departments).

Figure 8.2 can be summarised based on the information given by the medical staff. A summary of Figure 8.2 identifies the following entities:

- The main class, 'diabetes clinics in the selected hospitals in the Jordan management system', is the centralised class. This class represents a general view of the current diabetes clinics.
- The 'patients' are individuals who have diabetes mellitus and make frequent visits to the diabetes clinics of these hospitals. The information that these patients contribute includes medical history information, family history, symptoms and related printed documents.
- The 'nurses' mainly record patients' symptoms and share those symptoms with the doctors and outpatient doctors. Nurses do not attend medical conferences because they are busy with medical tasks. The information that these nurses provide includes patients' symptoms, laboratory results, new medical knowledge and other related printed nursing documents.
- The 'doctors and outpatient doctors' are those experts who diagnose and treat patients with diabetes. They attend conferences to gain new medical knowledge. The information that doctors and outpatient doctors provide includes patient diagnoses, printed laboratory results from nurses, results of any operations performed, new medical knowledge, prescriptions and other related printed medical documents.
- The 'medical administrators' are the charge nurses. They are the heads of the nursing departments of each diabetes clinic. Medical administrators attend conferences to gain new medical knowledge. They guide standard nurses and provide them with necessary instructions and medical tasks. The types of information provided by the medical administrators include task schedules, medical meeting minutes, medical tasks to be given to standard nurses, medical information, new medical knowledge, prescriptions and other medical administrative documents, all of which are in printed form.
- 'Renal, cardiac and other medical departments' are external entities that can contribute to the treatment of patients with diabetes. Patients may be referred for

extra appointments with doctors and outpatient doctors in other medical departments when symptoms or laboratory results show the presence of other illnesses related to diabetes. The information from the other medical departments also includes patient diagnoses, printed laboratory results from nurses in the diabetes clinics or other medical departments, results of any operations performed, new medical knowledge, prescriptions and other printed medical documents.

- ‘External sources’ are knowledge providers that provide additional medical and non-medical information. The information provided by external sources includes brochures, new medical knowledge from magazines and non-medical advertisements.
- ‘Laboratories’ are units of where medical tests such as blood and urine tests and images are performed. The information generated by laboratories consists of printed documents of results.
- ‘Computers/electronic devices’ are used by medical staff for recording patients’ information and distributing new medical knowledge within the diabetes clinics. According to the medical staff, this information is distributed via emails and links to related external medical sites.
- ‘Medical conferences/journals’ are external sources of information through which certain medical staff (i.e. doctors and outpatient doctors, and medical administrators) can obtain new medical knowledge.

8.3.2 Case 1 – The Information Flow Transaction of the Patients with Diabetes in the Diabetes Clinics of the Seven Selected Hospitals in Jordan

The flow of information involving the actor ‘patient’ is illustrated in Figure 8.3. The patient information includes the following steps:

Step 1: The registration information item from the actor ‘patient’ flows to the administration department. The administrator of the registration department registers the patient into the clinic and enters the patient’s general information. The list of data recorded per patient in the current administrative system includes the following:

- I.D. number.
- Physician name.
- Patient I.D. Label.
- Date.
- Fasting Blood Glucose Test.
- Time.
- Insulin.

- Dose.
- Route.
- Time.
- Ordered by.
- Given by.

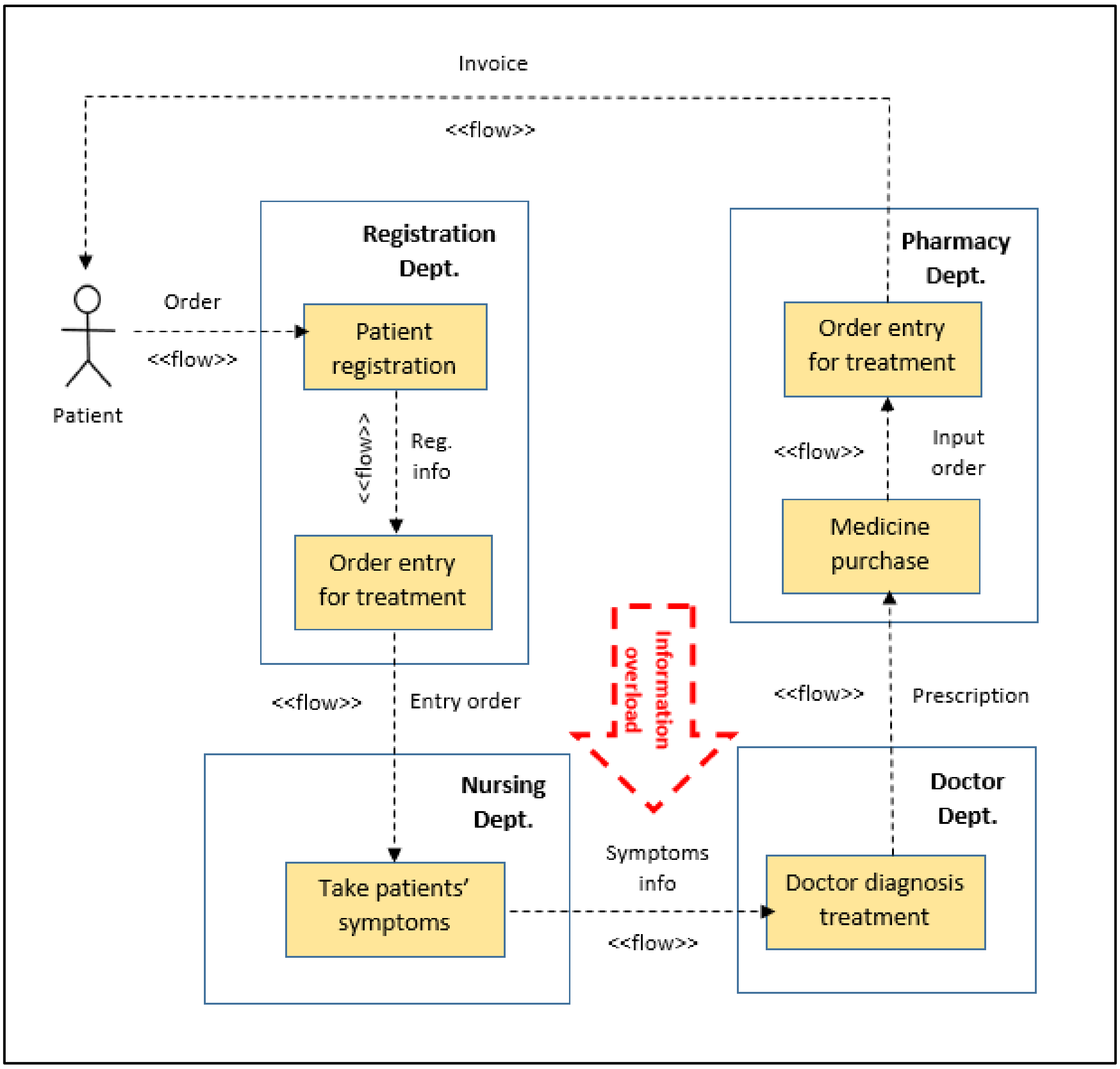

Figure (8.3): The information flow diagram for the patients in the diabetes clinics of the seven selected hospitals in Jordan (Case 1)

Step 2: Treatment is ordered while this registration information is sent to the nurses. They obtain symptoms which are then recorded in the medical history database.

Step 3: The symptom information is sent to the doctors who make a diagnosis. In this information flow step, the medical staff claims that information overload occurs because patients' symptom information is sometimes incomplete or has not been correctly recorded, making it necessary for doctors to retake the symptoms or search for the missing information. This wastes doctors' time in searching for the missing patients' information rather than exploiting the time in reading new medical knowledge that keeps accumulating. The issue of information overload here matches with the issues in Items 4.1, 4.3, and 6.2–6.4 of the Fishbone diagram in Figure 8.9.

Step 4: The diabetes doctor will diagnose the patient and provide the patient with a prescription.

Step 5: The patient will take the prescription to the pharmacy and purchase the required medication.

8.3.3 Case 2 – The Information Flow Transaction of the Patients with Diabetes in the Diabetes Clinics of the Seven Selected Hospitals in Jordan

The flow of information for the patients is illustrated further in Figure 8.4. The detailed information flow identifies the specific sources of information overload in these clinics where much details are shown in comparison to the details shown in Figure 8.3. The reason behind having much details of the information flow in this thesis is to explore the exact occurrences of information overload within these clinics to provide a clearer understanding of the problem.

The steps of Figure 8.4 are summarised based on the claims of the medical staff of the diabetes clinics in the selected hospitals in Jordan as follows:

- **Step 1:** The same process described for Step 2 in Figure 8.3 occurs in this step.
- **Step 2:** When the patient is being diagnosed, if the doctor orders laboratory tests, the patient will be given an order for tests to look for other illness that are likely to affect patients with diabetes. The doctor will provide the patient with a laboratory request form for the necessary blood tests, urine tests and imaging, and will make another appointment.
- **Step 3:** When the blood and urine tests and the images are taken for the patient, the blood unit department analyses them. The Radiology Information System (RIS) and the Picture Archiving and Communication System (PACS) manage the images and store them in the archives.
- **Step 4:** When the results are needed by the radiologist, information overload occurs as the medical staff claim that radiologists always receive unrelated tests and images due to the large volume of unorganised information stored in the archives. Items 4.1, 4.3, and 6.2–6.4 are information overload causes obtained from the Fishbone diagram in Figure 8.9, and show the information overload issues encountered in Step 4.

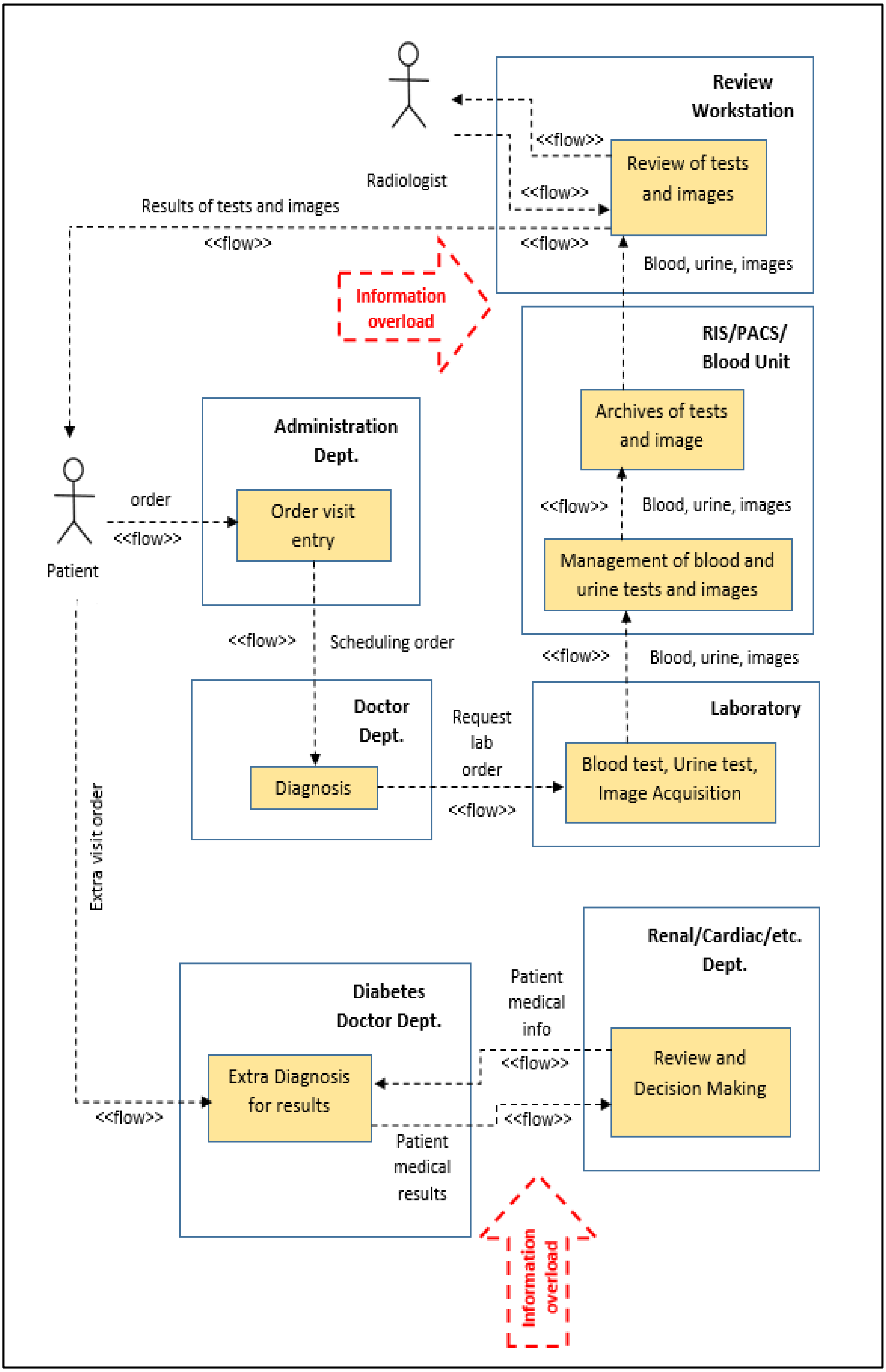

Figure (8.4): The information flow diagram for the patients in the diabetes clinics of the seven selected hospitals in Jordan (Case 2)

- **Step 5:** When the radiologists receive the right test and image information for a patient, they provide them to the patient to take to the next appointment.
- **Step 6:** The patient then revisits the doctor for additional diagnosis based on the test results. In some cases, the doctor will send the patient to other medical departments that deal with the complications of diabetes, such as renal problems, cardiovascular disease, eye damage (retinopathy), kidney damage (nephropathy), nerve damage (neuropathy), hearing impairment, foot damage, Alzheimer's disease and skin conditions. The results of tests are sent to other related medical departments for patient treatment. After diagnosing the patient in the other medical departments, doctors will deliver the patient's medical information either in person or electronically to the original diabetes doctor so that a decision can be made. The medical staff claims that information overload occurs in this step due to missing information that cannot be easily located or that is simply lost. The issue of information overload in this step matches with items 4.1, 4.3, and 6.2–6.4 of the Fishbone diagram in Figure 8.9.

8.3.4 The Information Flow Transaction among the Medical Staff in the Diabetes Clinics of the Seven Selected Hospitals in Jordan

In this subsection, the information flow among the medical staff, namely medical administrators, doctors and outpatient doctors, and nurses, in the diabetes clinics of the selected hospitals in Jordan is illustrated in Figure 8.5.

Figure 8.5 shows that there are seven entities through which information flows among the medical staff. Certain information flows to specific medical staff due to their positions in the clinics. The flow of information among the medical staff helps to identify the causes of information overload in the current situation and the steps at which the overload occurs.

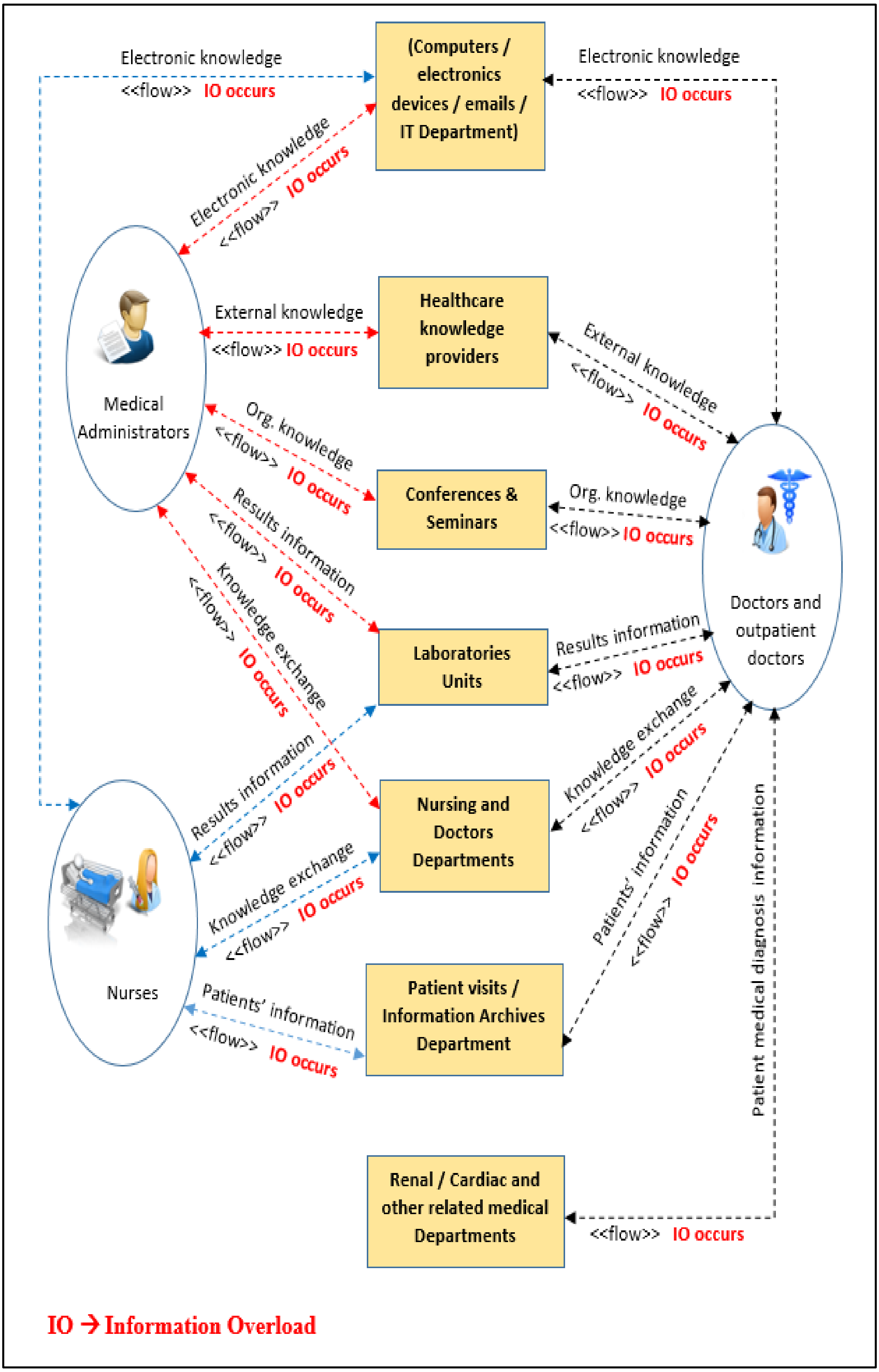

Figure (8.5): The information flow diagram among the medical staff in the diabetes clinics of the seven selected hospitals in Jordan

Based on Figure 8.5, the forms of information overload affecting the medical staff are described. These forms are based on what the medical staff reported to the researcher about the nature of information overload in their diabetes clinics. The origins of information overload for each of the seven entities shown in Figure 8.5 are explained as follows:

- **Computers/electronic devices/emails/IT department:** A collection of necessary and unnecessary emails is sent to the entire medical staff at unsuitable times and often to the wrong medical staff in the wrong quantity. Additionally, even though the right the medical staff may get necessary emails, they read more unnecessary emails, or receive them at an inappropriate time or in an inappropriate quantity. In these cases, information overload occurs. For instance, if necessary emails are sent to the right respondent at the wrong time, he or she might have insufficient time to read the emails. In this case, this staff member will accumulate many unread emails, leading to information overload. As another example, unnecessary emails might be sent to members of the medical staff at the right time, causing those staff members to read unnecessary emails when they have time, hence wasting time when they could be reading necessary medical emails that suit their domain and tasks best. The medical staff might be engaged in other important medical tasks preventing them from reading emails, may have low morale or may encounter IT or computer system failures preventing them from reading necessary emails. In these cases, information overload also occurs. The causes of information overload in of these cases are shown in the Fishbone problem analysis in Figure 8.9, particularly in Items 1.1–1.6, 2.1–2.7, 4.1–4.4, 5.1–5.11, 6.2–6.4, and 7.1–7.5.

- **Healthcare knowledge providers**: According to the medical staff, certain members of the medical staff are provided with unorganised medical information from the knowledge providers. The medical administrators, the diabetes doctors and the outpatient diabetes doctors are the three types of medical staff who receive up-to-date medical knowledge from the external healthcare providers. Figure 8.5 shows that there are arrows connecting the actors ‘Medical Administrators’ and ‘Doctors and outpatient doctors’ via the class ‘Healthcare knowledge providers’, excluding the actor ‘Nurses’. The fact that medical information is not sent directly to normal nurses is shown in Figure 8.5 by the lack of arrows connecting the actor ‘Nurses’ with the class ‘Healthcare knowledge providers’. This information is sent mostly to the knowledgeable medical staff who are experts. Consequently, information overload occurs since only certain respondents receive the new medical information, while other respondents do not have access to this knowledge, which leads to large amounts of unread medical information. Furthermore, the medical knowledge is usually sent to the medical staff at inappropriate times, such as when they are busy with other important medical tasks, or to large numbers of inappropriate recipients. Therefore, many medical staff read irrelevant information at the wrong time. Information overload occurs in these cases. Items 2.1–2.7, 4.1–4.4, 5.1–5.11, and 6.2–6.4 are information overload causes obtained from the Fishbone problem analysis illustrated in Figure 8.9, and match the information overload issues described for the class ‘Healthcare knowledge providers’.

- **Conferences and Seminars**: Similar to the knowledge exchange in the class ‘Healthcare knowledge providers’, the class ‘Conferences and Seminars’ also provides medical information to the medical staff, for instance when they attend medical conferences or seminars that are not held in their clinics. Another similarity between the two classes is that only certain members of the medical staff have the opportunity to attend medical conferences and to acquire new medical knowledge. However, some of these respondents might be unable to attend these conferences due to conflicts with other tasks or psychological issues. Hence, these members will be unable to acquire the new medical knowledge. In this case, information overload occurs as the new medical knowledge does not reach them or is unorganised if it reaches to them later. From the Fishbone problem analysis in Figure 8.9, these issues refer to the Items 2.1–2.7, and 5.1–5.11. Moreover, some or all of the medical staff present their research at medical conferences where they exchange knowledge with other researchers. The exchange of medical knowledge during the conference sessions is mostly kept tacitly in the minds of the medical staff who are attending, and is not codified by them. This is called ‘knowledge hoarding’. This also results in information overload when knowledge accumulates in the minds of some the attendees, while others absorb the medical knowledge properly during the sessions. Overload is also caused by the fact that some staff do not attend all the sessions or do not attend the conferences at all. The issue of this sub-process refers to the causes in Items 4.2, 4.4, and 6.1–6.4 obtained from the fishbone problem analysis in Figure 8.9.

- **Laboratories Units**: In Figure 8.5, note that the actors ‘Medical administrators’, ‘Doctors and outpatient doctors’ and ‘Nurses’ receive printed laboratory results from the class ‘Laboratory Units’. This relates to the medical staff’s claim that they sometimes read unnecessary laboratory results. In this case, information overload occurs since they waste their time reading laboratory reports that are unorganised or unnecessary, are related to other patients or are missing important results, leading to large amounts of unread or unrelated information. These issues of information overload are related to the causes in Items 4.1, 4.3, and 6.2–6.4 of the fishbone analysis problem as given in Figure 8.9. A related case of information overload is that the medical staff prepare the laboratory results to be issued, but IT system failures may occur, causing loss of information and wasting time. This is another example of where and how information overload occurs, and refers to causes in Items 7.1–7.5 of Figure 8.9. If there are no IT system failures, the patients obtain their laboratory results and take them either to their diabetes doctors or to their outpatient diabetes doctors. In this case, information overload is not encountered. The medical staff may be given unnecessary laboratory results due to the unorganised information that was prepared by the radiologists. This is another situation in which information overload occurs in the conveyance of laboratory results. For example, when the medical staff read information unrelated to their patient, the staff unwillingly waste their time attempting to decipher the results. Instead, the staff should be spending their time on treating the patient based on the right laboratory results or on reading new emerging medical knowledge. This part of the problem refers to the causes in Items 4.1, 4.3, and 6.2–6.4 of the fishbone diagram in Figure 8.9.

- **Nursing and Doctors Departments**: As shown in Figure 8.5, the actors ‘Medical administrators’, ‘Doctors and outpatient doctors’ and ‘Nurses’ exchange medical information with the class ‘Nursing and Doctors Departments’. When information is requested and exchanged among the three actors or between any two actors, information overload occurs since most of the medical staff keep the new medical knowledge tacitly in minds instead of codifying it in explicit ways. This indicates that knowledge hoarding affects the medical staff who do not have proper ways of sharing it with other medical staff, which leads to information overload. Thus, Items 4.2, 4.4, and 6.1–6.4 of the Fishbone diagram in Figure 8.9 refer to the issue of information overload that is occurring when medical knowledge is being requested and exchanged among the medical staff. When a group of staff, for instance, requires the newly obtained medical knowledge from other medical staff at a busy time, these medical staff will most often have no time to share the new medical knowledge properly with the requesting group. This implies that knowledge hoarding arises among the medical staff who keep the unread medical knowledge in mind, leading to the accumulation of tacit medical knowledge without explicitly codifying it. The reason behind this returns to the time issue of being engaged in other important medical tasks when information is being exchanged. Another example is that, due to the occurrence of low morale among the medical staff, they may not be able to fully focus on reading new medical knowledge. This unread knowledge accumulates, causing information overload from the hidden medical knowledge that must be explicitly codified and shared properly at the right time. Consequently, information overload will occur and the medical staff with low morale will maintain their old medical knowledge and still have to wait for a large amount of tacit knowledge to be explicitly codified at another suitable time. This will cause severe problems for patients with diabetes when some members of the medical staff keep using old medical knowledge. Accordingly, Items 2.1–2.7, 3.1–3.4, 4.1–4.4, 5.1–5.11, and 6.1–6.4 from Figure 8.9 of the Fishbone diagram refer to this case of information overload occurring when medical knowledge is being demanded and exchanged among the medical staff.

- **Patient visits / Information Archives Department**: Figure 8.5 shows that the only two actors who exchange knowledge from the information archives department are the 'Doctors and outpatient doctors' and the 'Nurses'. The medical staff told the researcher that the reason behind this is that these two actors are the ones involved in recording symptoms, diagnosing, and treating patients. In this case, information overload occurs due to missing patient information caused by the large amounts of information accumulated from the patients' frequent visits. This information is frequently unorganised, overwhelming and scattered in different archives. Items 4.3, and 6.2–6.4 from Figure 8.9 of the Fishbone diagram match with this case of information overload occurring when patients' information is required to be used by doctors, outpatient doctors, and nurses.

- **Renal/Cardiac and Other Related Medical Departments**: Figure 8.5 shows that the only actor who exchanges knowledge with the 'Renal/Cardiac and other related medical Departments' is the 'Doctor and outpatient doctors'. The medical staff said that this is because highly expert diabetes doctors and diabetes outpatient doctors are those who exchange medical knowledge with other medical departments that treat other illnesses related to the diabetes. The decisions of the diabetes doctors and outpatient diabetes doctors in recommending patients to be evaluated for other related illnesses is based on patients' laboratory results Hence, information overload occurs here since information from other medical departments may be missing or doctors in other medical departments may provide tacit information to patients who are then expected to provide this information to their original diabetes doctors. Another case is due to IT and computer system failures that occur when other doctors need to send the outcomes of their evaluations to the requesting doctors, resulting in lost patient information. Items 3.3, 4.1–4.4, 6.1–6.4, and 7.1–7.5 of the fishbone diagram in Figure 8.9 refer to these problems of information overload.

8.4 The Swim Lane 'as is' Modelling Process of the Current Diabetes Clinics System of the Seven Selected Hospitals in Jordan

In this section, the Swim Lane 'as is' modelling process is used to describe the current processes in the diabetes clinics of the seven selected hospitals in Jordan. Figures 8.6 and 8.7 show the entire 'as is' modelling process. The reason for splitting this process into two figures is that there are many steps involved in the current hospitals' situations.

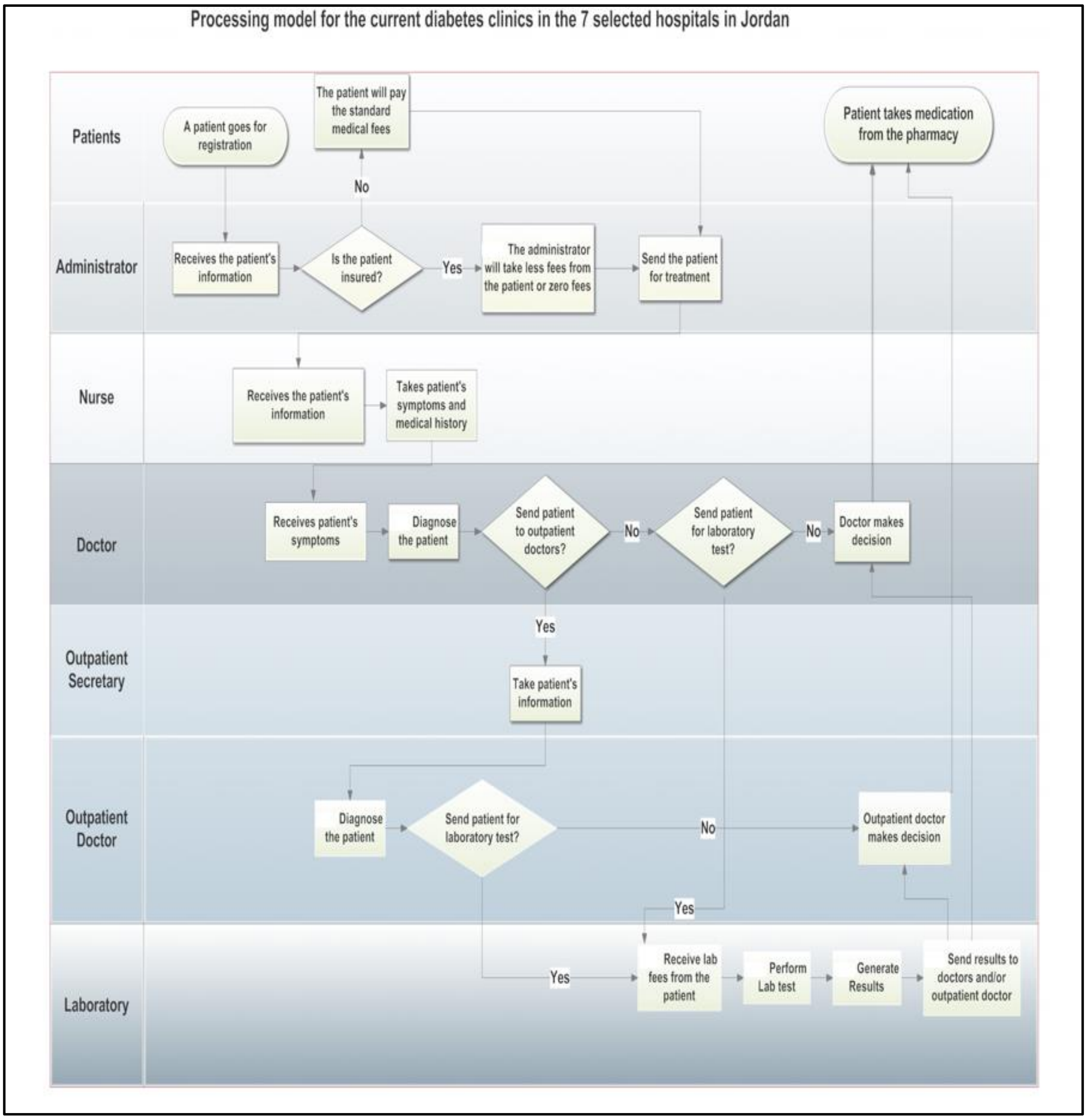

Figure (8.6): The Swim Lane 'as is' modelling process – Part 1

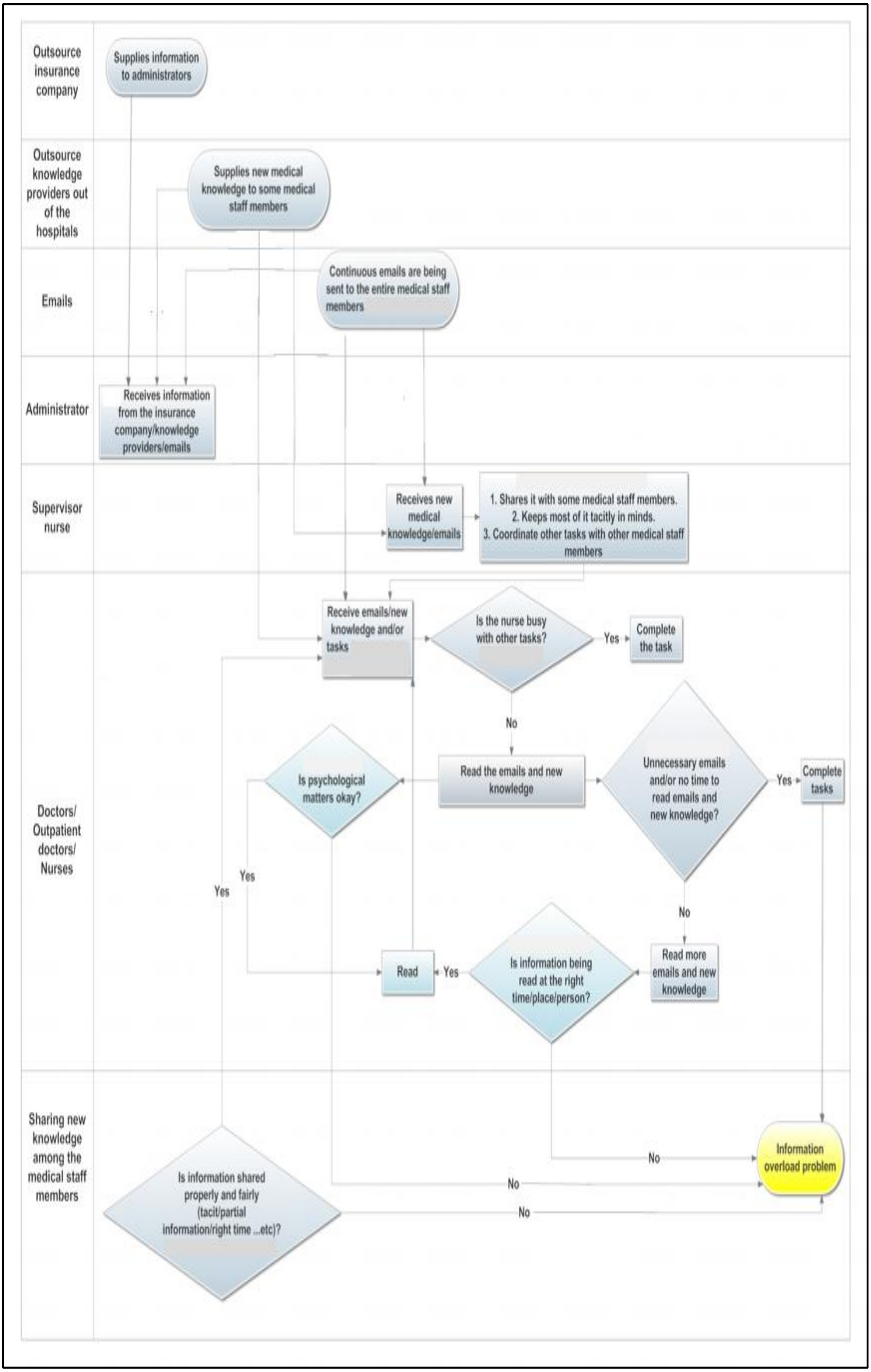

Figure (8.7): The Swim Lane 'as is' modelling process – Part 2

The difference between the Swim Lane 'as is' modelling process and the previously explained information flow diagrams is that this process illustrates the model processing stages organised in order for the current system. The information flow diagrams highlight the flow of information in the current situation in the seven hospitals in Jordan. Consequently, understanding the stages of this process allows the main information overload problems to be broken down into more specific causes and effects, as described in Section 8.5. The four types of symbols used in Figures 8.6 and 8.7 are shown below in Figure 8.8. The key symbols that are used include:

- 'Terminal' key: this oval shows the start and the end of the flow.
- 'Process' key: is rectangular and illustrates an action, a process or an operation that is required to be performed at a particular stage.
- 'Decision' key: is represented by a diamond shape and represents a question for which is answer is either 'Yes' or 'No'.
- 'Data flow' key: is an arrow that represents the flow direction of the data in the modelling process.

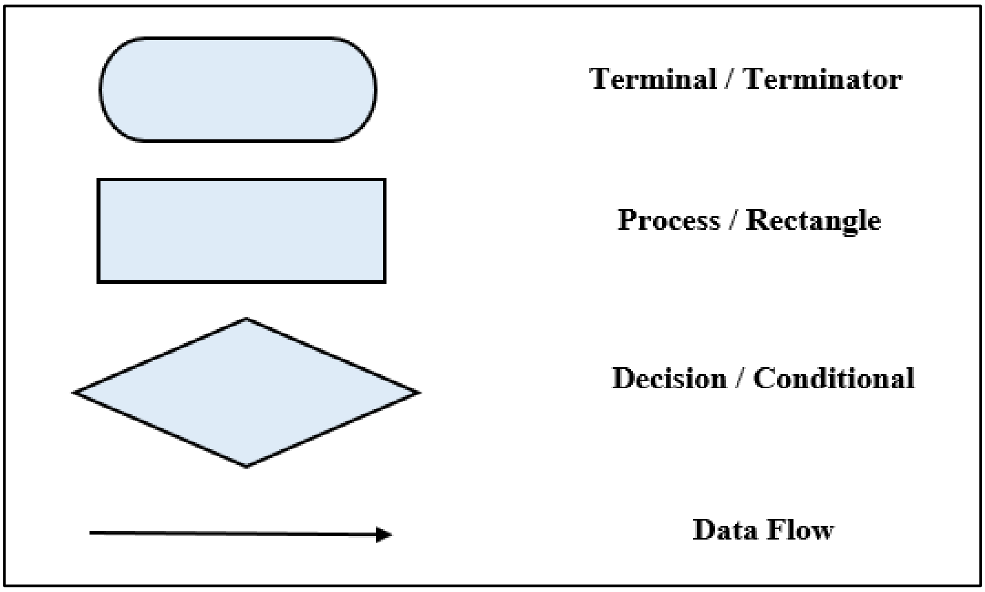

Figure (8.8): The Swim Lane key symbols

In Figures 8.6 and 8.7, each engaged entity is categorised in a single Swim Lane such that each Lane represents the processes of each entity in these hospitals. The current process used in these hospitals will be described. The Swim Lane modelling process is divided into steps, as shown in Figures 8.6 and 8.7. For Part 1 (Figure 8.6), the steps include the following:

1. In the first Swim Lane row, patients with diabetes register their personal details with the intended hospital.

2. As shown in the second Swim Lane, the administrator of that hospital receives the personal information for the patients, and checks to see whether each visiting patient is insured.
3. If any patient is insured, lower fees or no fees will be charged to that patient and the patient will be directed for medical treatment. Uninsured patients will be charged the standard hospital fees and will also be directed for medical treatment.
4. In the third Swim Lane, the nurse obtains the patient's personal information, takes the patient's symptoms and medical history and sends the information to an Endocrinologist who is a diabetes specialist.
5. As can be seen in the fourth Swim Lane, the Endocrinologist receives the patient's symptoms and medical history and then diagnoses that patient. Item 3.3 in the Fishbone diagram in Figure 8.9 shows that the cause of information overload in this processing step is that diabetes doctors keep most of the newly obtained medical information tacitly in their minds rather than codifying it due to poor time management.
6. Subsequently, the Endocrinologist will decide to whether to send this patient to an outpatient Endocrinologist.
7. If it is not necessary for the patient to be sent to an outpatient Endocrinologist, the Endocrinologist will decide whether to order laboratory tests. If this is not necessary, the Endocrinologist makes a final decision and the patient will be prescribed medication. If laboratory tests are necessary, the laboratory processes as shown in the seventh Swim Lane are used. Item 2.2 of the Fishbone diagram (Ishikawa, 1986) in Figure 8.9 causes information overload in this laboratory processing step because the nurses will be performing this laboratory task more often than keeping up-to-date with the new emerging medical knowledge. Specifically, the laboratory nurses collect the laboratory fees from the patient, perform laboratory tests and send the results to the Endocrinologist. After that, the Endocrinologist will make a decision and will prescribe medications for the patient.
8. If it is necessary for the patient be sent to an outpatient Endocrinologist, the outpatient Endocrinologist's secretary, shown in the fifth Swim Lane, will take the patient's information and send it to the outpatient Endocrinologist. This Endocrinologist will decide whether this patient needs laboratory tests. In this case the same laboratory process explained above in Step 7, which occurs with the hospital's Endocrinologists, is also used.

For Part 2 (Figure 8.7), the steps include the following:

1. In the first Swim Lane of Figure 8.7, the outsourced insurance company provides the administrators with the necessary information.
2. In the fourth Swim Lane, the administrators will receive this information from the company. Item 3.1 of the Fishbone diagram in Figure 8.9 causes information overload in this processing step. The reason for this is as explained previously in Step 3 of Part 1, namely that the financial registration process consumes the majority of the medical administrators' time and they lack time to keep up-to-date with the new medical knowledge.
3. Referring to the second Swim Lane, the new medical knowledge is supplied by the knowledge providers to medical administrators, doctors, outpatient doctors and supervisory nurses. In the third Swim Lane, necessary and unnecessary emails are being sent frequently to all respondents.
4. The medical administrators, doctors, outpatient doctors and supervisory nurses referred to in the fourth, fifth and sixth Swim Lanes receive the new medical knowledge from the knowledge providers. Items 2.1–2.7, 3.1–3.4, 4.1–4.4, 5.1–5.11, and 6.1–6.4 in the Fishbone diagram in Figure 8.9 cause information overload in this processing step. This is because these medical respondents are frequently engaged in other important medical tasks, the new medical knowledge is improperly shared and the knowledge is not codified. Personal issues also affect these respondents from time to time. These issues cause information overload when knowledge providers attempt to share the new medical knowledge with these respondents. In addition to these high-level respondents, the normal nurses receive high volumes of email, both necessary and unnecessary, causing information overload in this processing step, as shown by Items 1.1–1.6, 2.1–2.7, 3.4, 4.1–4.4, 5.1–5.11, 6.2–6.4, and 7.1–7.5 of the Fishbone diagram obtained in Figure 8.9.
5. As can be seen in the fifth Swim Lane, when the supervisory nurses receive the new medical knowledge, they attempt to share it with other respondents. However, this sharing of knowledge is improper as most of this information is kept tacitly in the minds of these supervisory nurses due to the insufficient time they have. The information from emails, which is intended to be shared among medical staff, may fail to be properly codified due to IT system failures, insufficient time or lack of sharing with the right respondents. Consequently, nurses get frustrated and are stuck with old medical knowledge which may cause severe problems for patients with diabetes. Supervisory nurses often focus solely on the coordination of tasks among

the normal nurses and other respondents. In this case, Items 2.1–2.7, 3.2, 3.4, 4.1–4.4, 5.1–5.11, 6.1–6.4, and 7.1–7.5 of the Fishbone diagram in Figure 8.9 cause information overload in this processing step.

6. The sixth Swim Lane shows that the doctors, outpatient doctors and nurses receive emails with new medical knowledge, but respondents require the right medical knowledge at the right time. Items 1.1–1.6, 3.3, 4.1, and 4.3 of the Fishbone diagram in Figure 8.9 cause information overload in this processing step.
7. If the respondent who needs the new medical knowledge is busy with other important medical tasks, this respondent must complete these tasks and will be unable access the necessary new medical knowledge. Items 2.1–2.7 and 3.4 of the Fishbone diagram in Figure 8.9 cause information overload in this processing step.
8. If the respondent requiring that knowledge is not busy with other medical tasks, and has no personal problems, the respondent will be able to read the emails and the new medical knowledge. However, if the respondent has personal problems when the information is sent, the respondent will not be able to read this new information even if it is relevant. In this case, information overload occurs as this respondent will not be able to focus on the new medical knowledge. Items 3.4 and 5.1–5.11 of the Fishbone diagram in Figure 8.9 cause information overload in this processing step.
9. If the respondent is not busy and has good morale, but is encountering large amounts of unnecessary, unorganised or irrelevant emails, this respondent will waste time when reading unrelated information, and will complete other medical tasks rather than reading the new accumulating medical knowledge leading to this respondent be deprived of necessary and relevant emails pertaining to new medical knowledge. Items 1.1–1.6, 4.1, 4.3, and 6.2–6.4 in Figure 8.9 show the causes of information overload in this case.
10. In this step, the same case applies as in Step 9. If the respondent is not busy with other tasks, is feeling well and is receiving necessary and relevant medical knowledge, this respondent will continue to read more emails containing new medical knowledge. If the information flow continues and contains mostly unnecessary and irrelevant information, this respondent will waste time, and will stop reading the information because the respondent will be engaged in other important medical tasks. In this case, Items 1.1–1.6, 2.1–2.7, 3.4, 4.1, 4.3, and 6.2–6.4 in Figure 8.9 cause information overload.

The previous detailed steps show that information overload occurs frequently due to the unorganised processes used in the diabetes clinics. Consequently, a ‘to be’ modelling process can provide improvements for reducing information overload and will be introduced in Chapter 9. This research project also proposes a knowledge management framework. In Section 8.5, the Fishbone diagram, which is also called the ‘Cause-and-Effect’ diagram, developed by Ishikawa in 1986 (Ishikawa, 1986) is presented and discussed in relation to the issues encountered in these hospitals.

8.5 The Fishbone Problem Analysis of the Research

As reported by the WBI Evaluation Group (2007), the Fishbone diagram (Ishikawa, 1986) is defined as ‘A cause-and-effect diagram that can be used to identify the potential (or actual) cause(s) for a performance problem’. This diagram is used in this research to explore the causes and effects of information overload in the diabetes clinics in the seven selected hospitals in Jordan. Figure 8.9 illustrates the Fishbone diagram developed for this research.

The reasons behind using this diagram are to clearly identify the causes and effects of information overload and to understand these causes so that solutions can be found.

The ‘main root’ or the ‘fish head’ represents the problem to be solved, and is also called the ‘effect’, which is information overload. The bones show the seven causes of the effect (see Figure 8.9). These causes include high volumes of emails, problems of engagement in other tasks, personal problems of the medical staff, improper sharing of knowledge, psychological issues, improper codification of the new knowledge and finally, IT and computer system failures. Side branches from these bones represent details of the causes.

In conclusion, the main idea behind the Fishbone diagram is to highlight the real causes of the problems identified by the primary research previously carried out in the diabetes clinics. To assist in tackling these causes, possible solutions are provided by introducing a ‘to be’ Swim Lane modelling process, followed by proposing a knowledge management framework presented in Chapter 9.

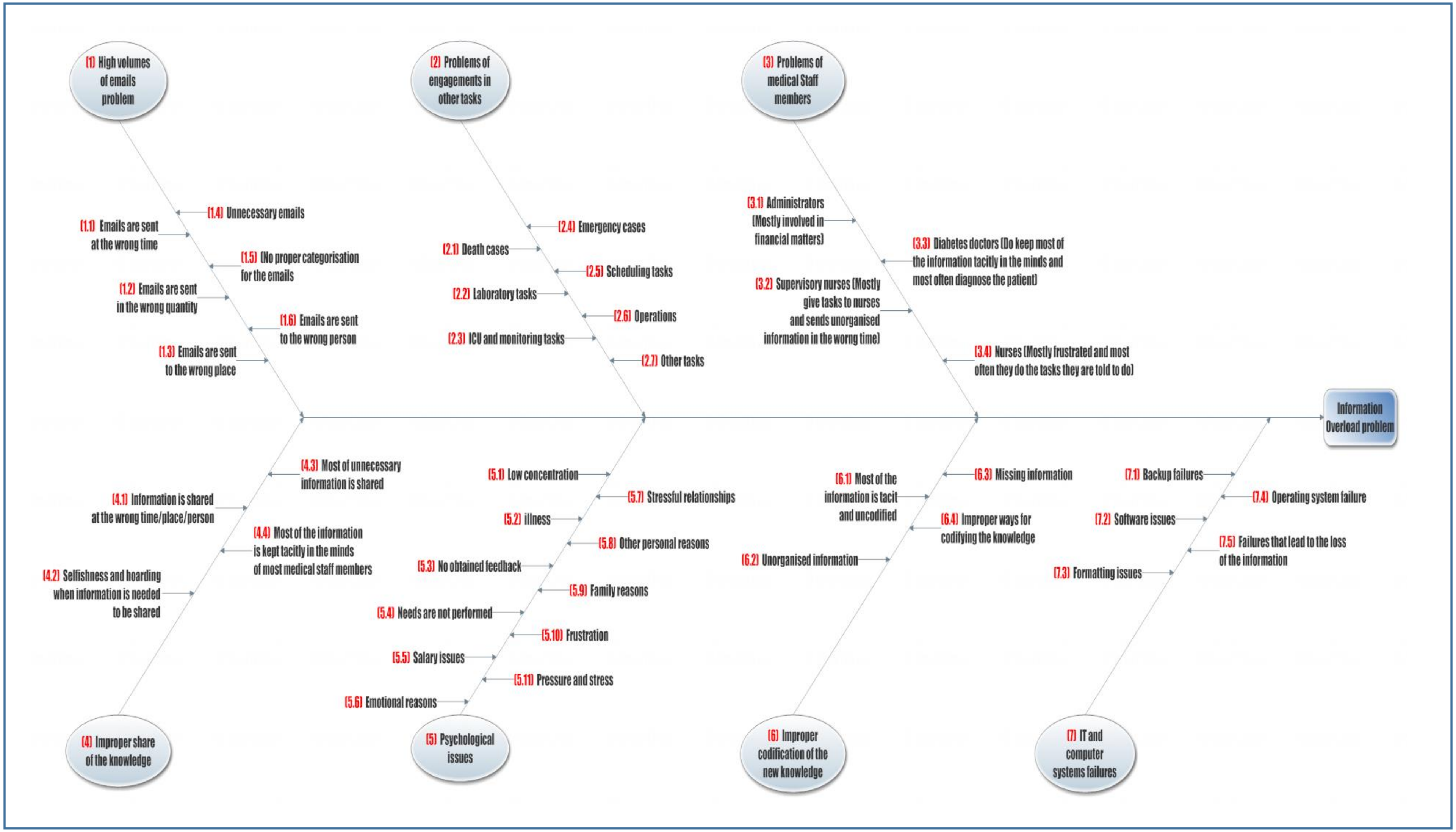

Figure (8.9): The Fishbone (Ishikawa) diagram of the research (Ishikawa, 1986)

8.6 Summary

In this chapter, a detailed description of the current situation in the diabetes clinics in the seven selected hospitals in Jordan was presented. The chapter aimed at analysing the information overload problem in detail by highlighting the situations in which this problem occurred in these clinics. First, the information flow diagrams were introduced to provide a clear view of how data currently flows in these clinics and how and where information overload occurs in each information flow. The Swim Lane ‘as is’ modelling process provided details of the current processes used. Finally, the Fishbone diagram was used to show the causes and effects related to the information overload problem in order to understand these causes for possible future improvements.

Chapter 9 presents a discussion of the Swim Lane ‘to be’ modelling process which provides improvements for reducing information overload. Further, a knowledge management framework is proposed in Chapter 9 to reduce the information overload problem.

Chapter 9

The Proposed Framework

9.1 Introduction

The information overload problem that exists in the diabetic clinics was analysed and discussed in Chapter 8 to understand the nature of the problem. The analysis in Chapter 8 was based on the information flow diagram, the ‘as is’ modelling process and the Fishbone diagram of the current situation. In this chapter, the Swim Lane ‘to be’ modelling process, which identifies ways to decrease information overload, is first presented. The proposed knowledge management framework is then introduced and discussed. Finally, a summary of this chapter is provided.

9.2 The Swim Lane ‘to be’ Modelling Process of the Current Diabetes Clinics System of the Seven Selected Hospitals in Jordan

In this section, the Swim Lane ‘to be’ modelling process describes the current situation in the diabetes clinics. Both theories, the ‘Externalisation’ and ‘Combination’ phases of the SECI model (Nonaka & Takeuchi, 1995) and Dervin’s Sense-Making model (Dervin, 1983), are used in the ‘to be’ modelling process to provide a structure for the proposed research framework. Both theories use items highlighted in green as shown in Figure 9.1.

The information overload problem is reduced by the enhancements provided by the ‘to be’ modelling process, as illustrated in Figure 9.1. These enhancements are items highlighted in red in this Figure 9.1.

Before beginning the discussion of these enhancements, it is important to understand which gaps and issues identified in the primary research led to the development of the enhancements shown in Figure 9.1.

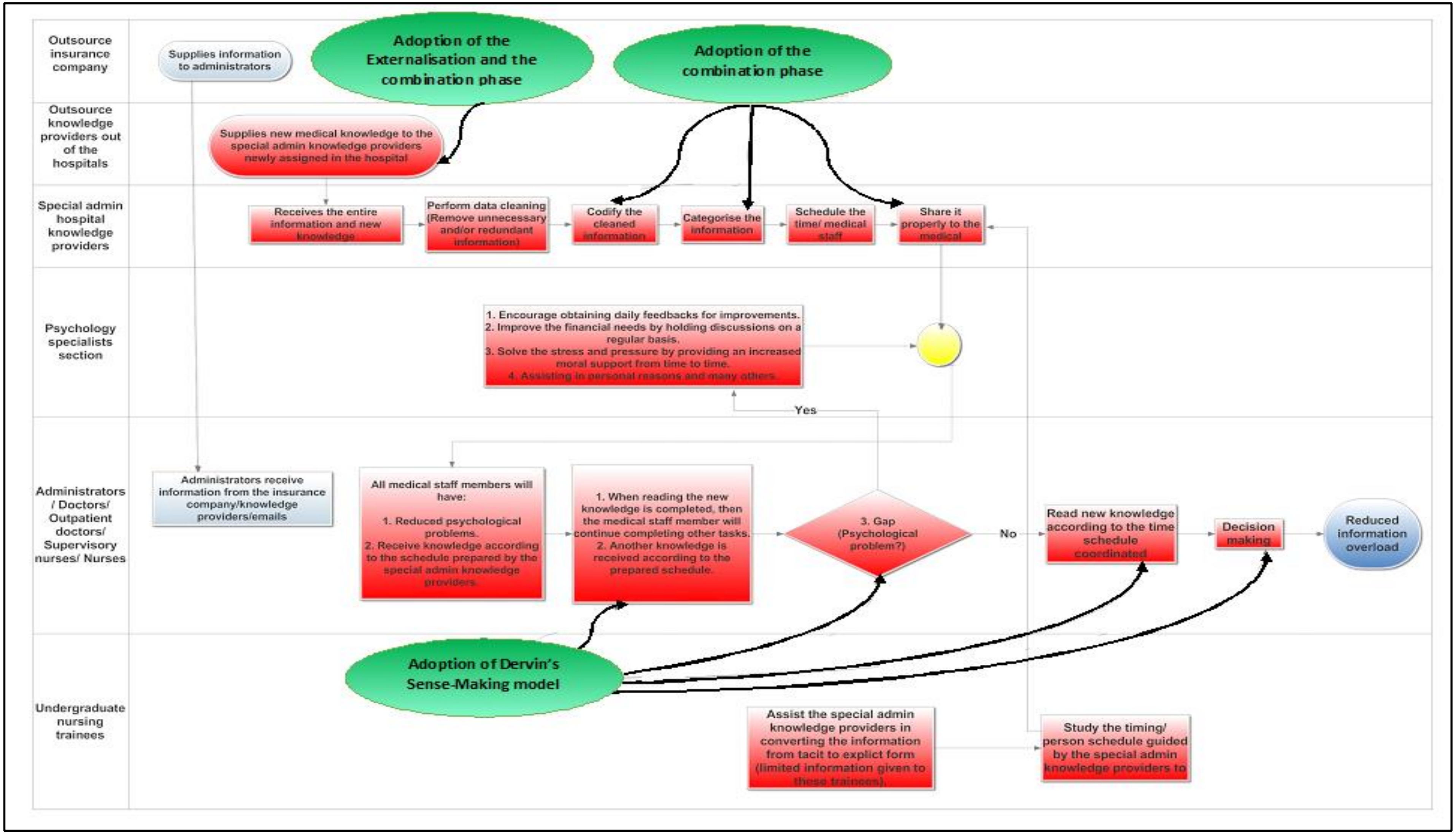

Figure (9.1): The Swim Lane 'to be' modelling process of the diabetes clinics of the seven selected hospitals in Jordan

In Chapters 6 and 7, the findings indicated that the problem was statistically approaching the 'average'. The gaps related to the main information overload issue, which emerged after conducting the primary research, include:

- Improper knowledge dissemination, improper codification of the knowledge and improper sharing of this knowledge.
- Psychological issues affect most of the medical staff at these hospitals.
- Improper organisation of the workload.

The enhancements displayed in Figure 9.1 reflect these gaps obtained from the findings of the primary research. Like Figures 8.6 and 8.7 in Chapter 8, Figure 9.1 also presents the processes in Swim Lane form. However, the difference is that Figure 9.1 represents the Swim Lane 'to be' modelling process and is an enhancement of the previous Swim Lane 'as is' modelling process of Figures 8.6 and 8.7, which presented the processing currently used in these hospitals.

The steps of the 'to be' modelling process depicted in Figure 9.1 are as follows:

1. Similar to the first Swim Lane step in Figure 8.7 of Chapter 8, the external outsource insurance company of the first Swim Lane in Figure 9.1 provides the administrators with the necessary information.
2. The first proposed enhancement is to appoint special hospital administration knowledge providers that can reduce the workload which is adversely affecting the medical staff.
3. In the second Swim Lane, a second proposed enhancement is to outsource knowledge providers to supply the new medical knowledge to the special administrative knowledge providers rather than supplying this knowledge directly to the busy respondents of the medical staff. In this way, the workloads of medical staff are reduced and, thus, information overload is reduced. The reason for this is that when the workload is reduced for these respondents, they will have more time to read relevant medical knowledge rather than wasting their time on disseminating information to other members of the medical staff.
4. In the third Swim Lane, the administration knowledge providers first receive the current knowledge from the outsource knowledge providers. In this enhancement step, the 'Externalisation' and 'Combination' phases of the SECI model are adopted so all knowledge can be transferred by external sources to the administration medical knowledge providers by either tacit to explicit means (Externalisation phase), or explicit to explicit means (Combination phase).

5. Subsequently, the special administration knowledge providers perform data cleaning by separating unnecessary and redundant information from necessary information.
6. These special administration knowledge providers codify the remaining information either electronically or in booklets or papers. In this enhancement step, the ‘Combination’ phase of the SECI model converts the knowledge from an unorganised codified explicit form to another newly organised codified explicit form.
7. The special administration knowledge providers categorise the clean, codified information according to job types of the medical staff, including medical administrators, diabetes doctors, outpatient diabetes doctors, supervisory nurses and normal nurses. Note that this categorisation process ensures that all medical staff, regardless of their job types, have up-to-date medical knowledge. In contrast, in the previous situation, knowledge was provided directly to only certain medical staff. In this enhancement step, the ‘Combination’ phase of the SECI model is also adopted. The reason behind this is to facilitate one of the aims of knowledge management which is to convert unorganised codified explicit knowledge into a new codified explicit form. The new explicit knowledge will also be sent to the right medical staff at the right time, in the right place and in the right quantity allowing them to properly categorise the knowledge. Codifying, categorising and sharing new medical knowledge appropriately reduces information overload, this achieving better performance and quality of care in these clinics.
8. The special administration knowledge providers coordinate the proper timing for disseminating the new codified and categorised medical knowledge to the appropriate medical staff in organised ways.
9. As a final step involved in the special providers’ roles, knowledge is shared properly based on providing the right information to the right medical staff member at the right time, in the right place and in the right quantity. By using dedicated administrative knowledge providers, the medical knowledge is codified, categorised and shared properly and the workload is shared appropriately, leading to reduced information overload in these hospitals.
10. The third proposed enhancement is related to the psychological issues and personal matters affecting the medical staff in these hospitals. As shown in the fourth Lane, the improvements suggested for this issue are first to obtain daily feedback from the medical staff to ensure the best quality of care for patients with diabetes in the future. Second, there is an urgent need for help with finances, as was claimed by many medical staff during the primary research and validation stages. The researcher

suggests that this improvement can be made by holding frequent discussions with these respondents. Third, the respondents also reported that reducing the stress and pressure incurred on the job is also needed. For example, Bock et al. (2008) argue that if employees within an organisation have low morale or are feeling confused or stressed due to information overload or for personal reasons, their attitudes will lead to poor performance. Additionally, Fuat et al. (2003) find that stress is due to information overload. Therefore, the medical staff claimed that stress can be reduced within these clinics by ensuring that knowledge is managed and disseminated efficiently when required. Fourth, based on statements from the medical staff, there is an urgent need for assistance with personal issues and other psychological issues. Help can be given by holding counselling sessions at convenient times.

11. In the fifth Lane, all medical staff will have reduced psychological issues, due to measures taken in the fourth Lane.
12. After that, these respondents will receive new medical knowledge prepared by the dedicated administrative knowledge providers on a proper schedule, as explained in Step 8.
13. When the medical staff read new medical knowledge, and this reading is complete ensuring that their morale is high and psychological needs are met, these respondents will be free to get back normally to complete other important medical tasks for their clinics. In this enhancement step, Dervin’s model is adopted. The reason behind this relates to the second and third phases of this model. As mentioned in Chapter 1, according to Dervin (1983), the second phase indicates that ‘During the move, the user makes sense of his/her environment, actions and the inputs of the information system’. The third phase of this model, also mentioned in Chapter 1, indicates that ‘It is then possible to move ahead when everything is assured to be meaningful’. In light of the current situation in the diabetes clinics, the idea behind the two phases of Dervin’s Sense-Making model (Dervin, 1983) is that complying first with the second phase of the model, the medical staff starts to read the new medical knowledge with no issues, gaps or obstructions, and with good psychological health (Fuat et al., 2003; Bock et al., 2008). If this occurs, complying with the third phase of Dervin's model, the staff will keep reading because everything sent to them is meaningful and relevant. After the reading stage, they will perform other required medical tasks. Fuat et al. (2003) and Bock et al. (2008) give evidence for this source of information overload when employees have low morale.

14. When more new medical knowledge is received at a later stage according to the proper timing schedule developed by the special administrative knowledge providers, the psychological states of the medical staff may improve. In this case, however, a gap might block their enthusiasm for reading more necessary medical knowledge at their scheduled times. Dervin's model is also adopted in this case and the fourth phase of this model, described in Chapter 1, is 'however, cognitive gaps or stops might block this movement ahead'. The movement of the medical staff based on completing the reading part and other necessary medical tasks thereafter is blocked by the changeable circumstances, which are negatively affecting these respondents. Consequently, the respondents, as illustrated by an arrow in the fifth Swim Lane of the 'to be' modelling process in Figure 9.1, must revise the psychological specialists section in the fourth Swim Lane to seek ways to solve these personal issues. Dervin's model is also adopted in this case, and the fifth phase states 'In this case, the cause of the stop or the gap's nature must be defined by the user'. This means that the medical staff know that personal issues are preventing them from properly reading and from properly completing other important and urgent medical tasks. Further, the sixth phase of this model indicates that 'After that, the gap is bridged when information or tactics are determined by the user based on his/her assessment'. This implies that the medical staff attempt to bridge their gaps by revising the psychological issues using the approach in the psychology section in the fourth Swim Lane of Figure 9.1, and continue reading and makings decisions. Hence, information overload is reduced.
15. If no psychological problems are encountered, there will be no gap, and the medical staff will continue to read the new medical knowledge according to the schedule. After that, these respondents will be able to make decisions since they have reduced information overloads.
16. Finally, the fourth proposed enhancement, as shown in the last Lane, is to use the visiting undergraduate nursing trainees. This involves having these trainees assist the administrative knowledge providers in converting the new medical knowledge from a tacit form to an explicit codified form. This will reduce the workload of these special providers, hence reducing their information overload. The trainees will be given the authority to assist the providers in sharing the new medical knowledge to the medical staff, but they will only be authorised to obtain limited medical information to share. The 'Combination' phase of the SECI model is also adopted in this step, as in Step 7, for the same reason.

17. These trainees will be tasked with studying the timing and scheduling processes with the guidance of the administrative knowledge providers. This will also reduce the workload of these providers and hence, information overload will be reduced. Consequently, an organised knowledge management scheme is achieved, ensuring the best quality care at these hospitals.

The proposed enhancement steps of the ‘to be’ modelling process were discussed by highlighting the proposed solutions based on the gaps derived from the ‘as is’ modelling process of the current hospital situations. These gaps emerged when conducting the primary research. In Section 9.3, the proposed framework reflects these proposed enhancement steps presented in Section 9.2.

9.3 The Proposed Knowledge Management Framework

In this section, the proposed framework is illustrated and discussed. Figure 9.2 represents the proposed knowledge management framework. This framework is based on the Swim Lane ‘to be’ modelling process described in the previous section. The difference between the ‘to be’ Swim Lane modelling process and the proposed framework is that this modelling process is a means of highlighting the changes proposed to the standard Swim Lane ‘as is’ modelling process.

The framework is the final image of the ‘to be’ modelling process. This framework represents the final resource for managing the information flow in these organisations. The proposed framework can be applied in these hospitals to manage information overload. Figure 9.2 consists of components, relationships and processes. The framework is divided into two categories, as seen in Figure 9.2: the enhanced knowledge management process category and the enhanced organisational knowledge category.

The framework containing these two categories is an enhancement of the proposed knowledge management framework in Mirza (2009). Additionally, the framework proposed in this thesis is based on enhancing the issues identified in the primary research (see Chapters 6 and 8). In the enhanced organisational knowledge category, two contributions are proposed based on the issues found in the primary research. The first contribution to this category is to assign new special administration knowledge providers for the purpose of reducing the overload on the medical staff. The next processes of this contribution are proposed based on the use of these new administration knowledge providers. The second contribution of this category is based on alleviating the psychological issues encountered in these hospitals, as illustrated in Step 1(b) from the Figure 9.2.

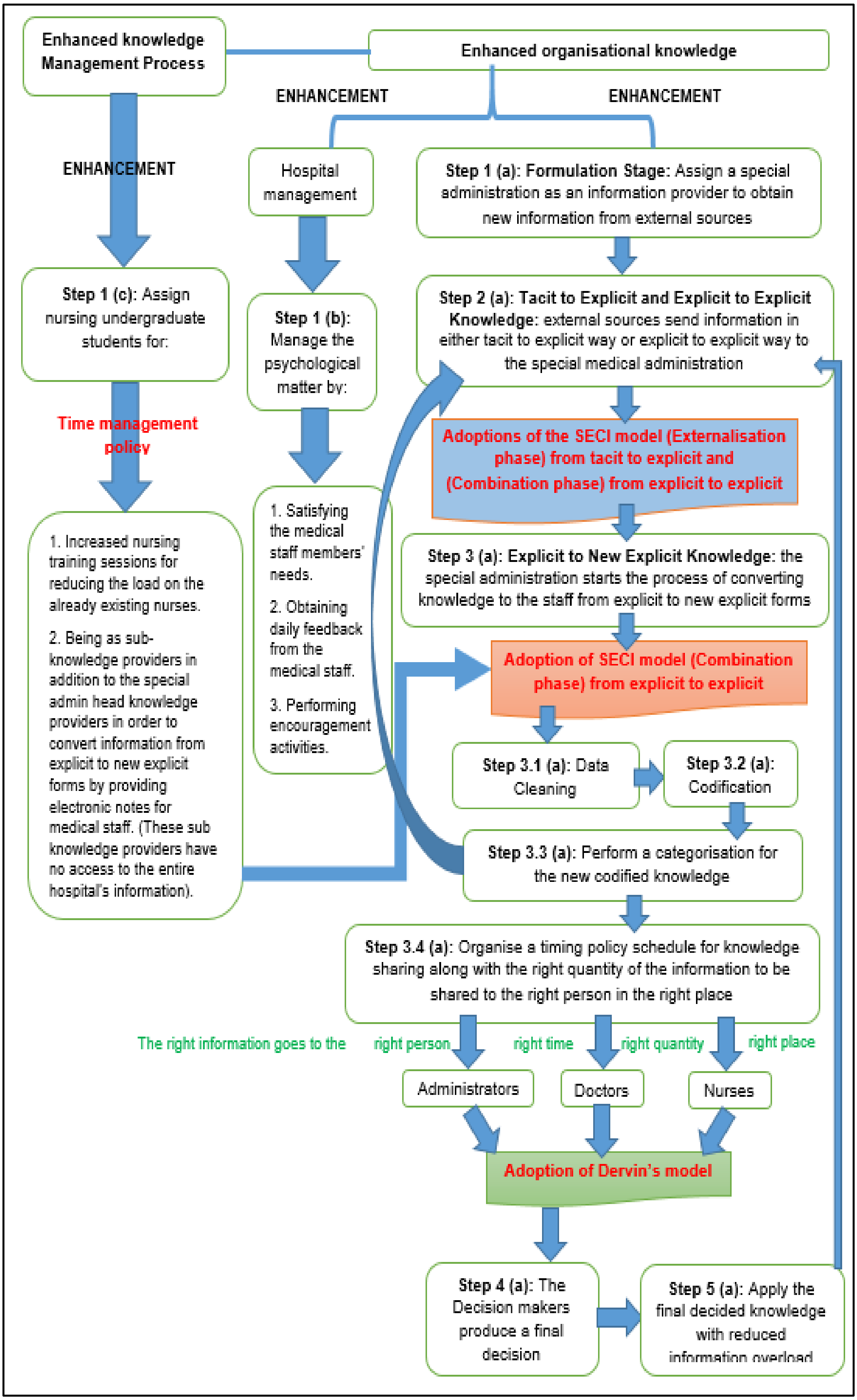

Figure (9.2): The proposed knowledge management framework of this research

In the second category, the enhanced knowledge management process category, a third contribution is proposed. The work overload of the special knowledge providers and the medical staff is also reduced when nursing undergraduates are used to assist in transferring some of the new medical knowledge to the medical staff from an explicit form to a new explicit form.

The three mentioned contributions in the two categories work in parallel. Therefore, it is worth elaborating each of these contributions individually.

As the first step of the contribution related to the enhanced organisational knowledge category, the special administration is assigned to obtain the new medical or non-medical information from the information outsources.

In the second step, the information outsources supply the assigned special administration knowledge providers with the new medical and non-medical information in one of two ways:

- Tacit to explicit form: where knowledge is tacitly transferred by external knowledge providers, such as conferences, companies and other medical departments related to the diabetes department. This information is obtained through various sources such as conversations, videos and media. Knowledge is initially captured and codified into readable unorganised forms by the special medical administrators. In this way, the Externalisation phase of the SECI model is applied.
- Explicit to explicit form: where knowledge that is already explicitly codified by external sources is delivered to the administrative knowledge providers in unorganised codified forms. Such external resources include knowledge providers, other medical departments related to the diabetes department and advertising companies that continuously disseminate unrelated medical knowledge to the administrative knowledge providers. In this way, the Combination phase of the SECI model is applied.

Note from the Figure 9.2 that the relationship between Step 1(a) and Step 2(a) is based on the exchange of information between external sources and the special administrative knowledge providers.

In the third step, the special administration knowledge providers start the process of converting the unorganised knowledge to a new organised and codified knowledge so that it can be sent to the medical staff (see Step 3(a)). This process starts with data cleaning to eliminate redundant information and isolate necessary medical information from non-medical or unnecessary information (see Step 3.1(a)). The special administration knowledge providers then codify the new necessary medical information (see Step 3.2(a)). Afterwards, the codified information is properly categorised by the special administration knowledge providers (see Step 3.3(a)) based on the type of the new information ensuring that the right information is effectively stored for the right medical staff in the right quantity.

Note from Figure 9.2 that there is an arrow going from Step 3.3(a) to Step 2(a) showing the relationship between the two steps. This relationship implies that, although the special medical administrators are done with the categorisation process in Step 3.3(a), they are still continuously updating the information by first cleaning it and then passing it through Step 3.2(a) for codification to Step 3.3(a) for categorisation, and so on.

The following step includes producing a timing schedule to assist in sharing the right knowledge with the right medical staff at the right time, in the right quantity and in the right place (see Step 3.4(a)). In this knowledge sharing process, which represents the sixth step, Dervin's Sense-Making model is adopted (Dervin, 1983) since it bridges any encountered gaps by solving the psychological matters affecting the medical staff, as in Step 1(b) when the new medical knowledge is being shared.

In the fourth step, the decision makers will make their final medical decisions (see Step 4(a)). In the fifth step, the final decisions for the distribution of the medial knowledge will ensure that information overload is reduced based on these organised steps (see Step 5(a)).

Similar to the previous relationship, which is highlighted in an arrow connecting Step 2(a) with Step 3.3(a), note from Figure 9.2 that there is also another relationship shown between Step 5(a) and Step 2(a) indicating the same relationship as previously explained for Steps 2(a) and 3.3(a).

In the second contribution of the first category, the hospital management manages the psychological matter by addressing the needs of the medical staff, including financial concerns, stress, personal needs and moral support. The hospital management can continue to assess the situation by obtaining feedback from the staff on a daily basis. Presently, most of the diabetes clinics of the seven selected hospitals in Jordan do not collect feedback from medical staff daily. Further, this contribution can also manage the problem by performing continuous encouragement activities to motivate these respondents to focus on their medical tasks and to give due concern to the emerging up-to-date medical knowledge.

In the third contribution, which belongs to the second category, nursing undergraduate students are assigned as a first step in order to reduce the workload on the special administrative knowledge providers and the rest of the medical staff and to improve time management. As the first step of this contribution, nursing training sessions are increased in order to reduce the workload on the existing staff. In the second step, these undergraduate trainees act as subordinate knowledge providers and assist the special administrative knowledge providers in codifying the new medical knowledge when converting the information from tacit form to explicit form. Additionally, these trainees will be directed to study the timing and scheduling processes with the guidance of the administrative knowledge providers, thus reducing their workload and decreasing information overload. The undergraduate trainees obtain the new knowledge from the special knowledge providers. However, the trainees will not be authorised to have unlimited access to the medical information related to the hospitals.

Referring again to Figure 9.2, it is evident that the relationship between the contents of Step 1(c) in the third contribution, assigning the nursing undergraduate trainees, is related to where the SECI model is adopted in the first contribution, as shown in the Figure 9.2. There is an arrow connecting these contents with the SECI model as illustrated in Figure 9.2. The reason for this relationship is that when these assigned trainees assist the special knowledge providers in delivering the knowledge electronically to the right people, this knowledge is converted between different explicit forms. Consequently, the combination phase of the SECI model is adopted here and shows the relationship between the steps of the third contribution and the SECI model, as shown in Figure 9.2.

In conclusion, the proposed framework is based on the investigations and improvements suggested in the framework proposed by Mirza (2009). The design of Mirza's framework is not supported by any theory. The framework proposed in this research project therefore enhances Mirza's framework by integrating the externalisation phase of the SECI model with Dervin's Sense-Making model along with the above discussed three contributions. The aim of enhancing Mirza's (2009) proposed framework is to propose a knowledge management framework that can manage processes in the healthcare domain, which is the setting of this research. This means that Mirza's framework is appropriate and understandable in terms of the way knowledge management is organised in healthcare systems. However, Mirza proposes a knowledge management framework related to the healthcare system without fully considering the information overload problem. This thesis focuses not only on the healthcare and knowledge management domains themselves, but also, and more importantly, on the information overload domain as it affects the diabetes clinics of the seven selected hospitals in Jordan. This focus is in response to the claims of the medical staff when approached in these clinics.

Moreover, the framework proposed in this thesis is also based on the investigations and improvements of the issues and gaps encountered in the previous primary research. Nonetheless, it is important to carry out a validation process for this framework. Hence, Chapter 10 presents the framework validation process carried out in the diabetes clinics to investigate the validity of the framework. The framework validation process is a means by which to investigate whether this proposed framework will work in practice in the diabetes clinics.

9.4 Summary

A proposed knowledge management framework, designed to manage and reduce information overload, has been introduced in this chapter. This framework is based on the Swim Lane ‘to be’ modelling process. This modelling process suggests improvements for reducing information overload resulting from the gaps encountered in the previous Swim Lane ‘as is’ modelling process highlighted in Chapter 8. Further, the proposed knowledge management framework represents the final result of the Swim Lane ‘to be’ modelling process, which forms the basis for reducing information overload in these medical organisations. Further, this framework is based on the investigations and improvements developed in the secondary and primary stages of this research that are designed to reduce information overload. The proposed framework needs to be validated to assure that it will work effectively in the clinics. Detailed framework validation processes are explained in Chapter 10.

Chapter 10

The Validation Processes of the Proposed Knowledge Management Framework

10.1 Introduction

In Chapter 9, a knowledge management framework is proposed for managing and reducing the information overload in the diabetes clinics of the seven selected hospitals in Jordan. However, it is necessary to check the correctness of this framework to determine whether it can work in these clinics by validating it using medical experts in the field who work in these clinics. Hence, in this chapter, the validation stages of the proposed knowledge management framework are discussed and outlined. First, the process of selecting the participants for the validation research is introduced and the preliminary stages of the framework validation are highlighted. Second, the secondary stages of the framework validation are explained and analysis of the framework validation results by the medical experts is presented. Finally, a summary of this chapter is given.

10.2 The Selection Process of the Validation Participants

The process by which the researcher chose the participants for the validation is based on a 'purposive sampling' technique, or ‘purposeful sampling’ technique, that is adopted from Teddlie and Yu (2007). This technique is used to select participants with specific characteristics, in this case respondents who are medical experts in the field. As declared by Tashakkori and Teddlie (2003a), ‘Purposive sampling techniques involve selecting certain units or cases based on a specific purpose rather than randomly’. The following represent the steps by which the researcher selected the participants to be involved in the validation research stage:

1) The researcher met with the medical experts in the field for the validation stage rather than with normal medical staff as these experts are more experienced and can contribute added value to the proposed framework by offering knowledgeable suggestions.
2) Using the original sample of 327 respondents, a minimum of 10% of highly experienced respondents from each medical position, including medical administrations, doctors and nurses, were selected. Hence, a minimum of 33 participants were chosen, including a minimum of 11 participants from each category: medical administrators, doctors and nurses. This group of participants represents a subset of medical experts from the diabetes clinics. The reason for

choosing highly experienced participants for the validation research is that they can provide the researcher with more complete information based on their extensive medical experience in comparison with the standard medical staff. A total of 46 participants from this subset volunteered for the validation stage. The reason for selecting this minimum percentage from the original sample is that the number of the highly experienced medical experts in the clinics is limited. Another reason is that there was limited time available to carry out the validation stage. Additionally, the medical experts were hard to reach since they were extremely busy with other medical tasks. However, as many medical experts were involved as possible. These factors restricted the number of participants in the validation stage.

3) The researcher first met with the head of nurses in each hospital and explained the need to meet with medical experts, as opposed to normal medical staff, for the purpose of validating the proposed framework. These nurses were also informed of the minimum percentage to be chosen as explained in Step 2. The head of nurses then provided a list of medical experts and their room numbers.

The limitations that arose from this selection procedure include:

1) The time limitation for obtaining consent letters for the validation research and the time needed to conduct the validation stage considering that the experts have limited availability.
2) While the number of participants is low, it was still difficult to get time with them because most of them were frequently busy with other medical tasks or were abroad attending medical conferences.
3) Low morale that was found among the experts and, based on their comments, other highly motivated experts with higher morale were sought. These experts had volunteered to participate in the validation research.

10.3 The Preliminary Stages of the Framework Validation Process

First, it was important to develop the essential research instruments before proceeding with the validation stage. These instruments are important steps and should be prepared prior to the start of the validation process because they facilitate a clear, comprehensive presentation of the proposed framework so the medical experts can provide informed opinions, comments and suggestions for further improvements. If a task needs to be performed, it is necessary to understand that task in order to manage it efficiently.

Prior to the proposal of the knowledge management framework, the researcher presented the information flow and the processing models for the current situation in the diabetes clinics.

The potential improvements will be facilitated by introducing the ‘to be’ modelling process, which leads to the proposal a new knowledge management framework. Hence, the ‘to be’ modelling process, which is an improvement on the ‘as is’ modelling process, is presented. The new knowledge management framework, which is the final image of the ‘to be’ modelling process, is proposed to reduce the information overload problem encountered in these clinics. The ‘to be’ modelling process is used to show the participating medical experts the benefits of the new framework.

After proposing the new knowledge management framework, the validation tools (instruments) are prepared before conducting the validation process. These instruments are prepared before presenting the proposed framework to the medical experts so that they can efficiently assess the usefulness of the framework. These instruments include the following:

- Information flow diagrams to show and explain the (see Chapter 8, Figures 8.2–8.5) current situation in the diabetes clinics to the medical staff. Note that some medical staff know nothing about the current information flow in their clinics.
- This diagram shows them clearly where, how and when information overload occurs in the current information flow, and shows them where they are involved in the process.
- To show and explain to them the ‘as is’ modelling process (i.e. the baseline process) of the current process used in these clinics (see Chapter 8, Figures 8.6 and 8.7).
- To guide them through the current ‘as is’ modelling process and to show them how particular steps of this process lead to information overload. Additionally, to show them where improvements could be made.
- To explain the problem and guide them through to understanding. This can be performed by clearly showing them the main problem and its causes based on the Fishbone problem analysis of the current hospital processes as shown previously (see Chapter 8, Figure 8.9).
- Following these steps, they will have a clearer perception of the situation. The next step is to explain the ‘to be’ modelling process (see Chapter 9, Figure 9.1), and the proposed framework (see Chapter 9, Figure 9.2) so that they can comment on it and provide suggestions for further improvements.
- Finally, their comments and suggestions for further improvements are recorded on paper.

After presenting these instruments, the framework is ready to be validated. The framework is evaluated with the assistance of medical experts in the field who assess the potential usefulness of the proposed framework. In general, the framework is evaluated using on the following strategies:

- Meeting with the panel of medical experts from the diabetes clinics to simulate and walk them through the framework.
- Giving information on how the framework is going to work.
- Providing them with the results of the validation are so they can suggest modifications to the proposed framework.

After presenting the instruments to these experts, the framework is evaluated for further improvements based on their answers to the four questions listed below.

- Is the proposed framework clear? Please explain in how it is clear or unclear.
- Is there anything that assures that the framework will adequately address the information overload problem?
- Does the framework reduce the problem of information overload?
- Are there any suggestions or comments for further improvement to the proposed framework?

The information provided by the experts is used to validate that the framework will work in practice to reduce information overload. The reduction of information overload is measured based on the increase in information quality and decrease in information quantity. The quality of information affects the ease and speed of decision making, as well as the quality of the decisions. These factors also relate to the amount of information needed to make the decision since the quality of information is balanced against the quantity of information needed to make the decision.

In Section 10.4, the secondary stages of validation are explained. These stages involve interactions with the experts of medical staff in person at the clinics.

10.4 The Secondary Stages of the Framework Validation Process

In the primary research, the 327 members of the medical staff responded to the research questionnaires. The participants included medical administrators, doctors and nurses from all seven hospitals surveyed (A, B, C, D, E, F, G). A subset of medical staff representing 10% of the 327 total participants was chosen and included a minimum of 11 from each of the three job types listed above. The validation process was carried out by approaching this subset of respondents in person. The framework validation process started by guiding this subset of medical staff through to the framework using the prepared instruments as highlighted in the previous section. Further comments and suggestions for improvements to the proposed framework were collected from these experts in paper form. When the framework validation process was complete, signed consent letters were obtained from the Human Resources Department of each of the seven selected hospitals confirming that this process was successfully conducted at the diabetes clinics (see Appendix E).

Even though many medical staff were engaged in other important medical tasks, the validation stage proved to be easier than the primary research stage. The reason behind this is that a small subset of medical experts was selected for the framework validation stage compared to the large number involved in the questionnaire stage of the primary research. After the consent letters were issued, analysis of the framework validation results was conducted based on the feedback obtained from the subset of experts. The following section highlights the analysis of the framework validation results.

10.5 The Analytical Results of the Framework Validation Process

In this section, the results of the framework validation are analysed and discussed. The participants included 14 medical administrators, 15 doctors and 17 nurses, making a total of 46 respondents of medical staff in the clinics. These respondents provided suggestions for further improvements to the proposed framework. The secondary results are based on the four questions provided to the medical staff (see Section 10.3).

In Question 1, which is ‘Is the proposed framework clear? Please explain in how it is clear or unclear.’, the results showed that most of the participants found the framework to be extremely clear to them and thought it could possibly reduce information overload.

In Question 2, which is ‘Is there anything that assures that the framework will adequately address the information overload problem?’, 40 participants agreed that the problem was very clear to them, was properly addressed by the proposed the framework and the relationships and outcomes were also clear to them.

For Question 3, which is ‘Does the framework reduce the problem of information overload?’, all 46 participants agreed that the proposed framework would reduce information overload as this framework addresses time management, psychological matters and the effective codification of the new knowledge. Even though the three questions showed satisfactory results in terms of the clarity of the framework, there are some suggestions provided by the participants for further improvement of the framework. Hence, in Question 4, which is ‘Are there any suggestions or comments for further improvement to the proposed framework?’, the answers included some similar suggestions and also some unique ones. Consequently, it is useful to classify the different answers provided by these respondents and represent them as shown in Table 10.1. The suggestions are shown in Table 10.1 along with the frequency of the answers.

Table (10.1): The results of the suggestions and improvements for the produced framework, which were obtained from the 46 participants in the diabetes clinics of the seven selected hospitals in Jordan

Suggestion number	Suggestion type	Frequency
S1	Reduce the workload over the medical staff respondents	17
S2	Improve communications among the medical staff respondents	2
S3	The right task must be assigned to the right person	42
S4	Solve the salary issue	10
S5	Increase the number of medical staff respondents	9
S6	Increase the medical training sessions	35
S7	Holding regular meetings, providing medical knowledge lectures, and/or putting 2–wise translated notes	12
S8	Increase and improve the computerised data knowledge systems	14
S9	Add more procures	1
S10	Improve IT failures and issues	3

The suggestion types were coded by grouping the similar answers collected from medical experts after the validation process as shown in Table 10.1. The table shows that is the most frequent suggestion is Suggestion number S3, which is "The right task must be assigned to the right person", suggested by 42 medical staff. The reason for this is that, based on their answers, most of the diabetes clinics do not assign tasks to the right medical staff member at the right time, in the right place and in the right quantity. This situation contributes to information overload.

In the proposed framework shown in Chapter 9, Figure 9.2, a sentence highlighted in green indicates that the right information is going to the right person at the right time, in the right quantity and in the right place. Thus, 42 participating respondents suggested that it would be better to consider the right task in the above sentence. The modification would read 'The right task goes to the right person at the right time, in the right quantity and at the right place.' Process maps could be useful for identifying the tasks in relation to the type of work. However, the sequence and timing of tasks are the two important key elements which should be taken into consideration. In short, this links to the idea of knowledge triggers in the field of knowledge management.

10.6 Summary

In this chapter, the validation processes used for the proposed knowledge management framework are categorised into preliminary and secondary stages and discussed. The preliminary validation stage involved the initial preparations of the validation instruments used to guide the medical staff through to the framework. The secondary stage involved detailed elaborations on how the real validation of the framework was carried out in these hospitals with the subset of medical staff experts. The subset of medical staff who volunteered to participate in the framework validation stage included 14 medical administrators, 15 doctors and 17 nurses from all seven diabetes clinics. The results based on the feedback from this subset showed that the framework is clear and is useful for reducing information overload in these clinics. Nonetheless, some suggestions and improvements to the proposed framework were provided to further reduce the information overload encountered in these clinics. In Chapter 11, the conclusions and the critical evaluations of this research project are presented along with the suggestions for future research and possible recommendations for this research.

Chapter 11

Conclusions and Future Research

11.1 Introduction

In Chapter 10, the validation process was described. Thus, it was important to check the reliability and feasibility of the validation process. Finally, in this chapter, a narrative description and a critical analysis are carried out. The critical analysis reflects on the objectives and whether they have been met; the lessons learned from the methods used and from the production of the validation framework; the advantages and drawbacks of the research; and the limitations experienced during the research. Additionally, the conclusions, suggested future research and possible recommendations are provided. Furthermore, the results to be generated from the research include facilitating better decisions and outcomes to reduce information overload, the time spent on decision making and the time spent processing patients.

The remainder of this chapter is divided as follows. The objectives of this research are revisited and discussed. A narrative description of the research is presented. The generality of the proposed solution is explained. The critical evaluation of the research is clarified. A discussion of the conclusions and the reflections on the research are presented to finalise this research. Suggestions for future research are presented. Finally, the suggested recommendations that arose from the research are represented.

11.2 Revisiting the Objectives

As mentioned in Chapter 1, the primary aims of this study are to research the current situation of information overload in the diabetes clinics of the selected hospitals in Jordan, and to propose and validate a knowledge management framework that can manage and reduce the that information overload.

The approach adopted was to review the literature, with particular attention to existing theories and existing knowledge management frameworks, and to conduct the primary research so that these could be taken into account in the development of the new knowledge management framework. The primary aim was divided into eight objectives, which are re-examined as follows:

- Objective 1 – 'To conduct a comprehensive literature search (secondary research) on the knowledge management, healthcare, and information overload domains.'

Chapter 3, 4 and 5 review the literature based on three key domains, including knowledge management, information overload domains and healthcare domains, respectively. These domains are related to each other since information overload is frequently encountered in many healthcare organisations where such a proper knowledge management system is urgently needed.

- Objective 2 – 'To carry out the primary research (including the data collection and analysis of data findings) with a representative sample of the selected hospitals in Jordan in order to investigate the phenomenon of information overload in these hospitals.'

Chapter 6 presents the analysis of the primary research in which data was collected from the respondents from the diabetes clinics in the seven selected hospitals (A, B, C, D, E, F, G) in Jordan. This is to investigate the phenomenon of information overload that is occurring in these clinics. The data collected from the questionnaires and interviews was based on certain methods and techniques, including the 'Opinion-based research' method, which was adopted from Sillars and Hallowell (2009) and used for the quantitative data in this thesis. The 'Qualitative research interview' method, which was adopted from Gill et al. (2008) was used for the qualitative data in this thesis. Both methods were chosen for the data collection process as they are the most suitable methods to use in mixed research approaches involving both quantitative and qualitative methods (Gill et al., 2008). The 'Questionnaires' technique, adopted from Cyfar (2017), was chosen for the quantitative data because this technique is considered fast and practical for data collection and analysis where data is being collected anonymously, and results are easily obtained (Cyfar, 2017). The 'Interview' technique, also adopted from Cyfar (2017), was chosen for the qualitative data since it encourages and motivates communication through open-ended responses, and it provides clear and focused discussions between the interviewer and the interviewees. Additionally, it facilitates easier and faster interviews compared to other types of interviews. This type of interview also facilitates the comparison and analysis processes.

Chapter 7 presents a summary of the results and findings obtained from the primary research analysed in Chapter 6. The findings from the primary research indicated that the problem is statistically approaching the average (i.e. neither the problem is high nor low).

- Objective 3 – ‘To develop a new knowledge management framework that can manage and reduce the information overload problem encountered in the diabetes clinics of the selected hospitals in Jordan.’

Chapter 8 initially discusses the analysis of the research problem prior to the proposal of the framework. Details of the information flow diagram and the ‘as is’ modelling process for the current situation were presented in order to provide a clear view of how the data is flowing in these clinics and of the places and ways in which information overload occurs in these hospitals. This also assists in forming the ‘to be’ modelling process and to propose the new knowledge management framework, which is the final image of the formed and is presented in Chapter 9. The framework has been produced based on the secondary research and on the gaps and issues identified in the primary research.

- Objective 4 – ‘To conduct a validation process for the proposed framework.’

Chapter 10 explains the validation processes for the proposed knowledge management framework. The framework was validated using a subset of medical experts in the field who work at these hospitals. The aim was to have them perform assessments of the potential usefulness of the proposed framework to determine whether it can work in practice at their hospitals.

- Objective 5 – ‘To perform a critical evaluation of the research, to draw the conclusions, and to suggest the future research.’

Chapter 11 presents a narrative description of this research, critical evaluation of the findings and the generalisability of the proposed framework. The final conclusions, future research and possible recommendations are also presented.

11.3 A Narrative Description of the Research

In any research study, it is important to gain experiences from the research. While conducting this research, experience was gained from both the secondary and primary phases. In the secondary phase, the experience included understanding the background of the research and the literature review in a way that related them to the research topic being considered. Additionally, this research helped the researcher gain experience in critically writing the perspective views of the many essential points and facts obtained from the literature. The primary research provided experience in dealing with different respondents of different ethnicities and backgrounds during the data collection stage. These experiences improved general research skills that can be used in any future research.

11.3.1 Limitations

It is important to highlight the limitations when conducting a research project. These limitations include issues of time management, difficulties in collecting data from busy respondents, delays in obtaining the consent letters from some hospitals and the refusal of some of the hospitals in Jordan to participate in this research. These limitations affected the researcher from the beginning of the primary research.

The way to overcome the problems faced during the primary research was to make frequent visits to multiple hospitals in a shorter time rather than spending much time for this visit. Accordingly, any arising issue could be resolved quickly and effectively. This can be achieved by contacting the administration of multiple hospitals before visiting them in order to use the time efficiently. The researcher noticed that some hospitals granted immediate approval for the researcher to distribute the questionnaires and to conduct the interview sessions obtaining consent letters from the participants (see Appendix C). However, other hospitals had policies that do not allow researchers to carry out studies in their clinics. Decisions in some hospitals took several weeks. The researcher used the time by starting to conduct the primary research at those hospitals that had agreed to issue consent letters while waiting for the issuance of consent letters from other hospitals. Despite finally finding seven hospitals in Jordan in which to conduct the primary research, the number of hospitals being used for data collection is large since the number of diabetes clinicians for each involved hospital is small. The number of medical staff involved in each diabetes clinic of the seven selected hospitals in Jordan is limited. Thus, this research needed the proper number hospitals in which to conduct the survey so that the results to be clarified would not be excessive. In conclusion, the problems faced while conducting the research were solved by performing several tasks in parallel.

11.3.2 The Generality of the Proposed Framework

The potential generality of any proposed framework can be increased in natural environments when results are being frequently repeated in larger samples in different places (Information Resources Management Association, 2015). It is assured by Altman et al. (2009), Moons et al. (2009), Steyerberg (2009), Moons et al. (2012), Smith-Spangler (2012), Steyerberg et al. (2013) and Debray et al. (2015) that measuring the performance of a developed framework with more participants is significant in assessing the performance of the developed framework outside the development environment and in assessing the generalisability of the developed framework. In contrast, due to the time limitations, there was no possibility to enlarge the survey by distributing it to more hospitals. However, the research identifies some factors that can contribute to assuring the generalisability of the proposed knowledge management framework based on evidence. These factors are described below.

- The Arab populations share many similarities in terms of culture, habit, religion and language. They are also similar in their organisations, processes, systems and structures (Boutayeb et al., 2012).
- The Arab populations are similar in their healthcare problems, particularly in the prevalence of diabetes mellitus. The highest rates of diabetes are found in Middle Eastern countries (Alghadir et al., 2016).
- It was reported that the prevalence of diabetes mellitus has currently reached a percentage of 27.4% in Jordan, 23.7% in Saudi Arabia, 20.1% in Bahrain, 20.1% in the United Arab Emirates and 14.9% Kuwait (Al-Hassan et al., 2017).
- Additionally, information overload can be applied to different broader disciplines (Gantz et al., 2009), as can be seen in Chapter 1, Figure 3.1 adopted from Gantz et al. (2009).
- From a percentage of 41% of the population in the United Arab Emirates, Saudi Arabia and Oman to a percentage of 62% of the population in Jordan, Egypt, Sudan, Algeria, Tunisia, occupied Palestine and Iraq is suffering from chronic undiagnosed diabetes. An approximate percentage of 10% of all adult deaths are related to the complications of diabetes in the Arab countries (Laher, 2014).
- The Middle Eastern countries are similar in their healthcare organisations, industries and structures (Boutayeb et al., 2012; Kloep, 2012; Saleh et al., 2014; Crezee et al., 2016). When patients are ill in the Arabian countries, most of the Arab healthcare systems are similar in a way that a patient is treated. This system shares similarity in terms of the organisations and structures in most of the Arab healthcare industries (Crezee et al., 2016). Furthermore, the Gulf Cooperation Council (GCC) shows similarities in the structure and system of their healthcare industries (Kloep, 2012). Hence, this is evidences that the proposed knowledge management framework can likely be generalised to other similar Arabian healthcare organisations.

It can be concluded from these different factors that most of these Arabic countries have similar percentages of the prevalence of diabetes mellitus. Additionally, since the countries share the same culture and many other similar aspects, the proposed knowledge management framework could be generalisable and transferable.

11.4 Critical Evaluation and Discussion

The study was conducted in an acceptable and appropriate way that ensured effective investigation of information overload. The aims were to research the current situation of information overload in the diabetes clinics of the selected hospitals in Jordan, and to propose and validate a knowledge management framework to manage and reduce this information overload. These aims were achieved by achieving certain objectives. The objectives to be met were to conduct a comprehensive literature search related to the domains of knowledge management, healthcare and information; to conduct primary research to investigate the information overload problem in these clinics; to develop a new knowledge management framework for reducing information overload; to conduct a validation process for the proposed framework; and finally, to perform a critical evaluation of the research along with drawing conclusions and suggesting the future research. The research achieved these objectives. However, it is significant to point out some limitations of the research. Due to the policy-constraints of many hospitals in Jordan concerning students conducting research surveys, only seven hospitals (A, B, C, D, E, F, G) agreed to have this research conducted in their diabetes clinics. The consent agreement permitted this study to evaluate the information flows in these clinics. Another limitation was the limited time available, which in turn affected the search for more hospitals in Jordan.

The data gathered from the survey questionnaires was limited due to respondents' ability to understand the survey content, since some of the respondents' spoken and written English skills were weak. This study attempted to simplify the questions as much as possible to make them clear. Nonetheless, a few respondents still did not fully understand the questions, which might make their responses unreliable. Consequently, the results may not perfectly represent the whole group of medical staff or all the hospitals in Jordan. Additionally, the results might not represent all the types of clinics in the seven hospitals since this study examined only diabetes clinics. One of the reasons for using diabetes clinics is that information overload occurs most frequently in these clinics, as verbally claimed by the medical staff in these hospitals. Another reason, also stated by these respondents, is that patients with diabetes usually require more care in these hospitals. Consequently, these respondents are likely to spend most of their time diagnosing and treating these patients on a regular basis, and not have sufficient time to keep up-to-date with the new emerging medical knowledge.

Another limitation is that two hospitals delayed issuing the consent letters for the questionnaires and interviews (see Appendix C). A second type of the consent letter (see Appendix D) assured that the survey had actually been conducted in these clinics. Further, another delay in obtaining consent letters was incurred after conducting the framework validation process (see Appendix E). These letters prove that the framework validation stage was carried out in these clinics.

Moreover, another limitation is that most of the medical staff were extremely busy with other important medical tasks when the primary research and the framework validation stages were being conducted at these clinics. For example, when approaching the clinics during the primary research stage and the later framework validation stage, many respondents were involved in emergencies in the middle of answering the survey questions. Many respondents used some of their free time to provide answers to the survey and the framework validation questions. Although the time slots were scheduled, many respondents did not show up due to being involved in necessary medical tasks or due to personal or psychological issues.

Valuable experience gained from this research includes comprehensive knowledge of the research process, experience with how primary and secondary research is conducted and how the two phases of research are related to each other. Second, understanding how the data and the modelling processes are applied in these hospitals in order to understand the nature of the information flow to other involved organisations. Third, having experience in validating a produced framework is also valuable. Fourth, gaining practical medical experience, for example, when meeting face-to-face with the medical staff of the diabetes clinics.

The disadvantages experienced during this research include the poor time management, the delays incurred in the primary research, the delays incurred in the framework validation stage, the unawareness of some of the medical staff of what the survey consisted of and the difficulties in scheduling time with the medical staff.

In summary, the lessons learned from the involved methods and from the production of the validation framework can be used to inform the shortcomings of this research. Future work would ideally involve a larger sample of respondents from more than seven hospitals, and for more than one type of clinic in order to achieve more generalisable results. Another lesson learned is to arrange better time slots to meet with multiple respondents of the medical staff simultaneously as much as possible rather than meeting with them individually as occurred during the primary research stage. This will save much time and effort. Another lesson is avoiding meeting with these respondents at the busiest times since they will be busy with important medical tasks. Hence, to address the shortcomings of this research, it would be best to include more than one country, investigate more than one type of clinic and involve more respondents.

11.5 Conclusions and Research Reflections

This thesis presented an overview and a comprehensive background of three domains: knowledge management, information overload and healthcare. The importance of integrating these domains was shown by the literature. The aim of this research was to study the current phenomenon of information overload in the diabetes clinics in the selected hospitals (A, B, C, D, E, F, G) in Jordan. The aim is also to produce and validate a conceptual knowledge management framework that can reduce information overload in these clinics. Therefore, an in-depth literature search related to these domains was conducted in this research. Additionally, elaborations on the contribution contents of the thesis, the research challenges, the research approach, the ethical statement, the research investigations and the preliminary conclusions from these investigations were all presented in this research.

In the first stage of the research, the Jordanian background and context was highlighted along with the healthcare system as it currently exists in Jordan. Additionally, a background of the knowledge management, healthcare and information overload domains was established to provide clear and understandable ideas about the topic.

In the second stage, the research methodology was discussed based on the 'research onion' adopted from Saunders et al. (2009).

In the third stage, the literature research was studied to provide a comprehensive understanding of the existing problems affected by information overload based on the previous studies. The findings from the secondary research identified six theoretical factors and integrated them into a theoretical framework to create the survey questionnaires and interview questions. The research methodology was based on a mixed approach, using both quantitative and qualitative methods, using the 'Opinion-based research' method and the 'Interview' method for their simplicity and appropriateness in collecting data within a short time.

In the fourth stage, official consent letters were obtained from the diabetes clinics (see Appendix C) agreeing for this survey to be carried out in the diabetes clinics of these hospitals.

In the fifth stage, the primary research was initiated by approaching the medical staff including medical administrators, doctors and nurses. A total of 327 respondents participated in the quantitative survey, including 72 medical administrators, 115 doctors and 140 nurses, both male and female. Only 40 of the 327respondents participated in the qualitative survey that involved interviews. All respondents were 18 years or older.

In the sixth stage, the data was analysed by using the SPSS tool. The purpose of conducting the data analysis was to explore the problems of information overload encountered in these clinics in depth. The findings from the analysis show that the results are statistically approaching the average indicating an average problem of information overload. The main reason for these problems was the lack of a proper management of tasks in these clinics. When the existing problems are explored in light of the primary research findings, a framework can be proposed that will improve the current situation of information overload and can be validated with the assistance of medical experts in the field who can assess the potential usefulness of the proposed framework.

Thus, the seventh stage involved proposing a knowledge management framework to improve, manage and reduce the information overload in these clinics. The proposed framework was based on two integrated theories, the SECI model adopted from Nonaka and Takeuchi (1995) and Dervin's Sense-Making model adopted from Dervin (1983). In the SECI model, two phases were used to provide a foundation for reducing information overload in the clinics. These comprise the Externalisation phase in which knowledge is converted from tacit to explicit forms, and the Combination phase in which knowledge is converted from explicit form to other new explicit forms. The framework has been produced based on three key points, the first of which is developing an understanding the current processes in these clinics and by modelling the information flow process in a sequential way based on suitable methods such as the information flow diagram and the 'as is' modelling process for the current hospitals' situations. This was performed by identifying the types of information being used in the clinics, the sources of this information, the way it is used and how it is being held in their clinics. The second key point is to identify and understand the information overload problem and identify contributing factors as well as the causes and effects of the problem. Based on the first and the second key points, the third key point involved enhancing the current existing 'as is' modelling process based on the 'to be' modelling process. The intended new situation, the 'to be' enhanced modelling process, is produced to form the proposed framework.

The eighth stage involves the validation of the framework. This framework was evaluated in the diabetes clinics of the seven selected hospitals in Jordan with the assistance of medical experts in the field by assessing the potential usefulness of the proposed framework. At first, the current modelling process of the diabetes clinics and how the information flows into these clinics were explained to the experts. Following that, the proposed framework was described to them and they were guided through it by providing them with instructions on how this framework was going to work. Finally, the framework was modified based on the results of the input obtained from these experts. The medical experts provided information on how the produced framework would work at their clinics in practice, and whether it would be effective in reducing information overload. These experts indicated that the framework could work efficiently and could reduce information overload. The recommendations provided by these experts as can be seen in Table 10.1 in Chapter 10 and focus on assigning the right task to the right person, at the right time, in the right quantity and at the right place. This could be where process maps have a place – identifying the tasks relating to the type of work. Nonetheless, the sequence and timing of tasks are the two key elements that need to be considered. This links to the idea of knowledge triggers in the field of knowledge management.

The research reflects the views of some medical staff from the diabetes clinics in the seven selected hospitals in Jordan. The number of medical staff involved in these clinics is limited. Thus, this research a limited number of hospitals in which to conduct the survey so the results to be clarified would not be excessive. Therefore, future research should include more medical staff in more than one type of clinic, and be conducted in multiple countries. Finally, although this research developed a knowledge management framework in the medical field, the same approach could be applied in other fields such as in business and education. Evidence that the proposed framework could be applied in many fields other than the diabetes field attests to the generality of the research contribution (see Chapter 1, Section 1.7). Knowledge management attempts to manage the work and processes in organisations by ensuring that the right knowledge goes to the right people in the right place at the right time in the right quantity (Bouthillier & Shearer, 2002). Hence, knowing that the organisations are similar in their processes, structures and operations indicates that the proposed framework can be further extended and modified for other disciplines where knowledge management can be to reduce information overload.

In conclusion, this research presents an effective framework for reducing the information overload encountered in the diabetes clinics of the seven selected hospitals in Jordan. Hence, this research represents a significant contribution that can lead to future opportunities since many healthcare organisations lack proper knowledge management frameworks. Thus, it is significant to review and search the literature and highlight the importance of the integrating knowledge management, healthcare and information overload domains.

11.6 Suggested Future Research

While reducing information overload in the diabetes clinics is based on the capabilities of the proposed knowledge management framework, there are still a number of enhancements that can be made to further development these capabilities. Such suggested developments for the produced framework are outlined below.

- A computerised knowledge data system can be applied to the framework to establish a system-wide process for knowledge codification rather than having the knowledge kept tacitly in the minds of medical staff without sharing it properly with other respondents. Further, the system can facilitate sharing the knowledge efficiently. For instance, this system would summarise everything involving the patients' history and care plans, and facilitate the sharing of medical information and new medical knowledge when required. Some of the seven selected hospitals in Jordan lack such a system. Hence, it is suggested that such a system be provided to these hospitals.
- A new monthly educational programme could be provided to manage the medical staff who are attending the classes. Monthly schedules for medical staff can be posted so that each staff member can plan to attend the classes they want to attend, but could not previously.

11.7 Recommendations

The following are the suggested recommendations from this research:

- Apply the developed knowledge management framework in the diabetes clinics of the seven selected hospitals in Jordan.

The implementation and the use of the produced framework in the diabetes clinics could assist in reducing the information overload that affects these clinics.

- Apply the developed knowledge management framework in other types of clinics in Jordan.

The implementation and the use of the framework in other clinic types in Jordan could assist in identifying more issues that could be solved based on the proposed knowledge management framework.

- Apply the developed knowledge management framework in other countries.

The implementation and the use of the framework in other countries could expand the scope to many other issues encountered in hospitals abroad. The broader the research is, the more issues are likely to emerge. Consequently, solving these issues would require modifications to the knowledge management framework proposed here.

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Appendices

Appendix (A): Questionnaires

Questionnaires and Interview Outline Classifications

A Novel Knowledge Management Framework for Managing Information Overload in the Diabetes Clinics of the Hospitals in Jordan

Dear Respondent,

The survey is divided up into two main appendices, which are mainly: the questionnaires and the interview.

APPENDIX A: QUESTIONNAIRES

- The questionnaires appendix (APPENDIX A) is divided up into nine sections as follows:

SECTION A: THE DEMOGRAPHIC INFORMATION
SECTION B: THE RESOURCES FACTOR (EXPERTISE FACTOR)
SECTION C: THE RESOURCES FACTOR (DATA FACTOR)
SECTION D: THE RESOURCES FACTOR (INFORMATION FACTOR)
SECTION E: THE IMPROVED WORK ABILITY PLANNING FACTOR
SECTION F: THE DIABETES CLINICS' IMPROVED EFFICIENCY FACTOR
SECTION G: THE IMPROVED KNOWLEDGE CONVERSION (EXTERNALISATION) AND SHARING FACTOR
SECTION H: THE IMPROVED ORGANISATION'S PROCESS FACTOR
SECTION I: THE IMPROVED ORGANISATION'S PROTECTION FACTOR

- SECTION A contains 12 multiple choice questions that are related to your demographic information.

- Each section (SECTION B – SECTION I) contains five multiple choice questions that are related to your opinions of the information and knowledge features being processed at your diabetes clinic of the hospital.

APPENDIX B: INTERVIEW

- The interview appendix contains open-ended questions of six questions that can be answered based on your own points of views.

Thank you

APPENDIX A (Questionnaires)

A Novel Knowledge Management Framework for Managing Information Overload in the Diabetes Clinics of the Hospitals in Jordan

Dear Respondent,

I am a post-graduate (PhD) student of computing in the field of Information Technology at School of Computing, Staffordshire University, United Kingdom. I am conducting an academic PhD thesis titled "A novel knowledge management framework for managing information overload in the diabetes clinics of the hospitals in Jordan". In fact, it is important to draw your attention that all provided information will be strictly used for academic purposes only and is kept anonymous. The hospitals will be assured that the full University ethics procedure will be followed in the research, that no patients or confidential patient records will be involved and that the normal guidelines on informed consent and anonymity will be followed, along with the usual University Code of Practice, as follows: http://www.staffs.ac.uk/research/ethics/index.jsp.

Thank you.

SECTION A **DEMOGRAPHIC INFORMATION**
1. Please state your nationality: o Jordanian o Others: Please specify ....
2. Please state your gender: o Male o Female
3. Please mark your age group: o 18 - 25 o 26 - 33 o 34 - 41 o 42 and over
4. Please select your education level: o Diploma o Bachelors o Masters o PhD o Other: Please specify ....

5. Please select your work experience:

- Less than 6 months
- 6 months - 1 year
- 1 - 3 years
- 3 - 5 years
- More than 5 years

6. Please determine your job category:

- Medical Administrator
- Doctor
- Nurse

(If your selected job category was 'Medical Administrator', then please go to Question 7 and continue from Question 10)

(If your selected job category was 'Doctor', then please go to Question 8 and continue from Question 10)

(If your selected job category was 'Nurse', then please go to Question 9 and continue from Question 10)

7. Which of the following types of work you are taking part in most frequently and most of your time?

- Assign schedules and tasks
- Consult with department heads and medical staff on their administrative needs
- Handle finances
- Hire, train and monitor clerks and secretaries
- Manage subordinate administrative staff
- Observing, recording and sharing the new obtained medical knowledge whenever possible
- Represent their organisations at investor meetings or governing boards
- Take care of repairing and maintaining their physical facilities

8. Which of the following types of work you are taking part in most frequently and most of your time:

- Admitting patients requiring special care followed by investigations and treatment
- Attending new medical conferences whenever possible
- Carrying out specific procedures, e.g. performing operations and specialist investigations

- Examining and talking to patients to diagnose their medical conditions
- Liaising with other medical and non-medical staff in the hospital to ensure quality treatment
- Making notes and preparing paperwork, both as legal record of treatment and for the benefit of other healthcare professionals
- Monitoring and treating patients with severe cases in the hospitals
- Observing, recording, and sharing the newly obtained medical knowledge whenever possible
- Promoting health education
- Teaching junior doctors and medical students, as well as auditing and research
- Undertaking managerial responsibilities, such as planning the workload and staffing of the department, especially at more senior levels
- Working with other doctors as part of a team, either in the same department or within other specialists

9. Which of the following types of work you are taking part in most frequently and most of your time?

- Administering medications, wound care, and other numerous personalised interventions
- Advising patients on how to self-administer medication and physical therapy
- Communicating with doctors
- Conducting research in support of improved practice and patient outcomes
- Observing and recording patients' symptoms
- Observing, recording, and sharing the newly obtained medical knowledge whenever possible
- Performing physical exams and health histories
- Providing education to patients and public on disease management, nutritional plans and medical conditions
- Providing emotional support to patients and their families

10. Please select the type of information you are using the most in your clinic of the hospital:

- Financial information (e.g. patient billing information)
- Laboratory information
- Medical information
- Nursing information
- Pharmacy information (e.g. pharmacy ordering information)

Registration information (e.g. admission and discharge information)

11. Daily computer using hours:

- Less than 2 hours
- 2–6 hours
- 6–10 hours
- 10–14 hours
- More than 14 hours

12. How would you rate the following diabetes information quality in terms of:

- Authority/Verifiability …….%......
- Scope of coverage …….%......
- Composition and Organisation…….%......
- Objectivity…….%......
- Integrity…….%......
- Comprehensiveness…….%..
- Validity …….%......
- Uniqueness …….%......
- Timeliness…….%......
- Reproducibility…….%......

SECTION B

THE RESOURCES FACTOR (THE EXPERTISE FACTOR)

How will you rate the following criteria?

1. Patients' charts are updated according to any new knowledge received from your daily medical meeting discussions:

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

2. During each meeting discussion in your hospital's diabetes clinic, clinical experiences are observed and recorded:

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

3. Lessons about newly obtained medical knowledge are learnt properly from clinical experts after each meeting discussion:

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

4. The clinical experts of your clinic provide you with new medical knowledge via clinical workflows to support decision making based on the knowledge:

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

5. The clinical experts of your clinic provide the best external evidence available in diabetes research:

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

SECTION C

THE RESOURCES FACTOR (THE DATA FACTOR)

How will you rate the following criteria?

1. In your hospital's diabetes clinic, the results of the data that are derived from diagnostic tests, clinical observations, and therapeutic treatments are regularly recorded in medical records:

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

2. The information from the medical data is stored in knowledge bases:

- Strongly agree
- Agree

- Neutral
- Disagree
- Strongly disagree

3. Your hospital's diabetes clinic faces a growing amount of unstructured and unorganised data:

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

4. As data is continuously acquired from different medical sources, it is presented in a structured format to aid in decision making:

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

5. Decision making is aided by structured data, and afterwards information is organised and shared properly:

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

SECTION D

THE RESOURCES FACTOR (THE INFORMATION FACTOR)

How will you rate the following criteria?

1. Your hospital's diabetes clinic follows the new information and knowledge flows within the hospital properly (i.e. the information flows from one source to another):

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

2. The information is codified (reported) immediately when received and is shared fairly among your hospital's diabetes clinic in organised ways:

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

3. When making decisions about diagnostic and treatment interventions at your clinic, you are always up to date on the medical resource information and the knowledge:

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

4. The right information is provided to the right people in the right place at the right time, and your clinic ensures a professional, cultured, and receptive community when information or knowledge is shared:

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

5. The spreadsheet system of your clinic is unable to store a large amount of information:

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

SECTION E

THE IMPROVED WORK ABILITY PLANNING FACTOR

How will you rate the following criteria?

1. Your hospital's diabetes clinic improves time management and the organisation's overall working ability:

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

2. Your hospital's diabetes clinic is helpful in improving diagnosis and extra patients' timing appointments and ensures good relations with patients:

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

3. Your hospital's diabetes clinic has well-defined rules and regulations about medical services and process knowledge:

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

4. Your hospital's diabetes clinic facilitates working cooperation with other knowledgeable persons in your clinic:

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

5. Your hospital's diabetes clinic maps different types of medical knowledge so that knowledge can be retrieved easily:

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

SECTION F

THE DIABETES CLINICS' IMPROVED EFFICIENCY FACTOR

How will you rate the following criteria?

1. In the past few years, your hospital's diabetes clinic has enhanced its efficiency in pointing out the latest medical services trends:

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

2. In the past few years, your hospital's diabetes clinic has enhanced its efficiency in finding new opportunities for medical services:

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

3. In the past few years, your hospital's diabetes clinic has enhanced its efficiency in adopting quick medical knowledge changes:

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

4. In the past few years, your hospital's diabetes clinic has enhanced its efficiency in checking the results of new services:

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

5. In the past few years, your hospital's diabetes clinic has enhanced its efficiency in fulfilling its responsibilities towards patients' needs:

- Strongly agree

- Agree
- Neutral
- Disagree
- Strongly disagree

SECTION G

THE IMPROVED KNOWLEDGE CONVERSION (EXTERNALISATION) AND SHARING FACTOR

How will you rate the following criteria?

1. In your hospital's diabetes clinic, departments are structured to share more and more knowledge by involving respondents in group discussions rather than in individual discussions:

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

2. In your hospital's diabetes clinic, medical processes are facilitated by knowledge exchange, and there are no limitations for knowledge creation:

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

3. In your hospital's diabetes clinic, medical staff's efforts to gain more knowledge are facilitated with materials:

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

4. In your hospital's diabetes clinic, staff are encouraged to acquire, share, and discuss knowledge with each other when others need their assistance:

- Strongly agree
- Agree
- Neutral

- Disagree
- Strongly disagree

5. In your hospital's diabetes clinic, the higher-level staff place importance on newly created knowledge, so the value of sharing knowledge exceeds its cost:

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

SECTION H

THE IMPROVED ORGANISATION'S PROCESS FACTOR

How will you rate the following criteria?

1. Your hospital's diabetes clinic has a process to facilitate gathering knowledge about patients' symptoms and checking the results of tested treatments for improvements:

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

2. Your hospital's diabetes clinic has a process to facilitate staff's efforts to devote themselves to delivering the best services possible:

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

3. Your hospital's diabetes clinic has a process for acquiring new knowledge's sources and types, for replacing old knowledge with newly created knowledge, for structuring and updating knowledge for medical services, and for sharing knowledge among the medical staff:

- Strongly agree
- Agree
- Neutral
- Disagree

- Strongly disagree

4. Your hospital's diabetes clinic has a process for quickly implementing new knowledge and taking into account the advantages of this implementation:

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

5. Your hospital's diabetes clinic has a process to facilitate providing new knowledge to the desired staff at the right time and for using new knowledge from better knowledge sources to solve newly encountered problems:

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

SECTION I

THE IMPROVED ORGANISATION'S PROTECTION FACTOR

How will you rate the following criteria?

1. Your hospital's diabetes clinic ensures knowledge security by avoiding unauthorised access within the clinic:

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

2. Your hospital's diabetes clinic ensures knowledge security by avoiding unauthorised access outside the clinic:

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

3. Your hospital's diabetes clinic provides knowledge access under some authentications:

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

4. Your hospital's diabetes clinic does not allow its staff to share the clinic's information with irrelevant persons:

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

5. Your hospital's diabetes clinic clarifies the knowledge protection rules in the clinic:

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

Appendix (B): Interview

1. What type of knowledge do you exchange when you carry out diabetes diagnosis?

2. How does your knowledge strategy assist you in improving your practice and patient dealing?

3. What type of current technologies you are using to manage your knowledge?

4. What suggestions can you mention to your diabetes clinic management of the hospital for the sake of reducing and overcoming the current information overload problem that is frequently affecting your clinic? Please explain.

5. Are you quite satisfied with the functionality of knowledge management system that is currently being used in your organisation? Why? How do you think it could be improved?

6. How do you think that time management can be improved to help being updated with the new knowledge and reduce the occurrence of the information overload that is affecting your clinic?

Thank you for your time

Appendix (C): Consent Letters from the Diabetes Clinics of the Seven Selected Hospitals in Jordan (Type 1)

IBN - AL HAYTHAM HOSPITAL

مستشفى ابن الهيثم

شركة مساهمة عامة

Date: 15/2/2014

Number: ihh/ ٤٠ل

To whom it may concern,

Dear Staffordshire University,

Herewith, we give permission to the student Mr. **Mohammed Azmi Qasem Al-Madi** with the Jordanian Passport No: K248990, to carry out surveys and interviews with hospital staff (i.e. managers, nursing staff and training staff) for the purposes of the research.

Sincerely yours

Medical Director

Dr. Zuhair Abu Faris

IBN AL HAYTHAM HOSPITAL

مستشفى ابن الهيثم

Tel: +962/6/5205555
Fax: +962/6/5516823
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Amman 11194 Jordan
E-mail: info@ihh.com.jo
Web site: www.ibn-alhaytham-hospital.com

مستشفى الاســراء
ESSRA HOSPITAL
كافة التخصصات الطبية

JCI Accredited حاصل على شهادة الاعتماد الدولي لجودة الخدمات الصحية

نتميز برعايتكم

To Whom It May Concern

Dear Staffordshire University,

Herewith, we give permission to the student Mr. Mohammed Azmi Qasem Al-Madi with the Jordanian Passport No: K248990, to carry out surveys and interviews with hospital staff (i.e. Managers, Doctors, Nursing stuff and Training stuff) for the purposes of the research.

Sincerely yours

Medical Director

Dr. Adnan A. Al-Dmor

مستشفى الإسراء
Al-Essra Hospital

عمان، الأردن، شارع الملكة رانيا العبدالله، مقابل الجامعة الأردنية
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www.essrahospital.net, info@essrahospital.net
Al-Essra Hospital Al-Essra Hospital Official Page

ISTIKLAL HOSPITAL

Al-Bilad Medical Services Co.

مستشفى الإستقلال

شركة البلاد للخدمات الطبية م.ع.م

Date : 23/02/2014

مجلس إعتماد المؤسسات الصحية
HEALTH CARE ACCREDITATION COUNCIL

To Whom It May Concern

Dear Professor W.Alan Eardley

Herewith, we give permission to the student *Mr. Mohammed Azmi Qasem Al-Madi* with the Jordanian passport No : K248990, to carry out surveys and interviews with hospital staff (i.e. mangers, doctors, nursing stuff and training stuff) for the purpose of the research as long as the privacy of patients is not affected.

Sincerely Yours ,,

Dr. Nader Al-Khalili

Hospital Director

Tel. 5652600 - 5652300 - Fax 5652710
P.O.Box. 1493 Amman 11821 Jordan
e-mail: info@istiklalhospital.com
Web site :www.istiklalhospital.com

هاتف ٥٦٥٢٦٠٠ - ٥٦٥٢٣٠٠ - فاكس ٥٦٥٢٧١٠
ص . ب ١٤٩٣ عمان ١١٨٢١ الأردن
e-mail: info@istiklalhospital.com
Web site :www.istiklalhospital.com

THE ISLAMIC HOSPITAL
Amman - Jordan

Tel.: 5101010 Fax.:5661773
P.O.Box:925693 Amman 11190 Jordan
P.O.Box: 2414 Amman 11181 Jordan
www.islamic-hospital.org

بسم الله الرحمن الرحيم

المستشفى الإسلامي
عمان الأردن

تلفون : ٥١٠١٠١٠ - فاكس : ٥٦٦١٧٧٣
ص.ب : ٩٢٥٦٩٣ عمان ١١١٩٠ الأردن
ص.ب ٢٤١٤ عمان ١١١٨١ الأردن
e.mail:info@islamic-hospital.org

Ref :
Date:

الرقم : 845/2014/15
التاريخ: 2014/02/27
الموافق :

TO WHOM IT MAY CONCERN

Dear Staffordshire University

Regarding with **Mr. Mohammed Azmi Qasem Al-Madi** (Jordanian Passport No: K24990), we give permission to carry out survey and interviews with hospital staff for the purposes of research.

General Director

Dr. Ammar Abu Supoh

C.c:
General file
Head of Q&T Dep.

المستشفى الاستشاري
Istishari Hospital

Date: 23 March 2014

To Whom It May Concern

Dear Staffordshire University,

With regards to the student Mr. Mohammad Azmi Qasem Al-Madi with the Jordanian Passport No; K248990, we give him permission to conduct surveys and interviews with our hospital staff (i.e. administrators, nursing staff, doctors, and training staff) for the sake of his research (A novel Knowledge management framework for managing information overload in diabetes center in Hospital in the Hashemite kingdom of Jordan).

Best Regards,

Administrative Director

Maher Al Faouri

ماهر هاشم الفاعوري
المدير الإداري
2506
المستشفى الاستشاري
Istishari Hospital

هاتف +962 6 500 1000 | فاكس +962 6 569 8833 | صندوق بريد 840431 عمان 11184 الأردن | بريد الكتروني aig@istisharihospital.com
44 Al-Kindi Str. Wadi Saqra - Amman - Jordan | 44 شارع الكندي - وادي صقرة - عمان - الأردن
www.istisharihospital.com

مستشفى الأردن
JORDAN HOSPITAL

Date : March 18, 2014

To Whom It May Concern

Dear Staffordshire University ,

With regards to the student **Mr. Mohammad Azmi Qasem Al-Madi** with the Jordanian Passport No; K248990, we give him permission to conduct surveys and interviews with our hospital staff (i.e. administrators , nursing staff, doctors, and training staff) for the sake of his research (A novel Knowledge management framework for managing information overload in diabetes centers in Hospitals in the Hashemite Kingdom of Jordan).

Best Regards,

Hospital Administrator

Eng. Ahmad Khattab .

JORDAN HOSPITAL
ADMINISTRATION

شارع الملكة نور هاتف: ٥٦٠٨٠٨٠ - ٥٦٠٨٠٣٠ - فاكسميلي: ٥٦٠٧٥٧٥ ص.ب ٥٢٠٢٤٨ عمان - الأردن
Queen Nour Street Tel. 5608080 - 5608030 - Fax. 5607575 P.O.Box 520248 Amman - Jordan
E-mail : jorhos@jordan-hospital.com - www.jordan-hospital.com

المستشفى التخصصي
THE SPECIALTY HOSPITAL

Date : 1/3/2014
Ref. : 5/1/T/74971

From : Institutional Review Board IRB
To : Mr. Mohammed Azmi Al-Madi

Subject: Your request to conduct a research at the specialty hospital with the below title :

Anovel knowledge management framework for managing information overload in diabetes Centers in hospitals in the Hashemite Kingdom of Jordan

Greetings ,,,

As per your submission letter to conduct the above mentioned according to the submitted protocol study and after discussing its contents during the last IRB meeting on 27/2/2014.

We are pleased to inform you that the Specialty Hospital Institutional Review Board will support this research by granting access to the relevant staff and we approved to conduct the above mentioned research and as per the attached protocol under the following conditions:

1. To sign a Confidentiality Agreement.
2. To send progress reports on regular basis and in due course.
3. To write a pledge to send a copy of the study results to the committee.
4. Not to publish this study in the scientific lodges before returning to the Specialty Hospital.

Wishing you success with your efforts

Chairman of the IRB Committee

Dr. Fawzi Al-Hammouri

المستشفى التخصصي
THE SPECIALTY HOSPITAL

عمان - الأردن - هاتف ٥٠٠١١١١ ٦ ٩٦٢+ - فاكس ٥٦٩٧٤٢٥ ٦ ٩٦٢+ - ص.ب ٩٣٠١٨٦ عمان ١١١٩٢
Amman - Jordan - Tel. +962 6 5001111 - Fax. +962 6 5697425 - P.O.Box 930186 Amman 11193
E-mail : info@specialty-hospital.com - Website : specialty-hospital.com

Appendix (D): Consent Letters from the Diabetes Clinics of the Seven Selected Hospitals in Jordan (Type 2)

IBN - AL HAYTHAM HOSPITAL

مستشفى ابن الهيثم

شركة مساهمة عامة

Date:22\5\2014

No/Ihh: ١٢٤٧

To Whom It May Concern

Dear Staffordshire University,

This is to certify that Mr. Mohammad Azmi Qasem Al-Madi has conducted a survey (using questionnaires and interviews) with administrators, doctors and nursing staff in the diabetes clinics in our hospital for the purpose of conducting his primary research analysis that is related to his PhD research project entitled "A novel knowledge management framework for managing information overload in the diabetes centres in hospitals in the Hashemite Kingdom of Jordan". Accordingly, this letter was issued upon his request.

Medical Director

Dr. Zuhair Abu Fares

Tel: +962/6/5205555
Fax: +962/6/5516823
P.O Box: 940614
Amman 11194 Jordan
E-mail: info@ihh.com.jo
Web site: www.ibn-alhaytham-hospital.com

مستشفى الاسـراء
AL-ESSRA HOSPITAL
كافة التخصصات الطبية

للتميز برعايتكم | حاصل على شهادة الإعتماد الدولي لجودة الخدمات الصحية | JCI Accredited

To Whom It May Concern

Dear Staffordshire University,

This is to certify that Mr. Mohammad Azmi Qasem Al-Madi has conducted a survey (using questionnaires and interviews) with administrators , doctors and nursing staff in the diabetes department of our hospital for the purpose of conducting his primary research analysis that is related to his phD research project entitled "A novel knowledge management framework for managing information overload ". This letter was issued upon his request .

مستشفى الإسراء
Al-Essra Hospital

Medical Director

Dr. Adnan A. Al-Dmor

عمان، الأردن، شارع الملكة رانيا العبدالله، مقابل الجامعة الأردنية
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www.essrahospital.net, info@essrahospital.net
Al-Essra Hospital | Al-Essra Hospital Official Page

Istiklal Hospital مستشفى الاستقلال

Albelad Medical Services Co. شركة البلاد للخدمات الطبية م.ع.م

Date: 16/07/2014

Dear Staffordshire University,

To Whom it May Concern

This is to certify that the PhD researcher Mohammad Azmi Qasem Al-Madi has conducted a survey (using questionnaires and interviews) with administrators, doctors, and nursing staff in the diabetes clinics in our hospital for the purpose of conducting his primary research analysis that is related to his PhD research project entitled "A novel knowledge management framework for managing information overload in the diabetes centres in hospitals in the Hashemite Kingdom of Jordan". Accordingly, this letter was issued upon his request.

Hospital Director

Dr. Osama Atari

HCAC
مجلس إعتماد المؤسسات الصحية
HEALTH CARE ACCREDITATION COUNCIL
2007 - 2009

2011- 2014

عمان - تقاطع شارع الاستقلال مع شارع الاردن (خلف وزارة الداخلية)

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بسم الله الرحمن الرحيم

THE ISLAMIC HOSPITAL

Amman - Jordan

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P.O.Box: 2414 Amman 11181 Jordan

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المستشفى الإسلامي

عمان - الأردن

تلفون : ٥١٠١٠١٠ - فاكس : ٥٦٦١٧٧٣

ص.ب : ٩٢٥٦٩٣ عمان ١١١٩٠ الأردن

ص.ب ٢٤١٤ عمان ١١١٨١ الأردن

e.mail:info@islamic-hospital.org

Ref :

Date: 1/9/2014

الرقم :

التاريخ:

الموافق :

Dear Staffordshire University,

To Whom it May Concern

This is to certify that the PhD researcher Mohammad Azmi Qasem Al- Madi has conducted a survey (using questionnaires and interviews) with administrators, doctors, and nursing staff in the diabetes clinics in our hospital for the purpose of conducting his primary research analysis that is related to his PhD research project entitled " A novel knowledge management framework for managing information overload in the diabetes centers in hospitals in the Hashemite Kingdom of Jordan" .

Accordingly , this letter was upon his request.

Head of Quality & Training Dep.

Mr. Iyad Odeh

S043D

المستشفى الاستشاري
Istishari Hospital

Date: 31/5/2014

To Whom It May Concern

Dear Staffordshire University,

This is to certify that **Mr. Mohammad Azmi Qasem Al-Madi** has conducted a survey (using questionnaires and interviews) with administrators, doctors and nursing staff in the diabetes clinics in our hospital for the purpose of conducting his primary research analysis that is related to his PhD research project entitled "a novel knowledge management framework for managing information overload in the diabetes centers in hospitals in the Hashemite Kingdom of Jordan".

According, this letter was issued upon his request.

Administrative Director

Maher Al Faouri

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44 Al-Kindi Str. Wadi Saqra - Amman - Jordan
www.istisharihospital.com

مستشفى الأردن
JORDAN HOSPITAL

Date: June.2nd, 2014

To Whom It May Concern

Dear Staffordshire University,

This is to certify that **Mr. Mohammad Azmi Qasem Al-Madi** has conducted a survey-using questionnaires and interviews with administrators, physicians and nursing staff dealing with diabetic patients at our hospital for the purpose of conducting his primary research analysis that is related to his PhD research project entitled:
"A novel knowledge management framework for managing information overload in the diabetes centers in hospitals in the Hashemite Kingdom of Jordan"

Accordingly, this letter was issued upon his request

Hospital Administrator
Eng. Ahmad Khattab

JORDAN HOSPITAL ADMINISTRATION

Page 1 of 1

شارع الملكة نور هاتف: ٥٦٠٨٠٨٠ – ٥٦٠٨٠٣٠ – فاكسميلي: ٥٦٠٧٥٧٥ ص.ب ٥٢٠٢٤٨ عمان – الأردن
Queen Nour Street Tel. 5608080 - 5608030 - Fax. 5607575 P.O.Box 520248 Amman - Jordan
E-mail : jorhos@jordan-hospital.com

المستشفى التخصصي
THE SPECIALTY HOSPITAL

Date : July 7th, 2014
Ref. : 5/1/T/76769

To whom it may concern

Dear Staffordshire University ,

This is to certify that **Mr. Mohammad Azmi Qasem Al-Madi** has conducted a survey (using questionnaires and interviews) with administrators, doctors and nursing staff providing care for diabetic patients in our hospital .

Accordingly, this letter was issued upon his request.

General Manager

Dr. Fawzi Al-Hammouri

المستشفى التخصصي
THE SPECIALTY HOSPITAL
المدير العام
GENERAL MANAGER

عمان - الأردن - هاتف ٥٠٠١١١١ ٦ ٩٦٢+ - فاكس ٥٦٩٧٤٢٥ ٦ ٩٦٢+ - ص.ب ٩٣٠١٨٦ عمان ١١١٩٣
Amman - Jordan - Tel. +962 6 5001111 - Fax. +962 6 5697425 - P.O.Box 930186 Amman 11193
E-mail : info@specialty-hospital.com - Website : specialty-hospital.com

Appendix (E): Consent Letters from the Diabetes Clinics of the Seven Selected hospitals in Jordan (Type 3)

IBN AL HAYTHAM HOSPITAL

مستشفى ابن الهيثم

شركة مساهمة عامة

Date:21\6\2015

No/Ihh: 1247 .

To Whom It May Concern

Dear Staffordshire University,

This is to certify that Mr. Mohammad Azmi Qasem Al-Madi has carried out a research validation process for the produced PhD framework with the assistance of a subsest of the administrators, doctors and nursing staff in the diabetes clinics in our hospital for the purpose of assessing the potential usefulness of the proposed framework that is related to his PhD research project entitled "A novel knowledge management framework for managing information overload in the diabetes centres in hospitals in the Hashemite Kingdom of Jordan". Accordingly, this letter was issued upon his request.

Medical Director

Dr. Zuhair Abu Fares

IBN AL HAYTHAM HOSPITAL

مستشفى ابن الهيثم

Tel: +962/6/5205555
Fax: +962/6/5516823
P.O Box 940614
Amman 11194 Jordan
E-mail: info@ihh.com.jo
Web site: www.ibn-alhaytham-hospital.com

مستشفى الاسـراء
AL-ESSRA HOSPITAL
كافة التخصصات الطبية
JCI Accredited

Date : 1/7/2015

To Whom It May Concern

Dear Staffordshire University,

This is to certify that Mr. Mohammad Azmi Qasem Al-Madi has conducted out a research validation process for the produced PhD framework with the assistance of a subsest of the administrators, doctors and nursing staff in the diabetes clinics in our hospital for the purpose of assessing the potential usefulness of the proposed framework that is related to his PhD research project entitled "A novel knowledge management framework for managing information overload in the diabetes centres in hospital in the Hashemite Kingdom of Jordan". Accordingly, this letter was issued upon his request .

Medical Director

مستشفى الإسراء
المدير الطبي

Dr. Adnan A. Al-Dmor

مستشفى الإسراء
E-3
Al-Essra Hospital

عمان، الأردن، شارع الملكة رانيا العبدالله، مقابل الجامعة الأردنية
Amman, Jordan, Queen Rania St., Opposite of Jordan university
T: +962 6 530 0300, F: +962 6 534 7888, P.O.Box: 1817 Amman, 11941 Jordan
www.essrahospital.net, info@essrahospital.net
Al-Essra Hospital Al-Essra Hospital Official Page

ISTIKLAL HOSPITAL
Al-Bilad Medical Services Co.

مستشفى الإستقلال
شركة البلاد للخدمات الطبية م.ع.م

Date: 24/8/2015

Num: 961 /I.H/4/5

To whom it may concerns

Dear Staffordshire University

This is to certify that Mr. Mohammad Azmi Qasem Al Madi has performed a research validation process for the produced PhD framework with assistance of administrators, doctors, nurses in our hospital for the purpose of assessing the potential usefulness of the proposed framework that id related to his PhD research project entitled " A novel knowledge management framework for managing information overload in the diabetes centers in the hospitals in the Hashemite Kingdome of Jordan ".

This certificate was issued upon his own request

General Manger

Dr. Osama Atari

Copy:

HR
Education Dept.

652600 - 5652300 - Fax 5652710
1493 Amman 11821 Jordan
info@istiklalhospital.com
www.istiklalhospital.com

هاتف ٥٦٥٢٦٠٠ - ٥٦٥٢٣٠٠ - فاكس ٥٦٥٢٧١٠
ص. ب ١٤٩٣ عمان ١١٨٢١ الأردن
e-mail: info@istiklalhospital.com
Web site :www.istiklalhospital.com

THE ISLAMIC HOSPITAL
Amman - Jordan

Tel.:5101010 Fax.:5661773
P.O.Box:925693 Amman 11190 Jordan
P.O.Box: 2414 Amman 11181 Jordan
www.islamic - hospital.org

بسم الله الرحمن الرحيم

المستشفى الإسلامي
عمان - الأردن

تلفون : ٥١٠١٠١٠ - فاكس : ٥٦٦١٧٧٣
ص.ب : ٩٢٥٦٩٣ عمان ١١١٩٠ الأردن
ص.ب ٢٤١٤ عمان ١١١٨١ الأردن
e.mail:info@islamic-hospital.org

Ref : ....

Date : ....

الرقم : ....

التاريخ : 2877 / 2015/149

الموافق : 2015/08/01

TO WHOM IT MAY CONCERN

Dear Staffordshire University

This is to certify that Mr. Mohammad azmi Qasem Al-madi has carried out a research validation process for the produced PhD Framework with the assistance of asubsest of the administrators, doctors and nursing staff in the diabetes clinics in our hospital for the purpose of assessing the potential usefulness of the proposed framework that is related to his PhD researsh project entitled "A novel knowledge management framework for managing information overload in the diabetes centres in hospital in the Hashemite Kingdom of Jordan".
Accordingly, this letter was issued upon his request.

ISLAMIC HOSPITAL
AMMAN

General Director

Dr. Ammar Abu Supoh

C.c:
General file
Head of Q&T Dep.

المستشفى الاستشاري
Istishari Hospital

Date: August 17 , 2015

To Whom It May Concern

Dear Staffordshire University,

This is to certify that Mr.Mohammad Azmi Qasem Al-Madi has performed a research validation process for the produced PhD framework with the assistance of a subset of the administrators, doctors and nursing staff in the diabetes clinics in our hospital for the purpose of assessing the potential usefulness of the proposed framework that is related to his PhD research project entitled " A novel knowledge management framework for managing information overload in the diabetes centers in hospitals in the Hashemite kingdom of Jordan ". Accordingly, this letter was issued upon his request.

Best Regards,

Administrative Director

Maher Al Faouri

ماهر هاشم الفاعوري
المدير الإداري
2506
المستشفى الاستشاري
Istishari Hospital

info@istisharihospital.com 840431 Amman 11184 Jordan عمان ١١١٨٤ الاردن ٨٤٠٤٣١ +962 6 569 8833 +962 6 500 1000
44 Al-Kindi Str - Wadi Saqra - Amman - Jordan ٤٤ شارع الكندي - وادي صقرة - عمان - الأردن
www.istisharihospital.com

مستشفى الأردن
JORDAN HOSPITAL

Date : August 10, 2015

To Whom It May Concern

Dear Staffordshire University ,

This is to certify that **Mr. Mohammad Azmi Qasem Al-Madi** has carried out a research validation process for the produced PhD framework with the assistance of a subset of the administrators, doctors and nursing staff in the diabetes clinics our hospital for the purpose of assessing the potential usefulness of the proposed framework that is related to his PhD research project entitled "A novel knowledge management framework for managing information overload in the diabetes centers in hospitals in the Hashemite Kingdom of Jordan " . Accordingly, this letter was issued upon this request.

Best Regards,

Hospital Administrator

Eng. Ahmad Khattab .

JORDAN HOSPITAL ADMINISTRATION

شارع الملكة نور هاتف: ٥٦٠٨٠٨٠ - ٥٦٠٨٠٣٠ - فاكسميلي: ٥٦٠٧٥٧٥ ص.ب ٥٢٠٢٤٨ عمان - الأردن
Queen Nour Street Tel. 5608080 - 5608030 - Fax. 5607575 P.O.Box 520248 Amman - Jordan
E-mail : jorhos@jordan-hospital.com - www.jordan-hospital.com

المستشفى التخصصي

THE SPECIALTY HOSPITAL

Date: 25/6/2015

Number: 5/1/T/81103

From: Institutional Review Board IRB

To: Staffordshire university

Greetings,

This is to certify that **Mr. Mohammad Azmi Qasem Al-Madi** has carried out a research validation process for the produced PhD framework with the assistance of a subset of the diabetes clinics in our hospital for the purpose of assessing the potential usefulness of the framework, which is related to his PhD research project entitled " A novel Knowledge management framework for managing information overload in the diabetes clinics in hospitals in the Hashemite Kingdom of Jordan" .

Accordingly, this letter was issued upon his request .

Chairman of the IRB

Dr. Fawzi Al Hammouri

المستشفى التخصصي

THE SPECIALTY HOSPITAL

عمان - الأردن - هاتف ٥٠٠١١١١ ٦ ٩٦٢+ - فاكس ٥٦٩٧٤٢٥ ٦ ٩٦٢+ - ص.ب ٩٣٠١٨٦ عمان ١١١٩٣

Amman - Jordan - Tel. +962 6 5001111 - Fax. +962 6 5697425 - P.O.Box 930186 Amman 11193

E-mail : info@specialty-hospital.com - Website : specialty-hospital.com

Appendix (F): Consent Form

STAFFORDSHIRE UNIVERSITY

CONSENT FORM

PROJECT TITLE: A novel knowledge management framework for managing information overload in the diabetes centres in hospitals in the Hashemite Kingdom of Jordan.

NAME: .... **DATE:** ....

HOSPITAL NAME: ....

- Has the purpose of the research been explained to you? **Yes/No**
- Have you been given an information sheet about the research? **Yes/No**
- Have you been given the opportunity to ask questions about the project? **Yes/No**
- Do you understand that you are free to leave at any time without giving an explanation? **Yes/No**
- Do you understand that you have the right to ask for the recorder to be switched off at any point, and that you do not have to answer anything you do not wish to? **Yes/No**
- Do you understand that your participation in the survey is voluntary and your response will be strictly kept anonymous? **Yes/No**
- Do you understand that the research I am carrying out will not publish any resulting material that identifies organizations or individuals without obtaining their consents? **Yes/No**
- Sessions will be recorded for the purposes of the researcher alone, this will ensure the research will be able to listen more attentively to the feedback and not concentrate on writing notes. This information will be retained till the dissertation is complete.
- Access to recordings will be limited to the researcher involved in the project and will not be included in full in the final written record of the research. Quotations may be used in presentations or related documentation, but participants in the research will not be identified by name at any time.

I confirm that this information has been provided prior to the research interview. I agree to take part in this research project.

Signed ....

Date 7th March 2014

Researcher: MOHAMMAD AZMI QASEM AL-MADI

Appendix (G): Information Sheet for the Survey Process

STAFFORDSHIRE UNIVERSITY

Faculty of Computing, Engineering and Sciences

Staffordshire University
Beaconside
Stafford ST18 0AD
United Kingdom

+44 (0) 1782 294000 (enquiries)
+44 (0) 1785 353403 (direct)
generalenquiries@staffs.ac.uk
www.staffs.ac.uk

3rd February 2014

To whom it may concern,

Statement on behalf of MPhil/PhD student - Mohammed Azmi Qasem Al-Madi
Jordanian Passport No: K248990 ATAS Reference No: NPG289/112182/2013
Staffordshire University Reference No: 9000068760

Mohammed Azmi Qasem Al-Madi is studying for the degree of MPhil/PhD in the Faculty of Computing, Engineering and Sciences at Staffordshire University in the United Kingdom. His research is provisionally entitled: 'A novel knowledge management framework for managing information overload in diabetes centres in hospitals in the Hashemite Kingdom of Jordan'. I am his Principal Supervisor and his provisional second supervisor is Dr. Justin Champion.

The project will involve secondary research (i.e. a literature search) into the domains of knowledge management, information overload and diabetes care. A primary research analysis will be carried out into the information requirements and provision of diabetes care in specialist Diabetes Centres in Jordan. The issue of reducing information overload while getting 'the right information to the right people in the right place at the right time' will be central to the research. Based on the findings of these modes of research a novel framework will be proposed and validated with the assistance of experts in the field. The research will be disseminated at conferences and in journals.

The hospitals will be assured that the full University ethics procedure will be followed in the research, that no patients or confidential patient records will be involved and that the normal guidelines on informed consent and anonymity will be followed, along with the usual University Code of Practice, as follows: http://www.staffs.ac.uk/research/ethics/index.jsp.

Mohammad's research plan will involve him in carrying out a survey (using questionnaires and interviews) with administrators, nursing staff and doctors in Diabetes Centres. He will need to do this at the research stage (to establish existing practices and requirements) and at the validation stage (to assess the potential usefulness of the artefact that he will create).

As a condition of his research, Mohammad is therefore required by the University to produce a formal letter from the Diabetes Centres in hospitals in Jordan that are participating in the research giving him permission to carry out surveys and interviews with Hospital staff. The letter(s) should clearly indicate that the Diabetes Centre supports the research and is prepared to allow Mohammad access to the relevant staff (i.e. managers, nursing staff and training staff) for the purposes of the research. We would be obliged if you could provide such a letter authorising Mohammad's research to go ahead.

If I can be of further assistance, please do not hesitate to contact me.

WA Eardley

Professor W. Alan Eardley
Professor of Enterprise Computing
School of Computing
Faculty of Computing Engineering and Sciences
w.a.eardley@staffs.ac.uk
44 00 (0)1785 353456

CREATE THE **DIFFERENCE**

INVESTOR IN PEOPLE

Appendix (H): Information Sheet for the Framework Validation Process

STAFFORDSHIRE
UNIVERSITY

27th May 2015

To whom it may concern,

Statement on behalf of MPhil/PhD student - Mohammed Azmi Qasem Al-Madi
Jordanian Passport No: K248990 ATAS Reference No: NPG289/112182/2013
Staffordshire University Reference No: 9000068760

Mohammed Azmi Qasem Al-Madi is studying for the degree of MPhil/PhD in the Faculty of Computing, Engineering and Sciences at Staffordshire University in the United Kingdom. His research is provisionally entitled: 'A novel knowledge management framework for managing information overload in diabetes centres in hospitals in the Hashemite Kingdom of Jordan'. I am his Principal Supervisor and hisl second supervisor is Professor Tony Atkins.

A primary research analysis has been carried out into the information requirements for the provision of diabetes care in specialist Diabetes Centres in hospitals in Jordan. The issue of reducing information overload while getting 'the right information to the right people in the right place at the right time' is central to the research. Based on the findings of the research a novel knowledge management framework for reducing information overload has been produced, using experts in the field as participants in the requirements analysis process. This framework now needs to be validated with the assistance of a subset of the same experts.

Mohammad's research plan will therefore involve him in carrying out interviews with administrators, nursing staff and doctors in the Diabetes Centres previously used for data collection in order to assess the potential usefulness of the framework.

The hospitals will be assured that the full University ethics procedure will be followed in the research, that no patients or confidential patient records will be involved and that the normal guidelines on informed consent and anonymity will be followed, along with the usual University Code of Practice, as follows: http://www.staffs.ac.uk/research/ethics/index.jsp.

If I can be of further assistance, please do not hesitate to contact me.

Professor W. Alan Eardley
Professor of Enterprise Computing
School of Computing
Faculty of Computing Engineering and Sciences
w.a.eardley@staffs.ac.uk
44 00 (0)1785 353456

W A Eardley

CREATE THE **DIFFERENCE**