# CROSS DISCIPLINARY EVALUATION FRAMEWORK

# FOR E-HEALTH SERVICES

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**A thesis submitted for the degree of Doctor of Philosophy**

**By**

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# Abstract

E-health is an emerging field in the intersection of information systems, healthcare and business management, referring mainly to healthcare services delivered and enhanced through the use of information and communication technologies (ICT). In a broader sense, the term characterizes not only a technical development, but also a wider way of thinking, an attitude, and a commitment for a network to improve and connect provider, patients and governments. Such a network will be used to educate and inform healthcare professionals, managers and healthcare users; to stimulate innovation in care delivery and health system management; and to improve the healthcare system locally, regionally, and globally.

The evaluation of e-health services in both theory and practice has proved to be important and complex. E-health evaluation will help achieve better user services utilization, justify the enormous investments of governments on delivering e-health services, and address the aspects that are hampering healthcare services from embracing the full potential of ICT towards successful e-health initiatives. The complexity of evaluation is mostly due to the challenges faced at the intersection of three areas, each well-known for its complexity; healthcare services, information systems, and evaluation methodologies. However, despite the importance of the evaluation of e-health services, literature shows that e-health evaluation is still in its infancy in terms of development and management.

The aim of this research study is to develop, and assess a cross disciplinary evaluation framework for e-health services and to propose evaluation criteria for better user's utilization and satisfaction of e-health services. The evaluation framework is criteria based, while the criteria are determined by an evaluation matrix of three elements, the evaluation rationales, the evaluation timeframes, and the evaluation stakeholders. The evaluation criteria have to be multi-dimensional as well as grounded in, or derived from, one or more specific perspectives or theories. The framework is designed to deal effectively with the challenges of e-health evaluation and overcome the limitation of existing evaluation frameworks.

The cross disciplinary evaluation framework has been examined and validated by adopting an interpretive case study methodology. The chosen case study is NHS direct which is currently one of the largest e-health services in the world. The data collection process has been carried out by using three research methods; archival records, documentation analysis and semi-structured interviews. The use of multiple methods is essential to generate comparable data patterns and structures, and enhance the reliability of conclusions through data triangulation.

The contribution of the research study is in bridging the gap between the theory and practice in the evaluation of e-health services by providing an efficient evaluation framework that can be applied to a wide range of e-health application and able to answer real-world concerns. The study also offers three sets of well-argued and balanced hierarchies of evaluation criteria that influence user's utilization and satisfaction of e-health services. The evaluation criteria can be used to help achieve better user services utilization, to serve as part of e-health evaluation framework, and to address areas that require further attention in the development of future e-health initiatives.

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## Publications

Some of the materials of this research study has been either presented and/or published in the following forms:

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Alshawi, S. and **Alalwany, H.** (2009) E-government evaluation: Citizen's perspective in developing countries, Information Technology for Development, Vol. 15, No. 3, pp. 193 - 208, Wiley Periodicals, Inc

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# Chapter One

# Introduction

**Chapter Abstract**

The aim of this chapter is to offer an overview of this research study. The study is about the evaluation of e-health services, an important and evolving research field which is still immature in terms of development and management. The chapter is intended to define the scope of e-health as employed in this study, and outline the main benefits that can be achieved or enhanced and the limitations that can be avoided by an effective evaluation. Then, the chapter will address the growing need for e-health evaluation, and the value of an efficient evaluation framework, this is essential to justify the conducting of this research. Finally the chapter provides the main aim and objectives of the research study and how it has been structured.

**Chapter Contents**

## 1.1 Introduction

Globally, healthcare services are considered to be the biggest service industry, and they are taking top priority, receiving enormous investments, and are growing at a rapid pace in most countries (Connell and Young, 2007; Mitchell, 2000: Pan American Health Organization, 1999).

E-health, which is basically enabled and driven by the use of information and communication technologies in healthcare has the potential to change the healthcare industry worldwide in terms of its infrastructure, and the costs and quality of services (Wickramasinghe and Misra, 2004; Wickramasinghe and Goldberg, 2004). Despite the potential that e-health may bring to the healthcare sector, the sector is the slowest in moving to the form of e-health among other government services. Skinner (2003) argues that the slow progress is related to the fact that healthcare does not have the standards in place that other sectors do. Holliday and Tam (2004) have a broader explanation; they see that slow progress is more related to institutional, cultural and financial factors.

An important area of research is that of the evaluation of e-health services. It could contribute to important knowledge that can be used to support the value of existing e-health projects, and to increase the quality and efficiency of future e-health initiatives. Despite its importance, the evaluation of e-health services as many researchers agree, is both an under developed and under managed area in theory and practice (Brender, 2006; Friedman and Wyatt 2000).

E-Health evaluation involves many stakeholders, users being the most important to be considered (Gustafson & Wyatt, 2004; Pagliari, 2007; Scandurra *et al*, 2008). Therefore, assessing e-health from users' perspective should address the key factors that influence the users' acceptance to the new adopted technologies including the risks and benefits associated with the design and implementation of the e-health initiative in specific contexts.

This chapter provides a background for the research study and introduces the main concepts in the field of e-health evaluation. This will include the main benefits and limitations of the adoption of e-health innovations. To justify the conducting of the research study, the growing need for e-health evaluation will be discussed. Then, the chapter will proceed to present the main aim and objectives of the study which is intended to develop an efficient evaluation framework for e-health services that address and overcome the limitation of existing frameworks. The study also intended to investigate user's perspective in the evaluation of e-health services, and to identify the evaluation criteria that influence users' utilization and satisfaction of e-health services. At the end of this chapter, an overview of the structure of the thesis is provided

## 1.2 What is E-health?

E-health is a very broad term encompassing various activities in an evolving field. This is reflected in the various definitions of the term. One of the concise definitions for the term has been provided by Eng (2002), according to him e-health refers to ''the use of emerging information and communication technology, especially the Internet, to improve or enable health and health care''

The World Health Organization suggests a common definition of e-health; we regard this definition being the most suitable to be used for this study, as it highlights the particular role played by the information and communication technology in healthcare. According to the Organisation, E-health can be defined as 'being the leveraging of the information and communication technology to connect provider and patients and governments; to educate and inform healthcare professionals, managers and consumers; to stimulate innovation in care delivery and health system management; and, to improve our healthcare system' (Hans Oh et al. 2005).

The variety of e-health applications is considerable, ranging from a self-help guide about treating common health problems at home to a virtual clinic which allows diagnostic consultations between patients and practitioners at separate sites. In light of the dynamic and evolving meaning of e-health concept and the wide range of applications that the

term e-health has covered, the questions are what the term e-health means and what is the e-health application that should be considered. In this study although we employ e-health as a broad term, the scope will be limited to the service delivery aspect by electronic means of information, advice, and consultation.

### 1.3 The Role and Benefits of E-health

The challenges and issues facing the healthcare sector around the world are a lot, these challenges include the limited nature of available human and financial resources, the pressure on healthcare organizations to develop new and more efficient ways to provide healthcare, and the high demands from an increasing ageing population on healthcare services.

There is a widespread recognition within the health policy makers that these challenges and issues cannot be dealt with and solved by traditional healthcare delivery systems. E-health technologies have the potential to deal with many challenges of the healthcare and play a critical enabling role in any healthcare reform to improve the efficiency, safety and ultimately the sustainability of the healthcare systems.

Although the common role of e-health for many governments is to deliver cost effective, more efficient, and higher quality healthcare services, the particular role and associated benefits of e-health initiative may vary according to the priorities and objectives of these initiatives, these may include;

***E-health supports disease management:*** e-health has the capacity to better support disease management systems in many ways. E-health services are able to better cope with the changing nature of new diseases like swine flu. In the case of spread of such diseases, a capable disease management system is required, and new care model is needed, the e-health model here is able to facilitate the data collection to track and control the disease spread, and can support the patients to treat themselves at home and minimise the impact of the disease on the whole community. E-health services also have the potential to be more useful for patients with chronic diseases by giving them the

opportunity to learn how they can manage their conditions correctly. Since those who suffer from chronic diseases in developed countries make a high percentage of the total patients and take high percentage of healthcare cost, for example they take up to 70% of medical costs in the United States (Bringewatt, 1998)

***E-health empowers people to better manage their own health:*** e-health services provide patients the pre-requisites of empowerment, such as time, information and support, which they value and considered largely to be lacking in the traditional healthcare services. The empowerment movement can serve both governments and people agendas. For people, it will enhance patient choice by helping them to be in control of their health and health care interactions. For governments, it will support their efforts to deal with limited healthcare resources and manage demand for healthcare services more effectively by enabling people to look after themselves and their families in their own homes without recourse to primary or secondary care. (O'Cathain *et al*, 2005).

***E-Health supports a more accessible and consistent healthcare services:*** the use of e-health technologies can make healthcare services more accessible and convenient to patients, and provide consistent healthcare services to geographically disperse populations. The variable accessibility and the inconsistency of healthcare services have been acknowledged as a key challenge for many governments. For example the inconsistency in the delivery of health services across the United Kingdom has been heightened to unprecedented levels by health professionals and government ministers leading to the development of NHS direct as a strategic move to deal with this challenge (Silvestro and Silvestro, 2003).

***E-Health can improve the efficiency of healthcare systems:*** one of the main roles of e-health technologies is to enhance the efficiency of healthcare in many aspects. Eysenbach (2001), and Kaur & Gupta (2006) argue that the (e) in e-health does not only stand for electronic, but stands for a number of other (e's) which together characterize what e-health is all about. E also stands for efficiency in health care, enhanced quality of care, encouragement of a new relationship between the patients and healthcare providers,

and extension of the scope of health care beyond its conventional boundaries.

### 1.4 The Barriers and Limitations of E-health

Although e-health innovations have an important role and offer a lot of advantages to healthcare sector, there are many barriers and challenges in adopting e-health technologies that must be realized and understood to ensure an effective implementation of these technologies. The main barriers and challenges include;

***The high cost of e-health technologies***: One of the key barriers to the adoption of e-health innovations is their high initial and operating costs, and the uncertainty regarding whether such innovations are able to payback these costs. Because of their high costs, e-health innovations require a financial support and commitment, which is only affordable by governments and large health organizations. Anderson and Balas (2006) reported on the outcome of a survey to assess the level of information technology use by primary care physicians in the United States, that over 80% of them see that the lack of financial support to e-health applications as a major barrier to adoption.

***The complexity in the adoption of e-health applications:*** The implementation of e-health applications as well as the time and effort involved in learning to use them has been counted as one of the main barrier to the adoption of these innovations. The complexities are related to various reasons including that many e-health applications inherit the complexities of healthcare domain (Ingram *et al*., 2006), the users of e-health applications are lacking of the basic IT skills (Gareis, 2005), and e-health providers are unable to deliver efficient and acceptable e-health solutions that can be integrated into the whole healthcare systems (Anderson and Balas, 2006)

***Privacy and security concerns in e-health application:*** The second barrier to the adoption of e-health innovations is the privacy concerns, since many e-health applications are Web-based or use the wireless Internet for communications, e-health user's may fear that medical records may not be secure when transmitted or stored using the information and communication technologies (Rash, 2005). Privacy concerns are also related to the

lack of a comprehensive set of national privacy regulations and officers of data protection in many countries (Dash, 2005). For example, United States has confusing, and inconsistent regulations that deal with the protection of data. This may encourage the private data collection companies, that collect, analyze and sell consumer data to breach the privacy regulations. In the European countries, the picture is different as the private companies are severely restricted from collecting personal data without individual consent (Anderson, 2007).

## 1.5 The Growing Need for E-health Evaluation

The e-health industry is growing to considerable size, both its contents and position with respect to other industries in healthcare sector. The evaluation of e-health services in both theory and practice has proved to be important and complex. The importance of e-health evaluation is due to the enormous investments of governments on delivering e-health services, and to the considerable pace of growing in the e-health industry.

The cost of adopting e-health technologies in healthcare sector of developed countries has plummeted dramatically, generating enormous investment of governments in this sector. For example, Deloitte and Touche (2003) reveals that e-health technologies are the third largest industry in the European health sector with a turnover of €11 Billion, and the spending on e-Health technologies is expected to increase by a factor of five by 2010 (The European Commission-SIBIS, 2003). Similar evidence from United Kingdom and United States; United Kingdom government announced that they are planning to spend in excess of £6 Billion on IT systems in the National Health Service, through the National Programme for information technology, which is known as NHS Connecting for Health (Protti's, 2005). United States Congress agreed to allocate more than $20 Billion for health information technology (IT) as part of the Feb 2009 economic stimulus package (Kaplan *et al*, 2009).

Despite the evidence of the huge investment of governments in e-health services, the literature (Brender, 2006; Friedman and Wyatt 2000; Lofstedt, 2005) show that e-health evaluation is still in its infancy in terms of development and management. Such

evaluations are essential to ensure that the resources allocated to e-health initiatives are spent effectively, and they are delivering the expected promised benefits. The evaluation of e-health services is also contributed to the development of successful e-health initiatives by addressing areas that require further attention. This is quite important considering the high rate of failed IT projects in public sector where 35 percent of IT government projects have been classified as total failures, and 50 percent as partial failures (Heeks, 2003). Other authors (Wears and Berg, 2005; Heeks, 2006) have been also reported similar failure rates for IT projects in healthcare.

## 1.6 Research Motivations

As discussed in the previous section, the need for e-health evaluation is growing dramatically. Despite that, literature shows that the field of e-health evaluation is under developed (Brender, 2006; Friedman and Wyatt 2000: Rahimi and Vimarlund, 2007) and there is a gap between the theory and practice (Eng, 2002; Pagliari, 2007). Eng (2002) argues that this gap is a result of the tension between e-health research efforts in academic institutions and commercial organizations, and he calls for collaboration between the two sides to develop e-health evaluation methodologies that can answer real-world concerns and can be used for different situations.

As will be discussed in chapter two, much of existing evaluation frameworks that have been proposed or used in e-health context are proposed or used originally for information system evaluation. These frameworks are suffering from many limitations including:

- Many of existing frameworks are either designed to focus particularly on the supply side of the healthcare services (Gustafson and Wyatt, 2004) or they are designed to target a specific user or a specific application of an e-health initiative (Houston *et al.* 2003; Scott et al. 2005).
- Existing frameworks inherited the problems of their use in IS evaluation. Moreover, the use of these frameworks is becoming even more problematic in terms of applicability and validity while e-health innovations are shifting from institution-centred to regional and national health information systems (Haux, 2006).

- Existing frameworks do not have the characteristics that allow them to work effectively for e-health evaluation as the context of evaluation is complex and unique. One main missing characteristic is the consideration of the multi disciplinary aspects while the healthcare dimension is either ignored or not fully considered in the design and the implementation of these evaluation frameworks (Connell and Young, 2007).

Thus, the problem that this study seeks to address pertains to the evaluation of e-health services, and it can be summarized by the following statement:

> *In the debate on the questions of why the healthcare sector is the slowest in embracing ICT and how to exploit the opportunities of e-health services, evaluation is given a significant importance, but the field is still under-managed and under-developed in theory and practice. The limitations of existing evaluation approaches and their associated frameworks motivate the researcher to re-think these approaches and re-conceptualise the design of existing frameworks. In the centre of the new approach is the recognition of the challenges encountered at the intersection of three research fields, each well-known for its complexity: healthcare services, information systems, and evaluation methodologies. This is quite important, as the absence of a cross disciplinary evaluation framework will hamper the efforts of healthcare organisations to address the aspects that require further attention in the development of successful e-health initiatives.*

## 1.7 Research Aim and Objectives

E-health is an emerging field in the intersection of information systems, healthcare and business management, referring mainly to healthcare services delivered and enhanced through the Internet and related technologies. Despite that healthcare services are considered to be the biggest services and are growing at a rapid pace in most countries, they are lagging behind in embracing information communication technologies and moving to the form of e-health services.

*The main aims of this research are to develop, and assess a cross disciplinary evaluation framework for e-health services and to propose evaluation criteria for better user's utilization and satisfaction of e-health services*.

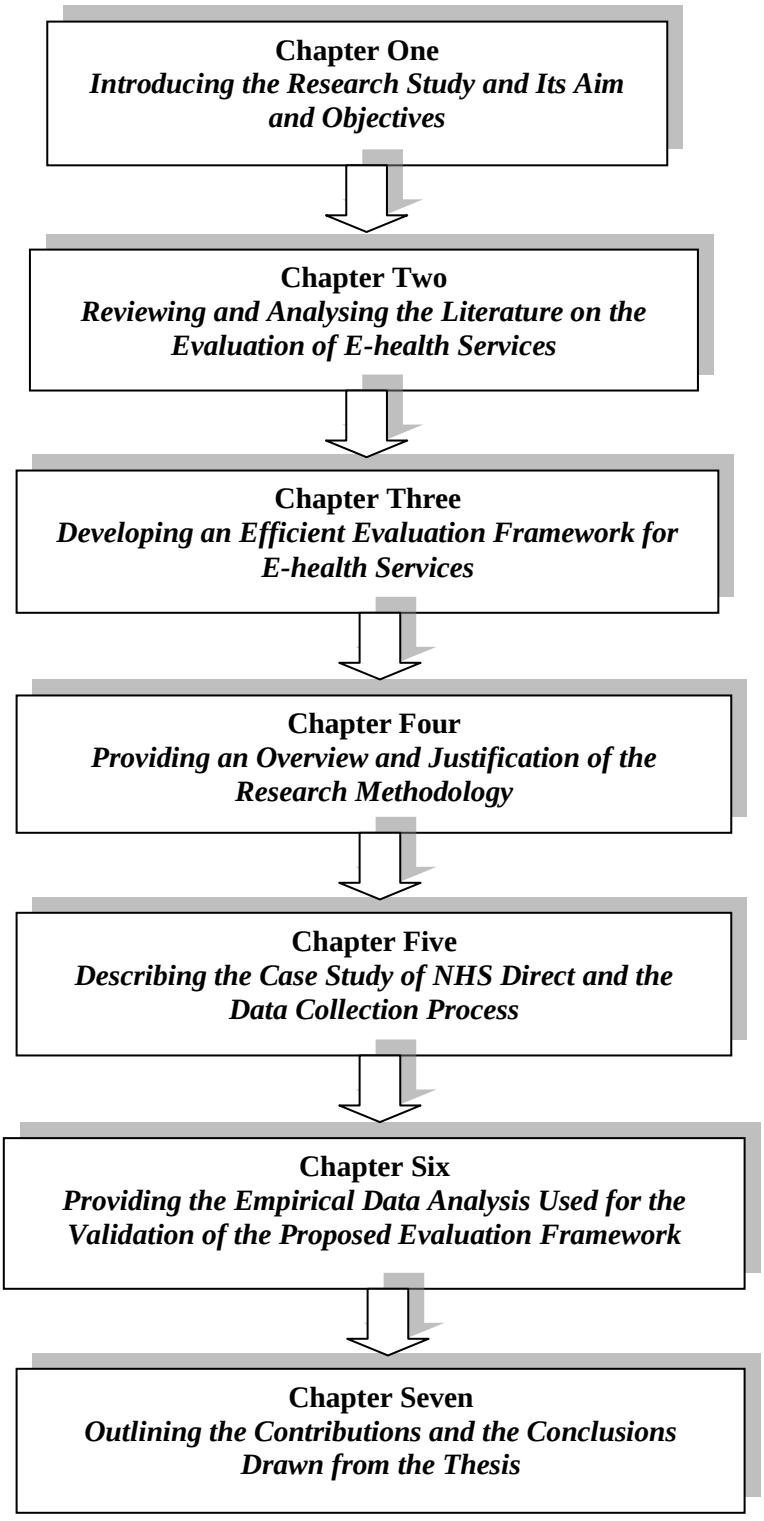
The framework is intended to overcome the limitations of existing evaluation frameworks that have been proposed or used in e-health context. The proposed evaluation criteria can serve as part of e-health evaluation framework, and also provide useful and necessary tools to allow the development of successful e-health initiatives by assisting the healthcare organisation to identify and thus address areas that require further attention.

Towards the main aims of this research, the research objectives include:

- Identifying the challenges associated with the evaluation context of healthcare services, the challenges related to introducing information systems to healthcare, and the challenges in establishing of an evaluation methodology.
- Identifying and examining the most common approaches that has been proposed or used for the evaluation of e-health services, and address their limitations.
- Defining the main characteristics of the proposed evaluation framework of e-health services.
- Building an evaluation framework that has to be sufficiently generic to be applicable to a wide range of applications but also sufficiently detailed to provide effective guidance in the evaluation of e-health services.
- Exploring the key factors that influence the users' acceptance to the new adopted technologies.
- Proposing evaluation criteria for the assessment of e-health services from users' perspective and address the key factors that influence the users' acceptance to the new adopted technologies.
- Applying the proposed evaluation framework and the evaluation criteria in practice through the use of case study methodology in order to validate them.

## 1.8 Thesis Structure

The structure of this thesis consists of seven integrated chapters. The structure will serve the aim and objectives of the study and complements the methodology proposed by Phillips and Pugh (2000), which comprises of background, focal and data theory to support the development of a novel contribution. The background theory will be covered in chapter two by the review and the critical analysis of the literature in the research area of e-health evaluation. The focal theory will be presented in chapter three through the development of the conceptual model; an efficient evaluation framework for e-health services. The data theory which intended to determine and justify the applicability and appropriateness of the evaluation framework to evaluate e-health services in practice will be covered by chapter four, five and six. Chapter seven will summarize the main theoretical and practical contributions of the study as well as the main conclusions drawn from the literature analysis, the conclusions drawn from theoretical model design and development, and the conclusions drawn from theoretical and empirical data analysis. Figure 1.1 below shows an outline of the thesis structure.


Chapter One
Introducing the Research Study and Its Aim and Objectives
Chapter Two
Reviewing and Analysing the Literature on the Evaluation of E-health Services
Chapter Three
Developing an Efficient Evaluation Framework for E-health Services
Chapter Four
Providing an Overview and Justification of the Research Methodology
Chapter Five
Describing the Case Study of NHS Direct and the Data Collection Process
Chapter Six
Providing the Empirical Data Analysis Used for the Validation of the Proposed Evaluation Framework
Chapter Seven
Outlining the Contributions and the Conclusions Drawn from the Thesis

# Chapter Two

# Literature Review

**Chapter Abstract**

*This chapter provides a summary review and critical analysis of literature on the evaluation of e-health services. It attempts to build a background of e-health evaluation context, where this research area is generally both under developed and under managed in theory and practice. The evaluation of e-health services resides at the intersection of three research fields, each well-known for its complexity; healthcare services, information systems, and evaluation methodologies. The chapter is intended to address the challenges encountered at the intersection of the three research fields. The chapter is also intended to review a set of existing evaluation approaches to aid the development of a cross disciplinary evaluation framework for e-health services in the next chapter.*

**Chapter contents**

## 2.1 Introduction

Introducing information and communication technologies in any sector or context including healthcare is not a goal in itself; the goal is enabling fundamental changes in the way work is done by introducing these technologies. The fundamental changes may have positive or negative impacts on the context but what drives the change in most cases is the need for improvements.

Many authors (Holliday and Tam (2004; Ranganathan, 2002; Skinner, 2003) reported that the healthcare sector is the slowest in embracing information communication technologies and moving to the form of e-health among other government services. They also reported that the sector is suffering from a low success rate when doing so. This makes it imperative to evaluate e-health services in their contexts.

The aim of e-health evaluation is to produce answers to one or more than one question. Although there are quite broad evaluation questions that have been dealt with in the literature, the main and most common question is why and how an e-health service provides benefits or drawbacks and in which contexts.

The aim of this chapter is to review and critically analyse the literature in the research area of e-health evaluation. There are many bodies of literature that will inform this research area from the literature in the evaluation of information systems, the e-health evaluation challenges, and evaluation approaches.

The thorough examination and presentation of the literature in the evaluation of information systems is necessary because much of existing evaluation frameworks that have been proposed or used in e-health context are proposed or used originally for information system evaluation. Addressing e-health evaluation challenges is required to

consider these challenges in the development of the proposed evaluation framework. Finally, the analysis of existing evaluation approaches is essential to build the theoretical model since the proposed model should overcome the limitation of existing ones. The selected evaluation approaches for analysis has been carefully identified to aid the development of an efficient evaluation framework that has to be sufficiently generic to be applicable to a wide range of e-health services but also sufficiently detailed to provide effective guidance.

## 2.2 The Evaluation Concept

> Not everything that can be measured is important, and not everything that is important can be measured.
>
> Albert Einstein

Evaluation is a value-laden concept that can take on many meanings. The Oxford Advanced Learner's Dictionary defines evaluation as "the activity of finding out or forming an idea of the amount or value of something or somebody". In the context of information management, Heinrich (1999) defines evaluation as the decisive assessment of defined objects, based on a set of predefined criteria, to solve a given problem.

Evaluations are generally conducted for a variety of reasons; Rossi and Freeman (1989) propose five reasons for evaluation.

- To assess the worth of ongoing initiatives or programs and aid in decisions regarding whether these initiatives or the programs should be continued, improved, expanded, or curtailed.
- To assess the utility of new initiatives or programs.
- To increase the effectiveness of management and administration of initiatives or programs.
- To satisfy the accountability requirements of an initiative sponsors and other stakeholders.
- To contribute to the substantive and methodological science knowledge.

The process of evaluation can be either quantitative or qualitative. In quantitative evaluation the evaluator adopts quantitative research approach. In such an approach the phenomena under investigation have to be fragmented and delimited into measurable or common categories that can be applied to all of the subjects or wider and similar situations (Winter, 2000). The evaluator here applied quantitative methods for studying these kinds of evaluation questions, in which selected features of the technology, the organization, the user, and the information needs generally are treated as independent, objective, and discrete entities respectively, and as unchanging over the course of the study (Kling and Scacchi, 1982).

In qualitative evaluation the evaluator adopts qualitative research approach. In such an approach, the evaluator uses a naturalistic approach that seeks to understand the phenomena under investigation in context-specific settings, such as real world setting where the evaluator does not attempt to influence the phenomenon of interest (Patton, 2002). Qualitative methods are applied here to examine the dynamics of a process rather than its static characteristics. The strengths of qualitative research methods lie in their usefulness for understanding the meaning and context of the phenomena studied, and the particular events and processes that make up these phenomena over time, in real-life, natural settings (Kaplan and Shaw, 2004).

Evaluation studies can be formative or summative (Friedman and Wyatt, 2000). Formative evaluation normally conducted during development to guide processes and attempts to improve the system under evaluation by providing formative feedback. This type of evaluation is fundamentally more powerful in the context of organizational learning. Summative evaluation normally conducted after development, and tries to demonstrate the outcome of a system in scientific routine.

### 2.3 The Evaluation in the Field of Information Systems

One of the broad and widely accepted definition of information systems (IS) evaluation in the literature (Doherty & King, 2004; Walter and Spitta, 2004; Willcocks, 1992) is the process of establishing by quantitative and/or qualitative methods the worth or value of

the IS. Considering the elements highlighted in this definition and the fact that IS evaluation involves a large number of stakeholders, each with his or her own particular values and objectives, the required evaluation framework should incorporate a number of elements.

These elements are closely interrelated, and are determined in practice by the demands of the situation. These elements are:

1. The subject: What is being evaluated?
2. The process: How do we get accurate results?
3. The method: What are the methodologies and tools used?
4. The stakeholders: Who are the key players?
5. The criteria investigated: What are the key issues which should be considered for the evaluation?

Many researchers (Jones & Hughes, 2001; Serafeimidis & Smithson, 2000) agree that the research area of IS evaluation is a complicated and difficult subject, but the reasons behind the complexity is a debatable issue between them. The debate between researchers is not only about the reasons behind the complexity of IS evaluation, but also about the most appropriate evaluation approach to be used for specific IS. One sign of the debate is the many IS evaluation approaches developed to represent different interpretations of IS evaluation. Farbey *et al.* (1993) classified a number of IS evaluation approaches, which included quantitative methods that used tangible or direct costs and benefits and qualitative methods that accounted for intangible or indirect cost and benefits, from the organizational and human perspective.

Some researchers argue that the suitability of an evaluation approach depends mainly on the IS and the organizational context. For example, Khalifa et al. (2004) stated that there is no single IS evaluation approach that can be applied to all situations. Farbey et al. (1993) added that IS evaluation can contribute to the success of the IS when the appropriate approach is applied to the appropriate organizational context.

In contrast, the evaluation of e-health has proven to be even more complicated, as the evaluation context is more challenging and the social aspects have greater impact on the system success or failure than any other information system. In the following section, the challenges of e-health evaluation will be discussed in details.

## 2.4 E-health Evaluation challenges

The research in the area of e-health evaluation is a complicated and difficult subject (Brender, 2006; Friedman and Wyatt, 2000). The complexity and difficulty lies in the challenges encountered at the intersection of three research fields, each well-known for its complexity; healthcare services, information systems, and evaluation methodologies.

Healthcare services are characterized by having many stakeholders which are working in different disciplines and pursuing different goals (Alvarez, 2003; Connell and Young, 2007; Ray, 2007). Healthcare services are also dictated by complex regulations, especially those that apply to directly manage patients' information. The medical knowledge itself and methods of healthcare delivery are changing rapidly and require a high degree of formalized working practices (Friedman and Wyatt, 2000). The regulations of healthcare services particularly in developed countries is complex in its diversity and wide ranging in its scope, ruling the relation with patients, health professionals, the public, taxpayers, employers, educators, regulators, and many others across the country. The medical knowledge is an enormous and dynamic field, Mcconaghy (2006) states that the medical knowledge doubles approximately every five years. Moreover the main aspects of this knowledge require an interactive environment to be transferred or practiced.

Information systems and its evaluation as many researcher (Serafeimidis and Smithson, 2000; Jones and Hughes, 2001) assent is another complicated and difficult research field. Symons and Walsham (1988) argue that the complexity is due to the multiple perspectives involved, and the difficulties of quantifying benefits. Willcocks (1992) has a similar view but he also believes that the complexity of information systems evaluation is changing and becoming more and more complex nowadays. This is because the nature of

information systems investments is changing both in terms of technological capability and the benefits they can deliver, as well as in terms of diffusion in most aspects of society. The evaluation of information systems in public sector has proved to be even more complex than the evaluation of information systems in private sector, as an accurate evaluation requires conducting the evaluation process in more challenging context. To overcome the complexity and difficulty of information systems evaluation in the public sector, it is necessary to address and consider a number of evaluation challenges in the development of the required evaluation framework. The first of these challenges is the investigation of various perspectives (Jansen, 2005), which may not only require addressing and meeting the general needs of a target group such as citizens, but also requires including the specific needs of the specific target groups of citizens that are using a particular service. The second challenge in evaluating information systems in public sector is in identifying and quantifying benefits. Beynon-Davies, (2005) states that it is difficult to determine the precise benefits associated with information systems in the public sector. An explanation to this lies in the different goals and objective of the information systems investments in public sectors, the benefits gained by these initiatives will be different as well, and the assessment of these benefits also vary according to the different perspectives of the stakeholders for the value of these benefits. The third challenge in evaluating information systems in public sector is the fact that in order for the evaluation to be proper, it should consider the social and technical context of use. This is a result of the opinion that information systems research is as much a social science as an information systems science (Myers, 1997).

The establishment of an evaluation methodology is the last complex and difficult research field. The field is suffering from the limited experience of using methods, the unfamiliarity with evaluation techniques and the difficulty in interpreting results (Ballantine *et al.* 1999; Farbey *et al.* 1999; Powell, 1999). The limited experience of using methods in e-health evaluation is related to a certain extent to the gap between the theory and practice. Eng (2002) argues that this gap is a result of the tension between e-health research efforts in academic institutions and commercial organizations. He believes that the academic sector succeeds in developing scientifically rigorous

evaluation methodologies, but these methodologies are not designed to answer real-world concerns. On the other hand, when commercial organizations conduct evaluations of e-health applications, they usually adopt methodologies with limited applicability to other situations. In adopting such methodologies, they maintain obtaining quick and practical answers because of market pressures. Table (2-1) summarizes the challenges encountered at the intersection of healthcare services, information systems, and evaluation methodologies.

| The Research Field | The challenges Encountered | References |
|---|---|---|
| **Healthcare Services** | • Healthcare services are characterized by having many stakeholders who are working in different disciplines and pursuing different goals.<br>• Healthcare services are dictated by complex regulations.<br>• The medical knowledge is an enormous and dynamic field.<br>• The main aspects of medical knowledge require an interactive environment to be transferred or practiced. | Alvarez (2003)<br>Connell and Young (2007)<br>Ray (2007)<br>Friedman and Wyatt (2000)<br>Mcconaghy (2006) |
| **Information Systems** | • The multiple perspectives involved.<br>• The difficulties of quantifying benefits.<br>• The nature of information systems investments is changing both in terms of technological capability and the benefits they can deliver, as well as in terms of diffusion in most aspects of society.<br>• Consider the social and technical context of use. | Walsham (1988)<br>Beynon-Davies (2005)<br>Jansen (2005)<br>Willcocks (1992)<br>Myers (1997) |
| **Evaluation Methodologies** | • The limited experience of using methods.<br>• The unfamiliarity with evaluation techniques.<br>• The difficulty in interpreting results. | Ballantine et al (1999)<br>Eng (2002)<br>Farbey et al (1999)<br>Powell (1999) |

**Table (2-1) The challenges encountered at the intersection of healthcare services, information systems, and evaluation methodologies**

## 2.5 Analysis of Current Evaluation Approaches

The evaluation of e-government services in general, and e-health services in particular as many researchers agree, is both an under developed and under managed area in theory and practice (Brender, 2006; Friedman and Wyatt 2000; Lofstedt, 2005). Nevertheless, the research field in this area has been the focus of a number of studies which take different approaches. The aim of this section is to analyse the most common evaluation approaches that has been used or proposed for e-health services. The analysis is necessary to address the strengths and weaknesses of existing evaluation approaches, and will aid the development of a cross disciplinary evaluation framework in the next chapter.

### 2.5.1 Traditional Evaluation Approaches

Economic analysis approach like Return on Investment (ROI) is one of the common used traditional approaches for the evaluation of e-health services (Rahimi & Vimarlund, 2007). The economic analysis evaluation is based on the assessments of economic outcomes, and it is conducted by decision makers when they are trying to understand how to best invest limited funds. Stone (2005) identifies five types of economic analysis evaluation that may be used in the healthcare context, they are:

1. Cost benefit analysis: An analysis in which incremental costs and effects are calculated and all benefits and costs are measured in money.
2. Cost effectiveness analysis: This type of evaluation is normally conducted when there is considerable uncertainty; it is designed to tell decision makers how much benefits are likely to be produced by different investments, the analysis outcomes are usually presented in ratios.
3. Cost utility analysis: Like cost–effectiveness analysis but also considers the quality of life in the analysis.
4. Cost consequences analysis: In this type of evaluation, the evaluators calculate the incremental costs and effects without any attempt to aggregate them.
5. Cost minimization analysis: In this type of evaluation, the evaluators calculate the incremental costs of alternatives options that may achieve the same outcome.

Other traditional approaches which have been proposed or used for evaluation in healthcare context include; Randomized controlled trials (Pagliari, 2007), and mathematical and computer simulation modelling (Eldabi *et al.* 2007)

Using traditional approaches can be problematic in evaluating information systems innovations in public sector. The problems of these approaches include the limited definition of stakeholders, the targeting of only direct tangible costs and benefits, and being only based on accounting and financial instruments (Farbey et al., 1995). Serafeimidis and Smithson (2000) had also criticized the traditional approaches to evaluation. They argued that traditional approaches are based on narrow technical and accounting terms, ignoring human and organizational components of systems users. Hochestrasser (1992) added that such evaluation approaches run the risk of not identifying all the hidden costs and intangible benefits generated from system users.

The most of problems associated with the use of traditional approaches to evaluate e-health innovations are inherited from the problems of using these approaches in information systems evaluation. Moreover, the use of these approaches is becoming even more problematic in terms of their applicability and validity while e-health innovations are shifting from institution-centred to regional and national health information systems (Haux, 2006).

### 2.5.2 Benchmarking Approach

Benchmarking is a process of measuring the products, services and operational practices of a given organisation to compare the organisation's performance and operational practices with others in a similar company or companies. The process aims to identify, adapt, and adopt practices that they believe will improve their performance and operation (Stapenhurst, 2009; Tolosi and Lajtha, 2000).

Since it was originated from the machine construction industry (Carey, 1995), Benchmarking approach has been used heavily in different sectors and context including healthcare services (Pantall, 2001). According to the research of benchmarking activity in

the United Kingdom (Figure 2.1), healthcare sector is taking the second lead in benchmarking activities (Hinton et al, 2000).

Globally, benchmarking has been applied across a range of service delivery, management and professional processes at strategic as well as operational levels. Sower *et al*. (2007) proposes five key aspects to be acknowledged for benchmarking process in healthcare context:

1. Benchmarking can be carried for strategies, operations and internal processes.
2. Benchmarking target is best of the best organization or unit within an organization. It is a continuous, systematic search to find, adapt and implement the best of the best practices.
3. Best of the best organization or unit can be in or outside the healthcare sector.
4. Determination of how the targeted organization or unit achieves its results. This requires an understanding of how other organizations or units have used different technologies and approaches to their advantage.
5. Determination of how the benchmarking information can be interpreted and used to improve strategies, operations or internal processes.

Although benchmarking has a number of benefits, the benchmarking process associated with a lot of limitations. Firstly, benchmarking is a complex process that needs a lot of commitment to succeed; it is also time-consuming and costly process, if not implemented properly (Hurmelinna, 2002). Secondly, it is difficult to identify and get the required information of the best practices. The widespread practices do not mean always that they are the best, and in most cases the required information for effective benchmarking from target organisation is difficult to be obtained (Kolarik, 1995).

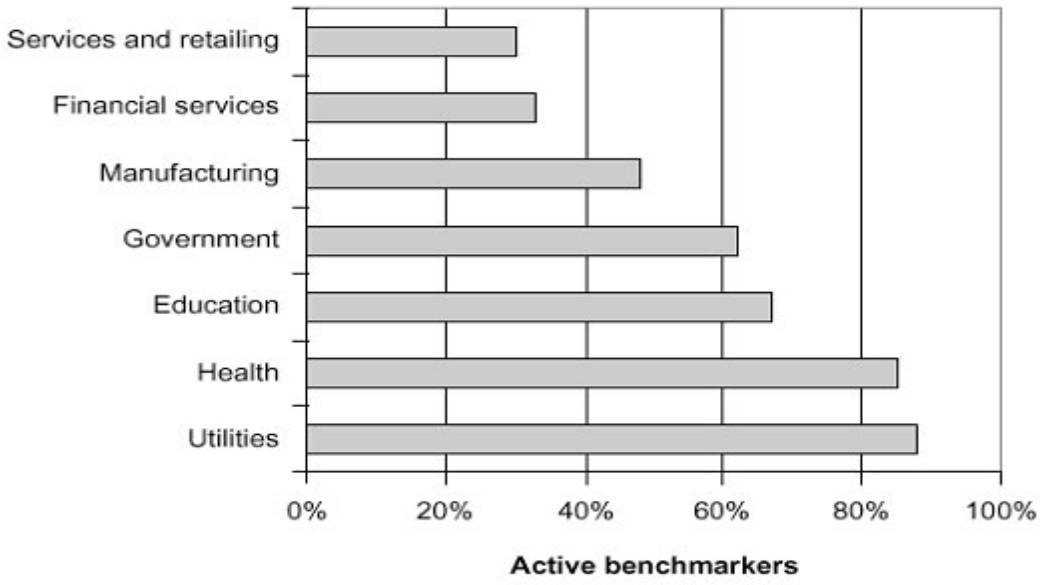



**Figure 2.1 Benchmarking activities in different sectors of UK**

**Source: Hinton M. et al. (2000)**

### 2.5.3 Balanced Scorecard Approach

The balanced scorecard (BSC) is proposed by Kaplan and Norton (1992) to address some of the limitation of the traditional performance evaluation approaches. Since then the BSC has probably been the most popular performance measurement model. Much of the research on performance measurement has been pre-occupied with just this model and it has been widely adopted in practice (Meyer, 2002).

The BSC is a multi-dimensional performance evaluation approach which is intended to evaluate organization performance from four different perspectives:

**i. The financial perspective:**

Financial performance measures are important components of the Balanced Scorecard; they indicate whether the organization's strategy, implementation, and execution are contributing to bottom-line improvement (Kaplan and Norton, 1992). The financial scorecard may adopt the traditional financial performance measures like Cost-Benefit Analysis or any other financial performance measures. The organization should set financial goals and select a set of financial measures to assess these goals. In the public sectors and healthcare sector as part of it, financial measures ensure that public

organizations are achieving their goals in an efficient manner that maintain profitability, growth, and stakeholders values.

### ii. The internal business process perspective:

The second part of the balance scorecard represents the internal business process perspective; it contains the measures of what the organization must do internally from processes, decisions, and activities throughout the organization to continue adding value for their customers and meet their expectations (Kaplan and Norton, 1992). In healthcare sector, the internal measures for the balanced scorecard should be linked to factors like efficiency, quality of services, performance, and the cost of delivering care. The measures should also stem from the business processes that have the greatest impact on customer satisfaction. The hard task in this scorecard is to identify those processes and develop the best possible measures with which to track the improvement. This may require either business process re-engineering or incremental improvement of the internal processes.

### iii. The customer perspective:

According to Kaplan and Norton (1992), the customer perspective in the balanced scorecard is measured by the ability of top management to translate their general mission statement on customer service into specific measures that reflect the factors that really matter to customers. Kaplan and Norton (2000) have argued that public sectors and healthcare organizations as part of it should place the customer scorecard measures at the top of its balanced scorecard.

The hard task in this perspective is to identify the target customers for an organization and the value proposition in serving them. Choosing an appropriate value proposition is even more challenging for healthcare organization with a wide range of customer and a variety of expectations.

### iv. The learning and growth perspective:

The learning and growth perspective is measured by the ability of an organization to learn, innovate, and share knowledge that will create more value for customers,

improving outcomes, and maintaining enhanced operating efficiencies (Kaplan and Norton, 1992).

The learning and growth perspective enables the organization to manage its intangible assets (people, technology, culture) and maintain an added value to be created in the future. The intangible assets are necessary part of any organization's strategy, and they can be divided into three categories (Kaplan and Norton 2004):

- Human capital: Evaluated by the availability of employee skills, employee talents, knowledge, and information required to support the preferred strategy.
- Information capital: evaluated by the availability of Databases, information systems, networks, and infrastructure required to support the preferred strategy.
- Organization capital: Evaluated by the organization abilities to build organizational leadership, to strengthen the culture, to align the organization activities with the preferred strategy, and to encourage greater teamwork and sharing of knowledge.

To identify the measures of the learning and growth scorecard, it is required for an organization to identify the measures related to customer and internal process perspectives first. Then, the learning and growth scorecard measures have to address and cope with the changes of success targets in order to sustain the ability to change and improve.

According to Zelman et al. (2003) and Aidemark (2001), the BSC is counted as one of the popular approaches in healthcare evaluation. The popularity is related to the potential advantages offered by an efficient implementation and use of the approach in healthcare. The advantages of the BSC include:

- The capacity to provide a set of performance measures that gives top managers a prompt and comprehensive view of organization performance (Gao and Gurd, 2006)

- The ability to educate the healthcare organization about areas needing improvement (Shutt, 2003)
- The capacity to maintain the balance between financial and non-financial performance measures of success, and the balance between internal and external constituents of the organization (Aravamudhan and Kamalanabhan, 2007)

Despite the popularity of the balanced scorecard model, the model has been criticized by many authors for its bias in evaluations. Moreover, Neely and Bourne (2000) claim that the failure rate in implementing the scorecard is very high, arguing that 70% of the organizations are failing in implementing the balance scorecard efficiently. The reasons of failing in implementing the balance scorecard are vary from one case to another. Lipe and Salterio (2002) state that a lot of organization are not benefiting from the use of the balanced scorecard, because they used common measures across different business units without adapting these measures to suit the context of these units.

In the healthcare context, there is similar picture of high failing rate of the balanced scorecard implementation (Radnor and Lovell, 2003). According to Patel *et al*. (2008) the success of the balanced scorecard model for e-health services is determined by the knowledge of relationships between the selected performance measures and how these relationships address short and long term performance goals. They argue that identifying such measures that can address performance improvement in short term and sustain the improvement for long term is very hard task and not always possible.

### 2.5.4 Stakeholders Evaluation Approach

Freeman (1984) was among the first, who introduced the stakeholders' concept. According to him, stakeholders can be defined as "any group or individual who can affect or is affected by the organization's objectives." Since then, several researchers have adopted the stakeholders approach in their research including information systems, e-government and e-health evaluations.

Although the stakeholder theory is primarily introduced as a management instrument, the theory also has an instrumental power; the theory establishes a framework for examining the connections between the practice of stakeholder management and the achievement of various organization performance goals like profitability, stability, and growth (Donaldson and Preston, 1995).

Stakeholders' evaluation approach is based on the extensive stakeholders' involvement in the evaluation process. According to Greene (2005) there are two primary reasons for involving stakeholders, they are:

1. Stakeholders' evaluation creates a sense of ownership that enhances the usefulness of the evaluation results, processes, or both.
2. Stakeholders' evaluation gives the potential for political influence that advances values related to equity, empowerment, and social change within the evaluation context.

This approach provides a number of benefits include the extraction of the true 'value' of the systems by addressing the concerns and views of the stakeholders. Moreover, the outcome of such evaluation provides useful input for a qualitative evaluation process (Barrow and Mayhew, 2000).

Avgerou (1995) propose four principles that must be considered to support an evaluation approach that addresses the views and concerns of the stakeholders, the principles are:

1. The evaluation process must be organised and supported by evaluator or evaluation team, to assess methodically aspects of the system under evaluation as seen appropriate by stakeholders.
2. The evaluation process is participative in a way to engage and allow all stakeholders to express their views and supporting them to defend their position.
3. The criteria of evaluation are determined by the context and represent all the views and concerns of the stakeholders.

4. The objective is to compromise and decide about future systems developments, either by accepting and possibly modifying plans and proposals for new systems or by learning the lessons of past experience.

A proper identification of evaluation stakeholders is an essential part in using stakeholders approach for the evaluation of e-health services. However, there is only limited literature that recognizes healthcare stakeholders and their changing role in the evaluation of e-health services. Moreover, even in the limited literature available on healthcare stakeholders, the description and identification of these stakeholders seems to be generally ignored (Mantzana and Themistocleous, 2006).

Identifying the key stakeholders for e-health evaluation requires defining the meaning of stakeholders and how the concept employed in the area of e-health research first. This is because of the inconsistency in stakeholder's definitions and uses, and the diversity of views about the reasons for their involvement in the evaluation process, which often results in proposing and deploying different approaches that lead sometimes to conflicting evidence and arguments (Bunn et al. 2002).

One of the popular and general approaches in categorizing e-health stakeholders is dividing them between supply side stakeholders (organizational perspective) and demand side stakeholders (users' perspective). According to Löfstedt (2007) most research in the area of e-government, and also in the development of e-services in public sector is dominated by supply side factors and there were none or a few efforts that focused on the demand side. Gustafson and Wyatt, 2004, acknowledged the dominance of supply side factors in the field of e-health as well. They stated that despite the fact that users are the most important stakeholder in the e-health evaluation, assessing e-health from users' perspective and addressing the key factors that influence the users' acceptance to the new adopted technologies is still lagging behind.

The National Health Service in the United Kingdom has its categorisation of stakeholders in the context of e-health. It believes that e-health stakeholders can be divided into three

different categories (NHS, The Good European Health Record, 1993), they are:

1. **Patients;** This category may include patients, next of kin, and carers
2. **Clinicians;** This category may include clinicians, non-clinicians, responsible clinician, a health care facility and clinical student.
3. **Third parties;** This category may include controller, technologist, administrator, and legal professional.

Another categorization of stakeholders in the context of e-health is proposed by Mantzana, et al. (2007). According to them, e-health stakeholders can be divided into four groups, they are:

1. **Accepters;** This category may include patients and next of kin.
2. **Providers;** This category may include clinicians, non-clinicians, clinical students, hospitals, and medical departments.
3. **Supporters;** This category may include administrators, legal professionals, researchers, suppliers, technologists, and insurance companies.
4. **Controllers;** This category may include managers, Government, and health authorities.

Many authors (Friedman and Miles, 2002; Mantzana, et al. 2007; Pouloudi & Whitley, 1997) recognise the importance of a dynamic approach to support the identification of healthcare stakeholders in a dynamic healthcare environment. They believe that such an approach can deal effectively with the changing roles and relationships of stakeholders, and acknowledged the impact of both internal and external factors on them.

In compliment to the dynamic approach in dealing with stakeholders, Pouloudi & Whitley (1997) propose four rules for stakeholders' identification, they are:

1. Stakeholders depend on the specific context and time frame.
2. Stakeholders cannot be viewed in isolation.
3. The position of each stakeholder may change over time.
4. Feasible options may differ from the stakeholders' wishes.

In conclusion, the stakeholders' evaluation approach which is based on the extensive stakeholders' involvement in the evaluation process provides a lot of benefits for e-health evaluation. A proper identification of the stakeholders and their changing role in the evaluation is an essential part in using the approach for the evaluation of e-health services. The identification of the stakeholders in an e-health evaluation environment requires a dynamic mechanist that recognizes the changing roles of stakeholders and acknowledges the impact of evaluation on them

## 2.6 The Limitations of Current Evaluation Frameworks

In the previous sections four groups of the most common evaluation approaches that have been used or proposed for e-health services were analysed. The aim is to address the strengths and the limitations of these approaches. The analysis is essential towards the development of cross disciplinary evaluation framework in the next chapter since the proposed framework should overcome the limitations of the current ones.

The analysis reveals that the current evaluation frameworks shares three common limitations. They are:

- As current e-health evaluation frameworks are not developed specifically in or for the healthcare context, none of them have unique characteristics that address the cross disciplinary challenges of e-health evaluation.
- There is no standard framework for evaluation effects and outputs of e-health implementation and the current frameworks are dominated by economic and organizational aspects.
- Current evaluation frameworks did not provide effective guidance throughout the various stages of system or service development stage, the analysis and planning stage, and the post implementation stage.

The analysis also reveals some other limitations characterized the use of each of the frameworks for e-health evaluation. For e-health evaluation frameworks that adopt stakeholder's approach, they are either designed to focus particularly on the supply side of the healthcare services (organizational perspective) or they are designed to target a

specific user or a specific application of an e-health initiative.

Current benchmarking frameworks for e-health evaluation are complex and require a lot of commitment to succeed. Moreover, the best of the best e-health practices which is suitable for benchmarking are either too difficult to identify or has not yet been achieved. This is because e-health is relatively a new innovation which still rapidly evolves and changes. One sign of e-health evolving is the shift from institution-centred to regional and national solutions and from health care professionals to patient-centred solutions,

Despite the popularity of the balanced scorecard model in e-health evaluation, the model has its limitations. The model used common measures, these measures are not designed to work effectively in e-health context and required an adaptation process which is very hard task and not always possible for healthcare organizations.

## 2.7 User's Perspective in the Evaluation of E-health Services

E-Health evaluation involves many stakeholders, users being the most important (Gustafson & Wyatt, 2004). Therefore, assessing e-health from users' perspective should address all the key factors that influence the users' acceptance to the new adopted technologies including the risks and benefits associated with the design and implementation of the e-health initiative in specific contexts.

There are many studies on the behaviour of users of new products and services, these studies were adopted in research to predict user's acceptance of innovations including e-health services. In the following sections, two lines of the most popular studies will be analysed to explore the key factors that influence the users' acceptance to the new adopted technologies. The two lines of studies are Diffusion of Innovations Theory and Technology Acceptance Model.

### 2.7.1 Diffusion of Innovations Theory

Diffusion of Innovations Theory (DOI) was one of the popular theories introduced by Rogers (1995) to explain how a new idea or innovation propagates in a social system.

The theory suggests three valuable insights into the process of social change (Robinson, 2009):

- The factors that make an innovation spread successfully.
- The importance of peer-peer conversations and peer networks.
- Understanding the needs of different user segments.

The theory is based on 50 years of research, and it is adopted by many researchers in different research fields including e-government and e-health research (Carter and Belanger, 2004; Chew *et al.,* 2004; Herlitzer et al., 2003; Roman, 2003). Since being introduced, the diffusion of innovations theory has been adopted in different ways in many studies including the use of the important part of the theory and the well-known S-shaped curve of adoption and the categorization of adopters.

The theory was adopted by Chew *et al.,* (2004) in a study to assess the internet use and identify sources from which physicians obtain medical information; the theory was used to describe the process by which physicians learn and develop skills at using the internet. In another study, Herlitzer et al. (2003) applied DOI theory to better understand the dynamic interactions between the characteristics of telehealth and the social system in which it is applied. The study concluded that DOI theory to be a suitable tool to understand technology adoption in the context of e-health.

In applying diffusion theory to e-health services evaluation, the most relevant points to recognize are the innovation perceived attributes identified by Rogers' study and their applicability to e-health services: Rogers (1995) describes the characteristics of an innovation in terms of its perceived attributes, and these attributes are responsible in controlling the rates of diffusion of the innovation. Rogers (1995) identified three primary perceived attributes, which are relative advantage, compatibility, and complexity. He added two other innovation attributes, which are trialability and observability.

- **Relative Advantage**

According to Rogers (2003), relative advantage is the strongest predictor of the rate of adoption of an innovation. He defines relative advantage as "the degree to which an innovation is perceived as being better than the idea it supersedes". Relative advantage can be represented mainly by the perceived costs and benefits associated with the adoption of an innovation in terms of economic return but also in terms of other intangible elements like social prestige, or savings in time and effort.

- **Compatibility**

Rogers (2003) stated that "compatibility is the degree to which an innovation is perceived as consistent with the existing values, past experiences, and needs of potential adopters". The adoption of an incompatible innovation often requires the prior adoption of a new value system, which is a relatively slow process.

- **Complexity**

Rogers (2003) defines complexity as "the degree to which an innovation is perceived as relatively difficult to understand and use". Different from the other attributes, complexity is negatively correlated with the rate of adoption. Therefore, unnecessary complexity of an innovation is an important obstacle in its adoption.

- **Trialability**

According to Rogers (2003), "trialability is the degree to which an innovation may be experimented with on a limited basis". Trialability is positively impacted the rate of adoption, the more an innovation is tried, the faster its adoption progress.

- **Observability**

The last attribute of innovations is observability. Rogers (2003) defines observability as "the degree to which the results of an innovation are visible to others". The easier it is for people to observe the results of an innovation, the more likely they are to adopt it. Such visibility stimulates peer discussion of a new idea between friends and neighbours. Similar to relative advantage, compatibility, and trialability, observability also is

positively correlated with the rate of adoption of an innovation.

From the five attributes or factors of DOI theory, we believe that trialability and observability are less pertinent for e-health services. Rogers (1995) considers trialability and observability as less important than the other three. Tornatzky and Klein (1982) have the same view, and they conclude that relative advantage, compatibility, and complexity are the most relevant factors to adoption research.

### 2.7.2 Technology Acceptance Model

The second line of studies relating to the behaviour of users to new products or services is Technology Acceptance Model (TAM) (Davis, 1986). The foundation of technology acceptance model is based on the theory of reasoned action proposed by Fishbein and Ajzen (1975) and counted as one of the most well established theories to predict and explain human behaviour. TAM was originally developed in the context of employees' adoption of a particular system in their work environment to predict and explain an individual's acceptance of a particular IT system.

Since it was proposed, TAM has been widely used by its own or combined with alternative theories and models to study user acceptance of technology in many sectors and different research fields (Karaiskos *et al.,* 2007; Ma and Liu 2004). The model also has been proven to be a reliable and robust through rigorous empirical testing in many different contexts including e-health (Holden and Karsh, 2009; Yarbrough and Smith, 2007). TAM was designed to examine the mediating role of perceived ease of use and perceived usefulness in their relation between systems characteristics and the probability of system use as an indicator of system success.

Davis (1989) defines perceived ease of use as "the degree to which a person believes that using a particular system is free of effort". According to Davis *et al.* (1989), perceived ease of use holds two basic mechanisms by which it influences attitude and behaviour; they are self-efficacy and instrumentality. Davis (1989) defines perceived usefulness as "the degree to which a person believes that using a particular system would enhance his

or her job performance". Hence, perceived usefulness is hypothesized to have a direct influence on behavioural intention. This is because it is assumed that users might intend to use the system, as they believe it is useful and they are able to do their job in better way (Davis *et al.*, 1989).

Many Information systems researchers (Adams et al. 1992; Doll et al. 1998; Segars and Grover, 1993) argue that TAM is valid in predicting the individual's acceptance of corporate information technology systems. However, as noted by several researchers (Hufnagel & Conca, 1994; Melone, 1990; Paul *et al.* 2003), TAM suffers from the absence of significant factors, including considering both human and social change processes and their affects on the adoption and utilization of new information systems.

The technological acceptance model was used in the evaluation of e-services in the public sector by many research studies (Al-adawi et al. 2005*;* Carter, and Belanger, 2004). The model was also applied to assess some applications of e-health services (Lanseng and Andreassen, 2007; Lapointe *et al*. 2002).

In a study conducted by Lanseng and Andreassen (2007), TAM has been applied to examine the introduction of self-service technology in health diagnosis as a means to reduce costs and improve quality in health care sector. The study concluded that TAM has an excellent capability to predict future behavioural intent of this new application in the context of health care services. In another study conducted by Horan et al. (2006), an analysis of physicians' use of the on-line system was performed employing mainly the same constructs that are traditionally used in TAM. The results of the study present a challenge to the use of TAM in such complex socio-technical context and concluded that there is much still to be done in terms of a comprehensive predictive model of physician adoption of technology.

### 2.7.3 Extensions of Technology Acceptance Model

Many researchers (Paul et al. 2003; Shen *et al.* 2006; Yarbrough and Smith, 2007) criticised TAM for its limitations and showed that TAM is incomplete in that it did not

account for social influence in the adoption and utilization of new information systems, as well as the model is unable to consider the influence of external variables and barriers to technology acceptance.

To overcome some of the limitations of TAM, the model was extended by many researchers to include human or social factors. Tung et al. (2008) propose a new hybrid technology acceptance model to study nurses' acceptance of the electronic logistics information system. The new hybrid technology acceptance model added two research parameters: trust and perceived financial cost.

Venkatesh and Davis (2000) extended TAM to explain perceived usefulness and usage intentions in terms of social influence and cognitive instrumental processes, naming the resulting model TAM2. The New model TAM2 added new variables to perceived usefulness, including the social influence variables (subjective norm and image), as well as cognitive instrumental processes variables (job relevance, output quality, and result demonstrability).

In conclusion, TAM continues to be the most widely applied theoretical model for describing an individual's acceptance of information systems. Despite its limitations, it has been proven that the model is a reliable assessment framework in many different contexts including e-health. In applying the original model or its extensions to e-health services evaluation, the constructs to be considered are the perceived ease of use, perceived usefulness, and trust to assess their influence in the users' utilization and satisfaction of e-health services. The variables attributed to each of the three constructs may require further investigations.

## 2.8 Chapter Summary

The research in the area of e-health evaluation is a complicated and difficult subject. The complexity and difficulty lies in the challenges associated with the evaluation context of healthcare services. Healthcare services are characterized by having many stakeholders who are working in different

disciplines and pursuing different goals. Healthcare services are also dictated by complex regulations, especially those that apply to directly manage patients' information. Moreover, the medical knowledge is an enormous and dynamic field and the healthcare delivery methods are changing rapidly and require a high degree of formalized working practices.

The complexity and difficulty of e-health evaluation lies also to some extent in introducing information systems to healthcare, while information systems and its evaluation is another complicated and difficult research field. The difficulties include the multiple perspectives involved in the evaluation, the complications of quantifying benefits, and the difficulties to consider the social and technical context of use.

The establishment of an evaluation methodology is another challenge for e-health evaluation as the field is suffering from the limited experience of using methods, the unfamiliarity with evaluation techniques and the difficulty in interpreting results.

The research in the area of e-health evaluation is not only complicated and difficult subject, but also is both an under developed and under managed research area in theory and practice. Nevertheless, the research in this area has been the focus of a number of studies which take different approaches. Each of these approaches has its merits and limitations. The most common used approaches are traditional evaluation approaches, benchmarking approach, balanced scorecard approach, and stakeholders' evaluation approach.

One of the most common used traditional approaches for the evaluation of e-health services is economic analysis evaluation like Return on Investment. The economic analysis approach is based on the assessments of economic outcomes, and it is conducted by decision makers when they are trying to

understand how to best invest limited funds. Traditional evaluation approaches has been criticized by many authors for targeting only direct tangible costs and benefits, and ignoring human and organizational components of systems users.

Benchmarking in another approach for evaluation where the target is best of the best organization. It is a continuous, systematic search to find, adapt and implement the best of the best practices. Although benchmarking has a number of benefits, the benchmarking process is associated with a lot of limitations. Benchmarking is a complex process that needs a lot of commitment to succeed; it is also time-consuming and costly process if not implemented properly. Moreover, it is difficult to identify and get the required information of the best practices.

The balanced scorecard is proposed to address some of the limitations of the traditional performance evaluation approaches. Since it was introduced, the BSC has probably been the most popular performance measurement model. Much of the research on performance measurement has been pre-occupied with just this model and it has been widely adopted in practice. Despite its popularity, the model has been criticized by many authors for its bias in evaluations and the high failure rate because of the poor implementation of the scorecard.

Stakeholders' evaluation approach is based on the extensive stakeholders' involvement in the evaluation process. This approach provides a number of benefits include the extraction of the true 'value' of the systems by addressing the concerns and views of the stakeholders. Moreover, the outcome of such evaluation provides useful input for a qualitative evaluation process.

The analysis of the most common used evaluation approaches and their associated frameworks in e-health context revealed that none of them have unique characteristics that address the cross disciplinary challenges of the context; this is because these frameworks were not developed specifically in or for e-health evaluation. The analysis also shows that existing frameworks are dominated by economic and organizational aspects, or they are designed to target a specific user or a specific application of an e-health initiative.

Despite the advantages of the frameworks that adopt stakeholders approach, the use of these frameworks in e-health still limited while many of them were developed to focus particularly on the supply side of the healthcare services. Moreover, such frameworks to be effective and beneficial require a dynamic mechanist that facilitates a proper identification of the stakeholders and their changing role in the evaluation which is still missing in existing frameworks. The use of benchmarking has long way to be useful and add value to e-health evaluation. This is related to many reasons including that e-health innovations are relatively new that are still evolve and change, the difficulties in identifying the best of the best case for e-health benchmarking, and the gap between theory and practice as theory is leading in e-health evaluation research. Despite its popularity, the balanced scorecard model has been adopted with common measures which are not designed to work effectively in e-health context. These measures required an adaptation process which is not always possible for healthcare organizations

The limitations of existing evaluation frameworks reveals the need for cross disciplinary evaluation framework that incorporate the strengths and overcome the limitations of existing frameworks. The literature review in this chapter provides essential background for the development of the evaluation framework in the next chapter. It is important to mention here that part of the literature analysis which contributed directly to the development process of the framework has been moved to the next chapter.

Despite the fact that users are the most important stakeholder in the e-health evaluation, assessing e-health from users' perspective and addressing the key factors that influence the users' acceptance to the new adopted technologies is still lacking behind. This chapter is closed by examining two studies on the behaviour of users of new products and services, Diffusion of Innovations Theory and Technology Acceptance Model. Both studies are very popular and have been adopted in research to predict user's acceptance of new innovations.

# Chapter Three

# Developing the Research Conceptual Framework

**Chapter Abstract**

*The purpose of this chapter is to guide the reader through the development of a research conceptual framework for this study. The study as we mentioned earlier is aiming to develop and assess an efficient evaluation framework for e-health services. The study is intended to deal effectively with the challenges in developing such a framework, and to propose a roadmap that assists in dealing with the complexities in the development process of such evaluation framework. The main aim of the study is to propose evaluation criteria that influence user's utilization and satisfaction of e-health services.*

*This chapter consists mainly of two sections, the first section covers the process of developing the evaluation framework, and the second section covers the identification and building of user's perspective evaluation criteria. The proposed evaluation criteria is based on two lines of studies relating to the behaviour of users of new products or services and on broad examining and critical analysis of the criteria used in the existing evaluations initiatives of e-government services generally but also particularly in an e-health context.*

*The proposed evaluation framework for e-health in this chapter is designed to overcome the limitations of existing evaluation frameworks that have been proposed or used in e-health context. The chapter also provides a set of clear and useful e-health evaluation criteria that can be accommodated by such a framework. The proposed framework and the evaluation criteria*

*require an empirical validation which will be performed in the following chapters of this research study using a case study methodology.*

*This chapter offers a conceptual framework for e-health evaluation that can contribute to an area of research which is still in its infancy in terms of development and management. The proposed evaluation criteria can be used to help achieve better user services utilization, to serve as part of e-health evaluation framework, and to address areas that require further attention in the development of future e-health initiatives.*

## Chapter Contents

## 3.1 Introduction

The following chapter seeks to outline the conceptual framework of this thesis. The proposed conceptual framework is an e-health evaluation framework that is aims to overcome the limitation of existing evaluation frameworks, contributes to important knowledge that can be used to support the value of existing e-health projects, and to increase the quality and efficiency of future e-health initiatives.

There are many evaluation approaches that have been proposed or used in the evaluation of e-health services; each of these approaches has its merits and limitations. In the previous chapter, four groups of evaluation approaches has been selected and analysed, as well as the challenges encountered in the context of e-health evaluation where the proposed evaluation framework should be used. Considering these challenges and the intended purposes of the framework, the main characteristics of the proposed framework has to be identified before the development of the proposed framework.

This chapter starts with presenting the main characteristics of the proposed framework, and then the rest of the chapter covers the process of building the evaluation framework, and the development of evaluation criteria that influences users' utilization and satisfaction of e-health services.

To maintain the comprehensiveness and the applicability of the proposed framework for a wide range of e-health services, a criteria-based evaluation approach has been chosen as it is the most appropriate for the design of the framework. The appropriateness stems from the fact that e-health applications are principally complex in nature, hence they require an approach that can be derived from a multitude of perspectives and theories.

Finally the chapter provides a well-argued and balanced hierarchy of evaluation criteria that can contribute to an area of research which is still in its infancy in terms of development and management. The criteria will be derived using an efficient mechanism for the identification of criteria offered by the proposed framework.

## 3.2 The Characteristics of the Proposed Evaluation Framework

The evaluation in the area of e-health services as many researchers argue, is dominated by economic and organizational aspects, has no standard framework for evaluating the effects and outputs of implementation and use, and the area in general is both under developed and under managed in theory and practice (Brender, 2006; Eng, 2001; Friedman and Wyatt 2000; Rahimi, and Vimarlund, 2007). Nevertheless, there is a wide range of information system evaluation frameworks, some of them were proposed and used in a healthcare context.

As it is discussed in chapter two, existing evaluation frameworks that have been proposed or used in e-health context are suffering from many limitations. These limitations include, that they are either designed to focus particularly on the supply side of the healthcare services (organizational perspective) or they are designed to target a specific user or a specific application of an e-health initiative. Moreover, the healthcare dimension is either ignored or not fully considered in the design and the implementation of these evaluation frameworks.

The proposed theoretical framework consists mainly of two sections. The first section covers the process of building a cross disciplinary evaluation framework that deals effectively with e-health evaluation challenges. The second section covers the development of evaluation criteria that influences users' utilization and satisfaction with e-health services.

To maintain the comprehensiveness and the applicability of the proposed evaluation framework for a wide range of e-health services and overcome the limitation of existing evaluation frameworks, the proposed evaluation framework for this research study would have the following characteristics:

- The framework has to be sufficiently generic to be applicable to a wide range of applications but also sufficiently detailed to provide effective guidance.
- The framework has to support the evaluator in making precise and effective choices at various stages of the evaluation process.

- The framework specifications are conceptualized by a number of elements or devices, such as lists, diagrams, keyword collections, and scenarios.
- The framework is criteria-based. The criteria can be grounded in, and derived from, one or more specific perspectives or theories.
- The framework only considers one stakeholder or a group of stakeholders with a common perspective in an evaluation process (In this study it is the users' perspective).
- Both the normative and the comparative approaches will be adopted in the development of the framework.

### 3.3 The Development of the Evaluation Framework

The research in the area of e-health evaluation is a complicated and difficult subject. The complexity and difficulty as it has been discussed in chapter two lies in the challenges encountered at the intersection of three research fields, each well-known for its complexity: healthcare services, information systems, and evaluation methodologies.

In order to conceptualize a cross disciplinary evaluation framework for e-health services that deals effectively with e-health evaluation challenges and overcomes the limitation of the existing evaluation frameworks, a roadmap for e-health evaluation is proposed. The proposed roadmap described in figure (3-1) consists of a number of elements, by which the evaluation process will be guided through. The main elements of the proposed evaluation roadmap are:

1. **The rationale of e-health evaluation:** why evaluate (determine the evaluation goals and objectives).
2. **The time frames of e-health evaluation:** Determine when to evaluate, and how long the evaluation process will take.
3. **The stakeholders of e-health evaluation**: Identify who would be considered in the evaluation from the relevant stakeholders in a specific time frame.
4. **The criteria of e-health evaluation:** Identify what to evaluate.

5. **The methods of e-health evaluation:** Choosing the most appropriate way to collect evaluation data.
6. Dealing with the ethical issues.
7. Determination of how to interpret and present the evaluation outcomes.

In the previous section, the researcher presented the main characteristics of the evaluation framework. One of the main characteristics of the framework, that the framework is criteria-based. The identification of the evaluation criteria is determined by an evaluation matrix of three elements: the evaluation rationales, the evaluation timeframes, and the evaluation stakeholders. In the following sections, the main elements of the proposed evaluation roadmap will be discussed, and critically analysed for their applicability in an e-health evaluation context.

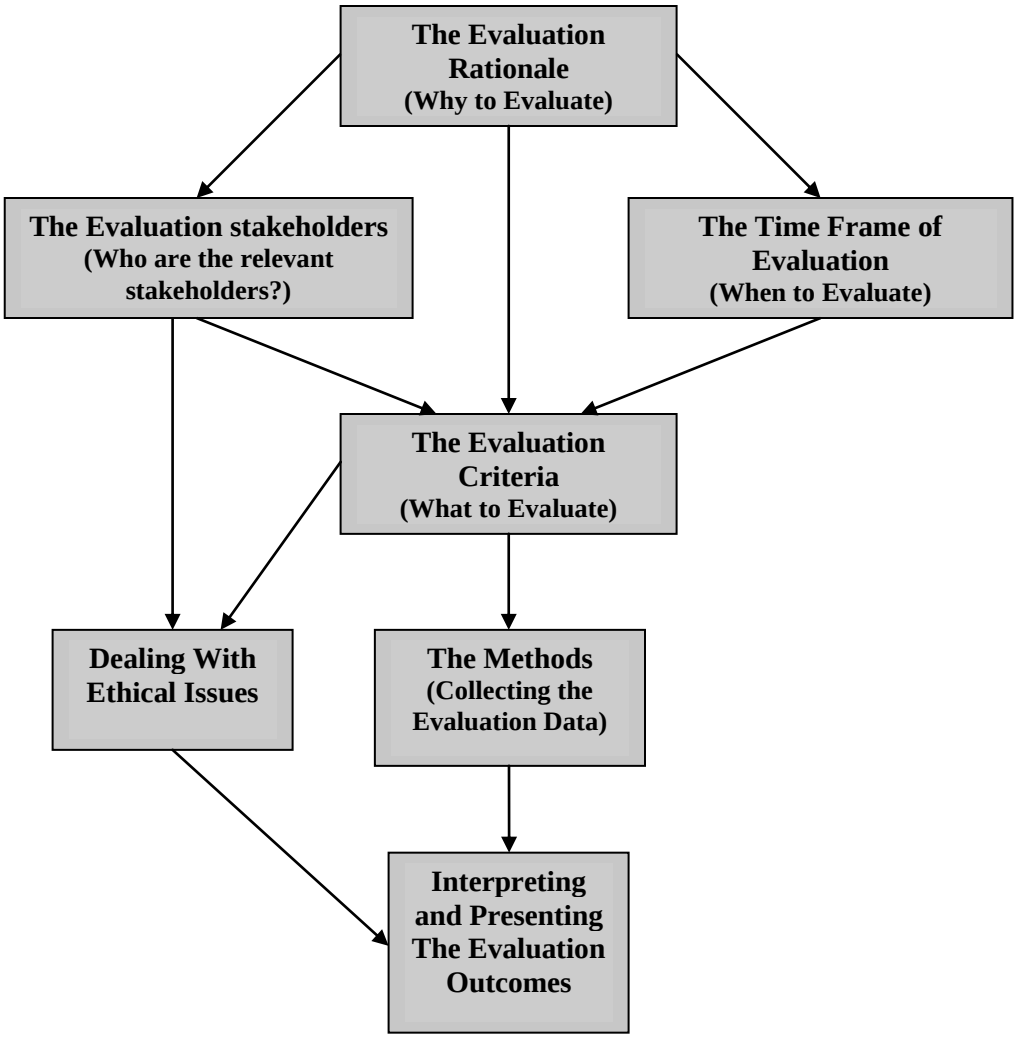



**Figure (3-1) The Elements of the Proposed Evaluation Roadmap for E-health Evaluation**

### 3.3.1 The Rationales of E-health Evaluation

The first element of the proposed road map is about identifying the general basis of the evaluation and decides on why to evaluate, and it is vital for an organization to determine as early as possible on the priorities of the evaluation questions for their evaluation initiatives.

The rationale for conducting evaluation in the field of e-health varies from one case to another; it can be for maintaining accountability for expenditure of resources (Heathfield et al. 1998; Wimmer et al. (2008); for developing and strengthening performance of

health organizations, individuals and/or systems (Aidemark, 2001; Heathfield et al. 1998; Wong-On-Wing et al. 2007); for decision-making (Brender, 2006; Kazanjian and Green, 2002); for promoting the use of information systems in healthcare (Friedman and Wyatt, 2000) and for usability and acceptability (Ascher et al. 2007; Nyman and Yardley, 2009; Pagliari, 2007)

Maintain accountability for expenditure of resources is the first rationale of e-health evaluation in the proposed roadmap; it is about assessing the value of governments' investments in the field of e-health. Governments have put considerable financial and human resources behind the development of e-government services; e-health services are high on the priority of governments and in the most developed countries they receive a sizeable share of the investment budget in healthcare (Deloitte and Touche, 2003; Mitchell, 2000; Protti's, 2005). In order to make such investments worthwhile, governments should have clear objectives in terms of outputs and the necessary financial and human resources to deliver specific goals by which they can justify these investments. Wimmer et al. (2008) indicated the importance of maintaining accountability for expenditure of resources as rational for evaluation. They believe that there is ambiguity regarding the value of these investments, and for whom, the value is needed first; they also believe that despite substantial investments of public funds, proper frameworks to monitor and evaluate the efficiency as well as benefits of such investments are lacking.

Developing and strengthening performance of health organizations, individuals and/or systems is the second rationale of e-health evaluation in the proposed roadmap; it is about assessing the performance of an organization, individual or system through a set of key performance measures. Performance measurement can be defined as "measurement on a regular basis of the results (outcomes) and efficiency of services or programs" (Hatry, 1999). Performance was considered as major issue in influencing the organizational perspective and is employed in theory and practice in the assessment of e-health services.

Developing and strengthening performance requires continuous performance assessment by adopting one of the performance evaluation approaches which is a challenging task in any performance evaluation. The most of existing performance evaluation approaches based on traditional accounting measures of performance. These measures suffer from the lack of comprehensiveness and the limited focus on long-term and outcome measures (Jones et al. 2007; Wong-On-Wing et al. 2007).

In contrast to traditional performance evaluation approaches, the balanced scorecard (BSC) as it was discussed in chapter two is proposed by Kaplan and Norton (1992) to address some of the limitations of the traditional performance evaluation approaches. The BSC is a multi-dimensional performance evaluation approach which is intended to evaluate organization performance from four different perspectives: the financial perspective, the internal business process perspective, the customer perspective, and the learning and growth perspective. Because the BSC provides 'a set of performance measures that gives top managers a prompt and comprehensive view of organization performance, it is one of the popular approaches in healthcare evaluation (Aidemark, 2001).

The usability and acceptability evaluation is the third evaluation rationale of e-health evaluation. This evaluation has been proposed by many researchers (Khalifa & Liu, 2004; Venkatesh & Morris, 2000) to explain the success or failure of information system implementation initiatives. Pagliari (2007) highlighted the significance and need of such rational in the evaluation of e-health services; she stated, the acceptability and usability evaluation of e-health technologies should have the ability to reveal the potential effectiveness of e-health innovations which have been compromised by insufficient user engagement in the design and development of e-health innovations.

As the usability and acceptability evaluation attributed to wide range of aspects (Melander-Wikman et al. 2005; Nielsen, 2003), the question that it poses is what of these aspects should be addressed in such type of evaluation? These aspects may include the features of high quality e-health services, the factors that influence achieving better user

services utilization, and the required user' satisfaction criteria of e-health services.
For the usability and acceptability evaluation to be successful, it should be designed to address a broad number of issues and dimensions which require adopting a multi-method approach and involving diversely constituted research teams. These issues may include tangible and intangible issues and cover the technical, economical, and social dimensions.

The fourth rationale of e-health evaluation in the proposed roadmap is evaluation for decision making. This rationale has been suggested by many authors (Brender, 2006; Kazanjian and Green, 2002) as an important rationale for e-health evaluation; it is about providing the basis for decisions regarding an e-health system under investigation or its implementation context. The Health Technology Assessment Framework proposed by Kazanjian and Green (2002) is an example of such evaluation. The framework was suggested to guide rational decision-making about the adoption of new e-health initiative. The framework is based on three questions: Who; What for; and How much and for whom? By answering theses questions, the evaluator should identify the main stakeholders that are affected and affected by the adoption of an e-health imitative, determine the purpose and value of it, and identify and quantify its benefits. The main dimensions of the framework are; population at risk, population impact, economic concerns, social context (including ethical, legal, and political concerns), and technology assessment information.

The evaluation to promote the use of information systems in healthcare is the fifth rationale of e-health evaluation in the proposed roadmap. Friedman and Wyatt (2000) argue that the core rationale of conducting evaluation is promotional; it is about encouraging the use of information systems in healthcare through assessing the risks and benefits for both users and government institutions.

Although we believe that the previous five evaluation rationales are the main and the most common used ones in the evaluation of e-health services, they are not inclusive as there are other rationales which may not fall into these five categories. Examples of these rationales are the evaluation initiatives that are designed to assess the technical or social

impact of an e-health system or service on a specific user or organization.

In the proposed evaluation roadmap, we are considering the five evaluation rationales which are mentioned above, as the main evaluation rationales. Each of these rationales requires certain timeframe and the consideration of a certain stakeholders. From the previous five rationales, the usability and acceptability evaluation has been chosen as rational for evaluation to identify a set or sets of evaluation criteria for this study. The choice is made in coordination with one of the aims of the study; this is to propose evaluation criteria for better user's utilization and satisfaction of e-health services.

Table (3-2) summarizes the main rationales for conducting evaluation in the field of e-health. Choosing one or more of these rationales for evaluation is determined by the most important question or questions for the evaluation. Based on the evaluation rationale, the evaluation process may take different time frames, deploy a particular evaluation method, require a qualitative approach, a quantitative approach, or both for data collection, and consider one or more than one perspective.

| | The types of rationale | References |
|---|---|---|
| **Rationales** | Maintain accountability for expenditure of resources | Heathfield et al. (1998)<br>Wimmer et al. (2008) |
| | Develop and strengthen performance of health organizations, individuals and/or systems | Aidemark, (2001)<br>Heathfield et al. (1998)<br>Wong-On-Wing et al. (2007) |
| | Usability and acceptability | Ascher et al. (2007)<br>Nyman and Yardley, (2009)<br>Pagliari, (2007) |
| | Decision-making regarding an e-health service or system under investigation or its implementation context. | Brender, (2006)<br>Kazanjian and Green, (2002) |
| | Promote the use of information systems in healthcare | Friedman and Wyatt, (2000) |

**Table (3-2) The Main Rationales for Conducting Evaluation in the Field of E-health Services**

### 3.3.2 The Time Frames of E-health Evaluation

The second element of the proposed road map is to determine when to evaluate and how long the evaluation process will take. This decision is based mainly on the general basis of evaluation which is normally determined first.

The time frames of evaluation or when to evaluate is a debatable issue in academic research and practice. Many authors (Symons, 1991; Jones and Hughes, 2001; Smithson and Hirschheim, 1998) argue that evaluation should be treated as continuing process throughout the various stages of system or service development. In contrast with this view, other authors (Remenyi and Sherwood-Smith, 1999; Serafeimidis and Smithson, 1999) argue that evaluation cannot be limited to the stages of system or service development and should be extended to cover the pre-implementation and post implementation stages, this will allow an incorporation of important aspects in the evaluation like changes in organisational objectives, and the system and learning processes. Similar to this view, Brender (2006) sees that the evaluation of e-health systems or services can be carried out during three phases; they are the analysis and planning phase, the development and the adaptation phase or after the developments has been completed and while the system is in use.

In this study, the adopted view is the one of extending the evaluation time frames to cover the pre-implementation, implementation, and post implementation phase, as we believe that many important evaluation dimensions like user perspective cannot be fully assessed during pre-implementation or implementation phases.

During the pre-implementation phase, the evaluation initiatives in principle may deal with any evaluation aspects based on the rationale of evaluation which have to be determined first. E-health evaluation, to maintain accountability for expenditure of resources is normally conducted during the pre-implementation phase. It may be used to assess the availability and the efficient use of an investment needed to implement the proposed e-health solution, to predict the costs and benefits associated with this investment, to judge whether this investment fits strategically with the direction and

priorities of a health organization and/or government, and to establish a plan to manage that investment.

E-health evaluation for decision-making regarding an e-health service or system under investigation or its implementation context can be conducted during the pre-implementation phase. The decision-making aspects which may be addressed in this phase include: whether the proposed e-health solution is able to solve the current problem and meet the demands and requirements of the users and the organization, is the proposed e-health solution complete and consistent in terms of size and coherence, and are the weaknesses and risks (internal and external) associated with the proposed e-health solution manageable and acceptable (Brender, 2006.)

During the implementation phase, the evaluation initiatives may take different approaches and deal with a wide range of aspects, these include: a response evaluation to assess the users reaction to system or service, an evaluation of considerations regarding whether and how to verify the fulfilment of the implemented e-health solution to the proposed one, and an evaluation for decision-making regarding an e-health service or system under investigation or its implementation context.

The response evaluation approach (Grover et al. 1996) which assesses the users' reaction to the system is usually performed during the final stage of development. The equity implementation model presented by Lauer et al (2000) is an example of the response evaluation approach. The model was based on the equity theory (Adams, 1965), a well-established theory in the social sciences and was adopted in e-health assessment to examine and understand user reaction to the implementation of a system. Lauer et al, (2000) stated that the focus of this approach is on the effect of the changes that such a system brings about on the system users.

Evaluation for decision-making can be quite useful specifically in the early stage of the implementation phase. The decision may concern with available choices when it is possible to keep the options open in the early stage of development to choose between

systems or implementation scenarios.

Post implementation is another phase when an evaluation initiative may be carried out. The evaluation initiatives may take performance evaluation, impact evaluation, or usability and acceptability evaluation.

Performance evaluation which aims to develop and strengthen performance is an essential function in any organization. Although some of the available traditional and multi-dimensional performance evaluation approaches can be used during the implementation phase, most can be applied more efficiently in post implementation phase.

The impact evaluation approach (Grover et al. 1996) is intended to assess the overall social and technical impact of the system on users and organisations. According to Grover et al. (1996), because the impact evaluation is the most comprehensive, it is the most difficult approach to undertake. The impact evaluation approach can be quite beneficial in evaluating e-health services because it would comprehensively recognize users and organisations needs, by measuring the acceptability as well as the risks and benefits of e-health services (Gustafson and Wyatt, 2004).

Usability and acceptability evaluations are normally performed during the post implementation phase and are aiming to improve our understanding of the factors that influence user's acceptance and use of information systems in healthcare. The initiatives of this type may cover a broad range of aspects; and adopt single or multiple research method like questionnaires and interviews (Van den Brink et al. 2005; Finkelstein et al. 2003).

Table (3-3) summarizes the proposed evaluation time frames mapped to evaluation rationales in the field of e-health. Choosing the proper time for evaluation is determined by the evaluation rationale which has to be determined first. Based on the evaluation rationale and the evaluation time frame, the evaluation process may deploy a particular

evaluation method and consider one or more than one perspective.

| Evaluation Time Frames | Evaluation Rationales |
|---|---|
| **Pre-implementation phase** | • Maintain accountability for expenditure of resources<br>• Evaluation for decision-making |
| **Implementation phase** | • Response evaluation to assess the user's reaction to system or service<br>• Evaluation for decision-making |
| **Post implementation phase** | • Performance evaluation<br>• The impact evaluation to assess the overall social and technical impact of the system on users and organisations<br>• Usability and acceptability evaluations |

**Table (3-3) The Proposed Evaluation Time Frames Mapped to E-health Evaluation Rationales**

### 3.3.3 The Stakeholders of E-health Evaluation

The third element of the proposed road map is about identifying the key stakeholders and determining who should be considered in the evaluation. The identification process should be based on the general basis of the evaluation and on when the evaluation is performed.

As it was discussed in chapter two, there is only limited literature that recognizes healthcare stakeholders and their changing role in the evaluation of e-health services. Moreover, even in the limited literature available on healthcare stakeholders, the description and identification of these stakeholders seems to be generally ignored (Mantzana and Themistocleous, 2006).

In this study, the adopted view is to divide e-health stakeholders between supply side stakeholders (organizational perspective) and demand side stakeholders (users' perspective).

The supply side stakeholders' category which represents the organizational perspective in the proposed model contains;

1. **Controllers:** This category includes top management, Government, and health authorities.
2. **Supporters:** This category includes technologists, administrators, professionals, and researchers.

The demand side stakeholders' category which represents the users' perspective in the proposed model contains;

1. **Patients:** This category include patients, next of kin and carers
2. **Healthcare Provider;** This category includes hospitals, General Practices, clinicians, non-clinicians, responsible clinicians, health care facilities and clinical students.

An adapted version of Pouloudi & Whitley (1997) rules will be employed to identify who should be considered in an evaluation scenario. The new version of rules has been adapted to suite e-health evaluation context and the evaluation framework requirements. The new version of rules will be employed as follow;

1. Stakeholder's identification depends on the service or the services we are evaluating, on the general basis of the evaluation, and on the evaluation timeframes (pre-implementation, implementation, or post implementation).
2. Although stakeholders cannot be viewed in isolation, every stakeholder in fact sees the e-health service and the evaluation process from its own standpoint. This may challenge the building of the evaluation framework and produce conflicting results. For this reason, we believe that the framework should only consider one stakeholder or a group of stakeholders with a common perspective in an evaluation process.
3. When to evaluate and how long the evaluation process will take play major role in determining the position and the involvement of each stakeholder. The stakeholders who could be considered in post-implementation phase may be not a feasible option to be considered in earlier phases.

### 3.3.4 The Criteria of E-health Evaluation

The forth element of the proposed road map is about identifying the evaluation criteria which we believe is the most important aspect of the framework because it determined what drives the whole evaluation process.

Cronholm and Goldkuhl (2003) differentiate between three types of strategies in relation to what drives the evaluation. These strategies are: criteria-based evaluation, goal-based evaluation and goal-free evaluation. In the criteria-based evaluation, some explicit general criteria are used as an evaluation measure. What is typical for this strategy is that a set of predefined criteria work as a basis for the evaluation. The chosen criteria rule the evaluation process and its results (Cronholm and Goldkuhl, 2003). One important advantage of this strategy is in its wide applicability while the criteria can be grounded in, and derived from, one or more specific perspectives or theories.

The goal-based evaluations use goals from the organisational context to assess the information system. Goal-free evaluation is based on gathering data about a broad range of actual effects of the system and evaluating the importance of these effects in meeting demonstrated needs (Patton, 2002).

Among the three previous approaches, the criteria based evaluation approach is the most appropriate for e-health services evaluations, and it is the adopted approach in the proposed evaluation framework of this study. The appropriateness stems from the fact that e-health applications are principally complex in nature, hence they require a strategy that can be derived from a multitude of perspectives and theories.

In general, the predefined criteria for criteria-based evaluation vary from one case to another. We believe that the identification process of the criteria for specific context should be based mainly on the three elements discussed in the previous sections (The Evaluation Rationales, The Evaluation Timeframes, and The Evaluation Stakeholders) as explained in the proposed model for the identification of evaluation criteria, figure (3-2).

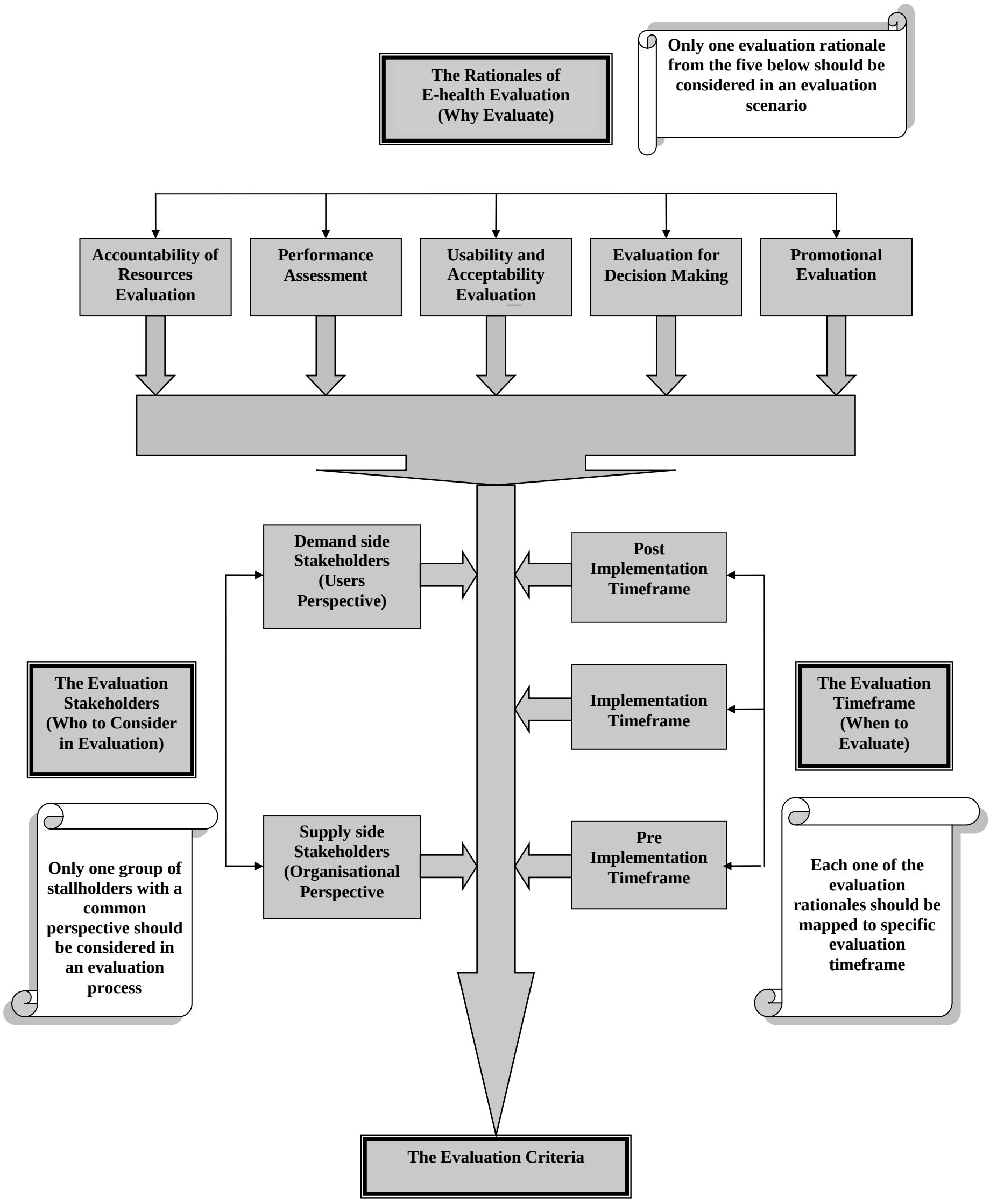



**Figure (3-2) The Proposed Model for the Identification of Evaluation Criteria**

For example, the identification process of the evaluation criteria in an evaluation scenario may consider performance assessment as evaluation rational, post-implementation as evaluation time frame and the group of supply side stakeholders as evaluation stakeholders. Although the evaluator has to consider these elements when identifying the criteria, the framework did not limit the choices of the evaluator to a specific theory or evaluation model. For this scenario; the evaluator has the flexibility to include the balanced scorecard and/or other traditional performance evaluation models to derive the multi-dimensional criteria. The scenario should produce a certain set of evaluation criteria which will be unique for these choices and different from any other scenarios.

The identification process of the evaluation criteria in another evaluation scenario may consider accountability of resources as evaluation rational, pre-implementation as evaluation time frame and the group of supply side stakeholders as evaluation stakeholders. For this scenario, the evaluator has to consider the three elements and look for the available theories and evaluation models in resources management to derive the criteria.

In this study, the usability and acceptability of e-health services has been chosen as rational for the evaluation. The choice as we mentioned earlier is made for a number of reasons. First, this rational is causative to one of the aims of the study. Both the aim and the rational are about investigating the users' perspective in evaluating e-health services and identifying the key factors that influence users' utilization and acceptance of e-health services. Second, we believe that despite the potential role of e-health evaluation to explain the success or failure of information system implementation in healthcare, the relation between e-health evaluation and the usability and acceptability of e-health services is overlooked in literature. Moreover transforming the outcomes of the usability and acceptability evaluation to knowledge that improve the effectiveness and efficiency of existing and future e-health services is not fully investigated.

In regard to the second element of evaluation stakeholders, this study is intended to focus on the assessment of e-health from users' perspective and address the key factors that

influence the users' acceptance of the new adopted technologies. The choice is made to reflect the importance of users in the field of e-heath evaluation while the literature is suffering from ignoring the user's perspective in the evaluation (Gustafson and Wyatt, 2004).

In regard to the third element of evaluation timeframes, this study will focus mainly on e-health evaluation during the post implementation phase as we believe that user' perspective cannot be fully assessed during pre-implementation or implementation phases. We also believe that e-health evaluation of this type is more applicable and useful for academic research including this research study. Such studies usually adopt case study methodologies and aim to improve our understanding of the role of information systems in healthcare and develop our ability to deliver high quality services in future developments.

### 3.3.5 Collecting the Evaluation Data

The fifth element of the proposed road map is about choosing the most appropriate way to collect the required data for specific evaluation. As we decided to select criteria-based strategy to drive the whole evaluation process including data collection, the evaluation method varies from one type of criteria to another.

Collecting the data for e-health evaluation can be done by using a single method or a multi-method approach (typically quantitative and qualitative). This decision depends to some extent on the data that has been chosen for specific evaluation process, and the process may take a short or a long time and involves simple or complex tools depending on the scale and the dimensions of the evaluation criteria.

According to Gustafson & Wyatt (2004), that the use of quantitative methods for e-health evaluation may offer an important and useful data for the direct costs and benefits criteria, but qualitative methods may be more useful in exploring user' perspective where using qualitative methods is essential in exploring user needs and what they feel when they use the system or the service and how it affects them.

The quantitative and qualitative methods which may be chosen for e-health evaluation include experiments, surveys, archival analysis, histories, case studies, interview, focus group, expert review and observation. The process of selecting and deploying the appropriate method is an important and critical issue, and should only be decided on after considering a number of factors including;

- The evaluation rational and its context.
- The evaluation criteria and its dimensions.
- The multi-dimensional aspects of e-health, as it has different roots and complex relationships associated with using information communications technologies, management as well as health regulations, and governments policies.
- The large number of stakeholders involved in e-health evaluation, each with their own particular needs, values and objectives.

### 3.3.6 Dealing with the Ethical Issues

The sixth element of the proposed road map is about dealing with the ethical issues as a central aspect in e-health evaluation, and follows the required ethical standard. In a survey conducted by Balzer (2004) to explore the elements of successful evaluation, the survey was designed to target evaluation experts from 46 countries. The result revealed that almost all respondents identified that the consideration of ethics is an absolute necessity in the process of implementing any evaluation initiative.

The ethical standards vary from one country to another, and one of the challenges in the development of e-health services across Europe has been the complex and diverse legal and ethical regularity environments (Richardson et al. 2002)). In the United Kingdom, the Department for International Development (DFID) recommends the following international ethical standards for evaluators to assist in evaluation initiatives (DFID, 2005)

- Evaluators should respect local customs regarding dress, personal interaction, religious beliefs and practices.

- Evaluators must respect people's right to provide information in confidence and must ensure that sensitive information cannot be traced to its source.
- In an evaluation team, all team members should have an opportunity to dissociate themselves from particular findings and recommendations. The report should acknowledge any unresolved differences of opinion within the team.
- Evaluators should provide maximum notice, minimise demands on time, and respect people's right to privacy or refusal to be involved.
- While evaluators should respect other cultures, they must also be aware of international values regarding minorities, women, children etc.
- The evaluation team should consult with the evaluation manager when there is any doubt about if and how issues, such as evidence of wrongdoing, should be reported.
- Evaluators are not expected to evaluate individuals, and must balance an evaluation of management functions with this general principle.
- Briefings and unofficial summaries may be shared, with the permission of the evaluation manager, as part of the transparent evaluation process.
- Principles of independence, impartiality and accuracy are paramount.

### 3.3.7 Interpreting and Presenting the Evaluation Outcomes

The final element of the proposed road map is about how to interpret and present the evaluation outcomes. The way by which the evaluation outcomes are presented can contribute to their value, how they are perceived, and their effectiveness in convincing different people.

Determining how to interpret and present the evaluation outcomes should be based on the general basis of the evaluation, or in other words, the presentation of the outcomes should serve the evaluation rational. Based on this the evaluation outcomes can be interpreted and presented to serve one of the following objectives;

- Secure accountability for resources
- Identify areas of poor performance
- Help users to comprehend and choose the right services.

- Guide top management regarding the adoption of new e-health initiative
- Promote the use of information systems through emphasizing its roles including generating valuable public health data.

### 3.4 Identifying and building Users' perspective Evaluation Criteria

E-health services evaluations are unable to reveal the full value of e-health initiatives without considering the perspectives of all the e-health services stakeholders and the e-health value measures presented by evaluation criteria consisted of all the key issues perceived by each of the stakeholders.

As mentioned earlier healthcare services are known to be a complex domain. This is related to the fact that healthcare is a safety critical area, dictated by a complex regulations. These regulations should be carefully considered in the selection process of the evaluation criteria, and in the description of the criteria used for a specific e-health context.

The identification process of the evaluation criteria for the chosen evaluation scenario of this study is based on the three elements of the proposed evaluation framework: evaluation rationales, evaluation timeframes, and evaluation stakeholders. In the chosen evaluation scenario, we are considering the usability and acceptability as rationale for the evaluation, post-implementation as evaluation timeframe, and the group of demand-side stakeholders as evaluation stakeholders. Figure (3-3) explains the proposed model for the development of evaluation criteria from user' perspective

As the aim here is to propose evaluation criteria for the assessment of e-health from users' perspective and address the key factors that influence the users' acceptance to the new adopted technologies, therefore the proposed criteria is derived from two sources. The first source is two lines of studies relating to the behaviour of users of new products or services. The second source is a broad examination of the existing evaluations initiatives specifically those that are based on e-health services case studies. The first source represented by DOI and TAM which are popular and widely used theories, but still have their own merits and limitations. One of the main limitations of both theories is that

they are not conclusive models and they suffer from the absence of significant factors. To adapt both theories for e-health context and overcome their limitations, critical analysis of e-health services case studies were used.

Considering the technical perspective, the economic perspective, and the social perspective in selecting and grouping the proposed evaluation criteria, the criteria will be grouped in three sets, which are usability criteria, direct costs and benefits criteria, and trust criteria. This classification should serve the deployment of the evaluation framework.

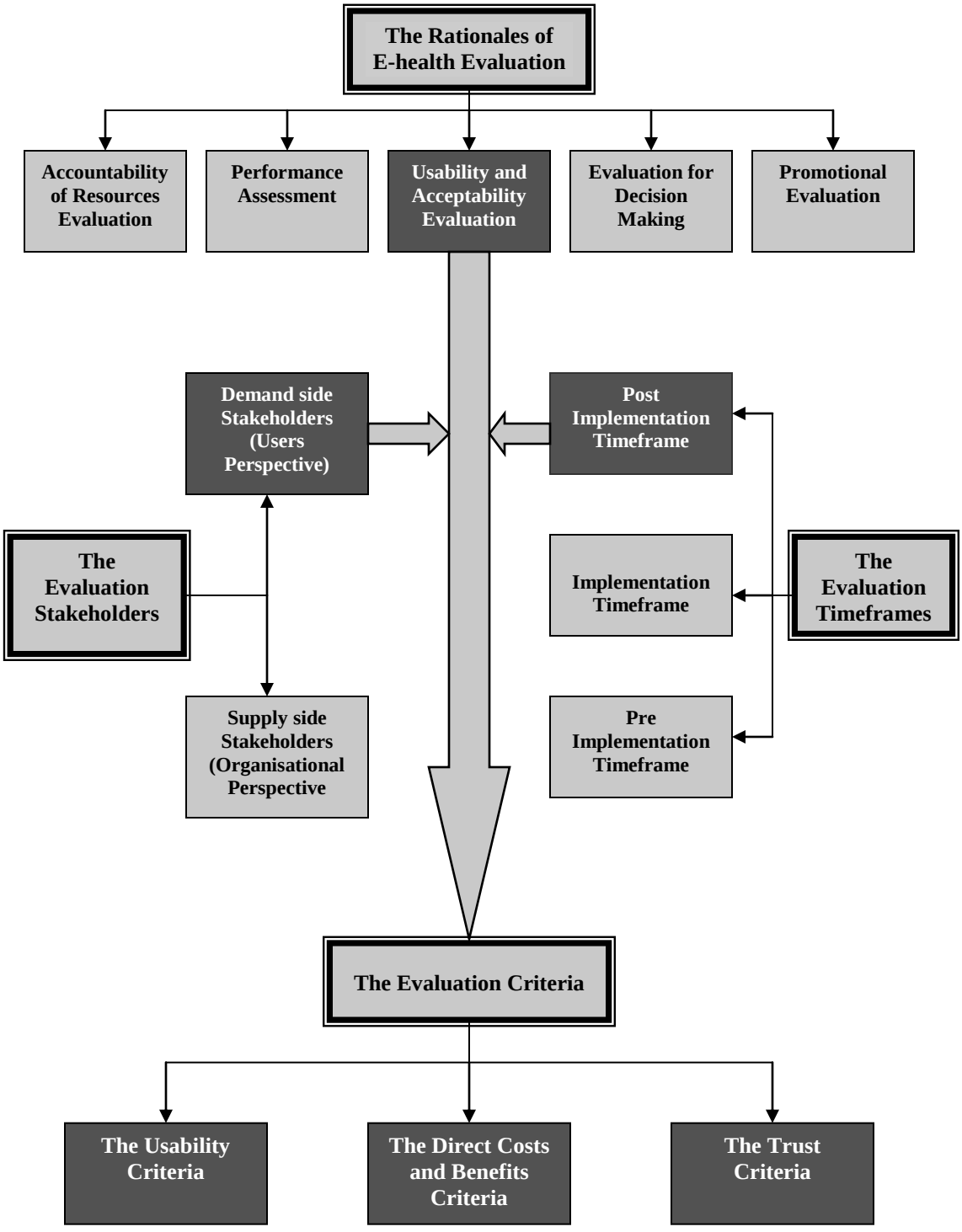



**Figure (3-3) The Proposed Model for the Development of Evaluation Criteria from User' perspective**

### 3.4.1 The Usability Criteria

The first set of evaluation criteria is the usability criteria. Usability in the proposed criteria may represent perceived ease of use and perceived usefulness as depicted by Davis (1989) technology acceptance model (TAM), or complexity as defined by Rogers (1995) diffusion of innovation.

Davis (1989) defines perceived usefulness as "the degree to which a person believes that using a particular system would enhance his or her job performance". He also defines perceived ease of use as "the degree to which a person believes that using a particular system would be free of effort". Rogers (1995) defines complexity as the "degree to which an innovation is perceived as difficult to understand and use"

We believe that perceived ease of use is predicted to influence perceived usefulness, since the easier a system is to use, the more useful it can be. We also believe that complexity and perceived ease of use are measures for the same issue. Therefore we are considering the three issues belonging to the same set and they will be represented by the usability criteria.

Usability has different interpretations and meanings depending on the context of use. Bevan and Macleod (1993) define usability as the quality of interaction within a particular context. Another description of usability which considers user's perspective is proposed by Nielson (1993), according to him, usability relates to how well users can use the functionality of a system or service in terms of what it can do. Researchers have provided broad dimensions and introduced long lists of aspects by which the usability can be assessed. These include accessibility (Steinfeld & Danford, 1999), functionality (Melander-Wikman et al. 2005; Nielson, 1993; Steinfeld & Danford, 1999), compatibility (Bevan et al. 2007; Chau and Hu (2001), user' satisfaction, easy to learn and use (Melander-Wikman et al. 2005; Nielson, 1993), and user interface (Melander-Wikman et al. 2005).

Accessibility is an important subset of usability. According to Terry Ma, and Zaphiris (2003), accessibility means an effective and efficient user interface which is inclusive of

more people in more situations and can achieve user satisfaction. Those people are different in their accessibility requirements and needs. A high percentage of them particularly those who suffer from disabilities or chronic illness are more likely in need than others for accessible and effective e-health services. Mont (2007) reported that an estimated 20 percent of American and Australian populations and 12.2 percent of British population have disabilities. Another research by Lenhart et al. (2003) shows a high percentage of about 38 percent of Americans with disabilities are using the Internet. The same research also shows that users with disabilities are more likely than the general population to use e-health services and have access to these services only from home.
Accessibility requirements for e-health services should generally accommodate all people, but particularly remove or reduce all the barriers that can hamper disabled people from fully benefiting from e-health services. One of the efforts for determining accessibility is the guidelines developed by the "Web Accessibility Initiative", a working group of the World Wide Web Consortium (Caldwell et al. 2007)

Despite the importance of accessibly in influencing the users' perspective of e-services in public sector and e-health services in particular, studies show that governments either ignored or did not pay enough attention to the accessibility importance. According to the Global E-Government Survey conducted by World Market Research Centre and Brown University (2001), only 2% of government websites worldwide have some form of disability access and only 7% of the e-government websites were accessible. Another study by West (2000) show that only 15 percent of American government websites offer some form of disability access, such as TTY (Text Telephone) or TDD (Telephone Device for the Deaf) or are approved by disability organizations. The study also revealed that only 4 percent of American government websites offer foreign language translation features on their websites. Another example for ignoring accessibly in healthcare services is a cross-sectional study by Zeng and Parmento (2004). The study aimed to evaluate the accessibility of consumer health information of 108 Web sites, and reported that no website met all the accessibly criteria in their assessing framework.

Compatibility is another important criterion to be included in the usability criteria. According to Rogers (1995), compatibility is measured by the degree to which an innovation is perceived as being consistent with the existing values, past experiences, and needs of potential users. Chau and Hu (2001) argued that compatibility is positively affecting user's attitude toward accepting new technologies in healthcare environments. They based their argument on the assumption that users would be more likely to consider technology useful if they perceived it to be compatible with their existing practices. In addition, users would consider technology easy to use if they did not need to change their practices significantly in an environment that can not cope with radical change.

Functionality is a broad criterion of the usability criteria which supposes to cover the user's requirements from a system to perform specific tasks in a specific situation; this includes accuracy, validity, robustly, speed and availability (Melander-Wikman et al. 2005).

User satisfaction is generally regarded as one of the most important measures of system or service success and should be included in the proposed usability criteria. The user satisfaction criterion can be measured by various dimensions including utility, reliability, efficiency, customization and flexibility (Horan et al. 2006).

Table (3-4) summarizes the proposed usability criteria, list of measuring aspects by which the criteria can be assessed and suggestions for measuring descriptions. The aim of proposing the measuring descriptions is to provide general guide for assessing these aspects. The applicability of the descriptions for specific context will be discussed in chapter six.

| Evaluation Criteria | Measuring Aspects | Suggestions for Measuring Descriptions |
|---|---|---|
| **Easy to learn and use** | **Easy to learn** | Measured by the time needed to learn to work with a service. |
| | **Easy to use** | Assessed by the simplicity of the service and how easy it is to understand and comprehend its functions |
| **Accessibility** | **Content Accessibility** | Measured by the degree of compliance with the Web Content Accessibility Guidelines |
| | **User interface** | Judged by the available options of user interfaces (e.g. Graphical interface, Multi-screen interface, Attentive User Interface). |
| | **Disability access & translation** | Is the system offering some form of disability access and foreign language translation features? |
| **Compatibility** | **Compatibility** | Assessed by how quickly and easily the e-service can fit into the whole healthcare system. |
| **Functionality** | **Accuracy** | Measured by the degree to which information provided by the service is free of errors |
| | **Validity** | Measured by the clarity and regularity of information updating. |
| | **Robustly** | Judged by the technical functionality of the service |
| | **Speed** | Judged by the system response time; web page load time; download time. |
| | **Availability** | Assessed by the availability of the service 24hrs/7days per week and the existing of alternative choices |
| **User satisfaction** | **Utility** | Assessed by the completeness and usefulness of the service content (Loiacono et al., 2002) |
| | **Reliability** | Judged by the appropriately of the service functions in terms of the technology as well as the accuracy of the content (Zeithaml et al. 2000). |
| | **Efficiency** | Judged by the time spent to complete the information task, quality of the information found, appropriateness of information found, and satisfaction with the outcome (Wang et al., 2005). |
| | **Customization** | Measured by the degree of service tailrarity to meet the needs of individual user (Burgess, 2004). |
| | **Flexibility** | Assessed by whether a system or a service provides choice of ways to state a need and delivers dynamic information (Zeithaml et al. 2000). |

**Table (3-4) The Usability Criteria and Suggestions for Measuring Descriptions**

### 3.4.2 The Direct Costs and Benefits Criteria

The second set contains the direct costs and benefits criteria. The criteria in this set are primarily based on Rogers's relative advantage. According to Rogers (1995), relative advantage is "the degree to which an innovation is seen as being superior to its

predecessor". It is essentially a cost–benefit analysis of how useful a given innovation when compared with what is already available. Relative advantage represents mostly the economic return involved in the adoption of an innovation, but could also include the immediacy of reward, social prestige, or savings in time and effort (Rogers, 1995). The direct costs and benefits criteria have traditionally dominated the traditional information system evaluation process, and they were criticized by many authors (Farbey et al. 1995; Serafeimidis and Smithson, 2000) for their limited relevance to the role of information systems. This limitation is in their definition of stakeholders, targeting only direct tangible costs and benefits and being only based on accounting and financial instruments. On the other hand, many authors (Eng, 2002; Glasgow, 2007; Gustafson & Wyatt, 2004; Smaglik et al. 1998) argue that direct costs and benefits are important and should be considered in evaluating e-health services. Despite the above mentioned opinions regarding the limitations of using the economic issues in the evaluation; we tend to support the opinion of including them as part of the evaluation criteria because healthcare services have a high economic impact on governments and citizens comparing to any other services (Bower, 2005; Friedman and Wyatt, 2000; Gustafson, 2001).

One of the efforts in assessing the direct financial cost and benefits of e-health is the e-health impact project which was commissioned by the European Commission (DG Information Society and Media) (Stroetmann et al. 2006). The main aim of the project was to evaluate the economic and productivity impact of e-health services. The research project developed a generic economic assessment and evaluation framework for e-health applications, and was mainly focused on citizens' perspective in assessing ten e-health application cases. The ten cases were selected from across the European Union for their proven, sustainable e-health application. The result of the assessment, which was carried over a period of 15 years, indicates a positive, sustainable economic impact of these e-health services.

Table (3-5) summarizes the proposed direct costs and benefits criteria and suggestions for measuring descriptions for e-health services evaluation. Adopting the proposed evaluation criteria and their descriptions for a specific e-health service should take into

account the relevancy of each of the evaluation criterion to the prevailing situation. This mainly depends on the maturity of the e-health initiative, and could lead to partial use of the evaluation criteria.

| Evaluation Criteria | Measuring Aspects | Suggestions for Measuring Descriptions |
|---|---|---|
| **Economic Saving** | **Money Saving** | How much money the citizens are saving by using the e-health service. |
| | **Time Saving** | How much time the citizens are saving by using the e-health service. |
| **Quality and Rewards** | **Effort Saving** | Measured by the degree of convenience in using a particular e-health service. |
| | **Quality** | Assessed by the added value to the citizens information and knowledge about their conditions, diagnoses, treatment options and healthcare facilities, as well as the appropriate timing of the service. |
| **Access Level** | **Access Level** | Judged by access level comparing to the same quality of services through alternative channel. |

**Table (3-5) The Direct Costs and Benefits Criteria and Suggestions for Measuring Descriptions**

### 3.4.3 The Trust Criteria

The third set of the proposed evaluation criteria is the trust criteria. Trust has been acknowledged as a crucial property of information systems that provide e-services in a variety of contexts, because failing to address the trust aspects correctly may have a profound impact on the e-services (Fruhling, and Lee, 2004**;** Presti et al. 2006). The aspects of trust must be tackled properly during the development and use of e-services. Trust can be defined as "the willingness of a party to be vulnerable to the actions of another party based on the expectation that the other will perform a particular action important to the trustor, irrespective of the ability to monitor or control that other party" (Mayer et al. 1995). Trust in e-health services is associated with data security and privacy of personal health data (Rodrigues, 2003). Given the sensitive nature of healthcare information, trust requires maintaining security in handling of patients' information, protecting their privacy, and assuring them that their personal information will be treated

confidentially. Without this assurance, it will be difficult to promote the use of e-health services.

Enhancing trust involves enhancing security measures. This requires a large variety of measures and principles. Slaymaker et al. (2004) identified several aspects for security to be considered in any e-health project. These aspects include: user authentication, encrypted data movement, data integrity, security breach detection, physical security, audit trails, client and server authentication, and availability.

Trust in e-health services is also associated with the privacy of personal health data. According to Davis et al. (1999) "Privacy is the state of being free from intrusion, and in the context of health care, it concerns the responsibility of a care provider to protect a patient from any disclosure (i.e., discovery by others), even unintentional, of personal health data by providing security to the patient and the patient's records".

Moor (1997), stated that the main consideration in developing policies for protecting privacy is to make sure that the right people, and only the right people, have access to relevant information at the right time. Moor (1997) also proposed a controlled and restricted access technique for managing privacy. The technique is based on setting up zones of privacy and provides the opportunity for different people to be authorized for different levels of access to different kind of information at different times.

In practice, studies show that governments and health organizations have different levels of consideration for trust, security and privacy in their initiatives. An example is the study of Jarvinen (2005) which concludes that governments and health organizations have low levels of consideration for privacy. The study which covers 39 American health organizations reveals numerous examples of practices that make the customer vulnerable can be found in the analysed healthcare privacy policies. These practices include the absence of an adequate privacy notice, not give the users reasonable control over their information and the use of technical and confusing language in the privacy policies that make it difficult for the user to fully understand them. Another study by West (2000) also

confirms similar finding. The study shows that there is very low consideration to the security and privacy in the American e-government websites. The study reveals that only 7 percent of American government websites have a privacy policy, and another 5 percent show some form of security policy. On the other hand, there are positive examples for the consideration of security and privacy such as the privacy provisions in Canada or quality seals for e-government services which was introduced in Austria (Aichholzer, (2003).

Table (3-6) summarizes the proposed trust criteria and suggestions for measuring the aspects of the criteria. Although the table provides clear and useful set of criteria, the criteria are general and it may be necessary to modify them to suite specific e-health initiative. The aim of proposing the measuring descriptions is to provide general guide for assessing the criteria aspects. The applicability of the criteria and their description for specific context will be discussed further in chapter six.

| Evaluation Criteria | Measuring Aspects | Suggestions for Measuring Descriptions |
|---|---|---|
| Security | **User authentication** | Measured by how strong the user authentication is and if its key capabilities are sufficient for e-health services |
| | **Encrypted data movement** | Assessed by the suitability of the technology used to protect the transfer of data. |
| | **Data integrity** | Determined by if the information is complete, whole, valid and digitally signed when required. |
| | **Security breach detection** | Judged by the ability of the system to monitor and look for suspicious activity on the network. |
| | **Physical security** | Assessed by how secure is the area that holding the database equipments and if it is located in an area with limited and controlled access. |
| | **Audit trails** | Judged by the ability of the system to record the modification of data, to keep the most up to date version of data and to retrieve old versions of data. |
| Privacy | **Responsibility** | Measured by the degree of protection supplied by the healthcare organization for patient information from any disclosure. |
| | **Access Control** | Assessed by the degree of control on different level of access to different kind of information at different time. |
| | **Confidentiality** | Measured by the degree of compliance with the UK Data Protection Act (1998) |

**Table (3-6) The Trust Criteria and Suggestions for Measuring Descriptions**

## 3.5 Chapter Summary

This chapter provides a conceptual framework for the evaluation of e-health services. The evaluation framework is designed to deal effectively with e-health evaluation challenges and overcomes the limitation of the existing evaluation frameworks that have been proposed or used in e-health context. The proposed evaluation framework is criteria-based, while the criteria can be grounded in, and derived from, one or more specific perspectives or theories. The proposed framework is sufficiently generic to be applicable to a wide range of applications but also sufficiently detailed to provide effective guidance. The framework will also support the evaluator in making precise and effective choices at various stages of the evaluation process.

The value of the proposed evaluation framework is that it offers a roadmap

for the identification process of the evaluation criteria. The identification of the evaluation criteria is determined by an evaluation matrix of three elements: the evaluation rationales, the evaluation timeframes, and the evaluation stakeholders. Switching between five main evaluation rationales, three evaluation timeframes, and any group of stakeholders with a common perspective produces number of scenarios. In any one of these scenarios, we will get a certain set or sets of evaluation criteria which will be unique for these choices and different from any other scenarios.

In an evaluation scenario, the proposed evaluation framework is deployed to propose evaluation criteria that influence user's utilization and satisfaction of e-health services. In the chosen evaluation scenario, we considered the usability and acceptability as rationale for the evaluation, post-implementation as evaluation timeframe, and the group of demand-side stakeholders as evaluation stakeholders. The outcome is three sets of clear and useful e-health evaluation criteria that can be accommodated by such a framework. The criteria are grouped in three sets, which are usability, direct costs and benefits, and trust. This classification should serve the deployment of the evaluation framework.

The proposed evaluation framework contributes to an important area of research and addresses the aspects that are hampering healthcare services from embracing the full potential of information and communication technologies towards successful e-health initiatives. The proposed evaluation criteria aims to explore the user' perspective in evaluating e-health services and identifying the factors that influence users' utilization and satisfaction of e-health services. The evaluation criteria can serve as part of e-health evaluation framework, and also to provide useful tools to allow the development of successful e-health initiatives by assisting the healthcare organisation to deal with the areas in need of improvement.

# Chapter Four

# The Research Methodology

**Chapter Abstract**

*The purpose of this chapter is to provide the reader with an overview and justification of the research methodology and methods used to gather the research data and the techniques used to analyze it*

*This study as we mentioned earlier aims to develop, and assess an evaluation framework for e-health services and to propose evaluation criteria that influence user's utilization and satisfaction of e-health services. The research data is required to validate the applicability and appropriateness of the framework to evaluate such e-health services, and to empirically examine and validate the proposed evaluation criteria as well.*

**Chapter Contents**

## 4.1 Introduction

While all research methodologies and methods have their strengths and weaknesses, some are more appropriate than others to be used in specific study context. This chapter seeks to build an argument that an interpretivist methodology of the case study is the most appropriate one to investigate and validate the proposed evaluation framework and the proposed evaluation criteria. The first section of this chapter will take the reader through several methodologies, their ontological and epistemological positions, what to consider and rejected from them. This is important to justify the use of the selected methodology for validation. The second section will discuss the research methods of archival records, documentation and semi-structured interviews which are used to collect the empirical data of this study.

## 4.2 Ontology, Epistemology and Methodology

Academic research can be conducted in different ways and may take different ontological and epistemological positions. These positions have usually a significant impact on the research design, objectives and on the knowledge produced out of the research.

One of the main challenging and important tasks for the researcher is to decide and select between varieties of research approaches. While it is important when making a choice to consider the research aim and the appropriateness of the approach, it is also important to understand the philosophical ideas on which the approach is based. The initial choice is not easy. Research approaches not only about selecting specific methodology to gather the research data and using particular techniques to analyze it, they are also consist of the choice of adopting particular ontological and epistemological perspective.

The term "Ontology" in its original sense is a philosophical discipline; it is a branch of philosophy that deals with the philosophical investigation of existence or being, and the interaction between social structures and individuals. The fundamental ontological question is about what exists. The way in which this question is answered depending on specific ontological position determines what can be accepted as a fact and what can be known (Craig, 1998).

There are different descriptions in the literature of what ontology means, one of the most relevant description for this study is Gruber (1995) one. According to him, ontology is an explicit specification of a conceptualization. Conceptualization refers to an abstract model of some phenomenon in the world by identifying the relevant concept of that phenomenon and explicit means that the types of concepts used and the constraints on their use are explicitly defined.

The term 'Epistemology' refers to the theory of knowledge and is concerned with the nature of knowing. The fundamental epistemological question is about how we know what we know. The way in which this question is answered determines the logic used to obtain knowledge (Lewis, 1996). According to Nissen et al. (1991) epistemology can be defined as the nature of human knowledge and understanding that can possibly be acquired through different types of research using an appropriate method of investigation

The literature on the philosophy of science in general and information systems in particular (Bryman, 2001; Yin, 2003) distinguishes between two main positions: positivism and constructivism/interpretivism, some other literature (Orlikowski & Baroudi, 1991; Robson, 2002) add critical position.

Positivism position represents a broad tradition of thought that assumes that reality is concrete and objectivity is achievable. Research conducted under positivist ontology considers a reality fixed and independent of the researcher and that objective knowledge can be produced through rigorous methodology. The researcher here is expected to add to existing knowledge by acting as observer and gathering generally quantitative data (Bryman, 2001).

Constructivism or interpretivism position represents the view that assumes that knowledge is socially constructed and reality is ultimately subjective. The view also assumes that reality is not objectively measurable, and, furthermore, individuals construct their reality by associating 'meaning' with certain events or actions (Bryman 2001). Researchers take interpretivist position considers people as an active part in constructing

social reality and social structures. The researcher here may need to use qualitative methodologies, emerging from methods such as in-depth interviewing and focus groups, which is required to understand people's lives, experiences and the subjective meanings and gather generally qualitative data (Rubin & Rubin, 2005).

According to Jonssen (1991) the main difference between interpretivism and critical position is a result from the view of society as being ordered or in conflict. In the interpretivist position the underlying social order is an outcome from the view that organizations have shared norms and practices. In the critical position the underlying social conflict resulting from the view that there is no unquestionable foundation for science, no 'facts' that are beyond dispute, and knowledge is a social and historical product (Robson, 2002).

Researchers who have adopted critical position believe that the real world is not only complex but also stratified into different layers. Social reality incorporates individual, group and institutional, and societal levels (Robson 2002). As critical position does not have or recommend specific research methodology (Ngwenyama, 1991), the researcher here is expected to adapt one of the interpretative methodologies to suite his needs.

As positivist position assumes that knowledge consist of facts that are independent, the positivism position is not suitable for this study. This is because the study is about e-health evaluation and deals with dependent issues (the evaluation criteria), the main part of the criteria is intangible variables which are difficult to be quantified.

As critical position does not have or recommend specific research methodology and assumes that society does not have shared norms and practices, the critical position is not suitable for this study.

Among the positivism, interpretivism and critical positions, the interpretivism is the most appropriate one for this study. The appropriateness stems from the fact that e-health services are principally complex in nature, they are delivered in complex social context,

and they are managed and controlled by different groups of stakeholders, hence they require an interpretivism position that can work effectively in such context.

## 4.3 The Research Approach

In order to achieve the research aim and objectives, it is important to choose an appropriate research approach for collecting, measuring, and analyzing the required data Galliers (1992) stated that "A research approach or strategy is a way of going about one's research, embodying a particular style and employing different research methods with which to collect data." There are quite a number of research approaches available such as experiments, surveys, case studies (Galliers (1992; Yin, 2003), simulation, action research (Galliers, 1992), and history (Yin, 2003) and the decision to select a particular research approach is a complex and important task.

The selection of an appropriate research approach is influenced by many variables including the purpose of the research (Glaser and Stauss, 1967), the characteristics of the research inquiry (Lowery and Evans, 2004; Myers and Avison, 2002; Yin, 2003), and the available time for the research (Glaser and Stauss, 1967).

The selection process of an appropriate research approach for this study, is an important and critical issue, and should only be decided on after considering a number of aspects including;

- The purpose of the research study, in view of the research area as it is residing at the intersection of three research fields, each well-known for its complexity; healthcare services, information systems, and evaluation methodologies.
- The characteristics of the research inquiry, which cover a broad range of questions including, why healthcare services are lagging behind in embracing ICT? What are the aspects which should be considered for e-health evaluation? How to identify the key factors that influence users' utilization and satisfaction of e-health services?

- The multi-dimensional aspects of e-health, as it has different roots and complex relationships associated with using information communications technologies, management as well as health regulations, and governments policies.
- The large number of stakeholders involved in e-health evaluation, each with their own particular needs, values and objectives.

The research approach which has been chosen to collect qualitative data is the case study approach. The approach has been chosen because it is the most appropriate for this study; this is due to a number of reasons.

The first reason is that the case study approach, as researchers from both social research and information systems has agreed (Galliers, 1992; Yin, 2003) is the most suitable approach where no exact measures for the variable of interest have been developed and where experiences of the actors are important and the context is critical. These features of case study approach are quite necessary for our research study where e-health is relatively new innovation that is currently shifting from institution-centred to regional and national health information systems (Haux, 2006).. Moreover, e-health evaluation and its context is both complex and under-developed field (Brender, 2006; Friedman and Wyatt, 2000).

The second reason is that the case study approach as reported by many authors (Galliers, 1992; Irani et al. 1999; Orlikeowski and Baroudi, 1991) is the most common approach which has a wide range of methods that are well established and valid to produce reliable results in many disciplines including information systems. In this study it provides the opportunity to use a variety of effective methods to validate the proposed evaluation framework and the evaluation criteria, this includes; interviews, documentation and archival records.

The third reason is that the case study approach considers the research context including the social dimension which is essential for this research study, and hence the depth of the inquiry possible through the case study approach is greater than the case with any other

research approaches, the approach also has the potential to provide a much more complete understanding of the meaning of the results and conclusions (Galliers, 1992).

According to Klein and Myers (1999), researchers can adopt positivist, interpretive or critical research methods in case study approach. In this study the adopted methods are interpretive research methods. The choice was justified in the previous section. The selected methods of interviews, documentation and archival records will be explained in the following section.

### 4.4 Research methods

Research methods can be either quantitative or qualitative with their respective various techniques for data collection. Quantitative research methods were originally developed in the natural science to study natural phenomena (Myer and Avison, 2002). Quantitative research is based on the principle of objectivity, and its design is a detailed plan of operation with predetermined hypotheses. Their strengths are in their ability to create factual, reliable outcome data that are claimed to be possibly generalized to some larger population (Steckler et al, 1992). Their weaknesses are in forcing individuals and human behaviour into rigid categories (Miles, 1994).

Qualitative research methods on the other hand were originally developed in the social sciences to study social and culture phenomena (Myer and Avison, 2002). Qualitative research is based on the principle of subjectivity, and its design is usually flexible unstructured and open to emerge and evolve overtime. Their strengths are in their ability to produce rich, detailed, valid process data that usually maintain integrated representation of the stakeholders perspectives of a research (Steckler et al, 1992) Their weaknesses are in labelling them as soft and less-systematic (Reichardt and Rallis, 1994).

The research methods for this study are required to gather data for the validation of the proposed evaluation framework and the proposed evaluation criteria that influence user's utilization and satisfaction of e-health services. With this in mind, the most appropriate method of data collection is qualitative. The decision to select qualitative methods is

based on the advantages that can be offered by such methods in terms of understanding the impact of soft and hard criteria on e-health evaluation, understandi`ng how evaluation stakeholders perceive and evaluate e-health services, and understanding the influence of social context on e-health service use. Moreover the limitation of qualitative methods in terms of bias in research findings can be overcome by triangulation of methods.

Many researches (Brewer & Hunter, 1989, Creswell, 2003; Yin, 2003) show the limitations of using single method in addressing more than one disciplinary perspective and suggest the multiple methods of data collection which is also called triangulation to get more reliable and consistence research findings. For this reason and because a qualitative data collection methods have been chosen, the multiple research methods will form a basis for rigorous and valid research findings

Yin (2003) lists six methods to collect data in case study methodology, they are; documentation, archival records, interviews, direct observation, participant observation, and physical artefacts. Among the six, the methods which have been selected to collect the data for the case study are documentation and archival records, as well as the use of semi-structured interviews, the data then collated and analysed. In the following sections, the selected methods which will be used to collect primary data of this study are presented and discussed.

### 4.4.1 Documentation Method

Documentation method is an important technique to gather primary and secondary data in case study methodology and it has been chosen as a primary method of data collection for this study. According to Yin (2003), Documentation method has a variety sources of data, this include letters, agendas, administrative documents, formal studies, and relevant texts in mass media. Although the use of documentation as a research method has a number of advantages, it has been criticised for some of its weaknesses.

One of the main advantages of adopting documentation is that it can be used both as primary source of evidence or to support evidence from other sources and specify events

and issues in greater detail than available through other data gathering methods (Burns, 2000). Moreover, the use of documentation as research method provides stability, unobtrusive, and usually covers a broad time span.

These advantages of documentation specifically the flexibility of use, comprehensiveness in coverage and the ability to provide different ranges of data in term or richness, are quite useful here. This is because the method is required to gather such type of data to validate the proposed e-health evaluation framework and the criteria as one of the main characteristics of the proposed framework to be sufficiently generic to be applicable to a wide range of applications but also sufficiently detailed to provide effective guidance.

The weaknesses of adopting documentation to collect data lies in the difficulty to maintain data accuracy as it may contain bias and influenced points of view, which need prior consideration and a great deal of systematic review and validation (Burns, 2000).

Bell (1999) proposes a list of actions to be used for documentation methods to maintain data accuracy and the reliability of a certain set of documents for a particular purpose, these actions include, examining the intended purpose of the documents, any unintended or unwitting evidence within the documents, the authorship, and the assumption and biases within the documents.

In order to minimize the effects of the weaknesses of documentation method on the reliability of the collected data for this study, an adapted version of Bell (1999) action list has been deployed. The adapted list of action is as follow;

- Identifying, getting access, and inspecting potential sources of data from published and unpublished documents
- Examining and categorizing documents reliability according to the authorship and the intended purposes of them.
- Classifying and verifying data within documents and remove any inconsistent data from consideration.

### 4.4.2 Archival records Method

Archival records are useful method to obtain primary data specifically in service oriented case studies. For this reason and because of the importance of the data of service records in the evaluation of e-health services, archival records has been adopted for this study as a second research method to collect new data and to extend and clarify the data of documentation method.

According to Yin (2003), Archival records has a variety sources of data which may be used selectively to suite the research requirements, these include; service records, organisation records, maps, lists, survey data, personal records, diaries, calendars, and telephone listings.

The advantages and weaknesses associated with the use of archival records are quite similar to documentation method, except that some of the data sources in archival records provide more quantitative rather than qualitative data. The other difference which has more relevance in e-health services is that it is usually more difficult to gain access to data sources of archival records because of privacy regulations.

Similar to the procedure used with documentation method, the adapted version of Bell (1999) action list has been deployed to increase the reliability of the collected data from archival records sources for this study.

### 4.4.3 Semi-structured Interview Method

According to Yin (2003), interview method is the most important source of case study data, as it has the ability to report and interpreted human affairs through the eyes of people. Interviews method has been described as a "purposeful conversation" which may be the dominant method of data collection or it may be used combined with other methods (Bogdan and Biklen, 2002).

Interview method has been used widely for data collection across all the disciplines including information systems research. There are different types and forms of interviews

suggested and used in theory and practice. Hitchcock & Hughes (1989) categorized interviews into nine types: structured interview, survey interview, counselling interview, diary interview, life history interview, ethnographic interview, informal/unstructured interview, and conversations. Cohen and Manion (1994) have different categorization, they group interviews into four types, including the structured interview, the unstructured interview, the non-directive interview, and the focused interview. Interviews also can be divided based on the degree of structuring into three types: structured, semi-structured and unstructured (Fontana & Frey, 2005).

Since it was decided to adopt an interpretative approach to collect qualitative data for this study, both semi-structured and unstructured interviews seem to be suitable types of interviews and should be considered here.

Unstructured interview is an interaction, a conversation between an interviewer and an interviewee guided by a general plan of inquiry that deal with a certain range of topics. This type of interview is of a flexible structure where there are few common standards or rules in conducting them. It is based on asking open-ended questions, in which interviewees can provide information about the case as well as their opinion in order to achieve a holistic understanding of the interviewee's point of view (Kvale, 1996).

While unstructured interviews offer a number of advantages including the maximum flexibility in their structure, the richness in the generated data and the enable of in-depth understanding of a phenomenon, there are many challenges in using them as a data collection method.

The main challenges are that it may require a long time, conversational skills, decisive knowledge and experience to collect systematic information in unstructured interview. Furthermore the data gathered by such interviews can be difficult to pull together and analyse because of the flexible structure of the interviews which normally generate different data patterns and structures (Patton, 2002).

A Semi-structured interview is an interview in which a predefined sequence of themes has to be covered, as well as suggested questions. However, the order and the forms of the suggested questions can be changed depending on the direction of the interview

which may or may not lead to additional questions (Kvale, 1996). This type of interview is able to produce less biased information compared to unstructured interviews, as well as giving an opportunity to extract new ideas and thoughts by deviation from the suggested questions.

The semi-structured interviews offer a number of advantages; they include their flexibility comparing to a structured one, they are able to generate comparable data patterns and structures, and they maintain the researcher's focus through interview guide which may contain prepared list of key themes, issues, and questions.

There are also many challenges in using semi-structured interviews as a data collection method. These include; they normally take a lot of time and effort, they need carefully planned preparation, and they require decisive knowledge and experienced interviewers to be able to ask prompt questions and gather rich and relevant data.

As the semi-structured interviews are more suitable than unstructured interviews for this study, they will be used here to gather qualitative data. The decision is made with consideration for the advantages and the challenges associated with the use of the semi-structured and unstructured interviews. The decision is also related to the research characteristics of the study in general and in particular to the proposed evaluation framework where it is designed to support the evaluator in making precise and effective choices at various stages of the evaluation process and require comparable data patterns and structures for validation.

Designing and conducting successful semi-structured interviews require a certain set of requirements before and during the interviews. During the preparation phase, the interviewer needs to prepare a checklist for the interviews, this may include:

- Design an interview guide, which contains a list of questions, topics, and issues that the researcher have to cover during the interview (Gubrium and Holstein, 2001).

- Identify interviewees based on the purposive sampling techniques. This type of sampling is primarily used for qualitative studies and involves selecting certain units (e.g., individuals, groups, institutions) or cases based on a specific purpose rather than randomly (Marshall, 1996; Tashakkori & Teddlie, 2003). Purposive sampling is used in this study as defined by Maxwell (1997) as a type of sampling in which, ‘‘particular settings, persons, or events are deliberately selected for the important information they can provide that cannot be gotten as well from other choices’’.
- Determining the most practical way of interview (focus group, face-to-face interview, telephone interview).
- Determine the time and the place for conducting the interview.
- Obtain consensus from the interviewee to participate in the study.

## 4.5 Data Analysis

Data analysis is the process of bringing order, structure and meaning to the multitude of collected data (Marshall and Rossman, 1998). Data analysis is an important part in the validation of the theoretical framework which can be either considered as one time event or an ongoing process, this is depending on the nature of the research project, the type of the required data (quantitative or qualitative), and the amount of data and resources available.

Since it was decided to adopt an interpretative approach to collect qualitative data for this study, the analysing process will be a dynamic and an ongoing process that links the collected data by the three selected methods and the formulation of the research conclusions. The analysing process will be based on ‘the ladder of analytical abstraction’ approach developed by Carney (1990). This approach has the advantage of simplicity; while at the same time provide a systematic and sufficient level of rigor in data interpretation.

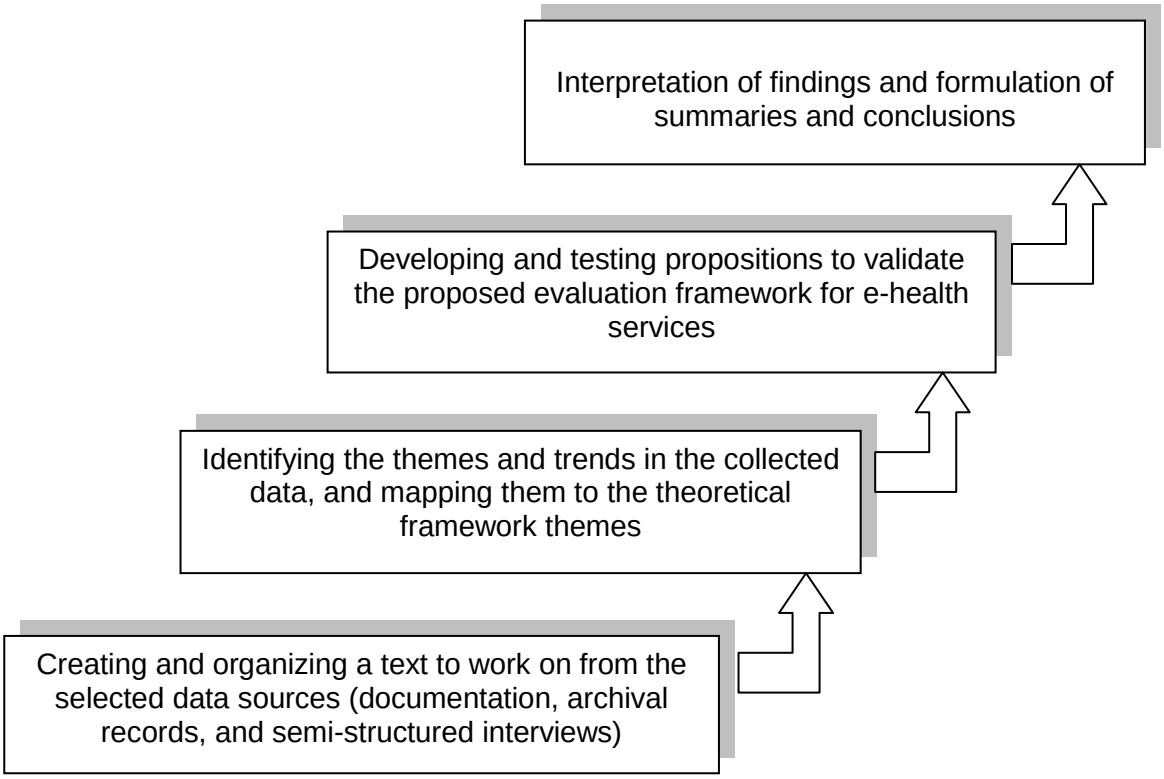



**Figure 4.1 The data analysis steps followed in this study**

The data analysis process as explained in Figure (4.1) will start with creating and organizing a text data to work on; this includes the reconstruction of interview tapes as written text and notes. This will be followed by combining and clustering the collected data in order to identify the themes and trends in the generated data, and mapping them to the theoretical framework themes. Then the data will be reduced and summarized to develop and test the propositions required to validate the proposed evaluation framework. The data analysis process will end by the interpretation of findings and the formulation of summaries and conclusions.

The multiple data collection methods used in this study will enhance the reliability of conclusions through data triangulation (Yin, 2003). The data triangulation process will be discussed in the following section.

## 4.6 Data Triangulation

Triangulation as a concept was first coined by Denzin (1989) meaning 'getting a fix from two or more places', and is intended to neutralise bias in any one approach. Data triangulation is normally used to insure the validity of the data and can be achieved in case study by retrieving data from a number of different sources to form one body of data. (Yin 2003)

Data triangulation may or may not include multiple methods of data collection, but many authors (Creswell, 2003; Patton, 2002; Yin, 2003) suggest the use of multiple methods with data triangulation to produce more reliable and consistent data. This can be explained as the poor quality data of one method may be compensated by the quality data of another. Data triangulation offers a number of advantages specifically when it is used with qualitative research methods. These advantages include; increasing the confidence in interpretation (Tellis, 1997), getting more reliable and consistence research conclusions, overcoming the limitation of qualitative methods in terms of bias in research findings, and facilitating the collection of data from a variety of perspectives (Guba, 1981)

The methods which have been selected for our case study are documentation and archival records, as well as the use of semi-structured interviews to gather wide range of data. The collected data is essential to verify and validate the applicability of the proposed evaluation framework for e-health evaluation in practice.

According to Creswell (2003), the multiple methods approach can follow two different strategies: sequential or concurrent. A sequential strategy will be adopted in this study, the sequential strategy use one method first and based on the results; a second method extends or clarifies the findings from the first.

As it was mentioned earlier, the method which is used first to collect the required data for this study is documentation method, and then the collected data will be structured to form a set of themes or categories. The use of archival records as second method is to collect

new data and to triangulate the data of documentation method. Finally the collected data by a series of semi-structured interviews should maintain the coverage of data and complete the data triangulation process.

## 4.7 Chapter Summary

As academic research can be conducted in different ways and may take different ontological and epistemological positions, the choice for this study is an interpretivism position. The appropriateness stems from the fact that e-health services are principally complex in nature, they are delivered in complex social context, and they are managed and controlled by different groups of stakeholders, hence they require an interpretivism position that can work effectively in such context.

Among a number of research approaches available, the approach which has been chosen and justified to collect qualitative data for this study is case study approach. The methods which have been selected to collect the data for the case study are documentation and archival records, as well as the use of semi-structured interviews, the data then can be collated and analysed.

The use of multiple methods to collect the empirical data is quite important and necessary for data triangulation and to cover the wide range of data. Data triangulation will increase the confidence in interpretation, help to get more reliable and consistent research conclusions, and overcoming the limitation of qualitative methods in terms of bias in research findings.

# Chapter Five

# The Case Study and Data Collection Process

**Chapter Abstract**

*This chapter provides a summary description of the case study of NHS Direct and the data collection process. The data is required to validate the proposed evaluation framework for e-health services, and the proposed evaluation criteria that influence user's utilization and satisfaction of e-health services.*

*The chapter starts with an outline description and critical analysis of the case study used in this research. The case study which has been chosen is NHS direct, one of the largest e-health services in the world. The data collection was carried out using three research methods; archival records, documentation analysis and semi-structured interviews.*

**Chapter Contents**

## 5.1 Introduction

The research methodology which has been chosen to collect the required data as discussed in chapter four is case study methodology. Selecting a suitable case study that can provide sufficient and appropriate data to validate the proposed evaluation framework and the proposed sets of evaluation criteria is a significant and challenging task.

Even though the healthcare sector in developed and developing countries is the slowest in embracing ICTs in the public sector and moving to the form of e-health among other government sectors, the United Kingdom currently has a competitive edge and leading position in this field. Because of this, and for practical reasons, it has been decided to adopt NHS Direct as a case study for this research. The choice is also based on the wide range of e-health services that are delivered by NHS Direct over a relatively long time.

Among the research methods available to be used in case study methodology, three methods have been deployed to collect qualitative data from NHS Direct. The use of the three research methods of documentation analysis, archived records, and semi-structured interviews serves the collection of the wide range of data and data triangulation in order to get more reliable and consistence research conclusions.

This chapter starts with background information about NHS Direct and the range of e-health services provided by the organization since its launch in March 1998 till now as one of the largest e-health services provider in the world. The chapter then provides a presentation of the data collection process through the selected methods. The required data for validation covers two sets of themes, the proposed evaluation frameworks for e-health services and the evaluation criteria that influence user's utilization and satisfaction of e-health services. Documentation analysis and archival records methods are used extensively to collect data for both parts, the analysis cover different types of documentation and archival records which was made available to the researcher by NHS Direct Trust. A number of semi-structured interviews with various stakeholders of NHS Direct were conducted to complete the missing data and generate comparable data

patterns and structures to enhance reliability.

## 5.2 The Case Study of NHS Direct - Background Information

The case study which has been chosen for the thesis is concerning an e-health service called NHS Direct. NHS Direct service is a 24 hour, confidential telephone, online and interactive digital TV health advice and information service. The services are managed by a head office in London and a nine region operational structure generally coterminous with Strategic Health Authority boundaries. The services were originally established by the Department of Health on a franchise model hosted by 22 different organisations, and then they were integrated to become a Special Health Authority in 2004. Since 2007 the services has been provided by the NHS Direct Trust in United Kingdom and are available through England and Wales. Since its launch in March 1998, NHS Direct has grown from small-scale pilots to being one of the largest healthcare services in the world.

The statement of the NHS Executive may summarize the concept of NHS direct, he states, "The principle is to provide people at home with easier and faster advice and information about health, illness and the NHS so that they are better able to care for themselves and their families" (NHS Executive, 1998).

The concept of NHS Direct was first proposed in the Chief Medical Officer's report, Developing Emergency Services in the Community, in September 1997. The Government then announced its commitment and proposed the formation of NHS Direct in December 1997 (Department of Health, 1997). The target was to establish a telephone helpline providing information and advice on healthcare covering England and Wales by the end of 2000. The objectives of the service can be summarized in the following points (Department of Health, 1997; Munro, *et al.* 1998):

- To facilitate better access to NHS services and improvements in out-of-hours traditional services.
- To offer reliable, consistent, easier and faster source of professional health advice, so the public can manage many of their health concerns at home or give them the best option for appropriate care.

- To provide simple and speedy access to a comprehensive and the latest range of health and related information.
- To improve quality and cost effectiveness of the delivery of emergency and GP services, and reduce unnecessary demands on other NHS services by providing a more appropriate response to the needs of the public.
- To allow healthcare providers to develop their role in empowering patients to make better informed choices about their own healthcare and partners in self-care, this will help healthcare providers to focus on patients for who care are most needed.

April 2004 signified the transformation of NHS Direct, bringing together 22 separate operations into a national organisation, as a Special Health Authority. This allows the channels integration of the NHS Direct telephone service (Advice and Guidance) with NHS Direct Online and NHS Direct Interactive (The Digital TV Service). This meant creating a new administrative framework for 4500 staff, and creating common standards that could be measured and assessed to achieve the highest possible (NHS Direct Annual Report and Accounts, 2005).

In April 2007, the status of NHS Direct was changed from a Special Health Authority to an NHS Trust. A Board was established comprising a Chair, seven non-executive directors and five executive directors. The Board and the Chief Executive as Accounting Officer are responsible for preparing the Annual Report, Remuneration Report and the financial statements in accordance with the National Health Service Act 2006. They are also responsible for ensuring the regularity of financial transactions (NHS Direct Annual Report and Accounts, 2009).

A joint review between NHS Direct and the Department of Health in April 2008 confirmed that NHS Direct's current operating model, which combines national delivery with effective engagement at a local level, is the right model for NHS Direct to deliver its objectives and achieve its strategic goals (NHS Direct Annual Report and Accounts, 2009).

The strategic goals of NHS Direct are outlined in the public consultation of the organization to become an NHS Foundation Trust; the main goals are (NHS Direct Business Plan, 2009):

- To increase revenues from contestable markets and grow core service contact volumes
- To generate a surplus for re-investment
- To attain best in class levels of operating efficiency that allowing NHS Direct to offer value for money to their customers
- To understand NHS Direct customers and work to fulfil their needs through developing services that utilise national capabilities at a local level
- To continuously improve user experience, driven by their needs to generate professional and appropriate responses
- To develop the skills and knowledge of the organisation and build staff loyalty and commitment.
- To empower people to make informed decisions/choices and improve overall health outcomes.
- To achieve pre-eminence in chosen areas of e-health through integrating the organization multi-channel capabilities

The following sections summarise NHS Direct core services through the three channels, telephone services, on-line services, and digital TV services.

### 5.2.1 NHS Direct Telephone Services

The NHS Direct telephone service was launched in 1998 as 24 hours 7 days a week service; national telephone coverage was achieved in November 2000. The service is run by highly qualified nurses in call receiving sites that provide advice to callers using advanced computer clinical decision support software. The service is the world's largest provider of telephone healthcare advice; as it has handled almost 5 million calls during the year April 2007 till March 2008.

The core services which are delivered by NHS Direct telephone service include (NHS Direct Annual Report, 2009):

- Clinical assessments which enable people either to care for themselves at home, or to find an alternative and right care from within the rest of the NHS
- Information on local health services and support organisations
- Advice for people on maintaining a healthy lifestyle
- Information about illnesses, conditions, tests, treatments and operations
- Complex enquiries about medication, like interactions, overdosing, poisoning, etc
- Information in response to national and local health scares, like swine flu.

### 5.2.2 NHS Direct On-line Services

The idea of an online healthcare information and advice service was first introduced in the Information Strategy for the NHS launched in 1998 (NHS Executive, 1998), followed by a target to introduce an online companion service for the telephone helpline by Autumn 1999 which was achieved by December 1999 (Department of Health, 2003).

NHS Direct On-line is the most heavily used health website in the UK, The website has received over 30 million unique visits during the year April 2007 to March 2008 (NHS Direct Annual Report, 2008).

NHS Direct Online provides a single public gateway to a range of NHS health campaigns and public information initiatives. It is also provides a confidential personal On-line enquiry service which can deal with individual requests. This service provides an opportunity for people to request health information with even greater anonymity than that offered by NHS Direct telephone services (NHS Direct Service Prospectus, Jan 2006).

The health information provision on the website includes:

- Self-help guide about treating common health problems at home.

- Heath encyclopaedia which allow users to search for a treatment or condition by using one of four search options. The Health Encyclopaedia is the most heavily used section of the website.
- Comparable choices of services available for specific treatment or condition available for different conditions.
- Common health questions.
- Hot topics on the latest health issues.
- Searchable database of local health services e.g. GPs, hospitals, dentists, pharmacies.
- Online health enquiry service.

### 5.2.3 NHS Direct Digital TV Services

NHS Direct recognized the importance of adding digital TV channel to their services a few years after the launch of the NHS Direct telephone services. NHS Direct Claims that the decision of launching a digital TV channel for their services is based on the research which shows that digital TV can expand NHS Direct services and make health information available to a much wider audience, and specifically to some sectors of the population. These sectors include low-income families, and the people who are hard to reach some of the services through other channels such as the internet because of technical barriers (NHS Direct, Jan. 2004).

NHS Direct Digital TV is intended to provide high quality evidence based health information from a trusted source and would expand the choice of ways in which people can access NHS Direct.

NHS Direct Digital TV was launched in stages across the digital TV networks since December 2004. The aim is to make it available to as many viewers as possible (Cunningham *et al.* 2005). NHS Direct Interactive, a digital satellite health information channel, is now available to some 18 million homes (NHS Direct Annual Report, 2008).

Originally, NHS Direct Digital TV is supposed to provide the following information (NHS Direct, Jan. 2004):

- Information about NHS Direct and about the NHS Direct services: this may include the NHS Direct telephone service, the online services and the digital TV as well as enhanced services which are difficult to be provided by other channels like text and audio translations in ethnic languages.
- Information about NHS services in general, this may include directory of local GPs, dentists, pharmacies, information about national bodies, voluntary organisations and patient groups.
- General health information, this service is intended to cover in the region of 140 topics relating to illnesses and conditions, tests, treatments and operations, in later stage, the service should expand to include self-care advice on treating common health problems and information about medicines.
- Information and advice about healthy living way like giving up smoking, diet, exercise etc.
- Hot topics about current health issues.

## 5.3 Data Collection Process

Adopting NHS Direct as a case study, in this chapter, a variety of themes related to the evaluation of e-health services are presented and discussed. The information was obtained by using three research methods. First; extensive documentation analysis which was made available to the researcher by NHS Direct Trust, second; the data of archival records of NHS Direct services, third; semi-structured interviews with various stakeholders groups of NHS Direct.

Although the study covers a period of about ten years of NHS Direct services, it cannot be presented in a narrative way. This is because of the wide aspects to be covered and considered in different depth, the size of NHS Direct services, and the constant organizational change of NHS Direct.

The data gathering process is required to serve the validation of the research conceptual model presented in chapter three; the model consists of two sections; the proposed e-health evaluation framework and the evaluation framework applied in specific scenario to

propose three sets of evaluation criteria. Towards this aim, the data gathering process is intended to generate certain data patterns and structures that could be mapped to the themes of the proposed conceptual model.

Since the proposed e-health evaluation framework is criteria-based, the criteria determine what drives the whole evaluation process. The identification process of the criteria for specific context according to the proposed framework is based mainly on three dimensions or elements; the evaluation rationales, the evaluation timeframes, and the evaluation stakeholders. Based on this, the first section of the proposed evaluation framework consists mainly of three broad themes; they are;

1. E-health evaluation rationales; the validity and the importance of certain evaluation rationale for e-health evaluation.
2. E-health evaluation timeframes; the appropriateness of conducting an evaluation initiative in specific timeframe, and the impact of evaluation timeframes on e-health evaluation and evaluation criteria.
3. E-health evaluation stakeholders; the changing role of e-health evaluation stakeholders with the change of evaluation timeframes, and their influence on e-health evaluation process and evaluation criteria.

When the proposed evaluation framework is applied in specific scenario to identify the evaluation criteria that influence user's utilization and satisfaction of e-health services, the outcome is three sets or groups of evaluation criteria; the usability criteria group, the direct costs and benefits criteria group, and the trust criteria group. Based on this, the second section of the proposed evaluation criteria can be represented by three broad themes; they are;

1. The usability criteria; the influence of the usability criteria on e-health evaluation, and which criterion can help in achieving better user services utilization
2. The direct costs and benefits criteria; the impact of direct costs and benefits criteria on e-health evaluation, and what represent this group of criteria.
3. The trust criteria; the significance of trust criteria in e-health evaluation, and what of the criteria should be considered to enhance trust in e-health services.

In the following paragraphs, the data gathering process using the three selected methods will be presented in order to map them to the six themes of the proposed conceptual model which has been stated above.

### 5.3.1 Documentation Analysis of NHS Direct

Documentation analysis method is used first to collect primary data for NHS Direct. The collection process is conducted in accordance with the adapted version of Bell (1999) action list which has been discussed in the previous chapter. Documentation analysis process started with identifying, getting access, and inspecting potential sources of data from the published and unpublished documents of NHS Direct.

Identifying the potential sources of data from NHS Direct documents is endowed with four groups of sources. The first group of sources are NHS Direct reports, this includes; NHS Direct annual reports, monthly and annual performance and quality reports, financial reports, and operations reports. The second group includes formal studies which are carried out directly by NHS Direct or independently on their behalf. The third group are administrative documents of NHS Direct; this includes plans and proposals, policy papers, and agendas. The fourth group includes NHS Direct NHS Direct minutes of meeting and other relative papers; this includes board minutes of meetings, audit committee minutes of meetings, risk management committee minutes of meetings, and clinical governance committee minutes of meetings. Table 5.1 summarizes these documents, classifies them into four groups and offer a short description to each one of them. The full details of the documents used for the analysis are presented in the appendices (Appendix B1 to B4).

Getting access and examining the selected documents of NHS Direct was a challenging and time consuming task in the light of the large and wide range of the required documents. In order to increase the data reliability, the documents were classified according to the authorship and the intended purposes of them. Then the data within documents was classified and verified to remove any inconsistent data from consideration.

| Documents Group | Type of The Document | Description |
|---|---|---|
| **NHS Direct Reports (114)** | **Annual Reports (5)** | • Five of NHS Direct Annual Reports and Accounts for the years; 2004-2005, 2005-2006, 2006-2007, 2007-2008, and 2008-2009. These report has been presented to parliament pursuant to section 98 (1c) of the National Health Service Act 1977, and pursuant to Schedule 15 of the National Health Service Act 2006. The five reports have been ordered by the House of Commons to be printed. |
| | **Performance and Quality Reports (45)** | • Total of forty five reports which provide overviews and reviews of national performance and quality of NHS Direct services for a period of about five years from 2005 to 2009. |
| | **Financial Reports (44)** | • Total of forty four reports which provide update on the financial performance of NHS Direct for the period of about five years from 2005 to 2009. |
| | **Operations Reports (20)** | • Twenty of NHS Direct operations reports which provide an overview of the development activities of the Scorecards during 2005. |
| **Formal Studies (5)** | | • Two independent research studies carried out by the Medical Care Research Unit of the University of Sheffield, on behalf of the Department of Health to evaluate NHS Direct first wave sites, first interim report (December 1998) and final report of the phase 1 research, July 2001.<br>• Three different and independent evaluations studied carried by IFF Research, King's College London, and the Medical Care Research Unit of the University of Sheffield during 2000 to 2008. |
| **Administrative Documents (81)** | **Plans and Proposals (15)** | • Fifteen of NHS Direct plans and proposals for a period of about five years from 2005 to 2009, these documents include, business plans, evaluation planes, and transformation action planes. |
| | **Policy and Strategy Papers (14)** | • Fourteen documents which outline some NHS Direct's policies and strategies like corporate risk management policies. |
| | **Agendas (52)** | • Total of fifty two agendas which provides brief background information to be presented, discussed or agreed by the Board of NHS Direct, other agendas which may also include key activities and issues of NHS Direct board meetings and NHS Direct Audit Committee Meetings |
| **NHS Direct Minutes of Meeting (85)** | **Board Reports and Minutes of Meetings (44)** | • These documents include a selection of forty four reports and minutes of meetings of the board of NHS Direct, all the meetings held during the period between 2005 and 2009, to present discuss or approve various meeting agendas. |
| | **Audit Committee Reports and Minutes of Meetings (18)** | • These documents include a selection of eighteen reports and minutes of the audit committee meetings, all the meetings held during the period between 2005 and 2009, to deal with various organisational and financial issues. |

| | | |
|---|---|---|
| | **Risk management Committee Minutes of Meetings (13)** | • Thirteen documents of NHS Direct minutes of meetings for the risk management committee, all the meetings held during the period between 2005 and 2009, to deal with various risk assessment issues, It includes information about the systems and processes being developed to manage risk as a part of integrated governance of NHS Direct |
| | **Clinical Governance Committee Minutes of Meetings (10)** | • Ten documents of NHS Direct minutes of meetings for the clinical governance committee, all the meetings held during the period between 2005 and 2009, to deal and assist with the development and the assessment of the clinical governance systems for NHS Direct services. |

**Table 5.1 The selected NHS Direct documents for data collection and analysis**

### 5.3.2 Archival Records of NHS Direct Services

It was mentioned earlier that archival records are useful method to obtain primary data specifically in service oriented case studies. As NHS Direct is a service oriented case study and because archival records of NHS Direct is a valuable source for the required data, archival records was selected as the second research method to collect new data and to extend and clarify the data obtained through NHS Direct documentation analysis.

Similar to the procedure used with documentation analysis, the collection process of the required data was conducted in accordance with the adapted version of Bell (1999) action list. The process started with identifying, getting access, and examining the archival records of NHS Direct.

The examining process of the archival records of NHS Direct identified three groups of the data sources. The first group of sources are NHS Direct service records, this include: NHS Direct service records through the three channels telephone, online, and digital TV. Some of these records were obtained from the online archive of NHS Direct or made available to the researcher by NHS Direct Trust. The second group of sources are NHS Direct organisation records. The most of these records were obtained through the online archive of NHS Direct and contain data about the development of the organization and the development of NHS Direct services in general. The third group of sources are NHS Direct surveys, which include staff and users' surveys. The staff surveys have been

conducted during the last five years to evaluate various aspects like future plans, communication, personal training & development, working relationships, reward & recognition, management, job satisfaction, and what change is required to improve the working life and the services to customers. Users' Surveys include the monthly satisfaction surveys of NHS Direct service to assess patients' satisfactions through specific set of questions.

Although the archive records have been considered as a valuable method for data collection in general, the use of this method with NHS Direct was limited comparing to document analysis method. This is related to the difficulties in gaining access to the required data because of the privacy regulations of NHS Direct Trust.

### 5.3.3 Semi-structured Interviews with Various Stakeholders Groups of NHS Direct

The method of semi-structured interviews with various stakeholders of NHS Direct was used to complete the missing data and generate comparable data patterns and structures to enhance data reliability.

Taking into consideration the time and efforts required to conduct the required sets of semi-structured interviews as they need carefully planned preparation, it was decided to start this task as early as possible and spread the interviews over few months. All the interviews were conducted in the period between late 2008 and early 2009.

During the preparation phase for the interviews, two interview guides, were prepared. The first interview guide was designed to cover the required data of the proposed evaluation framework, specifically the data required to validate the three main elements (the evaluation rationales, the evaluation timeframes, and the evaluation stakeholders). The first interview guide as explained in (Table 5-2) contains a list of questions, topics, and issues to be covered during the interview.

As explained in chapter four, the identification process of interviewees has been based on the purposive sampling techniques. This type of sampling which is also known as

judgement sampling requires prior practical knowledge of the research area (Marshall, 1996). The prior practical knowledge has been achieved through the use of documentation analysis and archival records first to analyse the case study of NHS Direct. The identification process of interviewees also considers the aspects of the interview guide and the wide range of NHS Direct stakeholders. The outcome of the identification process was a primarily list of nine interviewees. Only seven of them were interviewed; the other two interviewees apologized and the interviews with them were cancelled. The final interviewee list includes three technology consultants, two of the professionals and researchers who were involved in some stage in the independent evaluation initiatives of NHS Direct and two healthcare specialists who were selected from the National Advisory Group.

| The Themes | Theme Dimensions | List of Questions |
|---|---|---|
| **Theme One**<br><br>**E-health Evaluation Rationales** | The strengths and limitation of NHS Direct evaluation rationales | Q1 – How you evaluate the evaluation strategy of NHS Direct, did they effectively determine the priorities of the evaluation questions for their valuation initiatives?<br>Q2 - What are the strengths of NHS Direct evaluation rationales?<br>Q3 - What are the limitations of NHS Direct evaluation rationales? |
| | NHS Direct performance evaluation initiatives | Q1 - How you evaluate the performance evaluation initiatives of NHS Direct? Is their performance framework complete, if not what is missing? |
| | NHS Direct evaluation initiatives for decision making | Q1 - Is the evaluation initiatives for decision making provide effective guidance for NHS Direct? |
| | NHS Direct evaluation initiatives for maintaining accountability for expenditure of resources | Q1 - Is the evaluation initiatives for maintaining accountability of resources support the proper allocation of financial and human resources? |
| **Theme Two**<br><br>**E-health Evaluation Timeframes** | The appropriateness of NHS Direct's evaluation initiatives for their timeframe | Q1 - Are the evaluation timeframes selected properly for NHS Direct evaluation initiatives?<br>Q2 – How beneficial is the continuous evaluation of NHS Direct? |
| | The impact of evaluation timeframes on NHS Direct's evaluation | Q1 – Are the evaluation initiatives of NHS Direct managed effectively and equally during the three timeframes? |

| | | |
|---|---|---|
| **Theme Three**<br><br>**E-health Evaluation stakeholders** | The involvement of NHS Direct stakeholders in evaluation | Q1 - Did NHS Direct manage to identify and involve a wide range of evaluation stakeholders?<br>Q2 - Is the position and the involvement of each stakeholder in the evaluation of NHS Direct determined by the evaluation rationale and evaluation timeframe? |
| | The impact of NHS Direct stakeholders on service development. | Q1 - Have NHS Direct succeeded in establishing a mechanism to interpret the stakeholders views in a way that impact the direction of service development?<br>Q2 - Did the different user groups accepted NHS Direct and used it as intended? |
| | The role of users in the development and evaluation of NHS Direct services | Q1 - Have NHS Direct succeeded in involving the users in the evaluation of NHS Direct at the early stage of service development?<br>Q2 - Have the users had sufficient training and guidance to be able to assess NHS Direct services? |

**Table 5.2 The Semi-structured Interview Guide For the Data of the Proposed Evaluation Framework**

The second interview guide was designed to cover the required data of the user's perspective evaluation criteria (the usability criteria, the direct costs and benefits criteria, and the trust criteria). Similar to the first interview guide, the second interview guide as explained in (Table 5-3) contains a list of questions, topics, and issues to be covered during the interview.

The same procedures have been used to identify the interviewees for the second interview guide. The outcome of the identification process was a primarily list of eleven interviewees. Only eight of them were interviewed; the other three apologized and the interviews with them were cancelled. The final interviewee list included three technology consultants, three clinicians and nurses, one of the professionals who were involved in some stage in the independent evaluation initiatives of NHS Direct, and one healthcare specialist from the National Advisory Group.

All interviews were conducted face-to-face except three interviews where there were difficulties related to the schedules of the interviewees, and force the researcher at the end to conduct these interviews over the telephone. The most of the interviews time range

from 60 to 90 minutes depending on the interviewees schedules and the themes to be covered. As part of the ethical consideration, pre-consensus was obtained from all the interviewees participating in the study.

| The Themes | Theme Dimensions | List of Questions |
|---|---|---|
| **Theme One**<br><br>**The Usability Criteria** | The usability of NHS Direct services in United Kingdom | Q1 - Are NHS Direct services usable in the intended environment and for the intended user group and task?<br>Q2 - what of the criteria you suggest to assess the usability of NHS Direct?<br>Q3 - How important is the reliability and safety criterion for NHS Direct, and to which subset of criteria it belongs? |
| | The use of easy to learn and use to evaluate NHS Direct services | Q1 - What measuring indicators do you suggest to assess the easy to learn and use criterion for NHS Direct?<br>Q2 - Do you believe that the easy to learn and use criterion has direct or indirect impact on users' satisfaction? |
| **Theme Two**<br><br>**The Direct Costs and Benefits Criteria** | The tangible and intangible benefits of NHS Direct | Q1 - What are the main tangible and intangible benefits of NHS Direct?<br>Q2 – How we can measure the service quality of NHS Direct services? |
| | The use of economic return to justify the investments in NHS Direct | Q1 - What you think about the high operational costs of NHS Direct telephone service?<br>Q2 - Are NHS Direct services cost-effective, and is the economic return enough to justify the investments in NHS Direct? |
| | The use of service access level to determine the success of e-health services | Q1 - Is the service access level of NHS Direct a measure for the success or failure of the services?<br>Q2 - How can the access level fluctuation of NHS Direct telephone service be explained? |
| **Theme Three**<br><br>**The Trust Criteria** | The role of trust in the success of NHS Direct Services | Q1 - What are the main criteria that have to be considered to improve the trust in NHS Direct Services?<br>Q2 - Is NHS Direct a secure service, and how we can measure and enhance the data security of NHS Direct services? |
| | The impact of reliability and clinical safety on the trust in NHS Direct | Q1 - Are the services of NHS Direct reliable, and how can we assess that?<br>Q2 - Are you considering NHS Direct services clinically safe, and how this can be measured? |

**Table 5.3 The Semi-structured Interview Guide For the Data of the Proposed Evaluation Criteria**

## 5.4 Chapter Summary

The case study of NHS Direct has been chosen to gather qualitative data for the validation of the theoretical model. The choice has been taken for practical reasons, and because of the wide range of e-health services that are delivered by NHS Direct over a relatively long time. This chapter summarise NHS Direct core services through the three channels, telephone services, on-line services, and digital TV services.

The chapter also provides a description of the data collection process through the selected methods, documentation analysis, archival records, and semi-structured interviews. Documentation analysis of NHS Direct was used extensively to collect the required data. Documentation analysis process started with identifying, getting access, and inspecting potential sources of data from the published and unpublished documents of NHS Direct. As NHS Direct is a service oriented case study and because archival records of NHS Direct is a valuable source for the required data, it has been selected as a second research method to collect new data and to extend and clarify the data obtained through NHS Direct documentation analysis.

Finally, a total of fifteen semi-structured interviews with a various stakeholders of NHS Direct were conducted to complete the missing data and generate comparable data patterns and structures to enhance reliability.
To maintain successful semi-structured interviews, two interview guides were prepared. The first interview guide was designed to cover the required data of the proposed evaluation framework, specifically the three main elements (the evaluation rationales, the evaluation timeframes, and the evaluation stakeholders). The second interview guide was designed to cover the required data of the user's perspective evaluation criteria (the usability criteria, the direct costs and benefits criteria, and the trust criteria).

# Chapter Six

# Analysis

**Chapter Abstract**

*This chapter provides a critical analysis of the empirical data gathered for the validation of the proposed evaluation framework for e-health services. The data analysis covers two sections. The first section is the data that covers the main elements of the evaluation framework; this includes the evaluation rationale, the evaluation timeframe, and the evaluation stakeholders. The second section is the data that covers the evaluation criteria that influence user's perspective.*

*In section one, the analysing of the empirical data of NHS Direct's case study is intended to validate the applicability of the proposed framework to evaluate a wide range of e-health applications, and to provide effective guidance and capture the most relevant aspects of successful evaluation.*

*In section two, the analysis is intended to validate the three sets of the evaluation criteria; the usability criteria, the direct costs and benefits criteria, and the trust criteria. The validation may lead to incorporate new criteria and taking off others from the proposed sets of criteria.*

## Chapter Contents



## 6.1 Introduction

The limitation of the proposed evaluation framework for e-health services lies in the absence of validation and examination of the framework and the criteria. Hence, the proposed theoretical model requires an empirical validation which will be performed in this chapter using case study methodology.

In the following sections, NHS Direct case study has been adopted to critically analyse and validate the proposed evaluation framework. The proposed evaluation framework as explained in chapter three is criteria based. The criteria selection in an evaluation scenario is determined mainly by three elements; the evaluation rationale, the evaluation timeframe, and the evaluation stakeholders.

Hence, the case study will be analysed first in the light of the above three elements. This will include; First, the validity and the importance of certain evaluation rationale for the evaluation of NHS Direct; Second, the appropriateness of conducting an evaluation initiative in specific timeframe, and the impact of evaluation timeframes on the

evaluation of NHS Direct; Third, the changing role of NHS Direct stakeholders with the change of evaluation timeframes, and their influence on the evaluation process.

In this chapter, NHS Direct data will also be used to validate the proposed evaluation criteria that influence user's utilization and satisfaction of e-health services. This will include: First, the influence of the usability criteria on NHS Direct evaluation, and which criterion adopted by NHS Direct to assess the usability of the services. Second, the impact of direct costs and benefits criteria on the evaluation of NHS Direct, and what represent this group of criteria in NHS Direct evaluation initiatives. Third, the significance of trust criteria in the evaluation of NHS Direct, and what of the criteria has been considered by NHS Direct to enhance trust in their services.

The results of analysing NHS Direct case study in the light of the three elements of the proposed framework are required to validate the applicability of the framework for the following points:

- To evaluate a wide range of e-health applications.
- To provide effective guidance and capture the most relevant aspects of successful evaluation.
- To support the evaluator in making precise and effective choices at various stages of the evaluation processes.
- To capture the strengths and limitation of e-health evaluation rationales.
- To support the process of a proper identification and an effective involvement of e-health stakeholders during different evaluation timeframes of e-health evaluation.

The results of analysing NHS Direct in the light of the three set of criteria that influence user's utilization and satisfaction of e-health services may lead to approve part of the criteria, incorporating new criteria and taking off others from the proposed theoretical model.

## 6.2 NHS Direct Analysis in the Light of the Proposed Framework.

To examine the applicability and the practical validation of the proposed framework, the case study of NHS Direct will be critically analysed in the light of the main three elements of the framework. The data analysis will be a dynamic and an ongoing process that suppose to link the collected data by the selected methods and the formulation of the research conclusions. All the data of this section will be gathered from two sources, the documentation method and the semi-structured interviews. The use of both methods for data collection (Data triangulation) is intended to neutralise bias in any one method and insure the validity of the data. The data then will be organized and mapped to the three elements of the framework in order to validate their applicability for the evaluation of e-health services.

### 6.2.1 The Rationale of NHS Direct Evaluation

The rationale of evaluation initiatives in the case study of NHS Direct is changing while the service is growing from small-scale pilots to its size now as one of the largest healthcare services in the world. As NHS Direct is designed to be a multi-channel service, the rationale of evaluation is also varying according to the different channels of services.

The examination of NHS Direct's reports using documentation analysis revealed that the evaluation of the pilot sites of the telephone service has looked at three aspects of the service: a descriptive account of the structure and users of NHS Direct, caller satisfaction, and an impact assessment on other services. In a different report carried out by the National Audit Office on January 2002, the main aim of the piloting of NHS Direct's telephone service was expressed in the following statement:

> *"The piloting of NHS Direct's telephone service was concerned with how, rather than whether, the service would be implemented".*

The examination of two independent studies carried out on behalf of the Department of Health revealed that the main objectives of evaluation at piloting stage of telephone service are focused on four aspects:

- To evaluate the impact of NHS Direct service upon a range of other relevant services like emergency and out-of-hours services.
- To determine whether NHS Direct is able to deliver safe and appropriate health service in a prompt manner,
- To establish the views of NHS Direct stakeholders, including; service provider, patients and professional groups.
- To assess the technical infrastructure of the service by monitoring and reporting major system failures.
- To measure the operating and other direct costs of the service.

The rationale of evaluating the pilot sites of NHS Direct's telephone service and its effectiveness have been criticised by the researchers in the field of e-health evaluation. In one of the interviews with a researcher who was involved in some stage of the independent evaluation of NHS Direct. The question asked was; how you evaluate the evaluation strategy of NHS Direct, did they effectively determine the priorities of the evaluation questions for their evaluation initiatives? The answer in relation to piloting stage was:

> *"I understand that the principle aim of the evaluation at piloting stage is to determine whether NHS Direct is able to achieve the government policy of encouraging the safe and appropriate use of health services in a prompt manner. NHS Direct set up clear objectives for the piloting stage and put considerable efforts to achieve them, but their strategy was poorly implemented and the outcome value of evaluation at this stage is inadequate to enhance service development".*

Although the project executives believe that piloting was used effectively, Ministers decided that implementation and the roll-out of the service would proceed in a tight

timetable alongside piloting. This prevents the opportunity to make effective use of the formal and semi-formal evaluation of pilot sites. However, the project executives claim that the key lessons of the evaluation are taken forward through an effective communication between the pilots' team and those implementing the roll-out of the service.

The examination of NHS Direct's reports using documentation analysis revealed that the rationale of evaluating NHS Direct's online service is relatively different from the telephone service. While piloting is used for very limited purposes, the evaluation results are of no use as there is no staging plan to enable the results to be fully assessed and incorporated in the roll-out of the service. This can be attributed to the limited resources allocated for online service as the service was relying on part of the telephone service resources to support its activities. One of the researchers who were involved in the independent evaluation of NHS Direct gave a different explanation. When he was asked about the limited use of piloting and the disregarded of its results for online service, he stated:

> *"The intention of NHS Direct's executives was for NHS Direct's online to provide information services, and a limited symptomatic service which can be developed alongside the telephone service. The use of piloting here is unhelpful, and the design of online service is flexible enough to be changed at later stage of service operation".*

The examination of NHS Direct's documents revealed that the project executives believe that it is impossible to get useful results out of piloting and the service can be better evaluated in the light of the early operational period.

We mentioned earlier that April 2004 signified the transformation of NHS Direct, bringing together 22 separate operations into a national organisation. Since the roll-out of NHS direct service across the three channels and prior to 2004, there were few assessment initiatives. They are conducted at unit level and mainly focused on examining some quality aspects of the service provided by NHS Direct.

The rationale of evaluation initiatives in the last few years is mainly concerned with performance measures. By April 2005, NHS Direct started using the 'balanced scorecard' approach to assess the organization performance through selected key performance indicators. The balanced scorecard as it was discussed in chapter two and three is one of the popular approaches in healthcare.

The analysis of NHS Direct's annual reports revealed that since April 2005 NHS Direct start using the balanced scorecard approach to tracks its business plan objectives on a monthly basis through key performance indicators reported to the board. The analysis also revealed that the key performance indicators used for the balanced scorecard vary from one year to another and the board receiving regular monitoring information in respect of incidents and complaint trends only. In an interview with one of the researchers who were involved in the independent evaluation of NHS Direct; when he was asked; how efficient the balanced scorecard has been used by NHS Direct, the answer was:

> *If the BSC is implemented efficiently, it will allow NHS Direct to see the positive and negative impacts of e-health activities on the NHS as a whole. The value of the BSC rises if it is used with a wide range of key performance indicators. NHS Direct are likely to benefit from the BSC, but this will be determined by the goals and measures used.*

It takes NHS direct about a year to implement the balanced scorecard, the process includes, setting benchmark standards, and developing research audit and evaluation database. NHS direct claims that the aim of this process is to provide information on large-scale across the service and allow best practice and lessons learned to be shared nationally. The following statement is from the first Annual Report & Accounts for NHS Direct Special Health Authority for the year 2004-2005:

> *"The establishment of a Research & Audit Group in January 2005 was the first step in gaining a national audit perspective for the organisation, providing the opportunity to develop a national audit strategy. A Research Audit & Evaluation Database is currently being developed, which will provide information on large-scale internal audits to help co-ordinate audit activity and resources across the service and allow best practice and lessons learned to be shared nationally".*

In general, the results of examining NHS Direct revealed uncertainty regarding "why to evaluate" before and in the early stage of the service development. The aim of the limited evaluation initiatives in these stages is to provide the basis for the decisions about the NHS direct service and its implementation context. This resonates with the fourth rationale of evaluation in the proposed framework regarding what should be the main rationales of conducting evaluation in e-health services

The results also revealed that the focus of evaluation initiatives in later stages of using NHS direct service moved from quality aspects to business objectives employing a performance measurement system which would provide a set of measurements that gives the board a fast and broad view of the organization. This resonates to a certain extent with the second rationale of e-health evaluation in the proposed framework, which is about developing and strengthens performance of health organizations, individuals and/or systems.

Regarding "why to evaluate", the limitation of the evaluation initiatives for NHS direct service lies in the lack of comprehensive rationale strategy for evaluation during and before the roll-out of the service. The evaluation is also largely driven by organizational and external forces that required justification of the huge investments, and suffer from the lack of user involvement in the evaluation.

### 6.2.2 The Time Frames of NHS Direct Evaluation

Examining NHS Direct using documentation analysis has revealed that the decisions of when to evaluate and how long the evaluation processes will take is a challenging task which has not been well managed by the organization specifically before and in the early

stage of development. In the following paragraphs, the case study will be examined in the light of the three phases which has been proposed by the theoretical model, pre-implementation, implementation, and post implementation phases.

NHS Direct is proposed as an entirely new and unique service, the service has been designed to offer a single nation-wide service, to manage and co-ordinate a delivery system consistently throughout the country, and to deal with all health problems in all age groups. The problems of inconsistencies and variability in the delivery of health services across the United Kingdom have been acknowledged by health professionals and government ministers to unprecedented levels few years before the development of NHS direct. The question which has not yet been answered is whether the NHS direct service succeeds to deal with the problem of inconsistency and meet the demands and requirements of the users and the health organization.

NHS Direct started with an invitation for bids for the initial pilot sites in May 1998. Bids were received from differing organizations, which lead to service decentralization. The consequences of decentralization were huge on the service development mostly in the first few years of service development. The primary sign of decentralization is the development of each of pilot sites with different model, and different financial and physical infrastructure. Thus the sites have developed different service portfolios and play different roles within the operations network. NHS Direct project team claimed that they have been forced to accept service decentralization at this stage. In one of the National Audit Office reports, it was stated:

> *"Allowing local site providers to develop their own models of local implementation was crucial to the successful achievement of the timetable".*

Although service decentralization and variations between the pilot sites have a negative impact by slowing down the development of consistent practice and the adoption in some areas of good practice, they have also their benefits on the assessment richness. The examination of NHS Direct's documents revealed that the pilot sites had used three

different forms of clinical decision support system, two of these were US systems and the third was a UK system. According to an interview with one of the technology consultants, when he was asked about the benefits of service decentralization and variations between the pilot sites if there is any, he answered:

> *"The use of three various clinical decision support system which has been modified and tested according to local conditions provided a valuable input to the decision making process in later stage for the national system".*

Examining NHS direct using documentation analysis proves the difficulty to separate between the development phase and the period during which the system is in use. This is simply because the service is continuously growing and changing. The examination also shows the absence of an effective evaluation strategy for the assessment of the services during pre-implementation and the early stage of implementation phase. After about four years from the start of the NHS direct service, NHS direct service was still suffering from the lack of a comprehensive framework of detailed objectives. In a report prepared by the National Audit Office on January 2002, the Comptroller and Auditor General stated:

> *"A comprehensive framework of detailed objectives for the service has yet to be set. Without this, it is difficult for NHS Direct to judge its overall success as an organisation. NHS Direct has made some progress in developing a framework with key performance indicators for both the telephone and Online services, and more work is in hand".*

During the first few years of development, there were few evaluation initiatives for the service. These initiatives were either performed directly by NHS direct or carried out by independent research centres. NHS direct claims that, the evaluation initiatives in this stage are designed to address the impact of the service on both the public and the national health services, and to deal with specific evaluation aspects based on the rationale of evaluation. The evaluation aspects which have been dealt with include clinical quality aspects, economical aspects, development and progress aspects, and stakeholders' aspects.

The development process of NHS direct service across the three channels (Telephone, Online and Digital TV Service) continues while the service has been rolled out and while it's practically in use. By April 2004, when the integration of NHS Direct operations start through forming a national organization, the organization top management recognize the necessity for an ongoing evaluation plan. The main aim of the evaluation plan is to track the organization business objectives on a monthly basis using the balanced scorecard approach. The balanced scorecard (Kaplan and Norton, 1992) was originally proposed as a means to evaluate an organization performance from four different perspectives: the financial perspective, the internal business process perspective, the customer perspective, and the learning and growth perspective.

NHS direct organization succeeds in establishing a mechanism that provides information on a large scale across the service. The main aim of establishing such mechanism is to maintain a continuous improvement in operational performance, clinical performance and financial performance across all channels in order to achieve the performance targets agreed with the Department of Health in United Kingdom. A set of key indicators for operational performance has been set and tracked on a monthly basis.

In general, the results of examining NHS Direct regarding "when to evaluate" revealed that there is limited use of evaluation during the analysis and planning phase and in the early stage of development. The evaluation initiatives in this period are mainly concerned with clinical quality aspects, economical aspects, development and progress aspects, and stakeholders' aspects. The results also prove the value and the effectiveness of continuous evaluation particularly on the operational performance of NHS direct during the development and the use of the service.

Regarding "when to evaluate", the limitation of the evaluation initiatives for the NHS direct service lies in the absence of a complete evaluation framework before and in the early stages of development period. In later stages when the service is in a late stage of

development and in use, although the NHS direct organization claims that they start using the balance scorecards, the question of how efficient the deployment of the balance scorecards remains unanswered. Nevertheless, preliminary findings based on documentation analysis revealed that the main focus of the deployment of the scorecards is on operational and financial perspectives, but overlooking both the customer perspective and the learning and growth perspective of the balance scorecards.

### 6.2.3 The Stakeholders of NHS Direct Evaluation

For the case study of NHS Direct, the identification of stakeholders and their roles in evaluation is an important and challenging aspect in validating the proposed evaluation framework. In the following paragraphs, the data analysis of NHS Direct will be presented focusing on the stakeholders and their impact on the evaluation initiatives during pre-implementation, implementation, and post-implementation phases of NHS Direct.

As NHS Direct is an innovation that is intended to affect various aspects of access to NHS services in general, there are many stakeholders that have to be considered in any evaluation initiative. Determining the position and the involvement of each stakeholder should be decided according to the proposed theoretical model based on the evaluation rationale and the evaluation timeframe.

At the general level, the introduction of NHS Direct forms part of the United Kingdom government's policy for modernising the NHS. This allows the government departments and related governmental health organizations to take the central position as key stakeholders in the development and evaluation of the service in the pre-implementation phase.

Examining NHS Direct using documentation analysis revealed that during pre-implementation phase and before the roll-out of the NHS service, there are few formal and informal initiatives to evaluate the service. It is mentioned earlier that one of the main rationales of evaluation in this phase is concerned with how rather than whether the

service would be implemented.

As part of semi-formal evaluations, and shortly after starting work in 1998, the NHS Direct project team set up two consultative panels to obtain the views of potential users of NHS Direct telephone service. The first panel represented by the National Advisory Group. The group consists of wide range of organisations that are populated by senior representatives of the Royal Colleges and clinical societies. All members have clinical backgrounds and have a responsibility to be the link between their organisation and NHS Connecting for Health. The second panel represented by the Primary Care Implementation Group. The group consists of the main GP representative organisations.

In one of the interviews with a healthcare specialist from the National Advisory Group, when he was asked about how successful NHS Direct are in identifying and involving a wide range of stakeholders before the role-out of the service? He stated:

> *"Although NHS Direct has managed to identify and involve a good variety of stakeholders including the National Advisory Group, I believe that the involvement was not effective, the issues which were considered for consultation were limited, and the consultation process in general did not contribute as it should have done to the development of NHS services".*

Examining the data of NHS Direct has revealed that the pressure to implement the service in a short time had an impact on extending the consultation process and involving wide range of stakeholders. Moreover, the involvement of both consultative panels has been discontinued before the role-out of the service. Although part of the consultation panels are positive about considering their views and their involvement in the development of the service, the majority of the consultation panels agreed that there were no mechanisms to interpret their views, which resulted in having limited impact on the direction of service development.

The results of examining NHS Direct during implementation phase revealed that the project team acknowledged the local healthcare providers as key stakeholders and

recognized the importance of their involvement in the consultation process. Despite that, the level of consultation with local healthcare providers stayed limited and ineffective before and during the roll-out of the NHS Direct's telephone service. Moreover the guidance on the minimum requirements for consultation was not issued until a year from starting work on the service.

Examining NHS Direct's on-line service revealed similar results as the consultation with stakeholders was limited before the launch of the service. In later stage and after the launch of the service, formal consultative structure was established with the setting up of an advisory group. The group consist from nursing representatives, clinical professionals, and health information professionals.

The results of examining NHS Direct during post-implementation phase showed two different ranges of stakeholders which have impacted the assessment and improvement process of the services in this phase. The first range of stakeholders has characterized the period of NHS Direct as Special Health Authority. The second range of stakeholders has characterized the period of NHS Direct as Healthcare Trust.

By the time of integrating NHS Direct's telephone information, advice and guidance with NHS Direct Online and NHS Direct Interactive and creating the NHS Direct's Special Health Authority (SpHA), the SpHA top management started to take the central position as the key stakeholder in the development and evaluation of the services. Other important stakeholders like Department of Health and the Commission for Patient and Public Involvement in Health maintained limited involvement during this phase in the semi formal and formal assessment of some aspects of the services. The involvement of consultants, GPs, pharmacists, and nurses, continued in the assessment and improvement process of the clinical assessment system as an essential part of improving NHS Direct's telephone service in general. Although the users' involvement, including patients in the development and evaluation of the services, has improved at this stage, the involvement has stayed scattered and for limited purposes. This can be attributed to the absence of strategy to ensure a standardised approach to public involvement. The following

statement is from the Annual Report and Accounts of NHS Direct 2005-2006.

> *"We are currently developing a patient and public involvement strategy to ensure a standardised approach to public involvement across the country. The strategy will be implemented as part of the clinical governance arrangements under the direction of the Director of Nursing".*

However, the analysis of NHS Directs annual reports revealed that during 2005-06, NHS Direct's Special Health Authority consulted about 2,000 members of the public. The users' involvement in evaluation and consultation initiatives took many forms like discussion groups and surveys. The objectives of such initiatives include gaining feedback on a number of issues like the self-help guide of NHS Direct online and the accessibility and effectiveness of online content.

The transformation of NHS Direct trust gave more flexibility and freedom for the organization to offer a wide range of users including patients a greater say in the way in which the services are delivered by NHS Direct. In one of the interviews with a researcher who was involved in some stage of the independent evaluation of NHS Direct. The question asked was; Have NHS Direct succeeded in involving the users in the evaluation of NHS Direct at the early stage of service development and did they provide the users with sufficient training and guidance to be able to assess NHS Direct services? The answer was;

> *"No, we believe that NHS Direct failed to involve the users in the evaluation of the services at an early stage, and the involvement of service users stayed limited after that. We are not underestimating the complexities associated with an effective user's involvement, and even after a relatively long time, the Trust could not manage to establish guidance and provide sufficient training for user's involvement in evaluation".*

Nevertheless, examining the data of NHS Direct has revealed that NHS Direct's Trust has commissioned few evaluation initiatives which were undertaken by independent

institutes. These evaluation initiatives are focused mainly on the users of NHS Direct services to value their feedback and use this to inform the development of the services. In one of these initiatives, the Trust has commissioned an evaluation research to measure national awareness, usage and attitude towards NHS Direct's service amongst adults in England. In two separate evaluation initiatives during 2008, large scales of users were involved to assess specific aspects of the services, including the appropriateness and timeliness of NHS Direct referrals, and the user's satisfaction with the quality, efficiency, trustworthy, and reliability of the services. Both evaluation initiatives produced positive and consistent results. Although the findings of these evaluations seemed to be encouraging, they confirmed the problem of delays in involving users in the development and evaluation of NHS services. They also confirmed that NHS Direct still has long way to fully satisfy the needs of users and become better integrated with the rest of the NHS.

### 6.3 The Validation of the Evaluation Framework

As the proposed evaluation framework is intended to be sufficiently generic to be applicable to a wide range of applications but also sufficiently detailed to provide effective guidance, the framework seems to have captured most of the relevant aspect for successful evaluation of NHS Direct.

The proposed evaluation framework is also designed to support the evaluator in making precise and effective choices at various stages of the evaluation processes. The first stage of the evaluation processes which require precise and effective choice is the evaluation rationale or the determination of the evaluation goals and objectives.

The framework proposes five rationales for the evaluation of e-health services, they are: for maintaining accountability for expenditure of resources, for developing and strengthening performance of health organizations, individuals and/or systems, for decision-making, for promoting the use of information systems in healthcare, and for usability and acceptability.

The examining of NHS Direct in relation to evaluation rationale captured a number of

issues; the most important ones are as follow:

- The lack of comprehensive rationale strategy for the evaluation of NHS Direct services. One sign of that is the uncertainty regarding "why to evaluate" before and in the early stage of the service development.
- The main evaluation rationales adopted by NHS Direct are decision making evaluations to provide the basis for the decisions about NHS direct services and its implementation context, and performance assessments to strengthening performance of NHS Direct as an organization.
- It has been claimed, by NHS Direct, that some initiatives are for maintaining accountability for expenditure of resources, but in fact they are narrow focused and largely driven by organizational and external forces that required justification of public investments.
- The outcomes of NHS Direct evaluation initiatives for decision making have been poorly interpreted into useful actions because of the lack of a proper mechanism to do so, and the lack of faith in the evaluation value in the piloting stage.
- NHS Direct performance evaluation initiatives suffer from the absent of comprehensive performance framework with detailed objectives and wide range of specific and measurable indicators.

Although the United Kingdom has a competitive advantage and leading position in the field of e-health services, and NHS Direct is counted as one of the largest and advanced healthcare services in the world, the result of examining the case study confirms that there is a gap between theory and practice in relation to evaluation rationales. The gap is clear where NHS Direct looked for implementing their chosen evaluation rationales in a way that facilitate and maintain obtaining quick and practical answers, which may affect the applicability of the applied evaluation rationales to other situations.

In brief, the five proposed evaluation rationales are conclusive, and the analysis reveal that there are no evaluation rationales with in NHS Direct out of the scope of the proposed ones. The critical analysis of NHS Direct evaluation rationales in the light of the proposed ones succeeds to capture the strengths and limitation of NHS Direct

evaluation rationales.

The framework proposes three evaluation timeframes for the evaluation of e-health services; they are; pre-implementation, implementation, and post implementation phases. According to the framework, it is essential to determine when to evaluate and how long the evaluation process will take. This decision is based mainly on the evaluation rationale which is normally determined first.

The analysis of NHS Direct in relation to the second element of the proposed framework (evaluation timeframes) captured a number of issues; the most important ones are as follows:

- The decisions of when to evaluate and how long the evaluation processes may take is a challenging task which has been under-managed by NHS Direct specifically in pre-implementation and implementation phases.
- Despite the challenges to separate between the three timeframes in NHS Direct because of the overlap between implementation and post implementation phases as the services are continuously growing and changing, the data indicates that the mapping of evaluation initiatives to evaluation timeframes is essential for efficient evaluation.
- The results of analysing NHS Direct prove the value and the effectiveness of continuous evaluation particularly the performance assessment in the post-implementation phase.

In brief, the evaluation timeframes have been confirmed as an essential element in the evaluation of e-health in practice, and the three proposed timeframes are applicable and suitable dimension to differentiate and group different evaluation practices in the field of e-health.

The framework proposes e-health stakeholders as a third element that has huge influence in the evaluation of e-health services. This element is about identifying the key stakeholders and determining who should be considered in the evaluation. According to

the framework, the identification process should be based on the evaluation rationale and the evaluation timeframe.

The proposed framework categorizes e-health stakeholders into two groups, supply side stakeholders (organizational perspective) and demand side stakeholders (users' perspective). The supply side stakeholders' category includes controllers and supporters; the demand side stakeholders' category includes patients and healthcare providers.

The analysis of NHS Direct in relation to the third element of the proposed framework (evaluation stakeholders) captured a number of issues; the most important ones are as follows:

- The involvement of wide range of NHS Direct stakeholders is not an important aim by itself, the most important is how to make stakeholders involvement effective and establish a mechanism to interpret their views in a way that impact the direction of service development.
- Although NHS Direct acknowledged the importance of many stakeholders like local healthcare providers and recognized the importance of their involvement in the evaluation process, they find that the extending of stakeholders involvement is challenging task and may not always feasible specifically in pre-implementation and implementation phases.
- The result of analysing NHS Direct confirms the problem of delays in involving the users in the development and evaluation of NHS Direct services. This may require huge efforts and long way to go, but without that it would not possible to fully satisfy the needs of users and become better integrated with the rest of the NHS.
- Most of evaluation initiatives of NHS Direct are dominated by supply side stakeholders at least in the pre-implementation and implementation phases.

In brief, analysing the case study of NHS Direct confirms that e-health evaluation stakeholders together with evaluation rationales and evaluation timeframes have to be considered as main elements of the proposed e-health evaluation framework. The results

also show that the proper identification and the effective involvement of e-health stakeholders and considering their changing positions and roles with different evaluation timeframes have vital impact on the success of e-health evaluation in practice.

## 6.4 NHS Direct Analysis in the Light of the Proposed Criteria

In the proposed evaluation framework for e-health services, it has been argued that the framework should be criteria based; the criteria can be grounded in, and derived from one or more than one perspective or theory. According to the proposed framework, the criteria vary from one case to another, and the identification process of the criteria for specific context is based mainly on an evaluation matrix of three elements (The Rational, The Timeframe, and The Stakeholders).

In chapter three, the evaluation framework has been applied in specific scenario to identify the evaluation criteria that influence user's utilization and satisfaction of e-health services, the outcome are three sets or groups of evaluation criteria; the usability criteria group, the direct costs and benefits criteria group, and the trust criteria group.

In the following sections, the case study of NHS Direct will be used to critically analyze and validate the three set of the proposed criteria. The data analysis process will be started by creating and organizing the data to work on from the selected data sources. The data of this section will be gathered from three sources, the documentation method, the archival records, and the semi-structured interviews. The use of the three methods for data collection is essential for data triangulation. The data then will be organized and mapped to the three sets of evaluation criteria in order to validate them.

### 6.4.1 The Usability Criteria of NHS Direct

Developing specific and measurable criteria for the assessment of NHS Direct services is claimed to be one of main priorities of NHS Direct to create a more comprehensive evaluation framework. In the following paragraphs NHS Direct will be analysed to identify and discuss the adopted criteria by NHS Direct for usability.

Easy to learn and use is proposed as one of the criterion of the usability criteria that influence users' satisfaction and utilization of e-health services. The data of examining NHS Direct using document analysis and archival records shows that this criterion has not been applied to assess their services. NHS Direct believes that it is unrealistic to introduce measuring indicators to assess this criterion because the criterion is too general and it can be assessed through other criteria like patients satisfaction. As when the service is easier to learn and use, it is more likely to satisfy its users. While the proposed indicators to assess easy to learn and use criterion with their existing description may not provide valuable data, and because it is difficult to apply them in practice, the criterion will be excluded from the modified set of usability criteria.

Examining NHS direct focusing on the usability criteria identified functionality as an important criterion that has direct impact on the usability of the services. According to the proposed evaluation criteria, functionality is a broad criterion which supposes to cover the user's requirements from a system or service to perform specific tasks in a specific situation. The criterion can be assessed by many indicators, this includes accuracy, validity, robustly, speed and availability.

Examining the data of NHS Direct using document analysis revealed that speed and availability of healthcare services has been recognized as one of the important motivations for the adoption of NHS Direct. The following statement is from the NHS Direct Annual Report & Accounts 2007/08:

> *The availability and speed with which NHS Direct can be contacted, compared to booking an appointment with a GP or other health provider, was one of the main reasons for patients utilization and satisfaction of NHS Direct.*

The previous statement is similar to certain extent to the opinion of one of the interviewees who were involved in some stage in the independent evaluations of NHS Direct, when he was asked about what criteria he suggests to assess the usability of NHS Direct, he answered:

> *"NHS Direct should be assessed in relation to the objectives of the services. One of the main objectives of the services is to provide people with easier and faster health services that are available any time 24 hours 7 days a week".*

The analysis of NHS Direct documents revealed that they are considering availability as an important indicator in assessing the functionality of telephone services. The availability is measured here by abandonment rate, an indicator used by NHS Direct to identify proportion of callers/patients who are unable to get the service within a timely manner. The indicator is calculated by the percentage of calls abandoned after certain time following any message played against the total calls. Looking for more inclusive measure for availability, NHS Direct adopted another indicator for availability represented by calculating the time of 'busy' messages. These messages tell callers that the service is experiencing high demand and suggest that those with non-urgent problems either call back at another time or try alternative sources of health advice.

The use of the availability indicator in assessing NHS Direct telephone services provides poor results for the service functionality. When NHS Direct introduced this indicator, they set a target to achieve less than 5% of the time playing 'busy' message. The analysis results show that this target is unachievable at least in the near future, and 15% of the time may be a more realistic target. This is because NHS Direct has achieved 37% of the time at the beginning of the year 2008/09 and only improved to 25% of the time by the end of the year.

NHS Direct adopted another indicator to assess the functionality of their telephone service. The indicator is based on a number of speed measures which include the initial speed of response to telephone calls in general, and the time taken to deal with urgent calls and non-urgent calls. NHS Direct set specific times for these measures and agreed on specific targets to achieve, according to the Department of Health's quality standards for out-of-hours unscheduled care. The speed measures are determined by the percentage of calls answered within 60 seconds, the percentage of urgent calls commencing clinical

assessment in 20 minutes, and the percentage of non-urgent calls commencing clinical assessment in 60 minutes. NHS Direct claims that they have achieved very high scores in the speed measures between 93% and 98% during the year of 2007/8.

The second identified criterion for NHS Direct usability criteria is accessibility. According to the proposed evaluation criteria, accessibility is an important subset of usability, and can be represented by Content Accessibility, User Interface, and Disability access & translation.

The first indicator adopted by NHS Direct to measure the accessibility of telephone services is the availability of language translation features. NHS Direct are claiming that they recognize language translations are significantly important in discussions about medical conditions which reflect on the value of the services in general. NHS Direct is also claiming that they have arrangements to offer interpreting facilities in over 200 languages, and they have recruited bilingual nurses from ethnic groups represented in their area to reduce the requirement for interpreting services. Despite these claims, examining the data show that NHS Direct's interpreting facilities have been used sparingly to date. Based on subjective evidence from documentation analysis, NHS Direct suggests that the very low use of translation features is related to the unawareness of callers to the translation service of NHS Direct which forces some non-English speakers to access NHS Direct through a younger English-speaking friend or relative. For On-line Services, NHS Direct claims that their services are offered in more than ten foreign languages, examining the data revealed that the services in foreign languages are very limited compared to the services offered in English language.

The second indicator adopted by NHS Direct to measure the accessibility of both on-line and telephone services is the compliance with disability access requirements. NHS Direct claim that they acknowledged the accessibility requirements of people who are deaf or who have a loss of hearing, or who have learning difficulties and are trying to use NHS Direct telephone service. NHS Direct also claim that they acknowledged the accessibility requirements of people who are blind or who are partially sighted and trying to use the

on-line service.

The disability access requirements have been addressed by a set of actions. These actions include;

- The assessment of nursing staff recruited by NHS Direct on all aspects of communication, and the development of communications skills is included in training as part of the Continuous Quality Improvement process.
- Developing the website compatibility to add features for partially sighted users.
- The Offering of Text-phone and Type-talk capabilities.

The third identified criterion for NHS Direct usability criteria is patient satisfaction. The proposed evaluation criteria include a similar but more inclusive criterion called user satisfaction. The proposed evaluation criteria classified user satisfaction as an important subset of usability, which can be represented in e-health services by Utility, Reliability, Efficiency, Customization, and Flexibility.

NHS Direct adopted patient satisfaction criterion in many evaluation initiatives where the patient satisfaction for the telephone service measured by how it feels to be a patient calling a nurse advisor or health advisor. We believe that this measuring indicator for satisfaction is too general and did not give valuable feedback to improve the service. The analysis of NHS Direct Annual Reports revealed that NHS Direct top management has recognized the generalization of the used satisfaction indicators and they are planning to develop new satisfaction measures that can produce valuable users' feedback to support the development of staff, teams and services during 2009/10.

The forth identified criterion for NHS Direct usability criteria is compatibility. According to our proposed evaluation criteria, compatibility is an important subset of usability, and can be assessed by how quickly and easily an e-service can fit into the whole healthcare system. For NHS Direct, the compatibility is judged by the level of integration between NHS Direct services and the ability to link these services with other healthcare providers to enable the seamless transfer of care.

The fifth identified criterion for NHS Direct usability criteria is effectiveness. NHS Direct are measuring effectiveness by the percentage of callers who follow the advice given, on the assumption that advice given to callers is appropriate. The use of this criterion in assessing NHS Direct services provides inconsistent and conflicting results. When the criterion is applied in a survey conducted directly by NHS Direct, The outcome shows very high effectiveness of the services of 97%. In other evaluation initiatives like the one conducted by King's College London independently, the outcome show different picture, with average effectiveness of the services between 58% and 73%.

The inconsistency of results may be related to the vague description of effectiveness used by NHS Direct. NHS Direct believe that they may need to adopt more specific and quantifiable measures for service effectiveness, but the criterion itself is necessary and important one. The data obtained from the independent evaluation initiatives show that NHS Direct are benefiting from the use of service effectiveness in their assessment. The results of such assessments may contribute in improving the effectiveness of the services by addressing the limitations and developing the communication and clinical skills of the nursing staff.

### 6.4.2 The Direct Costs and Benefits Criteria of NHS Direct

The costs and benefits criteria are the second group in the proposed criteria. The group is represented by the most quantifiable measures, mostly by the economic return involved in the adoption of e-health services, but could also include the immediacy of reward, social prestige, or savings in time and effort.

Examining NHS Direct focusing on the costs and benefits criteria identified financial saving as an important criterion to assess the successful of the services. NHS Direct claims that financial saving is measured and represented by the statement of accounts which are prepared on an accruals basis, and give a true and fair view of NHS Trust’s state of affairs at the end of each financial year.

The use of financial saving criterion to assess NHS Direct telephone service revealed a high cost of the service. According to NHS Direct official figures from the information and advice service, the average cost of a call just over £16 during the financial year 2007/2008. The average cost is calculated by dividing NHS Direct's complete expenditure, including publicity, web management and consultants cost, by the number of calls which has been answered during the year. Although the average cost of a call to NHS Direct is less than the cost of a visit to the GP which is estimated by British Medical Association between £20 and £25, the difference not enough to justify the service economically taking into account that less than 50% of the calls were completed within NHS Direct during 2007/2008 without the need for onward referral to another healthcare service.

The use of financial saving criterion to assess NHS Direct revealed that the on-line service provides a better more cost effective solution than the telephone service. NHS Direct estimates that the economic benefits of on-line service exceeded the cost of the service in the third year of operation, driven by the considerable growth in the service utilisation. These economic benefits for both the NHS Direct and the patients, NHS Direct believe that the distribution of benefits to 2008 are about 87% of the benefits for NHS Direct, leaving about 13% of direct economic gain for the patients

The second identified criterion for NHS Direct costs and benefits criteria is service access level. NHS Direct is measuring this criterion by the number of calls answered for the telephone service, the number of on-line visits for on-line service, and the number of digital TV visits for digital TV service.

The use of this criterion in assessing NHS Direct telephone services provides a variety of results. The access level has been rising since the introduction of the service to reach its peak of 6.8 Million telephone calls for the year 2005/2006, and then the level fell down to settle at just about five Million telephone calls for the year 2008/2009. The result of assessing the access level of NHS Direct on-line service provide different picture while the level is on continuous rising since the introduction of the service. The access level has

been reached 13.5 Million on-line visits during the year 2005/2006, and grows to reach 30.7 Million on-line visits during the year 2007/ 2008. NHS Direct claims that the access level for digital TV service is growing as well. They argue that although the service was struggled to grow in the first two years, but the service start to develop after that and it has been offered to 8.5 Million households during the year 2006/2007 and reached 18 Million households during the year 2007/2008.

The third identified criterion for NHS Direct costs and benefits criteria is service quality. This criterion is measured for all services by the compliance with the core standards and regulations of Care Quality Commission. The Commission is an independent regulator of health and social care in England, its standards and regulations cover seven domains, safety domain standards, clinical and cost effectiveness domain standards, governance domain standards, patient focus domain standards, accessible and responsive care domain standards, care environment and amenities domain standards, and public health domain standards. NHS Direct claims that their services achieved excellent quality rating from the Care Quality Commission for the year 2009.

### 6.4.3 The Trust Criteria of NHS Direct

Examining NHS direct focusing on the trust criteria identified privacy as an important criterion that has direct impact on the value of e-health services. NHS Direct has adopted a confidentiality indicator to measure the privacy criterion; the indicator is assessed by the degree of compliance with NHS Confidentiality Code of Practice. The code provides detailed guidance on patient information confidentiality issues. NHS Direct claim that they collect some basic personal information about the people who are using their services, and all the information are recorded and stored securely on a computer system.

NHS Direct claim that they are applying the confidentiality measures in all their activities including; staff training, assessment, and research initiatives. If the training requires a data review like patient records and a call review to enable the staff to learn from the expertise and experience of their colleagues, the confidentiality measures are applied to make it impossible to tell who the information is about. Similar measures are applied for

assessment and research purposes. Furthermore, NHS Direct research has to be approved by a group of ethics experts before it can be conducted. If the research involves patient participation, NHS Direct has to provide full confidentiality for them and obtains consent prior the participation.

The second identified criterion for NHS Direct trust criteria is service reliability and safety. Examining NHS Direct's data revealed the difficulties to find an appropriate and direct indicator for service reliability and safety criterion. This is related to a certain extent to the complications to agree on absolute standards for reliable and safe e-health services. In one of the interviews with a healthcare specialist from the National Advisory Group, he stated:

> *"It is inappropriate to compare and apply the same reliability and safety measures of GPs or A&E departments to NHS Direct service. It may be acceptable that different GPs provide different service standards, but this must not be the case in NHS Direct. Occasionally, clinicians working with the same GP may disagree among themselves regarding the best approach to deal with a specific health concern, and this cannot be accommodated in NHS Direct".*

In another interview with one of the professionals who were involved in some stage in the independent evaluation initiatives of NHS Direct, when he was asked about the reliability and safety of NHS Direct services, and how this can be best assessed and measured, he answered:

> *"Although I believe that NHS Direct is currently offering acceptably reliable and safe services, this remains attributed to the type of the services and the limited cases that NHS Direct can deal with. It may be necessary for NHS Direct to establish a panel of assessors representing a wide range of backgrounds to agree on a proper mechanism for the assessment of reliability and safety of their services. A part of the assessment mechanism is to identify individual cases where inappropriate advice might have been given. These cases can then be explored in detail to see whether there are any lessons which can be learned".*

The examination of NHS Direct's data reveals that in the last few years they have adopted reliability indicator to assess the service reliability and safety; the indicator is represented by the number of serious adverse incidents identified for national review. NHS Direct has also adopted clinical safety indicator to assess their services; the indicator is measured by the percentage of serious adverse incidents leading to harm. NHS Direct believe that both indicators are contributing in reducing clinical errors to the minimum, and provide an essential feedback to develop and improve safe and reliable services.

NHS Direct established an action plan with a set of procedures to deal with each adverse incident locally and nationally to identify the actions required to reduce further immediate risks, to seek to identify root causes of adverse incident, and to help avoid a similar incident in the future. Adverse incidents are reported as well to external organizations like National Patient Safety Agency (NPSA), Health and Safety Executive, Medicines and Healthcare products Regulatory Agency (MHRA), Health Protection Agency, Care Quality Commission, the Counter Fraud and Security Management Service and some other national organisations.

NHS Direct also set up an electronic database to support the analysis of adverse incidents to seek to identify common patterns, relevant trends, likelihood of repetition and actions required to prevent the re-occurrence of similar adverse incidents. If the adverse incident related to human error factors, the actions may include a set off re-training programme. If the adverse incident related to technical error factors, this may require a modification to the decision support system.

The use of service reliability and safety criterion in assessing NHS Direct provides satisfactory results. NHS Direct identified seventy five serious adverse incidents for national review during 2008/09, only five of them are deemed to have led to harm to a patient, which equals 6.7% of the total number identified for national review. In an independent review carried by the University of Southampton's Health Care Research

Unit to assess the reliability and safety of NHS Direct through an examination of the records, the assessment produced similar results and confirms that NHS Direct offer reliable and safe services.

The third identified criterion for NHS Direct trust criteria is service security. NHS Direct has adopted data security indicator to assess their services; the data security indicator is measured by the number and the level of data security breach incidents. NHS Direct claims that they are managing and assessing data security according to an established Information Security Event Reporting and Management Policy. According to the policy, the data controller has a responsibility to record, categorize, and formally report all the incidents, in relation to protected personal data, either to the Information Commissioner's Office or recorded them centrally within the organisation according to the level of data security breach of these incidents. NHS Direct argue that they have a good record on data security. A sign of the good record is that there are no protected personal data related incidents, under any category, formally reported to the Information Commissioner' Office during the years 2004/5, 2005/6, 2006/7 or 2007/8.

The examination of the protected personal data related incidents of NHS Direct during 2008/9 shows different picture. In this year, there are three incidents which are formally reported to the Information Commissioner's Office, these incidents potentially affected 231 people. Moreover, there are another five incidents which has been categorized by the data controller not to fall within the criteria for report to the Information Commissioner's Office, but recorded centrally within the department. Two of these incidents which are only recorded centrally involve the loss of inadequately protected electronic equipment, devices or paper documents from outside secured NHS premises.

### 6.5 The Validation of the Proposed Criteria

In the previous sections, the case study of NHS Direct has been analysed to identify, present, and discuss the relevant criteria in the light of the three sets of evaluation criteria which influence the user' satisfaction and utilization of e-health services.

The first set of the proposed criteria is usability criteria group. According to the proposed criteria, this group contain five criterion, they are; easy to learn and use criterion, accessibility criterion, compatibility criterion, functionality criterion, and user' satisfaction criterion. The analysis of NHS Direct identifies a different set with five criterions as well. The new identified criterion is service effectiveness. Although there are some similarities between the two sets of criteria, the most of the indicators and their descriptions by which the criteria are assessed are different. The main similarities and differences are as follows;

- Easy to learn and use criterion has not been applied to assess NHS Direct services because the criterion is too general and the service can be assessed through another criterion like patients satisfaction. The criterion will be excluded from the modified set of usability criteria as the existing description of the criterion indicators in the proposed criteria may not provide valuable data, and because it is difficult to apply them in practice.
- While NHS Direct adopt patient satisfaction criterion in their assessment initiatives, the proposed evaluation criteria have similar but more inclusive criterion called user satisfaction. Furthermore, the indicator description adopted by NHS Direct for patient satisfaction is too general and did not provide valuable feedback to improve the service. Because of that, user' satisfaction will be adopted in the modified set of usability criteria with some changes for the measuring indicators.
- Although reliability is counted as a measuring indicator for user' satisfaction in the proposed usability criteria, the analysis of NHS Direct identifies service reliability and safety as a criterion which contribute to trust criteria rather than usability criteria. Subsequently, the service reliability and safety criterion will be includes as part of the trust criteria in the modified criteria sets.
- The analysis of NHS Direct identified service effectiveness as new criterion which has not been included in the proposed usability criteria. As the data show that the use of service effectiveness in assessing NHS Direct is contributing in improving the effectiveness of the services by addressing the limitations and

developing the communication and clinical skills of healthcare staff, the criterion will be added to the modified criteria sets.

In the light of the analysis outcomes of NHS Direct, A new modified set of usability criteria has been introduced. The new set contains five criterions, the criteria, their measuring indicators, and suggestions for measuring indicators descriptions are explained in table (6-1).

| Evaluation Criteria | Measuring Indicators | Suggestions for Measuring Indicators Descriptions |
|---|---|---|
| **Accessibility Criterion** | Content Accessibility Indicator (CY) | Measured by the degree of compliance with the Web Content Accessibility Guidelines |
| | User interface Indicator (UI) | Judged by the available options of user interfaces (e.g. Graphical interface, Multi-screen interface, Attentive User Interface). |
| | Disability Access Indicator( DA) | Assessed by the compliance with disability access requirements |
| | Languages Translation Indicator (DA) | Assessed by the availability of foreign language translation features, and the number of languages that cover the whole community. |
| **Compatibility Criterion** | Compatibility Indicator (CM) | Assessed by how quickly and easily an e-service can fit into the whole healthcare system, or by the level of integration between an e-service and other traditional healthcare services to enable the seamless transfer of care. |
| **Functionality Criterion** | Accuracy Indicator (AU) | Measured by the degree to which information provided by the service is free of errors |
| | Validity Indicator (VA) | Measured by the clarity and regularity of information updating. |
| | Robustly Indicator (RB) | Judged by the technical functionality of the service |
| | Speed Indicator (SP) | Judged by the initial speed of response to a service request, or by the time taken to deal with urgent and non-urgent requests |
| | Availability Indicator (AV) | Assessed by the availability of the service 24hrs/7days per week and the existing of alternative choices |
| **User Satisfaction Criterion** | Utility Indicator (UT) | Assessed by the completeness and usefulness of the service content |
| | Efficiency Indicator (EF) | Judged by the time spent to complete the information task, quality of the information found, appropriateness of information found, and satisfaction with the outcome |
| | Customization Indicator (CT) | Measured by the degree of service tailrarity to meet the needs of individual user |

| | | |
|---|---|---|
| | Flexibility Indicator (FX) | Assessed by whether a system or a service provides choice of ways to state a need and delivers dynamic information |
| **Service Effectiveness Criterion** | Effectiveness Indicator (ET) | Measured by the percentage of service users who follow the advice given, on the assumption that advice given to service users is appropriate |

**Table 6-1 the constructs of the modified usability criteria with the measuring indicators and their descriptions.**

The second set of the proposed criteria is the direct costs and benefits criteria. According to the proposed criteria, this group contain three criterions; they are; economic saving criterion, quality and rewards criterion, and access level criterion. The analysis of NHS Direct identifies similar set with three criterions as well; they are; financial saving criterion, access level criterion, and quality criterion.

Although there is similarity between the proposed set of criteria and the identified criteria of NHS Direct, the most of the indicators and the descriptions by which the criteria are assessed are different. The following paragraph summarizes the main characteristics of the direct costs and benefits criteria, together with the similarities and differences of the assessment indicators in theory and practice.

- The analysis of NHS Direct confirms that the economic return is not enough to justify the investments in e-health services, considering that these services are unable to replace or work independently of other traditional healthcare services.
- The demand for NHS Direct services represented by service access level is an important criterion to determine the success of e-health services. The data of assessing the access level for NHS Direct shows that it takes relatively long time for an e-health service to reach a satisfactory performance targets.
- The analysis of NHS Direct confirms the challenges in accurately evaluate an e-health service as the evaluation outcomes is partially based on the best estimate that can be generated from the intangible benefits of the service, and the ability to properly identify and quantify these benefits.

- The adopted quality indicators for quality and rewards criterion of NHS Direct are very broad and cover seven domains comparing to the proposed criteria one. Because the use of these indicators as they are may produce duplicate data, only part of the indicators will be used in the modified set of criteria.

Considering the analysis outcomes of the direct costs and benefits criteria of NHS Direct, A new modified set of the criteria has been introduced. The new set contains three criterions as well, Table (6-2) explain the criteria, their measuring indicators, and suggestions for measuring indicators descriptions.

| Evaluation Criteria | Measuring Indicators | Suggestions for Measuring Indicators Descriptions |
|---|---|---|
| **Economic Saving Criterion** | Money Saving Indicator (MS) | Assessed by how much money the users are saving by using the e-health service. |
| | Time Saving Indicator (TS) | Assessed by how much time the users are saving by using the e-health service. |
| **Quality and Rewards Criterion** | Effort Saving Indicator (ES) | Measured by the degree of convenience in using a particular e-health service. |
| | Quality Indicator (QU) | Assessed by the compliance with the core standards and regulations of United Kingdom Care Quality Commission, or By the added value to people' information and knowledge about their conditions, diagnoses, treatment options and healthcare facilities, as well as the appropriate timing of the service. |
| **Access Level Criterion** | Access Level Indicator (AL) | Judged by access level comparing to the same quality of services through alternative channel. |

**Table 6-2 the constructs of the modified direct costs and benefits criteria with the measuring indicators and their descriptions.**

The Third set of the proposed criteria is trust criteria. According to the proposed criteria, this group contain two criterions, security criterion and privacy criterion. The analysis of NHS Direct identifies more conclusive set with three criterions. They are; privacy criterion, reliability and safety criterion, and security criterion.

The following points summarize the main characteristics of the trust criteria, together with the similarities and differences between the proposed set of trust criteria and the identified criteria in the analysis of NHS Direct.

- The analysis of NHS Direct proves that failing to address the trust criteria properly may have a profound impact on e-health services, and the criteria of trust require a continuous review and must be tackled properly during the development and the use of e-health services.
- The analysis of NHS Direct identifies service reliability and safety as a new criterion which have direct impact on the trust in e-health services. The data also confirm that the use of this criterion in assessing NHS Direct is contributing in reducing clinical errors to the minimum, and provide an essential feedback to develop and improve safe and reliable services.
- Although security and privacy criteria have to be considered always in any e-health services, the priority to adopt specific indicator and neglect others has to be decided according to the e-health service and its context.

In view of the similarities and differences between the proposed set of trust criteria and the identified criteria in the analysis of NHS Direct, a new modified set of trust criteria has been introduced. The new set contains three criterions, the criteria, their measuring indicators, and suggestions for measuring indicators descriptions are explained in table (6-3).

| Evaluation Criteria | Measuring Indicators | Suggestions for Measuring Indicators Descriptions |
|---|---|---|
| **Security Criterion** | User Authentication Indicator (UA) | Measured by how strong the user authentication is and if its key capabilities are sufficient for e-Health services |
| | Data movement Indicator (DM) | Assessed by the suitability of the technology used to protect the transfer of data. |
| | Data integrity Indicator (DI) | Determined by if the information is complete, whole, valid and digitally signed when required |
| | Data Security Indicator (BD) | Judged by the ability of the system to monitor and report any data security breach incidents. |
| | Physical security Indicator (PS) | Assessed by how secure is the area that holding the database equipments and if it is located in an area with limited and controlled access. |
| | Audit trails Indicator (AT) | Judged by the ability of the system to record the modification of data, to keep the most up to date version of data and to retrieve old versions of data. |
| **Privacy Criterion** | Responsibility Indicator (RP) | Measured by the degree of protection supplied by the healthcare organization for patient information from any disclosure. |
| | Access Control Indicator (AL) | Assessed by the degree of control on different level of access to different kind of information at different time. |
| | Confidentiality Indicator (CF) | Assessed by the degree of compliance with NHS Confidentiality Code of Practice, and/or<br>by the degree of compliance with the UK Data Protection Act (1998) |
| **Reliability and Safety Criterion** | Reliability Indicator (RL) | Assessed by the number of serious adverse incidents identified for national review |
| | Clinical Safety Indicator (CS) | Measured by the percentage of serious adverse incidents leading to harm |

**Table 6-3 the constructs of the modified trust criteria with the measuring indicators and their descriptions.**

## 6.6 Chapter Summary

This chapter has provided a critical analysis for the case study of NHS Direct. The data of this chapter was gathered from three sources, the documentation method, archival records, and the semi-structured interviews. The use of three three methods for data collection (Data triangulation) is

intended to neutralise bias in any one method and insure the validity of the data. The analysis aims are to validate the main elements of the proposed evaluation framework and to validate the proposed evaluation criteria that influence user's utilization and satisfaction of e-health services.

The proposed evaluation framework as explained in chapter three is criteria based. The criteria selection in an evaluation scenario is determined mainly by three elements; the evaluation rationale, the evaluation timeframe, and the evaluation stakeholders. Hence, the case study was analysed first in the light of the above three elements. This has included; First, the validity and the importance of certain evaluation rationale for the evaluation of NHS Direct; Second, the appropriateness of conducting an evaluation initiative in specific timeframe, and the impact of evaluation timeframes on the evaluation of NHS Direct; Third, the changing role of NHS Direct stakeholders with the change of evaluation timeframes, and their influence on the evaluation process.

The proposed framework suggested five rationales for the evaluation of e-health services, they are: for maintaining accountability for expenditure of resources, for developing and strengthening performance of health organizations, individuals and/or systems, for decision-making, for promoting the use of information systems in healthcare, and for usability and acceptability. The analysis of NHS Direct revealed that the five evaluation rationales are conclusive, and there are no evaluation rationales with in NHS Direct out of the scope of the proposed ones. The critical analysis of NHS Direct evaluation rationales in the light of the proposed ones succeeds to capture the strengths and limitation of NHS Direct evaluation rationales. The main identified limitations are the lack of comprehensive rationale strategy for the evaluation of NHS Direct services, the poor interpretation of evaluation outcomes into useful actions, and the absence of comprehensive performance framework with detailed objectives

and wide range of specific and measurable indicators.

The framework proposed three evaluation timeframes for the evaluation of e-health services; they are; pre-implementation, implementation, and post implementation phases. According to the framework, it is essential to determine when to evaluate and how long the evaluation process will take. This decision should be based mainly on the evaluation rationale which is normally determined first. The analysis of NHS Direct has confirmed that the evaluation timeframes is an essential element in the evaluation of e-health in practice, and the three proposed timeframes are applicable and suitable dimension to differentiate and group different evaluation practices in the field of e-health. The analysis of NHS Direct in relation to the evaluation timeframes captured a number of issues. The most important ones are the necessity of evaluation initiatives mapping to evaluation timeframes for efficient e-health evaluation, and the value of continuous evaluation particularly the performance assessment for e-health initiatives.

The framework proposed e-health stakeholders as a third element that has huge influence in the evaluation of e-health services. This element is about identifying the key stakeholders and determining who should be considered in the evaluation. The analysis of NHS Direct in relation to evaluation stakeholders captured a number of issues. The most important ones are the dominant of supply side stakeholders in e-health evaluations, the delays in involving the users in the development and evaluation of e-health services have negative impact on users' utilization and satisfaction of e-health services, the difficulties in extending stakeholders involvement in e-health evaluation during pre-implementation and implementation phases, and the importance of establishing a mechanism to interpret the stakeholders' views in a way that impact the direction of service development.

In chapter three, the evaluation framework has been applied in specific scenario to identify the evaluation criteria that influence user's utilization and satisfaction of e-health services, the outcome were three sets of evaluation criteria; the usability criteria group, the direct costs and benefits criteria group, and the trust criteria group. The second aim of this chapter was to validate the proposed criteria.

The first set of the proposed criteria is the usability group. According to the proposed criteria, this group contain five criterions, they are: easy to learn and use criterion, accessibility criterion, compatibility criterion, functionality criterion, and user' satisfaction criterion. The analysis of NHS Direct identified a different set with five criterions as well. The new identified criterion is service effectiveness. Although there are some similarities between the proposed criteria and that identified in NHS Direct, most of the indicators and their descriptions by which the criterions are assessed are different. The analysis of NHS Direct revealed that reliability and safety criterion is contributing to the trust criteria rather than the usability criteria. The analysis also revealed that the easy to learn and use criterion is too general to be applied to the assessment of NHS Direct service but the service can be assessed through another criterion like patients satisfaction. Therefore, it has been excluded from the modified set of usability criteria.

The second set of the proposed criteria is the direct costs and benefits group. According to the proposed criteria, this group contains three criterions; they are: economic saving criterion, quality and rewards criterion, and access level criterion. The analysis of NHS Direct identified a similar set with three criterions as well, they are: financial saving criterion, access level criterion, and quality criterion. The analysis of NHS Direct also revealed a number of issues. The most important are, firstly, the challenges in accurately evaluating an e-health service, as the evaluation outcomes is partially based

on the ability to properly identify and quantify the intangible benefits of the service. Secondly, it takes relatively long time for an e-health service to reach their satisfactory performance targets. Thirdly, the economic return is not enough to justify the investments in e-health services, considering that these services are unable to replace or work independently from other traditional healthcare services.

The Third set of the proposed criteria is the trust group. According to the proposed criteria, this group contain two criterions, security criterion and privacy criterion. The analysis of NHS Direct identified more conclusive set with three criterions. They are; privacy criterion, reliability and safety criterion, and security criterion. The analysis of NHS Direct also revealed a number of issues. The most important are, firstly, the priority to adopt specific indicator and neglect others for privacy criterion has to be decided according to the e-health service and its context. Secondly, the use of reliability and safety criterion in assessing NHS Direct is contributing in reducing clinical errors to the minimum, and provide an essential feedback to develop and improve safe and reliable services. Thirdly, the trust criteria require a continuous review, and failing to address the criteria properly may have a profound impact on the success of e-health services.

# Chapter Seven

# Research Conclusions

**Chapter Abstract**

*This chapter outlines the main conclusions drawn from this thesis, this include the conclusions drawn from the literature analysis, the conclusions drawn from theoretical model design and development, and the conclusions drawn from theoretical and empirical data analysis. The chapter also presents the main theoretical and practical contributions of this research study. Finally the chapter provides the main limitations of the study and recommendations for future research in the area of e-health evaluation.*

**Chapter Contents**

## 7.1 Research Conclusions

This research study set out to develop, and assess an efficient evaluation framework for e-health services and to propose evaluation criteria for better user's utilization and satisfaction of e-health services. The following sections present the main conclusions drawn from the research study, starting with the conclusions drawn from the literature analysis.

### 7.1.1 Conclusions Drawn From the Literature Analysis

The analysis of literature review revealed that the research in the field of e-health evaluation is a complicated and difficult subject. The complexities are correlated mainly to the multi-disciplinary nature of the field and the challenges at the intersection of three areas, each well-known for its complexity; healthcare services, information systems, and evaluation methodologies. Healthcare services are dictated by complex regulations, characterized by having multi-disciplinary stakeholders, and require a high degree of formalized working practices. Information systems and its evaluation is another complicated and difficult research field. The main difficulties include; the multiple perspectives involved in IS evaluation, the complications of quantifying benefits, and the difficulties to consider the social and technical context of IS use. The establishment of an evaluation methodology is another challenge for e-health evaluation as the field is suffering from the limited experience of using methods, the unfamiliarity with evaluation techniques and the difficulty in interpreting results.

The critical analysis of e-health evaluation literature also revealed that it is both under-developed and under-managed in theory and practice. Nevertheless, the research field has been the focus of a number of studies which take different approaches. Each of these approaches has its merits and limitations. The most common used approaches are traditional evaluation approaches, benchmarking, balanced scorecard, and stakeholders' evaluation.

The examination of existing evaluation frameworks that have been proposed or used in e-health context show that they are suffering from many limitations. These limitations

include, that they are either designed to focus particularly on the supply side of e-health services (organizational perspective) or they are designed to target a specific user or a specific application of an e-health initiative. Moreover, the healthcare dimension is either ignored or not fully considered in the design and the implementation of these evaluation frameworks.

### 7.1.2 Conclusions Drawn From the Development of the Theoretical Model

This study has concluded that e-health services evaluation framework should be criteria based. The criteria can be grounded in, and derived from, one or more specific perspectives or theories, and cannot be entirely framed within the bounds of a single theory or perspective. Understanding the multi-disciplinary nature of e-health services evaluation and the challenges that it faces is the first requisite towards dealing effectively with the complexities, and overcoming the evaluation barriers of e-health services.

The characteristics of the e-health evaluation framework should maintain the comprehensiveness and the applicability of framework for a wide range of e-health services and overcome the limitation of existing evaluation frameworks.

The identification of the evaluation criteria in the criteria-based evaluation framework is determined by an evaluation matrix of three elements or dimensions, the elements are; the evaluation rationales, the evaluation timeframes, and the evaluation stakeholders. Switching between five main evaluation rationales, three evaluation timeframes, and any group of stakeholders with a common perspective will produce number of scenarios. In any one of these scenarios, certain set or sets of evaluation criteria can be achieved, which will be unique for these choices and different from any other scenarios

The rationale of e-health evaluation should be identified first together with evaluation timeframe and evaluation stakeholders for an evaluation scenario. Choosing one or more of evaluation rationales is determined by the most important question or questions for the evaluation. Based on the evaluation rationale, the evaluation process may take different time frames, deploy a particular evaluation method, require a qualitative approach, a

quantitative approach, or both for data collection, and consider one or more than one group of stakeholders.

E-Health evaluation involves many stakeholders, users being the most important. Therefore, assessing e-health from users' perspective should address all the key factors that influence the users' acceptance to the new adopted technologies including the risks and benefits associated with the design and implementation of the e-health initiative in specific contexts. To explore the user' perspective in evaluating e-health services and to present evaluation criteria that influences users' utilization and satisfaction of e-health services, an evaluation scenario have to be suggested in accordance with the evaluation framework. The suggested evaluation scenario has considered the following choices as the most suitable for this evaluation scenario; the usability and acceptability as rationale for the evaluation, post-implementation as evaluation timeframe, and the group of demand-side stakeholders as evaluation stakeholders. The evaluation scenario has produced three sets of well-argued and balanced hierarchy of evaluation criteria that include usability criteria, direct costs and benefits criteria, and trust criteria.

### 7.1.3 Conclusions Drawn From the Analysis of Theoretical and Empirical Data

This study has concluded that there is a gap between the theory and practice in the evaluation of e-health services. The gap is related to a certain extent to the tension between e-health research efforts in academic institutions and healthcare organizations. Although the academic sector succeeds in developing many evaluation methodologies for e-health services, many of these methodologies has been accused for their limitations to answer real-world concerns. On the other hand, when commercial organizations develop an evaluation methodology for e-health services, they usually adopt an approach with limited applicability to other situations. In adopting such approach, they seek obtaining quick and practical answers because of market pressures.

The analysis of theoretical and practical data has revealed that the five proposed rationales for the evaluation of e-health services are the most common used rationales; they also provide sufficient guidance for organizations to determine on the priorities of

the evaluation questions for their evaluation initiatives, as well as they support identifying the strengths and limitation of e-health evaluation initiatives.

The analysis of theoretical and practical data has proved that that the mapping of e-health evaluation initiatives to evaluation timeframes (when to evaluate and how long the evaluation processes take) is an essential element for efficient evaluation. The data also has shown that the three proposed timeframes are applicable and suitable dimension to differentiate and group different evaluation practices in the field of e-health evaluation.

The proper identification and the effective involvement of e-health stakeholders as well as considering their changing positions and roles with different evaluation timeframes have vital impact on the success of e-health evaluation. The data also has revealed that the achievement of effective involvement of e-health users require huge efforts from the evaluator, specifically in establishing a mechanism to interpret the users' views in a way that impact the direction of service development.

## 7.2 Research Contributions

The theoretical and practical contributions of this study are various as well as timely. As discussed in chapter two, the field of e-health evaluation is both an under-developed and under-managed area in theory and practice. However, there is wide range of information system evaluation frameworks, some of them were proposed and used to evaluate e-health services. These frameworks are suffering from many limitations. The following sections conclude the theoretical and practical contributions of this research, specifically in addressing the limitations of existing e-health evaluation frameworks.

### 7.2.1 Theoretical Contribution

The primary theoretical contributions of this study lie in the analysis of the conceptual foundation of e-health evaluation. The existing literature has been reviewed critically emphasising on the need for an e-health evaluation framework that has to be sufficiently generic to be applicable to a wide range of applications but also sufficiently detailed to provide effective guidance. The critical analysis includes the literature in the evaluation

of information systems, the e-health evaluation challenges, and the main evaluation approaches that has been proposed or used in e-health evaluation.

As the main aim of this study is to propose a theoretical framework for the evaluation of e-health services that can maintain the comprehensiveness and commensurate with empirical reality, the analysis of the conceptual foundation of e-health evaluation revealed that it is inappropriate to tie such framework to specific theory or perspective. To achieve that, criteria-based evaluation approach has been chosen as it is the most appropriate for the design of the framework. The appropriateness stems from the fact that e-health applications are principally complex in nature, hence they require an approach that can be derived from a multitude of theories and perspectives.

The multi-dimensional criteria will offer high flexibility and comprehensiveness to the proposed evaluation framework, since the criteria can be derived from a multitude of theories and perspectives according to the evaluation context. Furthermore, the identification process of the multi-dimensional criteria will offer an effective guidance and precise choices, while the criteria identification is regulated by an evaluation matrix of three dimensions (the evaluation rationales, the evaluation timeframes, and the evaluation stakeholders).

Another theoretical contribution of this study is the three sets of a well-argued and balanced hierarchy of evaluation criteria that influence user's utilization and satisfaction of e-health services. The criteria was derived by bringing together concepts from different sources including two well-established research theories, namely, the Diffusion of Innovation and the Technology Acceptance Model, as well as traditional evaluation models. The criteria have considered the technical perspective, the economic perspective, and the social perspective, and contain three sets; the usability criteria, the direct costs and benefits criteria, and the trust criteria.

### 7.2.2 Practical Contributions

The primary practical contribution of this study is for governmental department and healthcare providers who seek to understand why healthcare services are lagging behind in embracing information communication technologies and moving to the form of e-health services. The study has identified the advantages that could be offered by adopting e-health innovations as well as the drawbacks and limitations of these innovations.

The main practical contribution of this study is in providing cross disciplinary e-health evaluation framework that can be applied to a wide range of e-health application and able to answer real-world concerns. The framework is a considerable practical contribution as it can be used to support the value of existing e-health projects, and to increase the quality and efficiency of future e-health initiatives.

Another practical contribution of this study is the three sets of evaluation criteria that influence user's utilization and satisfaction of e-health services. The evaluation criteria can be used to help achieve better user services utilization, to serve as part of e-health evaluation framework, and to address areas that require further attention in the development of future e-health initiatives. Additionally this study has provided a list of measuring indicators by which the criteria can be assessed, and suggestions to describe the measuring indicators. The indicators descriptions will provide general guidance for the use of these indicators. Adopting the evaluation criteria and their descriptions for a specific e-health service should take into account the relevancy of each of the evaluation criterion to the prevailing situation. This mainly depends on the maturity of the e-health initiative, and could lead to partial use of the evaluation criteria.

## 7.3 Research Limitations

While this research study has its theoretical and practical contributions, as with every research project it has its limitations that should be acknowledged. The first limitation is associated with the size of the research study. The study is set out to offer cross disciplinary and efficient evaluation framework for e-health services. For the framework to be efficient and cross disciplinary, it should have specific characteristics and be able to

deal effectively with various e-health evaluation scenarios. This makes it unfeasible to examine all the possible evaluation scenarios, and only one of the evaluation scenarios has been investigated. The evaluation scenario which has been investigated is developed to assess the users' utilization and satisfaction of e-health services.

The second limitation is associated with the validation context of the evaluation framework. The case study of NHS Direct has been selected after careful consideration and for practical reasons. The decision is also related to the fact that United Kingdom has a competitive advantage and leading position in the field of e-health services, and NHS Direct is counted as one of the largest and most advanced healthcare services in the world. Despite that, the generated data from NHS Direct was only sufficient to validate the framework in the context of United Kingdom. Although theoretically speaking, the framework has been designed to be sufficiently generic to be applicable to a wide range of e-health applications, but still the applicability of the evaluation framework for a different evaluation context specifically for the context of developing countries has not been validated.

### 7.4 Future Research Directions

Lastly, it remains to discuss how this study could set off and guide future research. It was a challenging task to maintain focus and keeping on the track during the conducting of this research study; this is because of the size of the research field, the attractions of the alternative routes in the research field, and the setting of research priorities of this study. The development of the conceptual model opened a wide range of further research opportunities in the area of e-health evaluation where the research area generally is considered to be under-managed and under-developed.

A further research would be possible to investigate the ethical issues as a central aspect in e-health evaluation where the literature confirms that the consideration of ethics is an absolute necessity in the process of implementing any evaluation initiative. Although the ethical issues is considered as one of the elements of in the proposed framework, it is decided just to provide an overview of the ethical issues including the international

ethical standards for e-health evaluation. A feasible direction of research would aim at detailed examination of the ethical requirements in the evaluation of e-health services.

Further research could also be directed towards the evaluation scenarios in the criteria-based evaluation of e-health services. The proposed evaluation framework provides an evaluation matrix of three dimensions (the evaluation rationales, the evaluation timeframes, and the evaluation stakeholders) to identify the criteria for specific scenario. In this study, only one of the possible scenarios was investigated to assess the user's utilization and satisfaction of e-health services. A feasible direction of research would aim to investigate other scenarios like the performance assessment of e-health services from organizational perspective. In such scenario, performance assessment may be considered as evaluation rational, post-implementation as evaluation timeframe and the group of supply side stakeholders as evaluation stakeholders.

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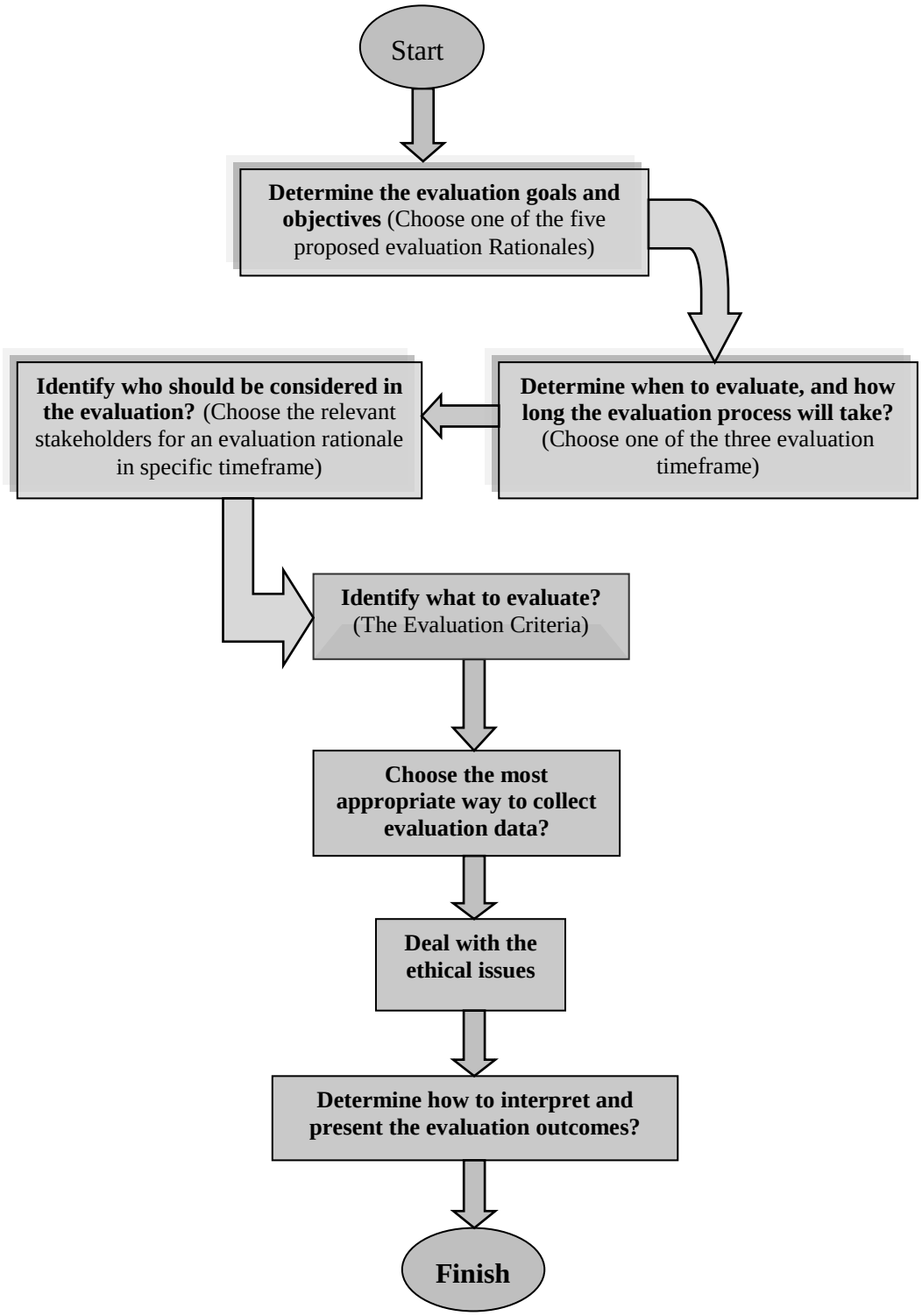
## Appendix A: The Proposed E-health Evaluation Flowchart



## Appendix B1: NHS Direct Reports Used for Document Analysis

| Reports | Report Type | Description | Date |
|---|---|---|---|
| Annual Report and Accounts of NHS Direct 2004/2005 | Annual Report | The first Annual Report & Accounts for NHS Direct Special Health Authority. The report reflects the developments and challenges faced by the organisation. | 2005 |
| Annual Report and Accounts of NHS Direct 2005-2006 | Annual Report | Presented to Parliament pursuant to section 98 (1c) of the National Health Service Act 1977. Ordered by the House of Commons | 19 July 2006 |
| NHS Direct Annual Report and Accounts 2006-2007 | Annual Report | Presented to Parliament pursuant to Schedule 15 of the National Health Service Act 2006. Ordered by the House of Commons | 16 July 2007 |
| NHS Direct Annual Report & Accounts 2007/08 | Annual Report | Presented to Parliament pursuant to Schedule 15 of the National Health Service Act 2006. Ordered by the House of Commons. | 17 July 2008 |
| NHS Direct Annual Report & Accounts 2008/09 | Annual Report | Presented to Parliament pursuant to Schedule 15 of the National Health Service Act 2006. Ordered by the House of Commons | 17 July 2008 |
| Performance Reports (3) | Performance and Quality Reports | 1. Monthly performance report with executive scorecard.<br>2. Performance report 2005.<br>3. Performance report with executive scorecard | 24 January 2005 |
| Performance Report | Performance and Quality Reports | Performance Improvement paper | 27 July 2005 |
| Performance Reports (3) | Performance and Quality Reports | 1. Quarterly Executive Scorecard July 05.<br>2. Performance report July 05.<br>3. Performance report August 05 | 21 September 2005 |
| Performance Report | Performance and Quality Reports | Performance report | 25 October 2005 |
| Quality Reports (2) | Performance and Quality Reports | 1. Controls Assurance report to board.<br>2. NHS Direct Assurance Framework 2005-06 | 6 December 2005 |

| | | | |
|---|---|---|---|
| Performance Report | Performance and Quality Reports | Monthly performance report | 28 February 2006 |
| Performance Report | Performance and Quality Reports | Monthly Performance Report February 2006. | 3 May 2006 |
| Performance Reports (3) | Performance and Quality Reports | 1. Monthly Performance Report with Executive Scorecard April 2006 v11 06B.025<br>2. Front Sheet for Performance Targets Trajectories July 06 cover.029.<br>3. Monthly Performance Report May 2006. | 5 July 2006 |
| Performance Report | Performance and Quality Reports | Performance report July 2006 | 5 September 2006 |
| Performance Reports (2) | Performance and Quality Reports | 1. Monthly performance report - August 2006<br>2. Monthly performance report - September 2006 | 31 October 2006 |
| Performance Reports (2) | Performance and Quality Reports | 1. AGM December 2006 - Clinical, operational and financial performance<br>2. Monthly performance report - October 2006 | 5 December 2006 |
| Performance Reports (2) | Performance and Quality Reports | 1. Performance - December 2006<br>2. Performance - November 2006 | 30 January 2007 |
| Performance Report | Performance and Quality Reports | Monthly performance report | 13 March 2007 |
| Performance Report | Performance and Quality Reports | Performance report - February 2007 | 18 April 2007 |
| Performance Reports (2) | Performance and Quality Reports | 1. Monthly performance report April 2007<br>2. Monthly performance report March 2007 | 22 May 2007 |
| Performance Reports (4) | Performance and Quality Reports | 1. Balanced scorecard Q4 2006-2007 (version 3)<br>2. Monthly performance report<br>3. NHS Direct Balanced scorecard Quarter 4 2006-07<br>4. Report on performance of C&B appointments line | 17 July 2007 |

| | | | |
|---|---|---|---|
| Performance Report | Performance and Quality Reports | Monthly Performance Report July 2007 | 5 September 2007 |
| Performance Report | Performance and Quality Reports | Monthly Performance Report September 2007 | 13 November 2007 |
| Performance Reports (2) | Performance and Quality Reports | 1. Monthly performance report - December 2007<br>2. Monthly performance report - November 2007 | 5 February 2008 |
| Performance Report | Performance and Quality Reports | Monthly performance report 20 March 2008 | 20 March 2008 |
| Performance Reports (3) | Performance and Quality Reports | 1. Annual performance report<br>2. Monthly performance report February 2008<br>3. Monthly performance report March 2008 | 22 April 2008 |
| Performance Report | Performance and Quality Reports | Monthly performance report April 2008 | 22 May 2008 |
| Performance Reports (2) | Performance and Quality Reports | 1. Monthly performance and quality report for August<br>2. Monthly performance and quality report for July | 22 September 2008 |
| Performance Report | Performance and Quality Reports | Performance and quality report | 16 December 2008 |
| Performance Report | Performance and Quality Reports | Performance Report for January 2009 | 24 March 2009 |
| Performance Report | Performance and Quality Reports | Performance Improvement Plan | 24 November 2009 |
| Performance Reports | Performance and Quality Reports | 1. Corporate performance report<br>2. Corporate performance report – Annex A<br>3. Corporate performance report – Annex B<br>4. Corporate performance report – Annex C<br>5. Corporate performance report – Annex D<br>6. Corporate performance report – Annex E<br>7. Corporate performance report – Annex F | 22 December 2009 |

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| Finance report | Financial Reports | Finance report Dec 04 | 8 February 2005 |
| Finance statement | Financial Reports | Financial Statement Jan 05 | 16 March 2005 |
| Finance report, statement and Frameworks (4) | Financial Reports | 1. Financial Board Report March 05<br>2. Financial Framework 2005-6 Report<br>3. Financial Statement March 05<br>4. Revenue Financial Framework 2005-6 | 26 April 2005 |
| Finance reports (2) | Financial Reports | 1. Financial paper efficiency savings May 05<br>2. Finance report May 05 | 31st May 2005 |
| Finance reports (2) | Financial Reports | 1. Finance Paper Efficiency Savings<br>2. Financial position | 27 July 2005 |
| Finance report | Financial Reports | Finance Paper Efficiency Savings July 2005-06 | 21 September 2005 |
| Finance reports (2) | Financial Reports | 1. Annex A - Consolidated income and expenditure for the period ended 31 January 2006<br>2. Financial report for the period ended 31 January 2006 | 28 February 2006 |
| Finance report and Frameworks (3) | Financial Reports | 1. Annex A - Consolidated income & expenditure for the period ended 28th February 2006<br>2. Appendix A - NHS Direct financial framework<br>3. Financial Framework 2006-7 | 3 May 2006 |
| Finance reports and Frameworks (3) | Financial Reports | 1. Financial Report to 31 May 2006<br>2. Budget Framework 2006/7 Income and Expenditure<br>3. Consolidated expenditure for period ending 31 May 2006 | 5 July 2006 |
| Finance reports (2) | Financial Reports | 1. Finance report July 2006<br>2. Income and expenditure July 2006 | 5 September 2006 |
| Finance report | Financial Reports | Finance report for the period ended 30 September 2006 | 31 October 2006 |
| Finance report | Financial Reports | Financial report for period ended 31 December | 30 January 2007 |

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| Finance reports and Frameworks (4) | Financial Reports | 1. Budget framework update 2007/08<br>2. Capital investment plans 2007/08<br>3. Finance report for the period ended 31 January 2007<br>4. Financial framework 2006/07 | 13 March 2007 |
| Finance report | Financial Reports | Finance report | 18 April 2007 |
| Finance report | Financial Reports | Finance report | 22 May 2007 |
| Finance reports (2) | Financial Reports | 1. Executive Summary - Finance Report for the period ended 31 July 2007<br>2. Finance Report for the period ended 31 July 2007 | 5 September 2007 |
| Finance report | Financial Reports | Finance Report to 30 September 2007 | 13 November 2007 |
| Finance report | Financial Reports | Executive Summary - Finance Report for the period ending 31 October 2007 | 19 December 2007 |
| Finance report | Financial Reports | Finance report for period ending 31 December 2007 | 5 February 2008 |
| Finance reports (2) | Financial Reports | 1. Finance appendix 20 March 2008<br>2. Finance report 20 March 2008 | 20 March 2008 |
| Finance reports (2) | Financial Reports | 1. Finance report for the period ended 29 February 2008<br>2. Finance report annex February 2008 | 22 April 2008 |
| Finance reports (2) | Financial Reports | 1. Finance report annex March 2008<br>2. Finance report for the period ended 31 March 2008 | 22 May 2008 |
| Finance report | Financial Reports | Finance report for period ended 31 August 2008 | 22 September 2008 |
| Finance report | Financial Reports | Finance report M7 2008-2009 | 21 November 2008 |
| Finance report | Financial Reports | Finance report for December 2008 | 27 January 2009 |

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| Finance report | Financial Reports | Finance report | 28 April 2009 |
| Transformation report | Operations Reports | Main Board Transformation Update March 05 | 16 March 2005 |
| Operations Report | Operations Reports | Operations Report April 2005 | 26 April 2005 |
| Operations and Transformation Report (2) | Operations Reports | 1. Operations report April 05<br>2. Transformation briefing May 05 | 31st May 2005 |
| Operations Reports (2) | Operations Reports | 1. Operations report June 05<br>2. Operations report May 05 | 27 July 2005 |
| Transformation reports (2) | Operations Reports | 1. NHS Direct transformation roadmap version 2<br>2. Transformation roadmap | 31 October 2006 |
| Transformation reports (3) | Operations Reports | 1. Transformation dashboard vs5.2<br>2. Transformation programme road map v2<br>3. Update on transformation programme dashboard - December 2006 | 5 December 2006 |
| Transformation reports (3) | Operations Reports | 1. Transformation dashboard vs 6.1<br>2. Transformation programme road map v3<br>3. Update on transformation programme roadmap and dashboard | 30 January 2007 |
| Transformation reports (4) | Operations Reports | 1. NHSD Executive Board Transformation dashboard version 6.6<br>2. Transformation checkpoint review 13 March 2007<br>3. Transformation roadmap version 5.0<br>4. Update on Transformation programme roadmap and dashboard | 13 March 2007 |
| Transformation reports (2) | Operations Reports | 1. Transformation action plan vs2<br>2. Transformation programme road map v5 | 18 April 2007 |

## Appendix B2: The Formal Studies of NHS Direct Used for Document Analysis

| Document Name | Description | Carried Out By | Date |
|---|---|---|---|
| Evaluation of NHS Direct first wave sites, First interim report to the Department of Health | Independent research study | The Medical Care Research Unit of the University of Sheffield, on behalf of the Department of Health. | December 1998 |
| NHS Direct callers' compliance with advice to attend A&E. | Independent research study | King's College London - Lambeth, Southwark and Lewisham Immediate Access Project | 2000 |
| Evaluation of NHS Direct first wave sites: Final report of the phase 1 research | Independent research Study | The Medical Care Research Unit of the University of Sheffield, on behalf of the Department of Health. | July 2001 |
| The appropriateness and timeliness of NHS Direct referrals | Independent evaluation of 4,554 users of NHS Direct | IFF Research | February 2008 |
| The Quality of NHS Direct's Core Telephone Service | Survey of users of NHS Direct's core telephone service | Picker Institute | April 2008 |

## Appendix B3: The Administrative Documents of NHS Direct Used for Document Analysis

| Reports | Report Type | Description | Date |
|---|---|---|---|
| Plan Reports (6) | Plans and Proposals | 1. Business Plan Cover Sheet<br>2. Business Plan Supplementary information appendix 1<br>3. Business Plan Supplementary information appendix 2<br>4. Business Plan Supplementary information<br>5. July update on Business Plan<br>6. NHS Direct Business Plan - May 05 | 27 July 2005 |
| Plan Report | Plans and Proposals | Excutive's summary of Winter Planning | 6 December 2005 |
| Plan Report | Plans and Proposals | Capital investment plans 2007/08 | 13 March 2007 |
| Plan Report | Plans and Proposals | National Staff Survey action plan | 19 December 2007 |
| Plan Report | Plans and Proposals | Business plan 20 March 2008 | 20 March 2008 |
| Plan Report | Plans and Proposals | Major Incident Plan and Training strategy | 24 March 2009 |
| Plan Reports (2) | Plans and Proposals | 1. Audit Committee annual work plan 2009/10<br>2. Investment Committee annual work plan | 23 June 2009 |
| Plan Reports (2) | Plans and Proposals | 1. Plans for future call recordings<br>2. Revised edition of the Major Incident Plan | 24 November 2009 |
| Policy Paper | Policy and Strategy Papers | NHS Direct Security Policy Statement | 16 March 2005 |
| Strategy Papers (2) | Policy and Strategy Papers | 1. ICT Strategy paper April 2005<br>2. Switching strategy | 26 April 2005 |

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| Strategy Papers (3) | Policy and Strategy Papers | 1. Multi-channel strategy<br>2. Multi-channel strategy presentation<br>3. New Media Multi-channel strategy | 27 July 2005 |
| Strategy Paper | Policy and Strategy Papers | ICT strategy update | 28 February 2006 |
| Strategy Papers (2) | Policy and Strategy Papers | 1. National Staff Survey strategy<br>2. Equality and Diversity strategy December 2007 | 19 December 2007 |
| Strategy Paper | Policy and Strategy Papers | Executive summary - HR strategy | 5 February 2008 |
| Policy Papers (2) | Policy and Strategy Papers | 1. Corporate risk management policy<br>2. Corporate risk management policy (2) | 16 December 2008 |
| Strategy Paper | Policy and Strategy Papers | Major Incident Plan and Training strategy | 24 March 2009 |
| Strategy Paper | Policy and Strategy Papers | Evaluation - May board strategy days | 23 June 2009 |
| Meeting Agenda | Agendas | Open board agenda Jan 05 | 24 January 2005 |
| Agendas (3) | Agendas | 1. Agenda for Change Milestones Feb 05<br>2. Agenda for Change report Jan 05<br>3. Agenda 8 Feb 05 | 8 February 2005 |
| Meeting Agenda | Agendas | Board Agenda March 05 | 16 March 2005 |
| Meeting Agenda | Agendas | Board Meeting Agenda 26 April 05 | 26 April 2005 |
| Agenda | Agendas | Agenda 31 May 05 | 31st May 2005 |
| Agenda | Agendas | Agenda 27 July 05 | 27 July 2005 |
| Meeting Agenda | Agendas | NHS Direct Board meeting Agenda 21 Sept 05 | 21 September 2005 |
| Meeting Agenda (2) | Agendas | 1. Open board agenda October 05<br>2. Stakeholder conference agenda November 05 | 25 October 2005 |

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| Meeting Agenda | Agendas | Open board agenda | 6 December 2005 |
| Agenda | Agendas | Agenda 28 Feb 2006 | 28 February 2006 |
| Agenda | Agendas | Agenda 03 May 2006 | 3 May 2006 |
| Meeting Agenda | Agendas | July Open Board Agenda | 5 July 2006 |
| Meeting Agenda | Agendas | Board agenda 5 September 2006 | 5 September 2006 |
| Agendas (3) | Agendas | 1. Board agenda 31 October 2006<br>2. Board agenda 31 October 2006 Appendix A - E<br>3. Board agenda 31 October 2006 Appendix F | 31 October 2006 |
| Agenda | Agendas | Agenda 5 December 2006 | 5 December 2006 |
| Agenda | Agendas | Agenda | 30 January 2007 |
| Agenda | Agendas | Agenda | 13 March 2007 |
| Agenda | Agendas | Agenda | 18 April 2007 |
| Agenda | Agendas | Agenda | 22 May 2007 |
| Agenda | Agendas | Agenda | 17 July 2007 |
| Agenda | Agendas | Agenda 13 November 2007 | 13 Nov. 2007 |
| Meeting Agenda | Agendas | Board meeting agenda 5 February 2008 | 5 February 2008 |
| Meeting Agenda | Agendas | Board meeting agenda 20 March 2008 | 20 March 2008 |
| Meeting Agenda | Agendas | Board meeting agenda 22 April 2008 | 22 April 2008 |
| Meeting Agenda | Agendas | Board meeting agenda 22 May 2008 | 22 May 2008 |
| Agendas (12) | Agendas | 1. Board Agenda<br>2. Agenda item 5<br>3. Agenda item 5 appendix<br>4. Agenda item 6.1<br>5. Agenda item 6.2<br>6. Agenda item 7<br>7. Agenda item 8<br>8. Agenda item 9<br>9. Agenda item 10 | 23 July 2008 |

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| | | 10. Agenda item 11<br>11. Agenda item 12<br>12. Agenda item 13.1 | |
| Agenda | Agendas | Board agenda | 21 Nov. 2008 |
| Agenda | Agendas | Agenda | 16 December 2008 |
| Meeting Agenda | Agendas | Agenda | 27 January 2009 |
| Meeting Agenda | Agendas | Agenda | 24 February 2009 |
| Meeting Agenda | Agendas | Agenda | 24 March 2009 |
| Meeting Agenda | Agendas | Agenda | 28 April 2009 |
| Meeting Agenda | Agendas | Agenda | 8 September 2009 |
| Meeting Agenda | Agendas | Agenda | 12 October 2009 |
| Meeting Agenda | Agendas | Agenda | 24 Nov. 2009 |
| Meeting Agenda | Agendas | Agenda | 22 December 2009 |

## Appendix B4: NHS Direct Minutes of Meeting Used for Document Analysis

| Reports | Report Type | Description | Date |
|---|---|---|---|
| Report and Minutes | Board Reports and Minutes of Meetings | 1. Board report Nov 05<br>2. Open board minutes | 24 January 2005 |
| Minutes of Meeting | Board Reports and Minutes of Meetings | Board minutes 8 Dec 04 | 8 February 2005 |
| Report and Minutes (2) | Board Reports and Minutes of Meetings | 1. Board Meeting minutes 8 February 2005<br>2. Format for Board Papers Report March 05 | 16 March 2005 |
| Minutes of Meeting | Board Reports and Minutes of Meetings | Board Meeting Minutes 16 March 05 | 26 April 2005 |
| Minutes of Meeting | Board Reports and Minutes of Meetings | NHS Direct Board minutes - 26 April 05 | 31st May 2005 |
| Minutes of Meeting (2) | Board Reports and Minutes of Meetings | 1. Board Meeting minutes 31 May 05<br>2. Stakeholders board meeting | 27 July 2005 |
| Report and Minutes (2) | Board Reports and Minutes of Meetings | 1. Board report July 05<br>2. NHS Direct Board minutes 27 July 05 | 21 September 2005 |
| Report and Minutes (2) | Board Reports and Minutes of Meetings | 1. August trend analysis board paper<br>2. Open board minutes | 25 October 2005 |
| Board Reports (2) | Board Reports and Minutes of Meetings | 1. Controls Assurance report to board<br>2. October 2005 board report | 6 December 2005 |
| Board Reports | Board Reports and Minutes of Meetings | February 2006 Board Report | 3 May 2006 |
| Minutes of Meeting | Board Reports and Minutes of Meetings | Open Board Minutes 3 May 2006 06B.022 | 5 July 2006 |
| Minutes of Meeting | Board Reports and Minutes of Meetings | Board minutes 5 July 2006 | 5 September 2006 |
| Minutes of Meeting | Board Reports and Minutes of Meetings | Board meeting minutes 21 September 2006 | 21 September 2006 |
| Report and Minutes (2) | Board Reports and Minutes of Meetings | 1. October 2006 board report<br>2. Open board meeting minutes - October 2006 | 5 December 2006 |

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| Minutes of Meeting | Board Reports and Minutes of Meetings | Board meeting minutes 30 January 2007 | 13 March 2007 |
| Report and Minutes (2) | Board Reports and Minutes of Meetings | 1. 13 March board meeting minutes<br>2. Board programme update v4 | 18 April 2007 |
| Report and Minutes (2) | Board Reports and Minutes of Meetings | 1. 18 April board meeting minutes<br>2. Format of commercial directorate board reporting | 22 May 2007 |
| Minutes of Meeting | Board Reports and Minutes of Meetings | Board meeting minutes 22.05.07 | 17 July 2007 |
| Board Reports | Board Reports and Minutes of Meetings | Standards for Better Health Board Report November 2007 | 13 November 2007 |
| Board Reports | Board Reports and Minutes of Meetings | Standards For Better Health Board Update 5 February 2008 | 5 February 2008 |
| Minutes of Meeting | Board Reports and Minutes of Meetings | Board meeting minutes 5 February 2008 | 20 March 2008 |
| Minutes of Meeting | Board Reports and Minutes of Meetings | Minutes of NHS Direct board meeting held on 20 March 2008 | 22 April 2008 |
| Minutes of Meeting | Board Reports and Minutes of Meetings | Minutes of NHS Direct board meeting held on 22 April 2008 | 22 May 2008 |
| Report and Minutes (2) | Board Reports and Minutes of Meetings | 1. June board minutes<br>2. Project board status update | 23 July 2008 |
| Report and Minutes (3) | Board Reports and Minutes of Meetings | 1. Board minutes 22 September 2008<br>2. Board paper: Board Committee Review<br>3. Revised terms of reference for board committees 22 September 2008 | 22 September 2008 |
| Minutes of Meeting | Board Reports and Minutes of Meetings | September board minutes | 21 November 2008 |
| Minutes of Meeting | Board Reports and Minutes of Meetings | Board minutes 21 November 2008 | 16 December 2008 |
| Minutes of Meeting | Board Reports and Minutes of Meetings | Minutes of December 2008 board meeting | 27 January 2009 |

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|---|---|---|---|
| Minutes of Meeting | Board Reports and Minutes of Meetings | Minutes of March board meeting | 28 April 2009 |
| Minutes of Meeting (3) | Board Reports and Minutes of Meetings | 1. Minutes of April board meeting<br>2. Minutes of May board meeting<br>3. Minutes of June board meeting | 23 June 2009 |
| Minutes of Meeting | Board Reports and Minutes of Meetings | Minutes from November's board meeting | 22 December 2009 |
| Audit Committee Minutes | Audit Committee Reports and Minutes of Meetings | Audit Committee Meeting Minutes 16 March 05 | 26 April 2005 |
| Audit Committee Minutes | Audit Committee Reports and Minutes of Meetings | Audit Committee Minutes - 26 July 05 | 21 September 2005 |
| Audit Committee Minutes | Audit Committee Reports and Minutes of Meetings | NHS Direct audit committee meeting minutes 20 October 2006 | 13 March 2007 |
| Audit Committee Minutes (2) | Audit Committee Reports and Minutes of Meetings | 1. Audit Committee minutes 9.05.07<br>2. Audit Committee minutes 24.05.07 | 17 July 2007 |
| Audit Committee Minutes | Audit Committee Reports and Minutes of Meetings | Minutes of audit committee meeting 11 October 2007 | 5 February 2008 |
| Audit Committee Minutes | Audit Committee Reports and Minutes of Meetings | Minutes of audit committee meeting held on 24 January 2008 | 22 April 2008 |
| Audit Committee Minutes | Audit Committee Reports and Minutes of Meetings | Minutes of the Audit Committee held on 1 May 2008 | 22 May 2008 |
| Audit Committee Report | Audit Committee Reports and | Audit committee terms of reference | 16 December 2008 |

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| | Minutes of Meetings | | |
| Audit Committee Report | Audit Committee Reports and Minutes of Meetings | Audit Committee Summary | 27 January 2009 |
| Audit Committee Minutes | Audit Committee Reports and Minutes of Meetings | Audit Committee meeting minutes | 24 March 2009 |
| Audit Committee Minutes | Audit Committee Reports and Minutes of Meetings | Audit Committee meeting minutes | 28 April 2009 |
| Audit Committee Minutes (2) | Audit Committee Reports and Minutes of Meetings | 1. Audit Committee meeting minutes<br>2. Audit Committee meeting summary | 23 June 2009 |
| Audit Committee Report | Audit Committee Reports and Minutes of Meetings | National Audit Office Management letter | 8 September 2009 |
| Audit Committee Report and Minutes (3) | Audit Committee Reports and Minutes of Meetings | 1. Audit committee action log<br>2. Summary from the Audit Committee meeting<br>3. Minutes from the Audit Committee meeting | 24 November 2009 |
| Risk management Minutes | Risk management Committee Reports and Minutes of Meetings | Risk Committee Meeting Minutes 8 Feb 05 | 16 March 2005 |
| Risk management Report | Risk management Committee Reports and Minutes of Meetings | Risk update - May 2005 | 31st May 2005 |
| Risk management Minutes | Risk management Committee | Risk Committe Meeting minutes 24 May 05 | 27 July 2005 |

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| | Reports and Minutes of Meetings | | |
| Risk management Minutes (2) | Risk management Committee Reports and Minutes of Meetings | 1. Risk Management Board Sub Committee minutes 23.01.07<br>2. Risk Management Board Sub Committee minutes 13.03.07 | 17 July 2007 |
| Risk management Report | Risk management Committee Reports and Minutes of Meetings | Risk management board sub committee | 5 February 2008 |
| Risk management Minutes (2) | Risk management Committee Reports and Minutes of Meetings | 1. Minutes of risk management board sub committee held on 24 January 2008<br>2. Minutes of risk management board sub committee held on 27 March 2008 | 22 April 2008 |
| Risk management Report | Risk management Committee Reports and Minutes of Meetings | Draft for risk committee approval | 22 September 2008 |
| Risk management Report | Risk management Committee Reports and Minutes of Meetings | Draft risk committee | 16 December 2008 |
| Risk management Report | Risk management Committee Reports and Minutes of Meetings | Corporate Risk and Assurance Register 2009/10 | 28 April 2009 |
| Risk management Reports (2) | Risk management Committee Reports and Minutes of Meetings | 1. Corporate risk and assurance register<br>2. Corporate risk and assurance register dashboard | 22 December 2009 |

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| Clinical Committee minutes | Clinical Governance Committee Minutes of Meetings | Clinical Governance Meeting 8 February 2005 | 16 March 2005 |
| Clinical Committee Report and minutes (2) | Clinical Governance Committee Minutes of Meetings | 1. Clinical Governance Minutes 26th April<br>2. Clinical Governance Terms of Reference | 31st May 2005 |
| Clinical Committee minutes | Clinical Governance Committee Minutes of Meetings | Clinical Governance meeting minutes | 6 December 2005 |
| Clinical Committee minutes | Clinical Governance Committee Minutes of Meetings | Clinical Governance Committee minutes 13.03.07 | 17 July 2007 |
| Clinical Committee minutes | Clinical Governance Committee Minutes of Meetings | Clinical Governance Committee 5 September 2007 | 5 February 2008 |
| Clinical Committee minutes | Clinical Governance Committee Minutes of Meetings | Clinical Governance Committee meeting minutes | 24 March 2009 |
| Clinical Committee Report | Clinical Governance Committee Minutes of Meetings | Clinical Governance Committee meeting summary | 23 June 2009 |
| Clinical Committee Report | Clinical Governance Committee Minutes of Meetings | Terms of Reference of the Clinical Governance Committee | 24 November 2009 |
| Clinical Committee minutes | Clinical Governance Committee Minutes of Meetings | Clinical Governance Committee meeting minutes | 22 December 2009 |