The Electronic Patient Records System as Technology-in-Practice

The impact of the implementation of new technology on the routines and structures in a health care setting

PhD Thesis

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Abstract

Adopting new technologies, such as electronic patient records (EPR) systems, is essential for improving inefficient practices and increasing productivity while reducing costs. However, studies show that many organizations fail to adopt technologies with demonstrable advantages. The relationship between technology and work transformation in complex organizations is poorly understood and further theoretical development is needed to advance our knowledge.

This research draws on Orlikowski's (2000) model of technology-in-practice, which suggests that the use of technology depends on how people interact with the technology and with each other over time and enact structures in social contexts.

This study looks at how routines change when an EPR is implemented in a private hospital in Greece and how the technology is changed by the routines surrounding its use, aiming to explore the role of agents in implementing and using technologies in health organizations. It is conducted in two stages and is based on interpretive epistemology. Twenty-two semi-structured interviews and over twenty hours of on-site observation were conducted and analysed using a thematic approach.

The findings show that the uptake of the EPR improved the performance of particular routines, the communication within the hospital, the productivity and service quality. However, in some departments different individuals introduced variations in the use of the technology and the surrounding routines.

This study highlights the role of agents in implementing, using and changing a technology and refers to the technological, organizational and interpretive conditions influencing their actions. It helps researchers to understand that when a technology is integrated in complex networks, its use is less malleable than in contexts where individual actions are independent and users can shape it to fit their needs. It also emphasizes the need for designing technologies that fit the needs of end users, adequate training, strong leadership and clinician engagement in the change process.

Acknowledgements

Inspired by the definition of organizational routines included in this thesis and adapting it to the process of writing a PhD thesis, I would like to emphasize that the PhD process is "*a collective phenomenon carried out by multiple actors*" that I have to give credit to. First and foremost, I would like to express my utmost appreciation to my supervisor, Dr Fraser Macfarlane, for his help, support and guidance throughout this "*journey*". He played a key role in the completion of this study by providing advice and assistance when necessary and by being always there anytime I needed him. I am sure that this "*journey*" would not have been as easy without his help.

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This thesis would not have been completed without the financial and psychological support of my family during the last three years. For this reason, this thesis is dedicated to my parents, Apollon and Eva, my brothers, Marios, Alexandros and Anastasis, my aunts, Melpo and Mary, and my fiancée, Christine, for encouraging me and boosting my confidence as well as being patient throughout this "*journey*".

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Abbreviations

AIT: Advanced Information Technology (-ies)

AST: Adaptive Structuration Theory

CIS: Clinical Information System

EHR: Electronic Health Records

EMR: Electronic Medical Records

EPR: Electronic Patient Records

EU: European Union

CASE: Computer-Aided Software Engineering

GDSS: Group Decision Support System

HIMSS: Health Information Management Systems Society

HP: Hewlett-Packard

ICT: Information and Communication Technology (-ies)

IKA: Idrima Kinonikon Asfaliseon (Social Security Organization)

IS: Information Systems

IT: Information Technology

NAHIT: National Alliance for Health Information Technology

NHS: National Health Service

NIH: National Institutes of Health

OAEE: Organismos Asfalisis Eleutheron Epaggelmation (Insurance Organization for the Self-employed)

OECD: Organization for Economic Cooperation and Development

OGA: Organismos Georgikon Asfaliseon (Agricultural Insurance Organization)

OPAD: Organismos Perithalpsis Asfalismenon Dimosiou (Civil Servants Fund)

OS: Organization Studies

PE.S.Y: Periferiako Systima Ygias (Regional Health System)

Statement of original authorship

The following submission for the award of Doctor of Philosophy at the University of Surrey is entirely my own work and has not been previously submitted to this or any other institution for this or any other academic award. Where use has been made of the work of other people, it has been acknowledged and fully referenced.

Nikolaos Mastellos

February 2011

CHAPTER I

1. Introduction

1.1 Introduction

New technology has been expected to bring great changes for our societies. Adopting new technologies is essential for many organizations to sustain competitiveness and improve the services provided that produce tangible market advantages. However, it is commonplace for several organizations to fail to assimilate new services, even those with demonstrable advantages. Organizational routines, which characterize much of an organization's ongoing activity, reinforce the status quo, further contributing in this way to the challenge of new technology adoption (Edmondson et al., 2001). This thesis seeks to explore how routines and structures change when a new electronic patient records (EPR) system is introduced in a private hospital in Athens, Greece, as well as how the technology is changed by the existing routines surrounding its use, with the aim of shedding light on the role of human agents in implementing and using new technologies in health care settings.

This chapter provides an overview of the thesis. In doing so, it first describes the rationale behind the choice of the researcher to conduct this study and refers to the existing knowledge in the information systems research field, which is concerned with the implementation and use of information and communication technologies (ICT) in social contexts, emphasizing the need for further investigation of the relationship between technology and transformation of work practices in complex organizations. In addition, it presents the most important aspects of the theoretical framework of the thesis and proceeds with the aim and objectives of the study, as well as the research methods and strategy adopted by the researcher. It then refers to the contribution of this study to the information systems as technology-in-practice research tradition and closes with a description of the Greek health care system and a summary of the content of each chapter of this thesis.

1.2 Background of the study

This era is characterized by significant technological developments, which rapidly influenced the way in which health care is organized and delivered. The introduction

of EPR systems is an important aim of many health care systems across the developed world. According to the European Commission Recommendation (2008), EPR systems should be introduced to all hospitals of the members of the European Union to achieve e-Health interoperability by the end of 2015. Health care organizations and governments, as with the case of the Summary Care Record in England, invest a lot of money in information systems, but they do not seem to get the results they expect to because such systems are complex and require extensive changes in how individuals practise and interact with each other to perform their tasks (Greenhalgh et al., 2008). The recent technological developments in health care coupled with the fact that many organizations fail or delay to adopt technologies that have demonstrated the ability to transform inefficient business practices and improve quality and productivity (Heeks et al., 1999) magnetized the interest of the researcher in studying the uptake of technology in health care organizations.

Moreover, EPR is an attractive technology to study for two reasons. First, it is a cost-effective innovation which has the potential to drive efficiency (Hillestad et al., 2005). In difficult days for the health care industry, when organizations are trying to slash budgets, cut costs and simultaneously improve efficiency, adopting new technologies, such as EPR systems, seems essential to improve quality and productivity. EPR technology has the potential to bring numerous and significant benefits to both health professionals and patients. Storing and sharing patient data electronically can reduce clinical errors, speed up clinical communication, assist doctors in diagnosis and treatment, make information more easily accessible to patients allowing them to have control over their record, reduce duplication and waste, improve the cost-effectiveness of health services and enhance the quality of health care audit and research (HC, 2007). The second reason refers to the fact that electronic records produce a series of well-defined narrative structures, which reflect and describe the work practices within an organization. By reading a patient record, someone could easily understand the hierarchical structure of health professionals, their daily tasks, responsibilities and the work which is performed within the organization (Berg and Bowker, 1997).

The interest of the researcher in studying organizational change and in particular the implementation and adoption of new technology and the resulting transformation of work practices in health care organizations also emerged from the identification of a gap in the literature with regards to the role of human agents in implementing and

using information and communication technologies in complex social contexts, such as health care organizations, which indicated that our knowledge needs to be strengthened in this area. The link between technology and organizational change in such contexts is poorly understood and further theoretical development is needed to advance our current knowledge.

Previous studies in the information systems research tradition have predominantly adopted a positivist approach and used quantitative methods to determine the technical success of the EPR regarding the proportion of tasks that have been successfully achieved electronically compared to a paper-based system, measure user satisfaction with the system as well as evaluate its impact on clinical outcomes (Sugden, 2003, Mitchell and Sullivan, 2001). However, such studies have failed to capture the social, cultural and organizational influences associated with the implementation and use of such systems (Delpierre et al., 2004). Their focus is on the technical design of the technology and the main challenge was seen as getting the design right, implementing the system and ensuring that it was used by clinicians. As a result, neither the technology nor its social context were considered in depth and therefore this body of literature does not offer useful insights on the implementation and use of EPR systems in health care organizations (Greenhalgh et al., 2009).

Other studies, which are positioned within the change management tradition, have focused on the organizational level in order to identify significant structural, cultural and historical barriers and facilitators to EPR implementation (Boddy et al., 2009, Doolan et al., 2003, Heeks et al., 1999, Kaplan et al., 2001, Sanchez et al., 2005). These studies are mainly qualitative in nature, built on an interpretive approach and generally focus on the impact of enabling and constraining organizational factors on the implementation and use of EPR systems, such as strong leadership, commitment and vision, adequate training, an enabling organizational culture, successful work redesign strategies and effective communication. However, they have not considered in depth the role of human agents who work and interact with the technology in a complex environment, which is characterized by the coordinated work of multiple individuals who have different interests, interpretations and knowledge of the technology (Greenhalgh et al., 2009).

A group of researchers have highlighted the role of agents in the implementation and adoption of information systems in organizations as actively and explicitly shaping

both the technology and the routines surrounding its use in a mutually adaptive way (Boudreau and Robey, 2005, Orlikowski, 2000, Orlikowski et al., 1995). Drawing on structuration theory (Giddens, 1984), these scholars attempt to explore the dynamic relationship between social structures, human agents and technology and how this changes over time in particular contexts. A handful of researchers have recently explored the uptake of information systems in health care organizations from that perspective (Davidson and Chiasson, 2005, Mogard, Bunch and Moen, 2006, Østerlund, 2002) but more needs to be done in order to understand what the implementation of the EPR means for a health care organization and the staff who work and interact in that context (Greenhalgh et al., 2009).

This study seeks to explore the impact of the implementation of an EPR system on the work practices and structures that exist in a health care setting. In contrast to previous studies, it draws on users' "stories" in order to capture their understanding of the EPR system. Capturing the interpretations of users will shed light to the role of agency in implementing and using advanced information technologies in complex organizations. This research examines what the managerial policy was, how the EPR was designed to be used, how it is used in practice and why and how different people introduce variations in the use of the technology and the routines surrounding its use. In this way, it informs future researchers, designers and managers about the way in which people interact with technology and enact new structures in their daily activities.

The choice of the research topic is also associated with the interest and background of the researcher. A good research topic is the one that is likely to maintain the interest of the investigator throughout the research process, since any type of scientific inquiry involves many hours of planning, data collection, data analysis and report writing (Gray, 2004). The interest in studying the uptake of technology in health care organizations emerged during the postgraduate studies of the researcher, when he undertook a project on the implementation and adoption of medical technology. This helped him to gain experience and knowledge in the field as well as ensure that it is a subject that interests him. In addition, the nursing background of the researcher influenced his decision to study the diffusion of innovations in a health care context, since it is an environment that he has experienced and feels familiar with.

Finally, the interest of the researcher in studying the uptake of technology in Greece came from a review of the literature which showed that our knowledge with regards to

the uptake of health information systems in this country is limited. Orlikowski (2000) called for other studies which would examine the implementation and use of new information systems in other countries in order to expand our understanding of how people recursively structure their use of technologies in different cultural contexts. In Greece, the use of EPR systems is limited and research has focused on the design of the technology (Orfanidis et al., 2004). However, more research is needed to explore the uptake of health information systems in Greece and this study helps to understand how new technologies are adopted across different countries.

1.3 Theoretical framework of the study

This study looks at how routines change when a new technology is introduced and how the technology is changed by the existing routines surrounding its use. As a result, change is an integral part of this study. Recent perspectives on organizational change have emphasized human agency over structures or technology in order to explain empirical outcomes that result from the use of technology in organizations (Boudreau and Robey, 2005). These approaches suggest that users are knowledgeable agents free to enact technology structures in different ways and organizational change is the result from the interaction between users and the technology rather than is caused by the embodied structures within the technology (Orlikowski, 2000).

This study draws on Orlikowski's (2000) model of technology-in-practice in order to explore how people interact with technology and enact structures in their recurrent activities. The model of technology-in-practice has its roots in Giddens' (1984) theory of structuration. The latter is a general theory of social systems which describes in theoretical terms what we observe in practice in specific contexts. To examine the relationship between structure and agency, Giddens (1984) departed from the conceptualization of structures and agents as two independent phenomena. He represented them as a duality. According to the notion of the duality of structure, rules and resources are both medium and outcome of the practices they recursively organize. Structures hence should not be seen as external to human agents, but rather as internal part of their actions since they exist in their minds as memory traces.

The applicability of structuration theory in the information systems research has received considerable criticism. First, it has been characterized as complex, involving concepts and general propositions that deal with social phenomena at a high level of

abstraction and thus give rise to diverse interpretations (Jones and Karsten, 2003, Pozzebon and Pinsonneault, 2005, Turner, 1991). However, the concepts of the theory of structuration should only be seen as a way of seeing the world rather than an explanatory mechanism (Jones and Karsten, 2003, Stones, 2005). A second concern is about the absence of a specific methodology which would facilitate the application of structuration theory to empirical research (Pozzebon and Pinsonneault, 2005). However, Giddens' (1984) aim was not to provide a methodological approach, but an explanation of the logic of research (Stones, 2005).

Although structuration theory is a general theory of social systems and pays little attention to technology, its contribution to the information systems field of research is valuable. It helps researchers to understand how users interpret and interact with technologies, what the results of these interactions are, how people enact particular practices by using certain properties of the technology and not others, as well as how people deal with the intended and unintended consequences of their interactions with the technology (Pozzebon and Pinsonneault, 2005). Moreover, Giddens (1984) introduced the notion of the duality of structure and agency and argued that structure is embedded in practice. This is an important point in the context of information systems research since it implies that structure is not embedded in technology but it emerges from the actions of human agents (Giddens and Pierson, 1998).

The ontological orientation of structuration theory implies that it needs other theories to provide a complete frame. The concepts of the duality of structure and agency and actors' knowledgeability have been widely used by a number of researchers (Barley, 1986, DeSanctis and Poole, 1994, Orlikowski, 1992). However, they have departed from the original concepts of structuration theory especially in treating technology as a structural property, which is inconsistent with Giddens' (1984) position that structure has a virtual existence and is instantiated only in practice (Jones and Karsten, 2003). This was acknowledged by Orlikowski (2000) who argued that social structures are not embodied within the technology but rather they emerge as people repeatedly interact with specific properties of the technology over time and thus they shape the technology structure that in turn shapes their interaction.

In contrast to previous structurational models which adopted an objective view of technology, the theory of technology-in-practice starts with human action and the way in which it enacts emergent structures through recurrent interaction with a technology.

The notion of enactment emphasizes that while people use technologies as they are designed, they can also depart from those prescribed ways by either ignoring specific properties of the technology or inventing new ones that are not anticipated and might not agree with designers' expectations. Through such use of a given technology, people recursively enact a set of rules and resources which structures their ongoing interaction with the technology. Users in their recurrent practices shape the technology structure which in turn shapes their use. Technologies in this way are not static, unchanging artefacts with external structures, but rather virtual, emergent, enacted structures (Orlikowski, 2000).

For the above reasons and the study's interpretive ontological position which calls for theories that employ a subjective view of reality, this study adopts Orlikowski's (2000) model of technology-in-practice in order to explore the relationship between people and technology. The aim of this research to explore how routines change when an EPR system is implemented in a health care setting and how the technology is changed by the existing routines surrounding its use requires an examination of how people use tools to perform their tasks (Pentland and Feldman, 2007). The integration of people and tasks is explained by the theory of organizational routines (Feldman and Pentland, 2003). In line with the study's focus on the role of agents in the change process, Feldman and Pentland (2003) adopt an agency perspective to show that routines not only provide stability, but also have qualities of flexibility and change.

Following Feldman and Pentland (2003), this thesis is based on the premise that organizational routines are collective phenomena which produce outcomes that range from stability to change. Feldman and Pentland (2003) argue that routines embody ostensive and performative aspects, which refer to the concept of structure and agency respectively, as found in Giddens' (1984) structuration theory. That is, a routine exists only in and through the activities of human agents. A routine that is not enacted in practice has no existence. The ostensive aspect describes the abstract, fixed idea of the routine, while the performative aspect incorporates the specific actions at specific times and places, carried out by specific people (the routine-in-practice). Change can emerge through the engagement of different participants in the performance of routines (Feldman, 2003). In addition, like Orlikowski (1996, 1993) and in line with Giddens' anti-positivist stance (Jones and Karsten, 2003), Feldman (2000, 2004) and Pentland and Rueter (1994) employed methods that are often associated with the

interpretive approach, such as participant observation, interviews and analysis of artefacts (documents, agendas for meetings, electronic messages) in order to explore the role of agency in the enactment, maintenance and modification of routines.

Structuration theory, the theory of organizational routines and the model of technology-in-practice inform this research about the relationship between structures, routines, actors and technology. Agents draw on their understanding, knowledge, skills, interests, expectations and the properties of a particular technology to enact structures (routines) that shape their interaction with the technology. The enactment of these routines also brings changes in other organizational structures surrounding the use of the technology, which are maintained in and through the activities of actors who perform these routines in a mindful way. It is the performative aspect of routine that determines how a routine will be performed. In the same way, the model of technology-in-practice draws attention to the people who recursively interact with the technology and decide how the technology will be used in particular contexts. The point here is that although technologies are designed to be used in specific ways, users can depart from these prescribed ways and invent new ones. In this way they shape the technology which in turn shapes their use.

1.4 Research aim and objectives

The aim of this thesis is to explore the way in which routines change when a new EPR system is implemented in a health care setting as well as how the technology is changed by the existing routines surrounding its use, with the aim of exploring the role of agents in implementing and using new technologies in health care contexts.

The objectives of the study are:

1. To examine how the system was designed to be used and how it is used in practice in order to identify any variations in the use of the EPR system,
2. To compare and analyse different routines surrounding the use of the EPR system in order to explore how the enactment of the electronic documentation of patient information routine induced changes in other organizational routines,
3. To examine how different people use the EPR system across different departments in order to explore the role of human agents in using the technology and shaping it to fit their needs.

1.5 Research approach and methods

This thesis adopts an interpretive philosophical approach in order to explore the impact of the implementation of an EPR technology on the routines and structures that exist in a health care setting. Seeing the world from a subjective, socially constructed viewpoint is in line with the aim of the study to explore the role of human agents in implementing, using and shaping new technologies in health care organizations. Interpretive research attempts to understand the context of the phenomenon under study (Walsham, 1993). Adopting the interpretive paradigm allows the researcher to explore how people use the technology to preserve or transform their work practices and how their interpretations are constructed and influenced within the context in which this process takes place.

The choice of a particular epistemological position has an impact on the methodology and the choice of appropriate methods for investigating the phenomenon of interest. In line with the interpretive paradigm, this study adopts a qualitative methodology. A qualitative methodology is appropriate when a particular phenomenon needs to be explored in a specific context and the investigator seeks a deep understanding of people's interpretations of this phenomenon (Creswell, 2007). Moreover, the research question and objectives indicate that an exploratory case study is the appropriate strategy in order to generate valid knowledge, since generalisation is not sought, the researcher looks for new insights and understandings of what is happening, is interested in answering "why" and "how" questions, has little control over events and investigates a context-dependent phenomenon (Robson, 2002, Yin, 1994).

This research took place at Mitera Hospital in Athens, Greece, a private organization, which provides maternity, paediatrics and general services to the population of Greece. A purposive sampling strategy was used since the question and objectives of the study implied that the researcher should recruit cases that were particularly informative and met specific criteria (Newman, 2000). In addition, twenty-two open-ended, semi-structured interviews and over twenty hours of on-site observation were conducted in two stages to explore the phenomenon of interest. Theses methods are commonly used by interpretive researchers and are in concert with the research strategy and the exploratory nature of the study (Blaikie, 2000, Blumberg et al., 2005, Golafshani, 2003, Mason, 2002, Yin, 1994). Objective and careful field notes were taken and interviews were recorded using a digital voice-recorder to ensure accuracy.

Both interview and observation data were transcribed verbatim and analysed thematically using the Ritchie and Spencer's (1994) Framework approach, a robust, well-established and pragmatically feasible method of analysis within the time and resource constraints of this study.

1.6 Original contribution sought

This study is positioned in the information systems as technology-in-practice research tradition. This field of research focuses on how social structures recursively shape and are shaped by human agency and looks at the role of technology in this process with a particular focus on the meso-organizational level. This tradition is interested in the relationship between actors, the technology and the organization as well as how this relationship changes over time and has its roots in symbolic interactionism. The latter is a theoretical tradition in organizational sociology and social psychology. Organizational sociology is the study of how people act within organizations and through their practices reproduce these social institutions (Cassel and Symon, 2004). On the other hand, social psychology is a science that focuses on how individuals and groups interact, view and affect each other. Sociologists and psychologists under the lens of this approach draw attention on how people behave, think, influence and relate to one another with an interest in people's attitudes and beliefs (Myers, 2004).

Symbolic interactionism holds that human interaction is mediated through the process of meaning and interpretation (Gray, 2004). The proponents of this approach argue that people act on the basis of the meanings that they attach to things, which in turn arise from the process of social interaction. Symbolic interactionists claim that these meanings are not fixed, but they are modified through an interpretive process. This paradigm views people as acting and purposive agents who construct social realities (Blumer, 1969). As a result, truth and meaning are not expressions of relationships to which people are forced to respond, but they refer to the consequences of a purposeful action (Schwandt, 1994). Therefore, this approach is regarded as a major influence on interpretivism, the paradigm adopted by the researcher to best address the research question and objectives.

This study aims to add knowledge to the information systems as technology-in-practice research tradition by exploring the relationship between organizational structures and agents and examining how this changes after the implementation of a

new EPR system with the aim of informing researchers, designers and managers about the way in which people interact with technological innovations and enact new structures in their everyday activities. In addition, this research attempts to expand Orlikowski's (2000) model of technology-in-practice, which came from the study of a flexible technology in software development and consultancy companies in the United States, by examining the use of an integrated and more complicated technology, in a more complex organization and in a different cultural context. In this way, it is hoped to offer useful insights on how people recursively structure their use of technologies in different technological, institutional and cultural circumstances.

1.7 Research context: the Greek health care system

This section provides a brief description of the Greek health care system in order to give an overview of the general context within which this study takes place. The Greek National Health Service (NHS) was established in 1983 based on the principles of equity, free access at the point of use and efficiency. The basic goals of the NHS were the increase of public health resources, the decentralization and administrative reorganization of the system, the development of primary health care services, the upgrading of hospital services, the strengthening of the human resources and the exercise of control over the private sector aiming at the gradual dissolution of the private services due to the growth of the public sector. Despite several changes since its establishment the overall objectives of the Greek health care system have not been achieved and the current system is characterized by a high degree of centralization, fragmentation of insurance funds, inequitable coverage and access to health services, a regressive system of funding, distortions in the allocation of resources and heavy reliance on relatively expensive inputs (Davaki and Mossialos, 2005, Permesidou and Mossialos , 2006, Tountas et al., 2002, 2005).

1.7.1 The Greek health care system: structure, coverage and financing

The Greek health care system is a mixed system of public and private funding and delivery. It is highly centralized with the Ministry of Health and Welfare (fig.1.1) being responsible for the formulation and implementation of health policy, the NHS regulations and the allocation of human and material resources to the various public medical facilities. The Ministry of Labor and Social Insurance bears liability for the supervision and regulation of the public insurance funds and the Ministry of Finance

is accountable for retrospectively subsidizing the NHS and health insurance funds (Economou and Giorno, 2009, Petmesidou and Mossialos, 2006).

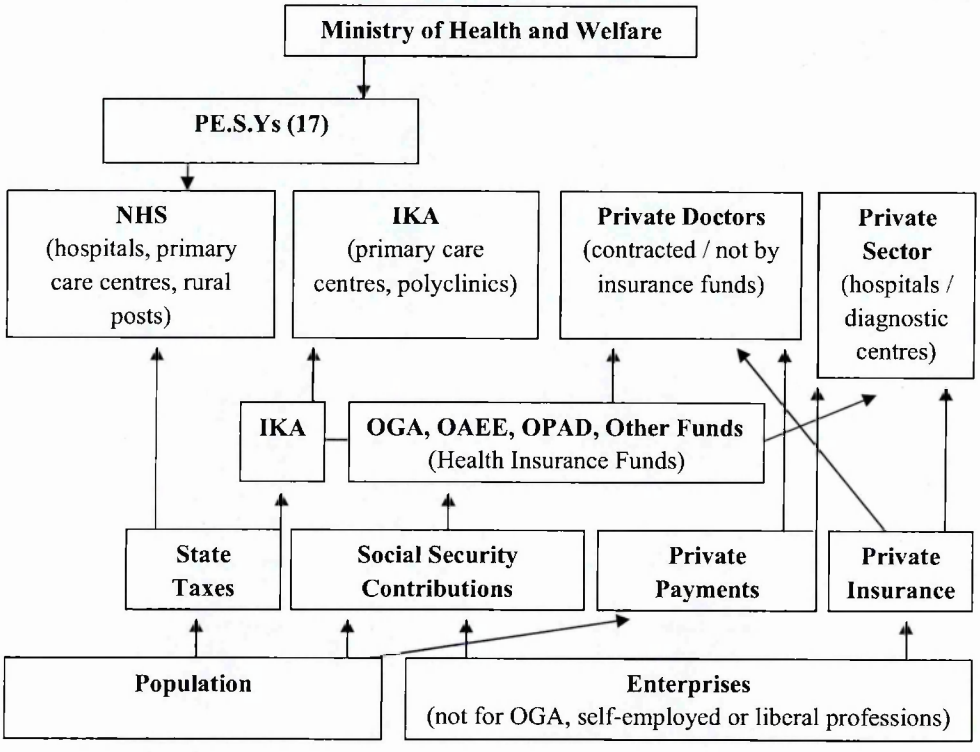


Fig. 1.1: Organization of the Greek health system: financing flows and health care delivery

As it is shown in fig.1.1, the country is divided in seventeen health districts and each district has an autonomous regional authority, the Regional Health System (*Periferiako Systima Ygias* / PE.S.Y). The public hospitals, health centres, emergency and outpatient services of each health region are under the jurisdiction of the regional PE.S.Y, whose central administration is exercised by a regional board supervised by the Minister of Health and Welfare. The board is responsible for the management of the annual budget of each region, which comes from public finance and the revenue from the operation of the health system, as well as for moving staff across hospitals and departments, which was not allowed before the 2001 reform resulting in NHS employees being tied to particular departments and hospitals (Davaki and Mossialos, 2005, Petmesidou and Mossialos, 2006, Tountas et al., 2002).

Hospital care is provided by NHS hospitals, polyclinics belonging to social insurance funds, private doctors and private hospitals. The majority of hospital beds (75%) are

in the public sector, while a smaller proportion (25%) is in the private sector. Primary health care is provided by i) NHS facilities, such as emergency services, hospitals' outpatient departments and health centres in rural and semi-urban areas, ii) health care networks operated by insurance funds, which consist of primary care polyclinics, health centres, private doctors and clinics contracted by the funds, iii) outpatient services mainly located in the rural and sub-urban areas covering the uninsured and the immigrants, and iv) private surgeries, hospitals, diagnostic centres, laboratories and outpatient facilities which provide private health care and are financed either through direct, out-of-pocket payments or by private insurance funds (Economou and Giorno, 2009, Tountas et al., 2005).

There are over than thirty insurance funds subject to different regulations, contribution rates, cover and access to health services. Most of these funds are small, since the four largest funds cover 95% of the population. The largest insurance fund, IKA (*Idrima Kinonikon Asfaliseon* / Social Security Organization) covers nearly 50% of the population and provides coverage to private sector employees and their families through 242 urban primary health centres and a few hospitals. The second fund, OGA (*Organismos Georgikon Asfaliseon* / Agricultural Insurance Organization), insures approximately 20% of the population and covers people who work in agriculture. The self-employed are covered by OAEE (*Organismos Asfalisis Eleutheron Epaggelmation* / Insurance Organization for the Self-employed) and the civil servants by OPAD (*Organismos Perithalpsis Asfalismenon Dimosiou* / Civil Servants Fund) which count for 13% and 12% of the entire population respectively. Supplemental private insurance plays a minor role in Greece covering nearly 10% of the population (Economou and Giorno, 2009, EIU, 2009, Petmesidou and Mossialos, 2006).

The Greek health system can be characterized as a mixed system, which is mainly financed by general taxation and social insurance contributions (proportional employer and employee contributions with no tax-deductions), as well as private direct out-of-pocket payments, informal payments and private insurance. The financing of health care services in Greece seems to be regressive with neither a coherent purchasing mechanism nor a coordination of the funds' purchasing activities. Certain health insurance funds (e.g. funds covering employees from the public and banking sector) offer more extensive benefits and require smaller contributions. For this reason, powerful unions representing the workers who use these funds have

repeatedly blocked attempts by the government to merge the existing funds and create a single financing agency. As a result, the allocation of resources remains subject to political negotiations and historical precedent, hindering the effective application of budget ceilings, the reduction of administrative and operational costs and the equal access to health services, decreasing the negotiating power of the NHS and insurance funds and impeding cross-subsidization and risk-adjustment schemes among the social insurance funds (Davaki and Mossialos, 2005, EIU, 2009, Tountas et al., 2005).

1.7.2 Health care expenditure

Total health care expenditure accounted for 9.7% of GDP in 2007, above the average of the OECD countries (9.0%). Public spending was estimated at approximately 60% of the total health expenditure in 2007 compared with an OECD (Organization for Economic Cooperation and Development) average of nearly 73% with social security contributions accounting for 48% of the total public funding and taxation contributing 52%. Private health expenditure accounts for 40% of the total health spending, 90% of which is direct out-of-pocket payments. Health expenditure is expected to grow by 4.8% in 2010 against the government's hopes to rise by 6.9% as Greece comes under considerable pressure to reduce its significant deficit. In addition, growth is expected to continue on a rate of nearly 4% each year for the period 2009-13 (Economou and Giorno, 2009, EIU, 2009, OECD, 2010, Petmesidou and Mossialos, 2006).

1.7.3 The private sector in Greece

The growth of the private sector was one of the failures of the health reform (1983), since instead of its gradual dissolution it experienced an unexpected growth. The establishment of private hospitals, which was banned in 1983, was again permitted in 1992 after an alteration of the law by the new conservative government. As a result, in the last two decades, the number of private hospitals has increased significantly. The majority of private hospitals are small with 150 or less beds each, while a small number of prestigious hospitals have a capacity that ranges from 150 to 400 beds. In 2000 there were 218 private hospitals in Greece compared to 139 public hospitals and the number of beds was 15,806 and 36,755 respectively. The market concentration in the private hospitals is very large and the structure of the market resembles more closely to an oligopoly since the first three firms dominate the market with about 45% market share. In addition, it is estimated that more than 400 private diagnostic centres

operate across the country and provide primary care services to the Greek population (Boutsioli, 2007, Tountas et al., 2005).

The private sector provides hospital care (specializing in obstetrics, maternity, mental and surgical care), outpatient consultations and diagnostic services to the insured who are covered by insurance funds that have signed a contract with a private organization or to civilians who pay for their health care in the form of out-of-pocket payments. The rise of the private sector in the provision of diagnostic services is partly explained by the fact that the 1983 law, which prohibited the establishment of new private hospitals, led many to invest in diagnostic care by setting up diagnostic centres. In addition, maternity and mental health have been increasingly privatized due to the widespread preference among Greek women to deliver in an environment that offers hotel amenities and the poor quality of the public mental hospitals respectively. The growth of the private sector in these areas further contributed to the increase of the private expenditure (Boutsioli, 2007, NSSG, 2002, Petmesidou and Mossialos, 2006).

The high rate of private health spending described in the previous section shows the population's dissatisfaction with the public health care system. This comes from the imbalance between the demand for health services and the supply of these services, the long waiting lists, the poor quality standards characterizing the majority of public hospitals compared to the high quality private hospital services and the rapid growth in the number of private doctors. As a result, 64% of private hospital care consists of surgical acts compared to a 44% in the public sector. Moreover, the lack of credibility in primary care makes a number of patients turn to the private sector for a second diagnosis. It is estimated that nearly 50% of aggregate primary care payments come directly from households compared to a 30% for hospital care and pharmaceuticals. This number reflects the incomplete coverage for certain types of care (e.g. dental care) and the lack of diagnostic equipment in the public sector (e.g. computed tomography scanners) which forces the insurance funds to resort to the private sector in order to provide the insured with the required services (Economou and Giorno, 2009, Mossialos et al., 2005, Tountas et al., 2005, Siskou et al., 2008).

1.7.4 EPR in Greece

In Greece, the use of EPR systems is limited and is mainly found in the private sector. The lack of diagnostic equipment in the NHS hospitals reflects the poor technological

infrastructure of the Greek NHS. The Greek Ministry of Economy and Finance in cooperation with the Ministry of Health and Welfare have included into the National Strategic Reference Framework 2007-2013 the action plan for the implementation of EPR and e-prescribing systems into the NHS hospitals, but the bureaucracy describing the Greek system overall and the recent economic crisis have delayed the implementation of the plan for the modernization of the health system (Economou and Giorno, 2009). This is the first study that explores the implementation and use of EPR systems in Greece. Research in this country has focused on the design of such systems rather than their uptake in particular settings (Orfanidis et al., 2004). The timing of this research coincides with the Government's plan to implement EPR systems into the NHS hospitals and this study seeks to help the Greek Government by providing information of how such technologies have been adopted in the private sector.

1.8 Summary

This chapter provides a summary of the theoretical framework and the research design of the thesis as well as informs the reader about the research context, the background and the contribution of the study. The next chapter presents the most important aspects of structuration theory and its application to the study of information systems in health care contexts. Chapter three describes the theory of organizational routines and its relationship with Giddens' (1984) theory of structuration and chapter four refers to the study of technology in organizations with a particular focus on the structurational perspectives on technology and the model of technology-in-practice. Chapter five introduces the EPR system, highlighting its major benefits and risks, the reasons for resistance and its differences with the paper-based system regarding the documentation and storage of health records. Chapter six refers to the ontological and epistemological assumptions of the thesis and chapter seven provides a description and justification of the research methods and methodology. Chapters eight presents the interview and observation findings from the exploratory study and chapter nine provides a deep analysis of the findings from the main study following the analysis of Orlikowski (2000) in the development of the model of technology-in-practice. Finally, chapter ten discusses the emergent themes from the data analysis along with the implications, recommendations and limitations of the study and closes with the overall contribution of the thesis within the current debates in the field.

CHAPTER II

2. Structuration theory and its application to the study of information systems in health care organizations

2.1 Introduction

Since the early decades of the twentieth century the search for a general theoretical framework which would capture the interrelationship between "action" and "structure" has shaped the development of organizational analysis (Reed, 1988). Recently, there is an increasing interest to address the complex relationship between "action" and "structure" and abandon antiquated notions which view social structures as an objective reality separate of social interactions (Reed, 1988, Slappendel, 1996). This chapter presents the key aspects of structuration theory and examines its application to the study of technology in health care settings. In doing so, structuration theory is first introduced in the context of Giddens' work, and then, drawing on Giddens' writings, its key aspects are described. In addition, the implications of the use of structuration theory in organizational research are highlighted. Finally, inferences are drawn with regards to its contribution to the study of information systems in health care organizations.

2.2 Structuration theory in the context of Giddens' work

The contemporary British sociologist, Anthony Giddens, was born in 1938 in Edmonton, North London. The author of approximately thirty-five books is considered to be one of the most cited modern contributors in the field of sociology, covering a vast range of topics, from reflexivity and globalization to modernity and structuration (Bryant and Jary, 2001, Giddens, 2006). Having previously published two significant studies of classical sociology, "Capitalism and Modern Society Theory" (1971) and "The Class Structure of Advanced Societies" (1973), revising the work of Durkheim, Marx and Weber who established the principal frames of reference of modern sociology (Giddens, 1971), Giddens first set out "Structuration Theory" in his book "New Rules of Sociological Method" (1976), where he referred to the production and reproduction of structure, the role of agents and the duality of

structure, and elaborated it in "The Constitution of Society" (1984), which is regarded as an invaluable reference book for all those concerned with the basic issues in modern social theory (Giddens, 1976, 1984).

2.3 Structuration theory: a theory rather than an explanation

At the outset, it should be emphasized that structuration theory is a general theory of social systems, such as organizations, which describes in theoretical terms what we observe in practice in a specific context. Thus, it should not be viewed as a testable explanation of social behaviour, but rather as a way of thinking about the world; and as Craib (1992, p.108) pointed out "*it does not give us anything to test or to find out*", but aims to "*tell us what sort of things are out there in the world, not what is happening to, or between, them*". In addition, Archer (1990) characterized it as "*fundamentally non-propositional*" and Gregson (1989) described it as a "second-order theory", a meta-theory, which is concerned with conceptualizing the general elements of human society rather than explaining particular events as they unfold at particular periods or places (Jones and Karsten, 2003, Kouroubali, 2002).

Furthermore, Giddens himself acknowledged that his theory does not carry any particular methodological implications, but its major objective is to provide an explanation of the logic of research (Stones, 2005). Giddens (1990, p.310-311) argued that:

"*I have never thought of structuration theory as providing a concrete research programme in the social sciences...it is an attempt to work out an overall ontology of social life, offering concepts that will grasp both the rich texture of human action and the diverse properties of social institutions. Some of these concepts should be useful sensitizing devices for research purposes, while others help provide an explication of the logic of research into human social activities and cultural products*".

In a health care context, therefore, the theory of structuration describes in theoretical terms what people observe in the practical world in a health care organization. Structuration theory is characterized of a high level of abstraction in dealing with social phenomena, offering the researcher a way of seeing the world, the particular sets of concepts, rather than an explanation of its mechanisms. This is recognized by Giddens (1989) who distinguishes between "theory" as a generic theory, and

"theories" as explanatory generalisations, arguing that structuration is clearly of the first type (Gregory, 1984, Jones and Karsten, 2003). At this point, it would be helpful to sketch out the key features of Giddens' theory and their possible implications to the study of social phenomena in health care organizations.

2.4 Structuration theory: a critical review

Structuration theory may be seen as an attempt to resolve the fundamental division within the social sciences between two conflicting approaches, positivism and interpretivism. That is, it provides a way to bridge the gap between those who consider social phenomena as influenced by exogenous, "objective", social structures and others who see them as outputs of the action of human "agents" in the light of their "subjective" interpretation of the world. According to Giddens (1993), positivism, in particular functionalism is a philosophical approach strong on structure but weak on actions, whereas interpretive sociologies are strong on action but weak on structure. His theory thus offers an alternative view of social phenomena that includes both "objective" and "subjective" interpretations of the world and provides a way of breaking out the inadequate dualism of action and structure as well as that between individual and society (Jones and Karsten, 2003, Kouroubali, 2002).

In doing so, Giddens suggests that social structures and human agents should not be viewed as independent and conflicting elements, but as a mutually interacting duality. Human social activities are recursive and human beings, in and through their actions, reproduce the conditions that make these actions possible. That is, the social activities of human agents serve to produce, reproduce or modify the social structures. On the other hand, social structures are not simply exogenous restraining forces, but are also resources to be deployed by human beings in their actions; they are enabling and constraining (Giddens, 1984). In a health care setting, for instance, a physician may start keeping patient records when such "structure" does not exist in the hospital. Their action may create the conditions to enact a change in the existing structures of the hospital. If other physicians follow their action, keeping detailed patient records could become a new norm (Kouroubali, 2002).

In his attempt to emphasize the contribution of his theory to the understanding of the interaction between agency and structure, Giddens (1991, p.204) proposes that:

"In seeking to come to grips with problems of action and structure, structuration theory offers a conceptual scheme that allows one to understand how actors are at the same time the creators of social systems, yet created by them...It is an attempt to provide the conceptual means of analyzing the often delicate and subtle interlacing of reflexively organized action and institutional constraint".

2.4.1 The core concepts of structuration theory: structure, system, structuration

Having previously discussed the "objective" and "subjective" dimension of Giddens' theory and the interaction between structure and agent, it is time to move deeper, to the core concepts of structuration theory. According to Giddens (1979, 1984), structuration is an ongoing process rather than a static property of social systems. He refers to structure as rules and resources that constitute the structural properties of social systems, the properties which make it possible for tangibly similar social practices to exist across varying spans of time and space.

In his book "The Constitution of Society" Giddens (1984, p.377) defines structure as: *"Rules and resources recursively implicated in the reproduction of social systems. Structure exists only as memory traces, the organic basis of human knowledgeability, and as instantiated in action"*. Defined in this way, structure is seen as rules of conduct and the ability to deploy resources, which exist in human mind itself. Human actors draw their actions upon those rules and resources, producing or reproducing in this way structure in the mind (Walsham, 2002). This is a crucial point in the context of technology research in health care, since it implies that structure does not exist in material artefacts, such as electronic health records systems, but only in human memory traces and through social practices. As a result, as he argues, *"...technology does nothing, except as implicated in the actions of human beings"* (Giddens and Pierson, 1998, p.82).

In Giddens' context rules of social life are generalisable procedures or techniques applied in the production and reproduction of social practices. They have two aspects: the first relates to the constitution of meaning and the second to the sanctioning of modes of social behaviour. Implicit and explicit principles of behaviour, habits and routines are forms of rules, whilst laws are codified interpretations of rules rather than rules as such. On the other hand, resources are distinguished in allocative resources, *"...forms of transformative capacity generating*

command over objects, goods or material phenomena", such as raw materials, land, and authoritative resources, "*...types of transformative capacity generating command over persons or actors*", such as power, authority (Giddens, 1984, p. 33).

Systems, on the contrary, are "*reproduced relations between actors or collectivities, organized as regular social practices*" (Giddens, 1984, p.25). They involve the situated activities of human agents, reproduced across time and space. In other words, systems are the patterns of interaction among actors. Structuration refers to the conditions governing the continuity or transformation of structures, and thus the reproduction of social systems. Analyzing the structuration of social systems means studying the ways in which such systems, based on the knowledgeable actions of human agents who draw upon rules and resources, the properties of social systems, in their everyday activities, are produced and reproduced in interaction (Giddens, 1984, Kouroubali, 2002).

Health care organizations are "small" societies. Health care actors, physicians, nurses, physiotherapists and other individuals involved in the delivery of health care, through their activities and interactions, produce and reproduce the social structures existing in a health care context. Social structures refer to practices and procedures in the provision of patient care in all its expressions. Hence they might involve activities of medical staff, rules that shape their interactions and procedures like the recording of patient data, which have been developed and maintained over time and space (Kouroubali, 2002). The relationship between agent and structure is one of the most difficult issues in social theory. How are actions of individual actors related to the structural characteristics of society?

2.4.2 Structuration theory: the duality of structure

To examine the relationship between structure and agency, Giddens departed from the conceptualization of structure and agents as two independent phenomena. He represented them as a duality. Structure is what gives form and shape to social life. However, it is not itself the form and shape, but it exists only in and through the activities of human actors (Giddens, 1989). Similarly, agency does not refer to people's intentions in doing things but rather to the flow of people's actions (Pozzebon and Pinsonneault, 2005). Therefore, there is a balance between structure and agency. According to the notion of the duality of structure, rules and resources are

both medium and outcome of the practices they recursively organize. Social structures through their properties, rules and resources, make social action possible, and simultaneously that social action creates those structures. Structure should not be seen as external to human agents, but rather as internal part of their actions since it exists in their minds as memory traces. Structure and action are two interdependent notions, and as Giddens (1984) puts it they represent a duality.

A focal premise in Giddens' theory is that people act in a knowledgeable and purposeful way. In addition, human agents are active and reflexive, and they are able to intervene in the world and change it by exercising some sort of power. Human beings know a great deal about the conditions and consequences in their day-to-day lives and they are able to discursively describe their actions and their reasons for those actions. Reflexivity refers to the capacity of human beings to routinely observe and understand their actions while they are performing those actions (Giddens, 1984).

Giddens distinguishes between two types of knowledge, discursive and tacit knowledge. The former refers to the agents' ability to provide explanations for their actions, while the latter to unconscious sources of cognition; that is, knowledge used in action but cannot be explicitly expressed. However, knowledgeability of social actors does not mean perfect control of their actions. Human knowledgeability is always bounded on the one hand by the unconscious and on the other by unacknowledged conditions and unintended consequences of action (Jones, 1999). This is greatly acknowledged by Giddens who notes that:

"*The flow of action continually produces consequences which are intended by actors, and these unintended consequences also may form unacknowledged conditions of action in a feedback fashion*" (Giddens, 1984, p.27) and that "*the production or constitution of society is a skilled accomplishment of its members, but one that does not take place under conditions that are either wholly intended or wholly comprehended by them*" (Giddens, 1993, p. 108).

As it was mentioned in section 2.3, structuration theory is a general theory of social organizations and its nature is rather ontological than explanatory, offering a way of seeing the world rather than explaining its mechanisms. Like societies, hospitals are institutions where a number of actions are taking place every day. Those actions rest on a set of rules and resources available to the knowledgeable agents, the health care

providers. These rules form the general framework in which health professionals perform their tasks. Seen under the lens of structuration theory, they are highly-skilled individuals who know a great deal about what they are doing and the consequences of their actions (Kouroubali, 2002). Through their interactions and actions maintain the social structures that exist in a health care setting and in some cases, as it is argued in the next section, they can challenge and eventually change them.

2.4.3 Structuration theory: the dimensions of the duality of structure

As it was aforementioned, social structure is drawn upon the actions of human agents, while their actions in social contexts serve to produce and reproduce that structure. Structure is, therefore, an enabling as well as a disabling resource which is deployed by humans in their actions. Specifically, Giddens (1984) identifies three components of structure: signification, domination and legitimation. The three structural components of social systems are, in turn, linked with corresponding elements of interaction, which he calls communication, power and sanction, through modalities of interpretive schemes, facilities and norms, respectively (Jones and Carsten, 2003). Modalities serve to clarify the main dimensions of the duality of structure in interaction, and humans draw on those modalities in the production of systems of interaction. The dimensions of the duality of structure are sketched out in figure 2.1.

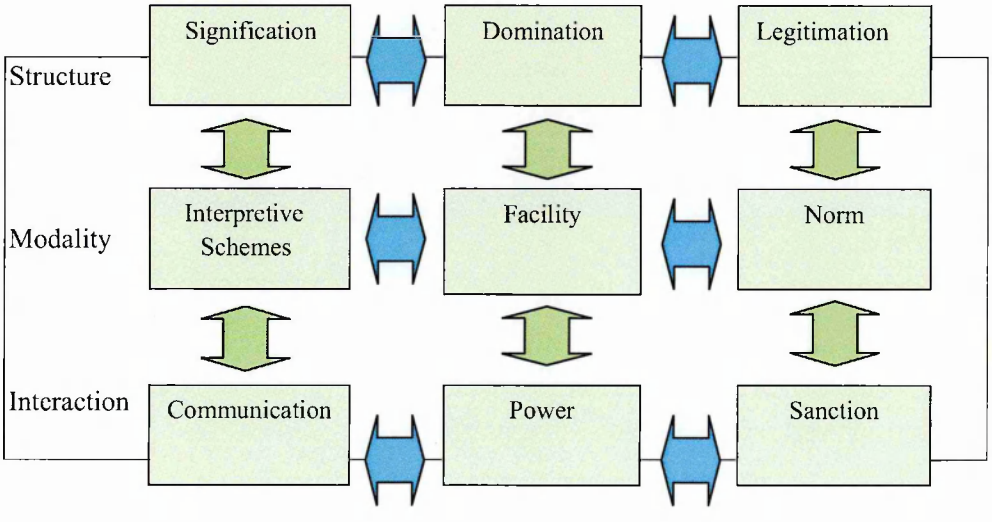


Fig. 2.1: The dimensions of the duality of structure (Jones and Carsten, 2003, p.6)

The dimensions of the duality of structure, as portrayed in figure 2.1, show how decisions and actions involve a mobilization of structural properties. That is, interpretive schemes are applied to communicate meaning in interaction on the basis of signification structure. In the structure of domination, agents draw on the structures within them in the form of specific facilities through which they exercise power at the interaction level. In systems of domination, individuals draw on rules and resources as a means of exercising authority over other human agents. Finally, specific norms of action are employed against the background knowledge of the prevailing situational norms provided by the legitimation structure. The individual's preferred norms are drawn upon against a prior knowledge of the wider legitimation structures, which indicate what is and is not the appropriate thing to do, and the resultant practices produce negative sanctions or rewards at the level of interaction. Issues of power and communication will also be involved in the determination of whether negative sanctions or positive rewards follow from the individual's norm-related practices. This distinction is only analytical (Jones et al., 2000, Stones, 2005).

At this point, it is useful to give some everyday examples in order to better understand how these interlinked dimensions work. Hence, the clothes that people wear at work reflect the structures that are reproduced by their conformance with accepted behaviour. When encountering an individual in a work setting people draw upon signification structures that inform their understanding of their role. The structure of signification refers to the purpose and the meaning that are attributed to an activity in a social context (Lawrence and Doolin, 1997). For example, someone would assume that a person in a white robe in a hospital is a doctor. In addition, clothes provide important clues not only about the role, but also about the power that someone holds. So, police officers' uniforms exert an influence upon people's behaviour which would be unlikely if they were in plain clothes. There are also structures of legitimation, as for instance in the degree of formality in employees' dress, and organizations may differ in the limits on how casual someone may be dressed on Fridays (Jones and Carsten, 2003).

Therefore, it is evident that structures, as those underling dress codes, are maintained by their ongoing reproduction by individuals, but they can be altered, as long as certain individuals challenge them, and new structures may develop over time. Hence, it seems that human actors have the freedom to make choices within structures and

even change them, while at the same time their actions are enabled or constrained by those structures (Gesler and Kearns, 2000). Health care organizations are contexts with unique features. Inherent to the health care profession is the autonomy of action in every day practice. Health professionals face life and death situations on a daily basis and each patient case is different with special characteristics. Hence, they set their own routines and procedures of medical practice. According to Giddens' theory structure is enabling as well as disabling; social actors, in this case health professionals, maintain the structures, for example recording patient information in a "big book" existing in each medical office of the clinic, through their ongoing reproduction, but, if some agents (doctors) establish the routine of keeping paper-based data for their patients, the structure(s) will be altered (Jones and Karsten, 2003, Kouroubali, 2002).

2.4.4 Structuration theory: time, space, context and routines

In addition to the agency-structure interaction, the notions of time, space and context are central to Giddens' theory. They are considered to be key features in understanding the properties of social systems; in what way people conceptualize time and space and how they manage to organize themselves across time and space (Giddens and Pierson, 1998). Furthermore, Giddens (1991) refers to contextual sensitivity as one of the major features of his theory that can be used as guidelines for empirical research. He believes that all social studies have cultural, ethnographic or anthropological elements, which are, nevertheless, often neglected in social research. Contextual sensitivity is related to the significance of context in any explanation or description. The study of context is inherent in the investigation of social reproduction and includes time and space boundaries and links causality to the knowledgeability of actors. In other words, one feature of the context can only be understood to be causally linked to another to the extent that human agents are aware about the link (Costello, 2000, Pozzebon and Pinsonneault, 2005).

Moreover, according to Giddens (1984, p.282) "*the study of day-to-day life is integral to analysis of the reproduction of institutionalized practices*". Organizational routines are the major forms of day-to-day social activity, and "*routinized practices are the prime expression of the duality of structure in respect of the continuity of social life*". He argues that through their engagement in predictable routines agents sustain a sense of ontological security. Indeed, many studies have concluded that increase in

routinization may be seen as an uncertainty decreasing strategy, since in cases of uncertainty routines contribute to actors' ability to pick a course of action (Becker, 2004).

Finally, Giddens (1979) distinguishes between the micro and macro spheres of social analysis and highlights the significance of space and presence in social relations by making a distinction between two levels of integration between social practices. The first is called "social integration" and refers to face-to-face interaction, whilst the second "system integration" and refers to relations between social systems or collectivities. The key aspects of structuration theory and their implications in the context of organizational research are summarized in table 2.1.

Feature of structuration theory	**Implication**
Duality of structure	Structure and agency are two inseparable and interdependent phenomena
Structure has a virtual existence	Rules and resources exist only in their instantiation and as memory traces orienting conduct
People are knowledgeable agents	Agents are aware of their condition and reflect on it
Agents always have the possibility to take a different course of action	Structural constraint simply places limits upon the feasible range of options open to agents in given circumstances
Unacknowledged conditions and unintended consequences	Production and reproduction of society is not wholly intended or comprehended by social actors
Contextual sensitivity	The study of context is inherent in social research
Time/space distanciation	Societies "stretch" over spans of time and space
Routine is integral in respect to the continuity of social life	Individual identity and social institutions are sustained through routine (ontological security)

Table 2.1: Key features of structuration theory and their implications in organizational research

2.5 Structuration theory and its contribution to the study of information systems

The applicability of structuration theory in the Information Systems (IS) research has been received considerable criticism. First, structuration theory has been characterized as complex, involving concepts and general propositions that deal with social phenomena at a high level of abstraction and thus give rise to diverse interpretations (Jones and Karsten, 2003, Pozzebon and Pinsonneault, 2005, Turner, 1991). However, Giddens felt that his concepts should only be seen as a way of seeing the world rather than an explanatory mechanism (Stones, 2005). The second concern was about the absence of a specific methodology which would facilitate the application of structuration theory in empirical research (Pozzebon and Pinsonneault, 2005). Structuration theory is not really applied in practice and Giddens does not defend it. In the critics regarding the absence of a specific methodology, he replied that his aim was not to provide a methodological approach, but an explanation of the logic of research (Stones, 2005).

Although it is a general theory of social systems and pays little attention to technology, its application to the IS research field is valuable. It helps researchers to understand how users interpret and interact with technologies, what the results of these interactions are, how people enact organizational practices by using certain properties of the technology and not others as well as how people deal with the intended and unintended consequences of their interactions with the technology (Pozzebon and Pinsonneault, 2005). In addition, Giddens was the first who introduced the notion of the duality of structure and agency and referred to the knowledgeability of human agents. He argued that structure is embedded in practice in which it is recursively implicated (Giddens, 1984). This is an important point in the context of IS research, since it implies that structure is not embedded in technologies, but it emerges from the actions of human beings (Giddens and Pierson, 1998). Further discussion on how IS researchers used aspects of Giddens' theory in the development of their theoretical models is provided in chapter four.

2.6 Summary

The ontological nature of Giddens' theory terminates the fundamental distinction between objective and subjective interpretations of social phenomena. The theory of

structuration offers a way for understanding the continuous interaction between action and structure as it takes place in different social settings. Despite its ontological orientation, its contribution to the study of information systems in organizations is valuable for two reasons. First, the notion of the duality of structure and agency, which suggests that structure exists only in people's minds as memory traces and is applied in practice through the activities of human agents, implies that structure is not embedded in technologies, but emerges from the actions of human actors. Second, the proposition that people are knowledgeable agents helps researchers to understand how different people with different interpretations, skills, knowledge, power, objectives and results sought interact with a particular technology and create, maintain or modify organizational routines by using certain properties of the technology and not others.

In a health care context, health professionals, through their recursive activities, produce and reproduce the structures that exist in their settings and have been developed and maintained over time and space. On the other hand, structures are constraining and enabling resources to be used by human actors in their actions. Health care actors are knowledgeable agents who are aware of their actions. They seem to know a great deal of what they are doing in their day-to-day activities and they can provide explanations for their actions. However, there are always unintended consequences that cannot be predicted. In addition, health care professionals, through their activities and interactions maintain the structures existing in hospitals, but they have always the opportunity to modify them and enact new structures in practice. It seems, therefore, that structuration theory is a useful interpretive tool in the hands of researchers, describing in theoretical terms what to observe in practice in health care – and not only – settings.

CHAPTER III

3. The theory of organizational routines and the relationship between "structuration theory" and the view of routines as a source of flexibility and change

3.1 Introduction

Organizational routines have been identified as an aspect of organizations that allows them to achieve stability. Many organizational scholars have described them as a form of coordination often used in organizations and an uncertainty decreasing mechanism. On the other hand, change is another concern of organizational scholars that has been significantly increased over the last years (Feldman and Rafaeli, 2002). Weick and Quinn, (1999, p.381) argued that "*change never starts because it never stops*". There is a debate in the literature about whether change in organizations is episodic or continuous. The theory of organizational routines, as developed by Feldman and Pentland (2003), provides considerable explanations about how change occurs.

This chapter refers to the concept of routines, their role in providing stability and generating change as well as the similarities between structuration theory and the theory of organizational routines. In doing so, it first presents the different views of routines drawn on the writings of organizational scholars. In addition, it provides an overview of the major characteristics of organizational routines and their impact on the organizational life. Then, the contribution of routines in generating change is emphasized and the main aspects of the view of routines as a source of change are presented in interaction with Giddens' structuration theory. Finally, the implications of the theory of routines in organizational research are highlighted with a reference to its contribution to the aim of this study to understand the role of agents in the preservation or transformation of work practices in a health care context.

3.2 Defining organizational routines

Routines are temporal structures that have been viewed as the primary means by which organizations accomplish their goals, since a lot of the work in organizations is performed through routines (Cyert and March, 1963). They offer a powerful concept

that accounts for much of what is happening in organizations and play an explanatory role in many organizational theories (Feldman and Pentland, 2003). It seems therefore that routines are clearly understood since the term is so widely used. However, this is not the case; although organizational routines are integral part of any organization, they have been notably difficult to define in a rigorous way.

The concept of routines has been first introduced by Stene (1940) who referred to the dynamic of routines to coordinate the performance of multiple participants. Cyert and March (1963) used as an example the hiring routine to show that routines are recurrent behavioural patterns that are shaped by rules and customs. They acknowledged the possibility of change in standard operating procedures, which they referred to as adaptation, but they suggested that change in routines is minor from one iteration to another (Feldman, 2000). At about the same time, Winter (1964, p.263) provided a definition of a routine as "*a pattern of behaviour that is followed repeatedly, but is subject to change if conditions change*".

The work of Nelson and Winter (1982) was a milestone in the endeavour to draw attention both to the role of routines in the economy and the role of the concept of routines in theory. They referred to routines as repeated and predictable patterns of behaviour which are bounded by rules and customs. In their work "An Evolutionary Theory of Economic Change", they drew a parallel between routines and genes. Routines play the role that genes play in biological evolutionary theory. They argued that organizations draw on routines as individuals draw on skills. In other words, routines are acquired by organizations, and in this way they become skilful and do not take decisions but just undertake processes of action. As in natural selection, the more successful organizations survive through the interaction of their genes - routines - and their environments (Costello, 2000). Like Cyert and March (1963), Nelson and Winter (1982) suggested that routines do change but slowly through evolutionary processes, and they referred to that change as mutation. However, their definition of routines focuses on the lack of change, as they conceptualize routines as regular and predictable behavioural patterns (Coche, 1998, Feldman, 2000).

More recently, Gersick and Hackman (1990, p.69) defined a habitual routine as "*a functionally similar pattern of behaviour used in a given stimulus situation without explicitly selecting it over alternative ways of behaving*". Furthermore, Cohen and Bacdayan (1994, p.555) referred to organizational routines as "*sequenced patterns of*

learned behaviour involving multiple actors who are linked by relations of communication and/or authority". Their research concluded that the stability of organizational routines is partly attributed to the fact that they are stored as distributed procedural memory in individuals' minds which is not easily available for discursive processing (Feldman, 2000). In addition, Cohen et al. (1996, p.683) defined a routine as "*an executable capability for repeated performance in some context that has been learnt by an organization in response to selection pressures*". According to their view of routines, there is a scope for change in routines, which is associated with their origins. However, after a period of continuous change, equilibrium is established which does not entail change.

In contrast to the aforementioned views of routines, which emphasize the stability of routines, the organizational literature acknowledges that routines can change. However, organizational scholars have mainly focused on external factors rather than inherent characteristics that bring about changes in the way in which an organization structures the accomplishment of work. Thus, Gersick and Hackman (1990) presented five reasons for change in habitual routines for groups: a) encountering a new situation, b) experiencing a failure, c) facing a change in the structure of the group itself, d) reaching a milestone and e) receiving an intervention which calls members' attention to their group norms. Furthermore, many researchers have acknowledged that technology is a trigger for changing organizational routines (Barley, 1986, Tyre and Orlikowski, 1994).

However, the foundation stone that shed light on the conceptualization of routines as a source of flexibility and change was a revised ontology of organizational routines published by Martha Feldman and Brian Pentland (2003). Their theory draws on empirical findings from other studies and suggests that organizational routines are collective phenomena which produce a wide range of outcomes that vary from noticeable stability to significant change. Detailed analysis of their theory and its implications as well as its relationship to the theory of structuration will be presented in one of the following sections. For the time being, it is important to refer to the definition of organizational routines as "*repetitive, recognizable patterns of interdependent actions, carried out by multiple actors*" (Feldman and Pentland, 2003, p.95). Based on the writings of many organizational scholars, the next two sections refer to the characteristics of routines and their impact on the organizational life.

3.3 The characteristics of routines

From the early stages of the exploration of the role that routines play in organizations, routines have been characterized as patterns (Becker, 2003). In 1964, Sidney Winter (1964, p.263) defined a routine as "*a pattern of behaviour that is followed repeatedly*" and three years later Arthur Koestler (1967, p.44) referred to routines as "*flexible patterns offering a variety of alternative choices*". However, different scholars have provided different interpretations of routines as patterns. That is, many authors have characterized routines as "recurrent interaction patterns" which are behavioural in nature and collective, as opposed to "recurrent activity patterns", which applies to the individual level, and have been associated with the term "habits" (Becker, 2004, Hodgson and Knudsen, 2004, Hodgson, 1993). Other scholars have conceptualized routines as cognitive patterns. As opposed to behavioural patterns, routines in this case have been viewed as rules, standard operating procedures and programs (Cyert and March, 1963, Simon, 1977).

Another two characteristics of routines have been identified in the literature. That is, routines are repetitive and collective in nature. A pattern of action that takes place only once is not a routine (Feldman and Pentland, 2003). In fact, it would be very difficult to call something happening once a routine. In addition, as it was aforementioned, routines are "recurrent interaction patterns", as opposed to "recurrent activity patterns" or habits. Interaction means action that involves multiple actors and implies that routines are collective in nature (Becker, 2004). The repetitive and collective nature of routines is emphasized in Feldman's and Pentland's (2003) definition of organizational routines.

Recognizing the involvement of multiple actors while carrying out a routine makes researchers aware that routines can be distributed. Individuals in organizations belong to different units and they are linked by interaction. Routines are distributed across space, and so does knowledge held by the actors who are involved in performing a routine. Hence, knowledge held by different individuals does not completely overlap, but it is dispersed (Minkler, 1993). Consequently, it is impossible to get an overview of the whole knowledge held in an organization. Where that is the case, agents do not have knowledge of all possible alternatives and uncertainty increases (Becker, 2004).

Moreover, there has been much debate in the literature on whether routines are characterized by "mindlessness" or are "effortful accomplishments". Proponents of the first proposition maintain that people perform routines without devoting conscious or explicit attention (Gersick and Hackman, 1990). On the other hand, scholars that support the second position argue that individuals do not carry out a routine in a mindlessness way. Pentland and Rueter (1994) used the phrase "effortful accomplishments" to describe the way in which participants create routines from a plethora of possibilities. As Giddens (1984, p.86) puts it: "*Routine is founded in tradition, custom or habit, but it is major error to suppose that these phenomena need no explanation, that they are simply repetitive form of behaviour carried out mindlessly*". People are knowledgeable actors; they know a great deal of what they are doing and they always have a choice to do otherwise. It seems, thus, that routines are not simply followed or reproduced, but human agents choose whether to maintain or change a routine (Feldman, 2000, Feldman and Pentland, 2003).

Furthermore, organizational routines have been characterized as processual in nature. As it seems from the definitions of routines, which were provided in section 2.2, many scholars have referred to the possibility of routines to change. In addition, this paper adopts the argument of Feldman and Pentland (2003) that organizational routines are a source of change and flexibility due to the involvement of different individuals in the performance of routines. Needless to say, change is a process. The potential of the concept of routines to explain change is based on the fact that routines as a unit of analysis are processual in nature (Becker, 2004).

Routines do not exist in a vacuum. They are embedded in an organization and its structures. Organizations differ and have different rules and procedures providing thus different contexts for the performance of routines. Routines have been characterized as context-dependent by many scholars (Cohen et al., 1996, Edmondson et al., 2001, Teece et al., 1997). Contextual specificity is an important factor in studying organizational routines that should not be neglected. Context matters because the relationship between routines and their context is complementary. Contextual specificity carries considerable implications. Limitations to the transfer of routines to other contexts arise since, when removed from their original context, routines may be meaningless and their productivity low (Elam, 1993, Grant, 1991). Problems with transferability of routines might come from the inability to copy some elements of the

routine due to problems in transferring tacit knowledge, the failure to recognize what is essential and what not or the incompatibility of the routine with the new context (Madhok, 1997, Szulanski and Winter, 2002).

In addition, routines have been found to be specific to the history of an organization. The last argument derives from the fact that routines take place at a certain point of time, which is characterized by environmental factors and interpretative mindsets (Becker, 2004). Because such circumstances are complex, the probability that routines will be repeated in the same way is low (Rivkin, 2001). In fact, Feldman (2000) found that whenever routines are replicated, people exert some influence and perform aspects of routines in different ways. Organizational routines are not only shaped by history, but also by local specificities. The significance of cultural differences should not be underestimated while analyzing organizational practices since they limit their generalisation in other contexts (Simon, 1976). The main characteristics of routines and their major implications in organizational research are presented in table 3.1.

Characteristics of Routines	**Implications**
Behavioural patterns	Collective recurrent activity patterns
Cognitive regularities	Rules, standard operating procedures
Repetitive patterns	A pattern of action that takes place only once is not a routine but a habit
Collective phenomena	They involve interaction between multiple actors
Routines are distributed across time and space	Knowledge is dispersed
"Effortful Accomplishments"	People create, maintain or change routines
Processual in nature	Routines as a unit of analysis explain change
Context specificity	Limits in transferring routines from one context to another
Historical Specificity	Routines have a starting point. Whenever repeated, people perform them in a different way
Cultural specificity	Cultural differences cause limitations to generalisation

Table 3.1: Major characteristics of routines and their implications in organizational research

3.4 The impact of routines on organizations

As it was aforementioned, organizations draw on routines as individuals draw on their skills. They play a very important role in organizations since a lot of work is performed through routines. Numerous roles have been identified and show the value of routines in the organizational life. First, organizational routines coordinate. That is, routines support a high level of simultaneity making many activities mutually consistent (March and Olsen, 1989). In addition, they guide actors' performance in relation to the performance of the others; that is what Nelson and Winter (1982) called "the routine as target". They provide individuals with knowledge about what is the appropriate behaviour on which to base their own decisions (Stene, 1940). In other words, routines legitimate an appropriate behaviour that is understood to be part of the routine and vice versa, maximizing in this way the legitimacy of the organization and increasing managerial control (Feldman and Pentland, 2003). In fact, routinized behaviour is easier to monitor and measure than a non-routine behaviour. The easier it is to measure, the easier to compare, and consequently the easier to control (Becker, 2003).

Organizational scholars have also found that routines economize on cognitive resources. Cognitive resources are limited, which means that neither all alternatives nor all consequences of any particular course of action can be known (March and Simon, 1958). Routines economize on the scarce information processing and decision making capacity of agents. Individuals usually focus on non-routine events whereas recurring events are taken for granted and are dealt with in a semi-conscious way (Cyert and March, 1963). The semi-conscious processing of recurrent patterns requires less cognitive resources since it is more automatic. Moreover, automatic reactions economize on the time necessary for reaching a solution. Therefore, routines allow organizations and individuals to save both on time and cognitive resources (Betsch et al., 1998).

Moreover, routines store knowledge and capabilities and thus play the role of memory in organizations (Huber, 1991). Nelson and Winter (1982, p.99) propose that "*the routinization of activity in an organization constitutes the most important form of storage of the organization's specific operational knowledge*". It is therefore widely acknowledged in the literature that routines store knowledge and are key components

of organizational learning. Routines not only store knowledge in the form of documents and databases, but they are also able to store tacit knowledge. Tacit or procedural knowledge characterizes knowledge of how things are done, which is not explicitly expressed; that is, it is relatively inarticulate (Cohen and Bacdayan, 1994). The concept of routines helps researchers to understand how the productive knowledge - knowledge of how things are done held by individuals and/or the organization - of organizations and particularly the tacit knowledge is stored, applied, decays and changes (Becker, 2003).

As it was aforementioned, routines economize both on cognitive resources and time. Other than that, they allow individuals to save on mental resources contributing in this way to the ability of actors to deal with complexity and uncertainty. Uncertainty is negatively related to decision making since the success of each outcome from a set of possible outcomes is initially unknown. In order to cope with uncertainty, therefore, organizations have to increase the amount of information available. However, some times, despite the increase in the availability of information, the possible outcomes will remain unknown, because the meaning is not clear and the new data do not improve actors' estimates of the probabilities of each outcome, leading in this way to ambiguity and giving rise to uncertainty. In a situation like that, routines have been seen as uncertainty decreasing strategy by contributing to individuals' ability to pick a course of action (Gersick and Hackman, 1990). That is what Giddens (1984) referred to as ontological security. Increase in routinization results in rise in predictability and simultaneously frees scarce cognitive resources (Becker and Knudsen, 2005, Hodgon, 1988).

Finally, the traditional views of organizational routines emphasize their ability to lead to inertia (Becker, 2003). A more polite way of putting this point is that they provide stability. The argument for the last point comes from the hypothesis that as long as a routine gives satisfactory results, no conscious cognitive problem solving process is initiated to find another way to achieve the task (Cyert and March, 1963, March and Simon, 1958). In addition, stable routines minimize costs since new practices entail costs for the identification of participants, the provision of training and the adjustment of contracts. Stability helps organizations to assess changes, compare existing with new practices, improving in this way organizational learning (Becker, 2004). However, sometimes the stability effect of routines leads to inertia. As will be

discussed in the next section routines are not inert. In contrast, they have a great potential for change. They produce a wide range of outcomes, contributing to both stability and change (Edmondson et al, 2001, Feldman and Pentland, 2003). The main effects of routines on organizations as well as their implications in organizational research are summarized in table 3.2.

Effects of Routines	Implications
Coordinating mechanisms	• Routines make many activities mutually consistent • They guide actors' performance in relation to each other • They set an appropriate behaviour • They increase managerial control
Economize on cognitive resources	• Individuals respond to routinized practices in an automatic way • They save on time necessary for reaching a solution
Store knowledge	Routines store both tacit and productive knowledge contributing to organizational learning
Decrease uncertainty	Actors' decision making ability is increased
Stability	Organizational learning is improved due to comparison and assessment of existing with new practices

Table 3.2: Effects of organizational routines and their implications in organizational research

3.5 Organizational routines as a source of change

This study focuses on the way in which routines change when new technologies are implemented in health care organizations. As a result, change is an integral part of this study. As previously mentioned, considerable attention has been paid to the contribution of routines in providing stability. Conceptualizing routines as abstract ideas or fixed structures seems to be a "convenient" explanation regarding their role in organizations. However, it omits the role of human agency. Traditional theories on organizational routines tend to reinforce the absence of agency within the routines and some times they have characterized people as passive recipients of decisions that have been made in the past; that is, people perform routines in a mindless way. They have not considered important factors such as the differences in information, preferences and interpretations among the human agents who perform these routines, limiting our

understanding on how routines can change (Feldman, 2000, Feldman and Pentland, 2003).

Routines do provide stability, but they can also be an important source of flexibility and change. Pentland and Rueter (1994) suggest that routines have qualities of both stability and change. They argue that "*an organizational routine is not a single pattern, but, rather, a set of possible patterns – enabled and constrained by a variety of organizational, social, physical and cognitive structures – from which organizational members enact particular performances*" (Pentland and Rueter, 1994, p.491). In their representation of routines as grammars of action they propose that agents have a repertoire of actions they can take. However, their final decision varies according to previous actions and is guided by rules of "grammar" about what actions go together (Pentland, 1995). They conclude that those rules, which reflect the unvarying qualities of routines, constitute the structure that enables and constraints the actions that take place.

Like Pentland and Rueter (1994), Feldman (2000, 2003) suggests that variation and stability are both parts of organizational routines mainly because they are based on mindfulness rather than mindlessness. She proposes a performative model of organizational routines that brings agency back into the picture. Like Giddens, she argues that routines are performed by people who think, feel, create, resist and have different interests and different interpretations of routines. All of these forces influence the enactment of organizational routines and create in them a high potential for change. In addition, Feldman and Pentland (2003) refer to the inherent capability of every organizational routine to generate change. They define organizational routines as "*repetitive, recognizable patterns of interdependent actions, carried out by multiple actors*" and they offer a new theory based on the relationship between structure and agency. Finally, Feldman (2004) sheds light to the role of resources in change. The main aspects of those theories as well as their relationship with Giddens' structuration theory are presented in the following paragraphs.

3.6 The distinction between the ostensive and performative aspect of routines

Latour (1986) first introduced the notion of ostensive and performative aspects in the analysis of power, proposing that power exists both in principle and in practice. He referred to the former as the ostensive aspect of power and the latter as the

performative aspect. Like Latour, Feldman and Pentland (2003) argue that organizational routines also embody ostensive and performative aspects, which refer to the concept of structure and agency respectively, as found in Giddens' theory of structuration. At the outset, it should be clarified that their theory pays attention only to the inherent capability of routines to generate change. That is, it does not consider external factors, such as meta-routines, which replace existing work practices, as a means to bring about change. They focus on the relationship between specific performances and stable patterns in order to explain how routinized work practices can generate a wide range of outcomes, which vary from noticeable stability to significant change.

To begin with, organizational routines consist of two complementary aspects, the ostensive and the performative aspect. The former refers to the abstract, generalised idea of routines, which does not change. In "structurational" terms, it is what Giddens (1984) calls structure. That is, in the way that structure gives form and shape to social life, the ostensive aspect of a routine gives form and shape to organizational life. Routines have been defined as recognizable patterns of action and, despite some variations that might occur, one can easily recognize the core pattern of a specific routine as opposed to another routine. In terms of the theory of organizational routines as developed by Feldman and Pentland (2003), this would be the ostensive aspect of the routine.

The ostensive part of a routine shapes participants perception about what the routine is. However, it is important to emphasize that it is not monolithic, and different participants will have different understandings based on their role and point of view. As Giddens (1989) puts it, structure exists in and through the activities of human actors. The ostensive aspect of a routine cannot incorporate specific performances. This is straightforward, since it is impossible to specify in detail how a routine will be carried out. It merely provides guidelines about the courses of action that should be taken for the accomplishment of an objective in diverse situations and it should not be neglected that there are always contextual differences which influence the way in which a routine is carried out (Feldman and Pentland, 2003, 2007, Pentland and Feldman, 2005).

On the other hand, the performative aspect of a routine incorporates the specific actions, at specific times and specific places, carried out by specific people that bring

the routine to life. In "structurational" terms, it is what Giddens refers to as agency. Pentland and Rueter (1994) used the phrase "effortful accomplishments" to describe how participants decide to enact routines from a repertoire of possibilities. Change requires effort, while stable patterns are followed in a sub-conscious way (Greenhalgh et al., 2007). Human agents carry out routines against a background of rules and expectations and they are always aware of what they are doing. That is, as Giddens (1984) puts it, they are knowledgeable agents who interpret their actions in order to make sense of those actions and, although their choices of how to act appears mindless at times, there is always the possibility of doing otherwise (Feldman and Pentland, 2003).

The view of organizational routines as a source of change brings agency centre-stage. According to the definition of organizational routines, routines are carried out by multiple participants. The involvement of different agents inevitably introduces diversity in the information, interpretations and objectives of the participants. The participants in the performance of a routine do not all have access to the same information and they do not interpret it in the same way. Furthermore, they do not all have the same goals and they do not seek the same results. Therefore, their subjective interpretations of the appropriate course of action may vary. In other words, there is not a single, objective, monolithic routine but a variety of different perspectives of what is involved in the routine (Feldman, 1989, Feldman and Pentland, 2003, 2007).

Organizational routines consist of the resulting performances and the interpretations of these performances. Performances of routines vary from one iteration to another and so do the interpretations of agents of what these routines are (Feldman, 2000). In addition, routines not only vary from one iteration to another, but also according to different contexts. Giddens (1991, 1984) refers to contextual sensitivity, which includes time and space boundaries, as inherent to social reproduction. Like Giddens, Feldman and Pentland (2003) argue that even routines that have been repeated many times in the past by the same people need to be adjusted to changing contexts. Moreover, the fact that organizational routines are carried out across time and space reinforce the argument for different understandings of the actions that people have taken as well as the appropriate next action and hence provides opportunities for different interpretations of what the routine actually is.

Furthermore, organizational routines have been characterized as patterns of interdependent actions. That is, participants in a routine act in a context created by the actions of other individuals. Because their actions are interdependent, they must adjust to each other's actions. The last argument reveals that there are some limitations in individuals' actions. They cannot act as they please, because the actions of others can create or rule out alternatives. In the next iteration of the routine, each participant may face a different set of possibilities which have been determined by the actions of others. Therefore, the interdependence of actions not only can be viewed as part of structure, but also as part of the performative aspect of a routine that can result in variations in specific performances of the routine (Feldman and Pentland, 2003, Feldman and Rafaeli, 2002).

It seems thus that the idea that there is an internal dynamic to routines which can promote continuous change is related to the notion of the duality of structure and agency as has been introduced by Giddens. The ostensive aspect of a routine incorporates the abstract idea - structure - of the routine, while the performative aspect - agency- consists of the specific performances of the routine at specific times, in specific places, by specific people. Both aspects are essential to constitute what is understood to be a routine. Without this distinction, it is easy for researchers to mistake the ostensive aspect of the routine for the whole routine with all the methodological implications that such mistake entails. Understanding this relationship can help researchers to understand the role of variation in organizational routines and the interplay between stability and change (Feldman and Pentland, 2003).

3.7 The relationship between the ostensive and performative aspect of routines

Structuration theory suggests that structure is produced and reproduced through the actions of human agents, and those actions in turn are constrained and enabled by structure (Giddens, 1984). Like structure and agency, the ostensive and performative aspects of organizational routines are recursively related. Performances create and recreate the abstract idea of the routine, while the ostensive aspect constrains and enables the performances. The relationship between the ostensive and performative aspects of routines emphasizes the significance of routines in organizations.

Organizational members can use the ostensive aspect of routines as a guide of what actions have to be taken. That is what Nelson and Winter (1982) referred to as the

"routine as target". However, it cannot specify the particular performances of the routine, in particular contexts and at specific times as they are performed by specific people. People always take the last decision on how a routine is carried out. In addition, the ostensive aspect of routines can be used as a guide of accounting for actions that have been already taken. In this way, actions that are understood to be part of the routine are legitimated and vice versa. Legitimate actions provide a justification or explanation when someone challenges those actions. Other than that, the ostensive aspect of routines allows people to refer and make sense of a variety of activities which otherwise would be incomprehensible. Therefore, it is often perceived as a resource for managerial control, since managers have usually the power to create rules and other artefacts that document a particular version of the ostensive aspect of a routine (Feldman and Pentland, 2003, Feldman and Rafaeli, 2002).

On the other hand, the performative aspect of routines creates, maintains and modifies the ostensive aspect of routines. As it was aforementioned, routines are defined as repetitive, recognizable patterns of interdependent actions. An independent collection of performances is not a routine. It is the ostensive part of the routine that makes those actions coherent and recognizable as a routine. Likewise, the ostensive aspect of the routine has to be performed repeatedly in order to be recognized as a routine. Like structure, which is produced and reproduced in and through the activities of human agents, the ostensive aspect of a routine is created, maintained and modified through the recurrent performances of organizational agents. Through the process of repetition and recognition organizational routines are enacted. By performing constantly the enacted routines people maintain the ostensive aspect of those routines. However, as Pentland and Rueter (1994) argue, people make choices from a repertoire of activities and, thus, they can decide to deviate from the ostensive aspect of a routine introducing variations and modifications into the structure of the routine. For this reason, the performative aspect of routines has been viewed as a primary source of power and resistance for non-managerial employees towards the control exerted by managers through the form of rules and material artefacts (Feldman and Pentland, 2003).

3.8 The role of resources in change

The previous section introduced the reciprocal relationship between performances and structure as they are both embedded in routines. It seems that power is an integral part

of organizational routines. Managers use the ostensive aspect of routines as a form of dominance, while subordinates use the performative aspect of routines as a form of resistance. Power, needless to say, is a resource. The movement between performative and ostensive aspect gives the opportunity to people to produce variations in a routine. These variations might be unintended or intentional. In the second case, that occurs in order to change the way in which work is done in an organizational context. It should not be neglected that people have different interests and goals. In the end, the routine is retained (Feldman, 2000, 2004, Miner and Robinson, 1994).

According to the notion of the duality of structure and agency, rules and resources are both medium and outcome of the practices they recursively organize (Giddens, 1984). Like structure, resources embedded in routines are created and recreated through the actions of the participants in those routines. Indeed, Feldman (2004) found that agents' actions are a way of creating resources. Through the actions of the participants in a routine, resources, such as authority and information, enact schemas which in turn produce new resources (Fig. 3.1). The relationship between actions, resources and schemas sheds light on how change in organizational routines occurs. Change in one of those interdependent elements has the potential to bring about changes in all of them and, consequently, to organizational routines. In addition, the role of resources in organizational change efforts informs managers and organizational scholars about the reasons that resistance occurs (Feldman, 2004).

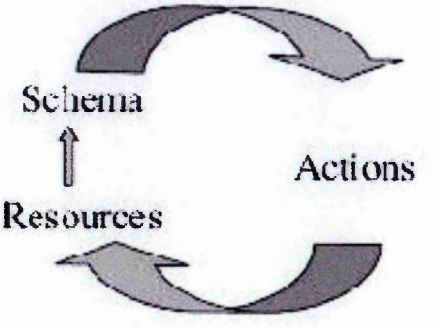


Fig. 3.1: Resourcing cycle (Feldman, 2004, p.296)

3.9 Implications of endogenous change in organizational routines

The performative model of organizational routines suggests that routines have an inherent capability that can produce a variety of outcomes which range from stability

to change. According to Feldman (2000), change occurs as a result of participants' reflections on and reactions to various outcomes of previous iterations of the routine. She has found many reasons that explain why change happens, which are related to different kinds of outcomes (p.620):

- Actions do not produce the intended outcomes.
- Actions produce unintended and undesirable outcomes.
- Actions can produce new resources and therefore enable new opportunities.
- Actions might produce outcomes that fall short of ideals.

Each of these cases is associated with a change response. In the first two cases, participants respond by repairing the routine in order to generate the intended and desired outcome. In the third case, agents change the routine in order to take advantage of the new opportunities by expanding the routine. Finally, when there is a potential for further improvements, participants respond by striving in order to attain the ideal. The involvement of agency in organizational routines inevitably includes a range of thoughts, actions, behaviours and feelings. People turn their plans into actions, which in turn produce outcomes that are compared with ideals as well as with previous plans and supply the plans for the next iteration of the routine (Fig. 3.2). In this way change is generated (Feldman, 2000).

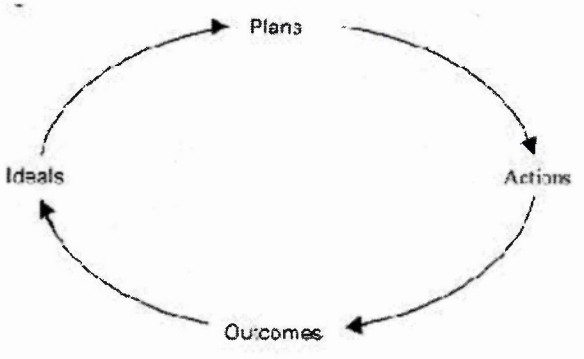


Fig. 3.2: The performative model of organizational routines (Feldman, 2000, p.623)

Conceptualizing routines as a duality enhances researchers' understanding about whether organizational change is episodic or continuous. Change can be either episodic or continuous because it can produce a wide range of outcomes. The tendency of a routine to change or remain stable depends on the process of variation,

selection and retention that takes place between the ostensive and performative aspects of the routine. That is, performances are variations that are selectively retained in the structure of the routine. Endogenous change can occur through the engagement of the participants in the routine. According to Feldman (2000, 2003), differences in the adoption rate of change are mostly related to the internal dynamics of the routine rather than to organizational factors, such as participants' perceptions towards the routine and managerial support. In other words, it is the process of moving from the performative to ostensive and vice versa that explains the different rates of change in different routines (Feldman and Pentland, 2003).

3.10 Summary

Organizational routines are considered to be important means by which organizations accomplish their work. They are recurrent, interdependent phenomena involving the participation of multiple actors. Despite the focus on the role of routines in providing stability, recent work on routines has emphasized their potential to generate change. Change in routines is endogenous and derives from their ongoing performance. Like structure, the abstract idea of a routine is created, maintained and modified through the activities of the people who perform the routine. It is the relationship between the ostensive and performative aspects of routines that provides an ongoing opportunity for variation, selection and retention of new practices and allows routines to generate a wide range of outcomes that vary from stability to change. People combine elements of past experiences to deal with present situations and then, drawing on a repertoire of possible actions, they decide whether or not to produce variations in the performance of a particular routine, select these variations and turn them into part of the story by retaining them. Throughout this process, it is important the role of diverse agents who have different interests, understandings and goals, and decide either to produce variations and hence change or resist to any form of change and thus provide stability.

This study seeks to explore how people use an EPR system and maintain or change their existing ways of working. Therefore, the relationship between people and tasks is an integral part of this study and the theory of organizational routines helps to understand this relationship by providing insights into the role of agents in changing the way in which routines are performed. Table 3.3 summarizes the key aspects of the theory of routines and its implications in organizational research in the context of

structuration theory. The next chapter refers to the model of technology-in-practice, which informs the study about how people interact with "tools" to perform their tasks.

Structuration Theory	Organizational Routines	Implications
• Duality of structure	• Routines as a duality	• Inherent capability of routines to generate change
• Structure • Agency	• Ostensive aspect • Performative aspect	• Capturing this relationship can help researchers to understand the role of variation in routines and the interplay between stability and change
• Structure is produced and reproduced through the actions of human agents and those actions in turn are constrained and enabled by structure	• Performances create and recreate the abstract idea of the routine, while the ostensive aspect enables and constrains those performances	• The ostensive and the performative aspects of organizational routines are recursively related
• Structure consists of rules and resources that are both means and outcome of the practices they recursively organize	• Through the actions of the participants in a routine, resources enact schemas which in turn produce new resources	• The relationship between actions, resources and schemas sheds light on how organizational routines change
• Contextual sensitivity	• Performances of routines vary according to different contexts	• Organizational routines need to be adjusted to changing contexts • Different interpretations of what a routine is
• Knowledgeable agents	• Routines as "effortful accomplishments"	• People carry out routines against a background of rules and expectations and they are always aware of what they are doing

Table 3.3: Structuration theory, organizational routines and their implications in organizational research

CHAPTER IV

4. The impact of technology on organizational forms: structurational perspectives on technology and the model of technology-in-practice

4.1 Introduction

The introduction of new technologies has been always acknowledged as a trigger for organizational change (Tyre and Orlikowski, 1994). Van de Ven (1986, p.591) argued that, once in use, new technologies "*not only adapt to existing organizational and industrial arrangements, but they also transform the structure and practices of these environments*". Failures to implement information and communication technologies (ICTs) in organizations, such as Electronic Patient Records systems (EPR), and the constant evolution of technologies lead researchers, managers and organizations to get back to approaches that examine the interplay between actors and technologies (Hussenot, 2008). In order to examine how technology and organizational structures are interconnected, organizational research has to focus on how agents use tools to do tasks (Pentland and Feldman, 2007). The integration of people and tasks is explained by the theory of organizational routines which was presented in the previous chapter. The purpose of this chapter is to describe how people interact with advanced technologies and enact structures through recurrent use of specific features of a given technology.

In doing so, it first presents the differences between organization studies (OS) and information technology (IT) research, the problems with prior conceptualizations of technology and refers to the normalisation process model and the reasons for its exclusion. In this way, it emphasizes the need for a structurational approach in order to understand the relationship between technology and organizational structures. Moreover, the main differences between subjective and objective perspectives on technology are presented along with the main aspects, strengths and weaknesses of two structurational models of technology, Adaptive Structuration Theory (AST) and the theory of the duality of technology (Orlikowski, 1992a), which however adopt an objective view of technology. The aim of this thesis calls for the use of a subjective approach, which is provided by Orlikowski's (2000) model of technology-in-practice.

Its key aspects and differences with previous structurational theories on technology are summarized providing in this way a justification for its adoption by the researcher.

4.2 Organization studies (OS) and information technology (IT) research on technology and organizations: problems with the conceptualization of technology

Technology has always been a central theme in organization studies (OS) and information technology (IT) research. Many scholars have tried to investigate, define and understand the way in which technology interacts with organizations. As a result, divergent definitions and opposing perspectives regarding the scope of technology - what is defined as comprising technology - have been developed over the previous years, which have limited our understanding on the precise role of technology in organizational affairs (Orlikowski, 1992a).

Information technology (IT) researchers are primarily interested in how to design better technological artefacts or how users of these technologies can appropriate them more effectively. Understanding how information technology shapes organizations are central aspects of many IT studies. For example, a considerable amount of IT research has examined the impact of technology on organizational structures and communication patterns (Huber, 1990, Malone et al., 1987), as well as on the performance of individuals, groups or organizations (Fuller and Dennis, 2009, Grant and Higgins, 1991, Weill, 1993, Zack and McKenney, 1995). IT studies, however, have limited generalisability, treat technology as an independent influence on human behaviour or organizational properties and adopt an objective view of technology regarding its impact on organizational forms. Thus, they ignore the role of agents in developing, maintaining and changing a technology (Orlikowski and Barley, 2001).

On the other hand, organization studies (OS) researchers are more interested in answering the question "why" and generalising their findings by identifying causal relationships, discovering regularities and articulating general principles. For instance, many organizational studies have focused on the impact of technology on individual or organizational productivity (Belanger et al., 2001, Menon et al., 2000). This view has extended our understanding to think of technologies as social artefacts, including the various tasks, techniques and knowledge used when individuals engage in any productive activities. However, most of organizational studies have resulted in conceptualizations of technology as abstract, independent and fixed artefacts, and

hence they have taken technologies for granted ruling out the role of human agency in shaping either the design or the use of technology (Orlikowski, 1992a).

Orlikowski and Iacono (2001), based on a comprehensive review of the literature, grouped the most important conceptualizations of technology under five categories: the nominal view, the "tool" view, the computational view, the "proxy" view and the "ensemble" view of technology. The most important aspects of these perspectives as well as their weaknesses are summarized in table 4.1.

4.2.1 Nominal view of technology

A review of the literature has shown that the majority of technology related studies have adopted a nominal view of technology. That is, the word "technology' or any other similar term is used a few times in these studies and emphasis is given to a wide range of topics of interest to the information systems (IS) field, missing the opportunity to offer more concrete insights into IS phenomena, such as the role of technology in the lives of IS professionals or the processes of IS planning. For instance, Beath and Orlikowski (1994) describe a content analysis of an Information Engineering systems development methodology with no reference to any technology that might be developed using this methodology or might support its use. Therefore, in the nominal view, technologies are not described, defined or theorized; they exist "in name" but not "in fact".

4.2.2 Computational view of technology

An IT group of researchers have focused on the computational power of information technology. That is, these studies are primarily interested in the features of specific technologies and their potential to manipulate, store, retrieve and transmit information, supporting, processing, modelling or simulating in this way aspects of the world. For example, research under this category has either engaged in generating algorithms that can build new systems or enhance existing ones that can support human activity (Trice and Davis, 1993) or has attempted to represent social, economic or informational phenomena, such as processes, structures and knowledge, through the methodology of data modelling or simulation. This approach reflects the computer science view of information technology and as such it does not include useful insights from more recent social and economic theories that refer to how people interpret,

adopt, use and modify specific technologies in complex social contexts (Orlikowski and Iacono, 2001).

4.2.3 "Tool" view of technology

One of the most well-known conceptualizations of technology is the view of technological artefacts as tools. From this approach, technology is seen as the engineered artefact which is expected to do what its designers intend it to do. Technical matters, well defined, unchanging and controlled by humans are taken into account regarding what the technology is and the way in which it works. For this reason, the "tool" view hampers the potential of seeing technologies and organizations as mutually dependent and dynamically emergent; and, as Latour (1987) puts it, it "black boxes" technologies by conceptualizing them as abstract and stable artefacts that can be used by anyone, anytime and anywhere. Like Latour, Kling (1987) argues that the "tool" view conceives information technology as a computing resource, a piece of equipment which provides specifiable information processing capabilities, and perceives technology as independent of the social or organizational arrangements within which it is developed and used.

In "tool" studies, technology is always the primary independent variable which affects, alters or transforms the dependable variable of the study. For example, Applegate et al. (1988) argued that management information systems are tools deployed by organizations for downsizing or restructuring, as they can replace middle managers and analysts, thereby cutting down costs and providing efficiency. In addition, according to this approach, technologies are seen as "productivity tools" which have specific technical features that can enhance the performance of a firm, as well as tools for information processing, such as the Internet. Therefore, such studies adopt an objective view of technology that does not consider the influence of human agency on how technologies are appropriated, deployed, used or modified (Orlikowski and Iacono, 2001).

4.2.4 "Proxy" view of technology

The "proxy" view of technology assumes that the important aspects of technology can be measured in terms of users' perceptions, diffusion rates or capital spent. Ease of use, artifact's relative advantage and intention to use the technology are some of the variables included in studies about users' perceptions. Measures of the process of

diffusion of a particular type of artefact have been seen to be of high importance by a great number of scholars in the IS research (Rogers, 2003). Researchers are interested in how many individuals, organizations or nations are currently using a technology within or across some socio-institutional contexts as well as in the organizational, cultural or economic barriers associated with potential failure of diffusion. While very useful in identifying some interesting socio-psychological and socio-economic patterns, such as the lack of diffusion of obviously useful technologies or the absence/presence of business value from investments in technology, the "proxy" view does not take into account historical, contextual or cultural variations in IT artefacts. Hence, these studies are short of the means to account for temporal and contextual variations in the identified patterns (Orlikowski and Iacono, 2001).

4.2.5 The "ensemble" view of technology

More recently, a number of researchers, dissatisfied with the "tool" and "proxy" views of technology, adopted an "ensemble' approach which focuses on the dynamic interactions between people and technology from its design and construction until its implementation and deployment in organizations or the society as a whole. That is, technology is conceptualized as structure. Such a conceptualization draws on principles which come from the theory of structuration (Giddens, 1976, 1984). Technology in this view is seen to embody social structures, sets of rules and resources, which have been embedded into the technology by designers during its development and which are then appropriated by the users of this technology as they interact with it (Orlikowski and Iacono, 2001). However, they did not manage to provide convincing explanations on how human agency shapes the way technologies influence organizational routines and structures once the technology is deployed and used in organizational settings (Orlikowski and Barley, 2001).

Structurational perspectives on technology adopted a view of technologies as social objects, seeking to explain how the interests and perspectives of different actors shape the design and meaning of technical systems (Fulk, 1993, Prasad, 1993). DeSanctis and Poole's (1994) and Orlikowski's (1992a) structurational model of technology, explored the ways in which users appropriate the social structures embodied in a given technology, the intended and unintended consequences of using a particular artefact as well as the outcomes of such interaction between agents and technologies. Such approaches emphasize the importance of technology-in-use, but they tend to

view technology as relatively monolithic and as an aspect of structure distinct from agency located in the people (Rose and Jones, 2005).

Moreover, other researchers tried to better understand how technologies come to be used in particular ways. Artefacts in this case are conceptualized as embedded in complex and dynamic social contexts. Kling and Scacchi (1982), for instance, developed this view into what they called the "web of computing" to examine how various organizational forces, such as organizational arrangements or policies and resources, promoted the introduction, effective management and use of new artefacts. In addition, Latour (1987) opposed to a view of technologies as "black boxes" and he called for unpacking those boxes through analyzing networks of agents and alliances which are anchored in those technologies and reveal how new technologies come to be. Together with Michael Callon, he developed the Actor-Network Theory (ANT), which has become a popular way to analyse Information and Communication Technologies (Mutch, 2002).

Actor-Network Theory attempts to explain and understand the complex social and technological relations between actors and technology (Hussenot, 2008). Technologies as well as human actors are not stable, fixed entities, but they change over time, across social and organizational contexts, and in their relations with other entities (Singleton and Michael, 1993). That is, they have to be continually maintained through the engagement of the actors involved (Jones and Graham, 2003). A central premise in this theory is the notion of translation; the process through which actors develop interest in using a technology in their work. This is the result of the negotiations and compromises that take place through the process of enactment of technology-in-practice. The process of translation is based on the fact that despite the intentions of its designers, the fate of an artefact is always in the hands of others (Latour, 1991). It is analogous to the concept of appropriation or enactment, as well as an alternative to "proxy" views of diffusion as a way of understanding how technological innovations spread (Latour, 1999, Pentland and Feldman, 2007).

In an ANT context, technologies embody specific patterns of use - not structures - which enable a certain set of activities and constrain others (Prout, 1996). However, those scripts are not necessarily fixed and may be translated by other actors in ways not intended by the designers, and thus result to changes in technologies (Singleton, 1996). Under the lens of ANT, human and non-human entities, whether technologies

or organizations, are seen as equivalent for analytical purposes, and they are both labelled as actants (Latour, 1991, Law, 1992). However, the characterization of non-human actors as having attributes of agency does not seem to be realistic. Such heterogeneity as well as the lack of consistent definition of the associations between the actants makes these networks complex, unwieldy and difficult for analysis. In addition, while ANT focuses on the networks of associations between human and non-human actors locating structure within the network, it does not explicitly explain why these networks occur and what is that makes them cohere (Pentland and Feldman, 2007). The most important aspects of each view as well as their weaknesses are summarized in table 4.1.

Conceptualizations of technology	Basic ideas	Problems
Nominal view	• Emphasis is given to a wide range of topics associated with the introduction of a technology, but not in the technology itself	• It does not offer insights into IS phenomena • No definition or description of the technology
Computational view	• Interested in the features and functionality of a technology	• No reference to social and economic theories
Tool view	• Technology as an artefact • Objective view of technology • Technology as productivity tool	• It presents technologies as "black boxes" • The relationship between a given technology and an organization is not dynamic
Proxy view	• Technology is measured in terms of users' perceptions, diffusion rates and capital spent	• No reference to contextual, historical or cultural variations in technologies
Ensemble view	• Technologies embody social structures • Analysis of actor-networks • The notion of translation	• Technology is seen as being static • Difficult to identify associations among human and non-human actors

Table 4.1: Orlikowski and Iacono's (2001) categorization of perspectives on technology and organizational forms: basic ideas and weaknesses of each view

4.3 Normalisation process model

A recent perspective on the uptake of technology is the normalisation process model. It is a sociological perspective which aims to explain why some new technologies are embedded in health care work and become "normalised" while others do not, by identifying enabling and constraining factors associated with the implementation of complex interventions (May 2006, Murray et al., 2010). The model was derived from analyses of qualitative studies, using interview and ethnographic methods, undertaken between 1995 and 2005 examining professional-patient relationships (e.g. May et al., 2004), changing patterns of care (e.g. May et al., 1996), the development, evaluation and implementation of telemedicine and related e-health systems (e.g. May et al., 2003) as well as the production and use of evidence for practice (e.g. May et al., 2005).

Carl May and his colleagues are concerned with explaining the factors that promote or inhibit the implementation of healthcare technology by focusing on collective social action. They argue that, in any attempt to introduce or modify existing patterns of collective action in health care, three core components of complex intervention are involved: actors, objects and contexts. The first refers to the individuals and groups (e.g. physicians, managers, patients) who encounter each other in a health care setting and the aim of the intervention is to change their behaviour and its intended outcomes. Objects are the institutionally sanctioned means (e.g. protocols, clinical guidelines, electronic patient records) by which knowledge and practice are enacted and the aim of interventions related to objects is to change people's expertise and actions. Finally, the third component of complex interventions, contexts, refers to the organizational, institutional and legislative structures enabling and constraining people and procedures, which aim to change the way in which people work and enact practices to achieve their goals in a health care context (May, 2006, May et al., 2007).

"Normalisation" refers to the embedding of a technique, technology or organizational change as a routine in clinical practice and is one possible outcome of collective action. Others include "adoption", where a complex intervention is used but does not become routinely embedded in daily work, and "rejection", where people disregard or refuse to use a complex intervention. May (2006) argues that the degree of normalisation of an intervention depends on its impact on four constructs known as interactional workability, relational integration, skill-set workability and contextual

integration. The first construct is concerned with how a complex intervention affects interactions between people and work practices. Relational integration describes how the intervention relates to existing knowledge and relationships, while skill-set workability refers to the impact of the intervention on the current division of labour. Finally, the fourth construct is concerned with how a complex intervention relates to the context in which it is introduced (May, 2006, May et al., 2007).

The normalisation process model is a recent but yet relatively untested framework for understanding how healthcare technology becomes embedded in practice (Robert et al., 2009) and May (2006) himself acknowledged that more studies are required to explore the constructs of his theory and extend the model. The normalisation process model also carries significant epistemological limitations. That is, it has a limited scope and provides a set of assumptions that can be used to develop and test hypotheses by empirical investigation (May et al., 2009). It can therefore be used as the basis for structured instruments in experimental research (e.g. randomised controlled trials) to explore the relationship between the constructs and propositions underpinning the model (May, 2006). The latter implies that this theory is not appropriate in the context of this study since it is designed to be used by researchers who adopt a positivistic epistemological perspective and use quantitative methods to investigate the uptake of technological innovations in health care.

Moreover, in their attempt to give a structure to the description of their model, May and his colleagues (2007) characterized the dynamic components of the model - actors, objects and contexts - as static and unchanging. However, this does not fit with the interpretive approach of this study and the aim to explore the dynamic relationship between organizational routines, agents and the EPR system and how this changes over time. The normalisation process model is less effective in explaining ongoing change in both the organizational routines and the technology. It is limited in exploring the implementation of complex interventions in health care contexts in relation to the work that it involves (May et al., 2007) and is useful for studies that explore how a technology is "normalised" in health care work. However, it is not intended to deal with the diffusion, adoption and ongoing use of technological innovations by different individuals or groups in particular contexts (May et al., 2007). For all the above reasons, it was not considered appropriate for this study.

4.4 Objective versus subjective views of technology

Most social theories are broadly classified into two opposing categories depending on whether their ontological assumptions view social reality as objective or subjective (Burell and Morgan, 1979). Objectivists focus on the institutional properties of social systems which are seen to be independent of human action, while subjectivists point out the importance of agency in the interpretation, creation and modification of the social world. The former attempt to understand social phenomena by explaining how institutional aspects shape human action and influence social relationships over time, while the latter by explaining how knowledgeable human agents create and recreate their social world through their activities (Orlikowski and Robey, 1991).

The different treatments of technology make clear that different researchers, with different backgrounds, have different interpretations about the nature of technology and its impact on organizational structures. Subjectivist approaches, on the one hand, focus attention on the users of specific technologies, excluding the possibility that systems have any objective characteristics. On the other hand, objectivist views are more common and they assign technology the role of independent variable, thereby treating both technology and organizational structures as objects. For example, research on medical technology demonstrates that objective characteristics might influence the use of technology and alter social relationships (Barley, 1990). Therefore, such theories ignore the social interpretations and actions that might modify the impact of particular technologies (Orlikowski and Robey, 1991).

It seems thus that the interconnection of structure and action is essential in order to better understand and analyse the relationship between technology and organizational forms. Van de Ven and Poole (1988) called for new theories that would link action and structure and that would be used to inform analysis. Such a theory is Anthony Giddens' theory of structuration, which has been presented in chapter two. Giddens' (1976, 1984) theory has challenged the opposition in the social sciences between subjective and objective interpretations of the social reality. "Structuration theory" bridges the gap between objective and subjective conceptions of organizations and allows organizational researchers to include both (Poole and Van de Ven, 1989). While his theory is posed at the level of society, it can also be applied at multiple levels of analysis.

The first attempt to apply the principles of "structuration theory" in order to examine the relationship between technology and organizational structure was in 1986, when Barley studied the introduction of two identical CT scanners in the radiological departments of two different community hospitals in Massachusetts. Barley (1986) treated structure as an emergent process rather than a static configuration and he conceptualized technology as a social object, with fixed features across time and contexts of use that triggers certain social dynamics that lead to anticipated and unanticipated structuring consequences. He concluded that identical technologies can be embedded into different social systems and in different ways, leading to different structural outcomes (Liker et al, 1999, Orlikowski and Robey, 1991).

While very important for understanding the role of technology as a trigger of structural change in social contexts, this study does not consider technology as causing or even constraining structure. That is, technology, in Barley's (1986) context, is seen as an occasion for structuring, in the way that it provokes human interactions that might then influence revised social structures. In addition, in the case of CT scanning technology, users have little control over the functioning of the technology and there is no scope for physical modification of the technology during its use. In the case, however, of e-health technologies, users and other stakeholders might exercise considerable influence over the specific features of the technology-in-use, shaping and reshaping in this way its applications, so that it ceases to be a fixed, objective constraint (Orlikowski, 1992a, Orlikowski and Robey, 1991).

Many researchers have adopted Giddens' theory of structuration as their ontological tool in their analyses of the impact of technology on organizational structures. However, they have used different epistemological approaches and their ontological assumptions vary. That is, DeSanctis and Poole (1994) adopted a positivist approach in order to examine the relationship between the structures embodied within the technologies and the structures that emerge in human action when people interact with these technologies. Like Orlikowski (1992a), they conceptualize technology in an objective way, which emphasizes the existence of structures embedded within the technologies. On the other hand, Orlikowski (2000) used an interpretive approach to describe the impact of technology on organizational forms. From her point of view, it is the subjective interpretations of users who enact technologies-in-practice that play the most important role. At this point, it would be useful to present the main aspects

of each theory in order to highlight their differences and emphasize why this paper adopts Orlikowski's (2000) structurational model of technology-in-practice.

4.5 Adaptive structuration theory (AST)

Although the original formulation of Giddens' theory of structuration paid little attention on technology, it has been very influential in the literature which is concerned with the use of information systems in organizations. DeSanctis and Poole (1994) proposed "adaptive structuration theory" (AST) as a framework for studying variations in organization change that take place as advanced information technologies (AITs) are used. In their theory, they describe the interplay between such technologies, social structures and human interaction. AST focuses on the social structures, rules and resources, built into such technologies. Those structures, in turn, may be reproduced, modified, enhanced or combined with manual procedures, creating, in this way, new structures within the technology. Thus, they propose that there are structures within technologies, as well as structures that emerge through the interaction between those structures and the human agents.

In "adaptive structuration theory", social structures within technologies take either the form of structural features or they represent the spirit of such features. Structural features are the specific rules and resources or capabilities provided by the technology, whereas spirit is described as the intended goals and values underlying a specific set of structural features, which indicate how people should use the technology and how to interpret its features. On the other hand, structures embodied in a technology may not be used directly, but in combination with other sources of structure. When these structures are applied, they produce outputs that, in turn, become additional sources of structure. These new sources of structure are emergent structures, rules and resources upon which individuals can draw as social action unfolds (DeSanctis and Poole, 1994, Poole and DeSanctis, 1990).

They argue that the structural features of an advanced information technology provide a set of interpretive schemes through which users understand their world. For example, software can be used as an interpretive scheme for translating human action into routines (Orlikowski and Robey, 1991). In addition, technology can be seen as a means of domination. Its structural features are rules and resources embedded in the technology by its designers who exercise power in this way by enabling and

constraining the actions that they want to be produced through the use of the technology (Pentland and Feldman, 2007). On the other hand, the spirit of technology constitutes a moral order of the appropriate uses of the technology that legitimate it. Furthermore, it can work as a means of signification or domination to the technology, in the way that it helps users to understand its meaning and presents the types of influence moves to be used with it, respectively. Together with the structural features of a technology, they form its structural potential, which human agents can draw on to constitute particular social structures in interaction (DeSanctis and Poole, 1994, Orlikowski and Robey, 1991).

Central to AST is the process of appropriation. In structuration theory, structuration occurs when human agents, drawing on rules and resources in their everyday activity, produce and reproduce social systems in interaction (Giddens, 1984). Similarly, in an AST context, appropriation of the structures that are inscribed in a particular technology is the process by which rules and resources, whether from the technology or other structural sources, are brought into action within a specific context and at a specific point of time, thereby producing and reproducing those structures. Such an appropriation takes place when humans actively choose how technology structures are used. When brought into action, social structures may take on new forms due to interpersonal interaction, which might reflect rules and resources that are modified from the technology. Finally, when the social structures of the technology or the emergent forms of technology structures are used, reused and accepted in interaction, they become institutionalized and bring about organizational change (De Sanctis and Poole, 1994).

According to DeSanctis and Poole (1994), people appropriate structural features of technologies in different ways – appropriation moves – and among a wide range of potentials. Hence, they might choose to directly use the structures, combine them with other structures, constrain them as they are used, or make judgments about their usefulness. Moreover, people may select to appropriate the structural features of a technology either faithfully or unfaithfully. Faithful and unfaithful appropriations respectively refer to the degree to which the use of a particular technology is consistent with the spirit and structural features of the technology or not. Thus, they propose that people's decision processes to appropriate technology structures will vary according to the nature of AIT appropriations. According to the principles of

AST, desired decision processes' outcomes would result if the appropriation is faithful, the number of appropriation moves is high, attitudes towards appropriation are positive and the decision processes are task rather than power-oriented (Orlikowski, 2000).

The basic idea here is that technology embodies an important aspect of structure. However, this is an objective view of technology, which represents technological innovations as unchanging and static within the framework of a particular study. People adopt and even change features of the technology according to their needs and interests, but the basic technological structure is determined by the designers of the artefact. AST focuses on the importance of the ability of individuals to appropriate features of technologies in relation to their interactions. While useful in capturing the importance of agency in shaping the situated use of technology, the notion of appropriation frames human action in terms of interaction with the structures embedded within a particular technology (Orlikowski, 2000, Pentland and Feldman, 2007).

Finally, DeSanctis and Poole adopted a positivist epistemological approach to develop their theory, drawing on observations of a small group using a group decision support system (GDSS) and developing hypotheses about advanced information technology (AIT) appropriation. That is opposed to the approach that Orlikowski (2000) used in the development of her structurational model of technology-in-practice, which is the approach adopted by the researcher in this study. The most important aspects of AST as well as its weaknesses are presented in table 4.2.

Aspects of AST	Weaknesses
• Structures are embedded within the technology • Social structures emerge through the interaction between technologies and human agents • The notion of appropriation, actors appropriate features of the technology through their interaction with it	• Objective ontology. Technology is conceptualized as relatively static and unchanging. Structures are embodied within the technology • Positivist epistemological approach • Human action is limited in terms of interaction with the structures that are embedded within the technology

Table 4.2: Aspects of "adaptive structuration theory" and areas for improvement

4.6 Structurational model of technology: the duality of technology

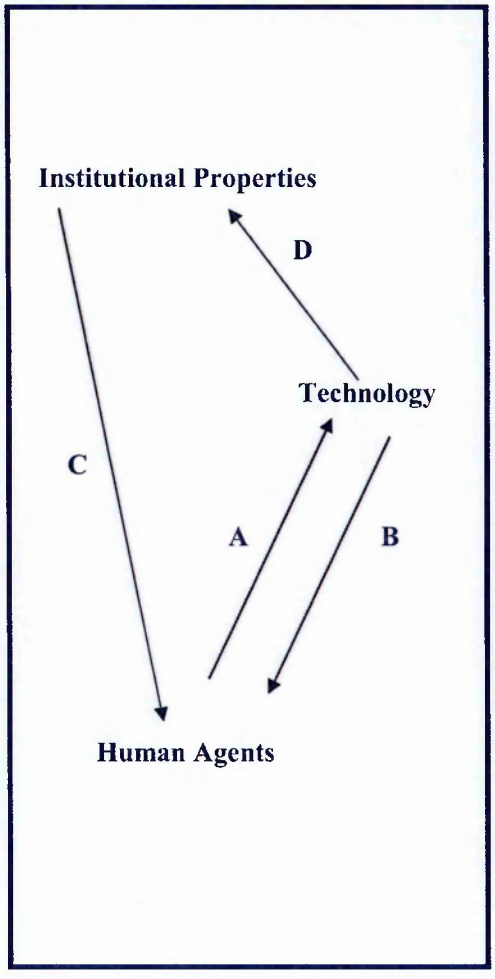
Like DeSanctis and Poole (1994), Orlikowski (1992a) places technology centrally within the process of structuration. She argues that technology is created and modified by human action, while it is also deployed by humans to accomplish their work. She calls this recursive relationship as the duality of technology. In this view, technology is the social product of subjective human action that takes place within a structural and cultural context, and simultaneously it is an objective set of rules and resources which facilitate and constrain human action, contributing thereby to the creation, recreation and transformation of this context. However, she states that, once developed and appropriated by agents, technology becomes institutionalized.

As in "structuration theory", human action is always knowledgeable and reflexive, although it may have intended or unintended consequences. The adoption, for example, of an electronic mail system for increasing communication and information sharing may have the unintended consequence of reducing status barriers and social context cues (Sproull and Kiesler, 1986). In addition, human action using technology not only has an effect on local conditions, but also on the environment in which the agents are situated. Other organizations may adopt similar practices and a new structure may become part of people's activities in a macro level (Orlikowski, 1992a).

A second premise in Orlikowski's theory is the notion of interpretive flexibility, which refers to the degree to which users of a particular technology participate in its constitution during development or use. The interpretive flexibility operates in two modes of interaction: the design mode and the use mode. The former refers to the interpretive schemes, resources and norms embodied in the technology by its designers, while the latter to the shared meanings that users attach to the technology, which influence the appropriation of the modalities designed into the technology. Moreover, the interpretive flexibility is influenced by the material features of the artefact, agents' experience and contextual characteristics. In their engagement with a technology, users interpret, appropriate and modify it in various ways due to a number of individual and social factors. However, the factors influencing a technology reveal that interpretive flexibility is not infinite. That is, it is constrained by the features of the technology and the institutional structures of signification, domination and legitimation that exist in a given context (Orlikowski, 1992a).

The structuration of technology is influenced by actors' interpretations of their work, the organization, the technology, their access to organizational and technological resources, and the norms that guide action in their social contexts (Orlikowski et al., 1995). This model highlights four key elements that continuously and simultaneously influence the interaction between technology and organizations (fig.4.1):

1. Technology is the product of human action (arrow A)
2. Technology is the medium of human action (arrow B)
3. The institutional conditions of interaction with technologies (arrow C)
4. The institutional consequences of interaction with technologies (arrow D)



Arrow	Type of Influence	Nature of Influence
A	Information technology as a product of human action	Information technology is an outcome of such human action as design and development, appropriation and modification
B	Information technology a o medium of human action	Information technology facilitates and constrains human action through the provision of interpretive schemes facilities and norms
C	Conditions of interaction with information technology	Institutional properties influence humans in their interaction with information technology, such as, intentions, design standards, professional norms, state of the art in materials and knowledge, and available resources (time, money, skills)
D	Consequences of interaction with information technology	Interaction with information technology influences the institutional properties of an organization, through reinforcing or transforming the systems of signification, domination , and legitimation

Fig 4.1: The structurational model of the duality of technology (Orlikowski, 1992a, p.410)

As it is shown in figure 4.1, users draw on institutional properties, such as work procedures, to use the technological features available to them in order to accomplish a particular task. In doing so, they appropriate them and create a set of social practices, which reinforce, adjust or transform the existing institutional properties. The first component represents technology as the product of human action. This means that it would reflect the objectives of its designers, as well as that it has to be used by human agents in order to have any effect. The second element, that is, technology is the medium of human action, implies that technology, once used, mediates users' activities in an organizational context by enabling some and constraining other. The third component reflects the influence that institutional properties exert upon humans when they interact with a technology. While interacting with technological innovations, people are influenced by the values, interests, culture and other organizational forces that surround them. In turn, they use the existing stocks of knowledge, resources and norms that reflect the organization's structures of signification, domination and legitimation. As a result of this interaction, fourth element, humans either choose to sustain the institutional structures of an organization or decide to change them (Orlikowski, 1992a, Orlikowski and Robey, 1991).

While it employed subjective epistemological methods – ethnographic techniques - for studying technology, such as interviews and observation of participants as they were interacting with the Computer-Aided Software Engineering (CASE) technology, the model of the duality of structure, like AST, adopts an objective view of technology. It refers to structures embedded within a technology that are then appropriated by users as they interact with them. Orlikowski (1992a, p.410) notes that:

"*Human agents build into technology certain interpretive schemes (rules reflecting knowledge of the work being automated), certain facilities (resources to accomplish that work), and certain norms (rules that define the organizationally sanctioned way of executing that work)*".

However, this conceptualization of technology is problematic for two reasons. First, it depicts technologies as relatively static and unchanging with fixed structures that are available to users; and second, situating structures within technologies is a departure from Giddens' theory that refers to structures as having only a virtual reality, "structure in mind", that is given shape only when it is "*instantiated in activity*"

(Whittington, 1992, p.696). In Giddens' (1989, p.256) theory "*structure is what gives form and shape to social life but is not itself that form and shape...because structure exists only in and through the activities of human agents*".

Furthermore, as in AST, human action associated with embedding structures within a technology during its design, as well with appropriating those structures during its use, is central to this theory. While useful in explaining various outcomes associated with the use of technologies in different contexts, the notions of embodied structure and user appropriation are less effective in explaining ongoing change in both technologies and their use. The solution to this problem is provided by Orlikowski's (2000) model of technology-in-practice. Orlikowski (2000) substitutes the notion of embodied structures with that of emergent structures and the notion of appropriation with that of enactment of technologies-in-practice which are the themes of the following section. The most important aspects of Orlikowski's (1992a) model of the duality of technology as well as its weaknesses are presented in table 4.3.

Aspects of the duality of technology	Weaknesses
• Structures are embedded within the technology. Technology as an objective set of rules and resources	• Objective, static view of technology • Departure of Giddens' conceptualization of structure as having only virtual reality
• Design mode: interpretive schemes, resources and norms embodied within the technology by its designers • Use mode: shared meanings that users attach to the technology, which influence the appropriation of the structures embodied within the technology	• The notions of embodied structures and user appropriation are not effective in explaining ongoing change in both technologies and their use

Table 4.3: Aspects of the model of the duality of technology and areas for improvement

4.7 The structurational model of technology-in-practice

In the structurational model proposed by Orlikowski (1992a) as well as in "adaptive structuration theory", elements of technology that have been built within the technology are external to human action. The properties of a given technology do not constitute rules and resources and as such, they cannot be considered to be structures.

It is only when they are recursively used that those elements become structures, rules and resources applied in the constitution of a particular social practice. For instance, software packages or data files installed on people's PCs are potential structural elements until they are actually used in their ingoing activity (Orlikowski, 2000). In structurational terms, rules and resources exist only "*in and through the activities of human agents*"; and as Taylor (1993, p.57-58) puts it:

"*In its operation, the rule exists in the practice it "guides"...the practice not only fulfils the rules, but also gives it concrete shape in particular situations...In fact, what this reciprocity shows is that the "rule" lies essentially in the practice. The rule is what is animating the practice at any given time, not some formulation behind it, inscribed in our thoughts or our brains or our genes or whatever. That is why the rule is, at any given time, what the practice has made it*".

Therefore, while it seems that technologies encompass some material properties, they do not embody structures since structures only exist in practice. Structuration occurs as people recursively interact with the properties of a technology, producing and reproducing, through the resulting social practice, a particular structure of technology use. Hence, according to Orlikowski (2000), structures of technology are not embodied within the technology, but rather they emerge as people repeatedly interact with specific properties of the technology and thus they shape the set of rules and resources that in turn are used to shape their interaction.

In addition, AST and the structurational model of technology proposed by Orlikowski (1992a) suggest that agents in their ongoing activity appropriate the structures embedded within technologies. While useful in pointing out the importance of human action in influencing the situated use of technology, the notion of appropriation frames human agency in terms of interaction with structures that are embodied within a particular technology. However, instead of adopting as starting point the technology and then examining how people appropriate its embedded structures, the theory of technology-in-practice starts with human action and the way in which it enacts emergent structures through recurrent interaction with a technology. The notion of enactment emphasizes that while users use technologies as they are designed, they can also depart from those prescribed ways by either ignoring specific properties of the technology or inventing new ones that are not anticipated and might not agree with designers' expectations. For example, many people use Microsoft or similar office

programs in their daily lives. However, they do not use all the "properties" of the program. Some utilize 5%, others 10%, at best 25% of their functionality according to their needs, ignoring the rest (Orlikowski, 2000).

The notions of emergent structure and enactment offer a useful extension to previous structurational models of technology. Humans enact structures in their recurrent use of technology. Through such use of a given technology, people recursively enact a set of rules and resources which structures their ongoing interaction with a given technology. Users in their recurrent practices shape the technology structure which in turn shapes their use. Technologies in this way are not static, unchanging artefacts with external structures, but rather virtual, emergent, enacted structures that Orlikowski (2000) calls technologies-in-practice. The following section discusses the methodological implications of this model for the conceptualization of technology.

4.7.1 Technology as an artefact and use

The model of technology-in-practice recognizes that, when it comes to the analysis, there are two distinct aspects of technology: the technology as artefact and technology-in-use. The former refers to what the technology is as a specific device, technique, appliance or gadget, which has material and cultural properties chosen by its designer. The latter refers to the specific structures routinely enacted as people use the specific device, technique, appliance or gadget in their ongoing activity in specific contexts. Users might decide not to use a technology and in this case no structures are enacted since the technology is not applied in any recurrent social practice. Furthermore, even if they choose to use it, they might do so in ways not anticipated by its designers. Users sometimes work around or modify the properties of a technological innovation, thereby shaping the artefact to fit their needs or interests (Orlikowski, 2000).

Therefore, it seems that technologies, like routines, have an "ostensive" aspect and a performative aspect, which determines how the artefact will be used, contributing in this way to both organizational stability and change. According to Orlikowski (2000), the enactment of a technology-in-use may take different forms which range from inertia, where technology is used as a medium of maintaining the existing practices, to change, where technology is used in order to change the existing ways of accomplishing tasks. Technologies come with a set of properties, but how these

properties are going to be used depends on what users do with them in their ongoing activity and how they interpret the properties and functionality of a technology. However, the uses of a particular technology are not infinite, and there are always boundaries on how people use them. Orlikowski (2000) argues that the larger the system within which an artefact is being used, the narrower the range of alternative uses available to actors. The following section presents structuration process of technology-in-practice.

4.7.2 The structuration of technology-in-practice

Giddens (1984) argued that human agents draw on their stock of knowledge, the facilities available to them and the norms that inform their ongoing activity to recursively produce and reproduce the structural properties, rules and resources, that structure their social action (fig.4.2).

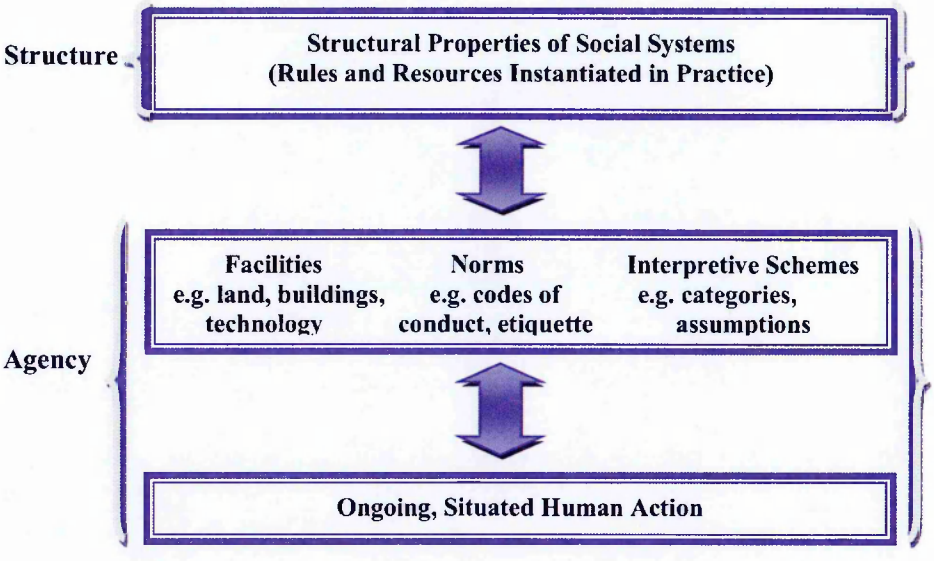


Fig. 4.2: Enactment of structures in practice (Orlikowski, 2000)

Orlikowski (2000) adopted Giddens' notion of structure (fig.4.3). When people use a technology, they draw on the properties comprising that technology, its material characteristics and functionality inscribed by its designers, as well as the properties added on by users through previous interactions. In addition, they use their knowledge, skills, power, assumptions and expectations about the technology and its function, influenced by communication, training methods and previous iterations with

the technology (Orlikowski and Gass, 1994). People's use of technology becomes structured by these experiences, meanings, knowledge, power relations, norms and the characteristics of the technology itself. In this way, agents enact a set of rules and resources in practice that is then used to structure their future interactions with the technology in their recurrent activities. As it is shown in figure 4.3, people's recurrent interaction with technology enacts other social structures along with the technology-in-practice (Orlikowski, 2000).

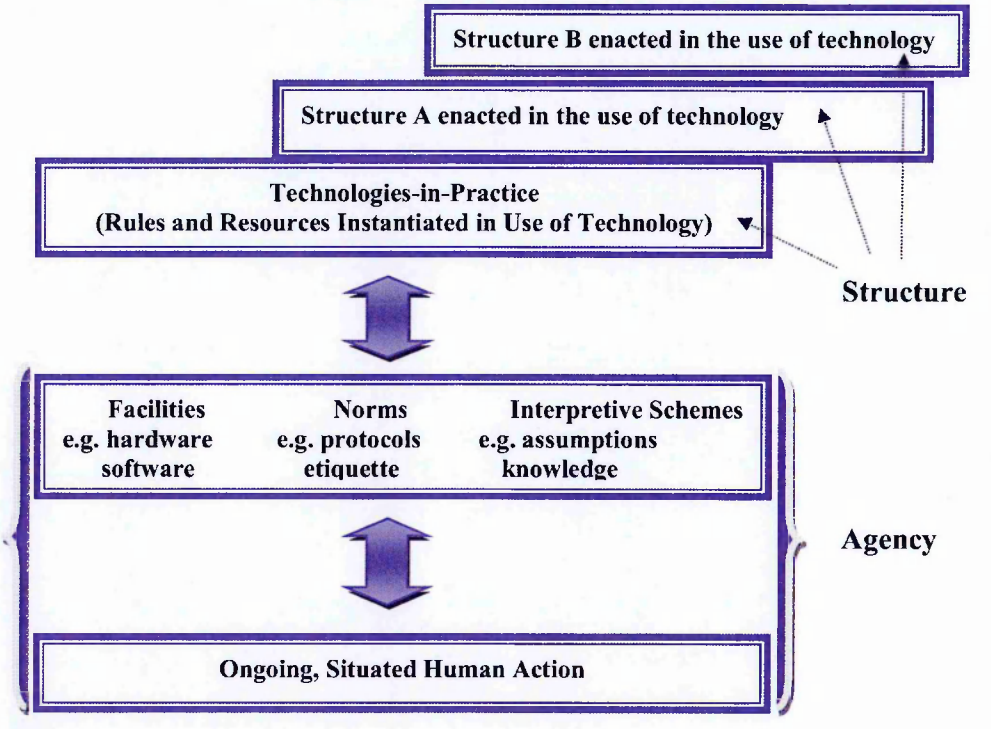


Fig. 4.3: Enactment of technologies-in-practice (Orlikowski, 2000)

People either reinforce or transform the structures that have been enacted in an organizational context over time. As humans' experience changes in awareness, knowledge, power or the technology, they act and change the technologies-in-practice. As agents change the technologies-in-practice, they simultaneously change the facilities, norms and interpretive schemes adopted in their use of the technology (fig.4.3). Modifications in the use of a given technology might bring changes in other organizational structures and, if these changes are maintained over time, then significant changes in those organizational structures might emerge. In contrast to other structurational perspectives, this model recognizes that, although technologies-

in-practice may become institutionalized – routines - over time, there is always the possibility of a different structure being enacted through recurrent human action. According to the consequences associated with the enactment of a technology-in-practice, a wide range of outcomes can be produced, which vary from noticeable stability to significant change either on the technology or on the work practices and structures around the technology (Orlikowski, 2000). The most important aspects of this theory in comparison with the aspects of the other structurational models of technology are summarized in table 4.4.

Technology-in-practice	**AST and structurational model of the duality of technology**
• Technologies embody material properties. Structures are not embodied within the technologies but they emerge only in practice (emergent structures)	• Structures are embedded within a technology. Human agency is external to those structures (embodied structures)
• Starting point is human action and the way in which it enacts emergent structures through recurrent interaction with a technology (enactment)	• Starting point is the structures within the technologies and then how agents appropriate those structures (appropriation)
• Two aspects of technology: technology as an artefact with material features and technology-in-use	• Technologies embed structures, structural features and spirit, which together form their structural potential
• Enactment of technologies-in-practice	• Appropriation of technological structures
• Technologies cannot be stabilized. There is always a possibility of a different structure being enacted through agency	• Structures become institutionalized over time
• Interpretive epistemology/ontology	• They both adopt an objective view of technology. AST is also based on objective epistemology

Table 4.4: Technology-in-practice, AST and the structurational model of the duality of technology: main aspects and differences

4.8 Summary

This study adopts a subjective approach in order to better understand and analyse the dynamic relationship between technology and organizational structures. The model of technology-in-practice seems to be the most appropriate theory for studying the use of technology in organizations. Prior structurational approaches on technology, such as "adaptive structuration theory" and the theory of the duality of technology, have conceptualized technology in an objective way, which has resulted in seeing it as relatively static, monolithic and unchanging. However, this is not the case. Designers do embed material characteristics in the technology that define who may use it and how, but users might choose to do otherwise and use the technology in anticipated ways to serve their own interests that may result in changes to existing social structures and enactment of new ones. It should not be neglected that users evaluate technologies, adapt them to their own needs and translate them for their own purposes (Graham, 2001). Technologies are neither fixed nor unchanging. In contrast, they embody material features that change as users recursively interact with them in a specific context and time. Structures emerge in and through the activity of human agents; that is, they are technologies-in-practice.

CHAPTER V

5. The Electronic Patient Records (EPR) System

5.1 Introduction

Around 1990 it was clear that telecommunications, computers and IT in general had developed much. Modern medicine, assisted by the latest technological achievements, may help to deal with many diseases more quickly and effectively. Nowadays, computer science tools, such as software programs and ICT systems, actively support the daily work that is performed in a health care setting (Sierdzinski and Karpinski, 2003). The introduction of Electronic Patient Records (EPR) systems was – and is - an important aim of many health systems across the developed world. Health care organizations using EPR systems improve their ability in both medical and administrative aspects. This chapter introduces and describes the Electronic Patient Records system emphasizing its major benefits and the risks involved in the use of the technology. Moreover, it draws on the literature to capture the most important reasons for individuals' resistance to use the system. Finally, it presents the differences between the traditional paper-based system and the electronic system, and focuses on the changes that are induced in the work practices and professional roles within a health care setting due to a transition from paper-based to electronic records system.

5.2 Defining Electronic Patient Records (EPR)

The first known health record was developed by the ancient Greek physician Hippocrates in the fifth century B.C., with the goal to record and accurately reflect the course of disease as well as indicate the cause of disease (Greene et al., 2005). Ever after, multiple terms have been used to define Electronic Patient Records (EPR), such as Electronic Health Records (EHR) or Electronic Medical Records (EMR), but, for most users, they all have the same meaning (Waegemann, 2002). However, a significant difference between EMR and EHR is that the former is used within a single organization, while the latter conforms to nationally established interoperability standards and includes health records that can be created, managed, and consulted by

authorized clinicians and staff across more than one health care organization (NAHIT, 2008).

According to the European Commission Recommendation (2008, p.13), an EPR is defined as *"a comprehensive medical record or similar documentation of the past and present physical and mental state of health of an individual in electronic form, and providing for ready availability of these data for medical treatment and other closely related purposes"*. In addition, the National Centre for Research Resources (2006, p.1) of the National Institutes of Health (NIH) in the United States, using the Health Information Management Systems Society's (HIMSS) definition, states that an EHR is "*a longitudinal electronic record of patient information generated by one or more encounters in any care delivery setting. Included in this information are patient demographics, progress notes, problems, medications, vital signs, past medical history, immunizations, laboratory data, and radiology reports*". Therefore, EPR is an electronic set of medical and demographic records containing data on a single patient with a list of entries about the individual's medical health (Hassey et al., 2001).

5.3 Components of an Electronic Patient Records system

Electronic Patient Records (EPR) system is a technology specifically designed to provide detailed and accurate information about patients electronically. It is a system for recording, retrieving and manipulating information in electronic health records (European Commission Recommendation, 2008). In order to work with the EPR, the potential user has to log into the system's database and search it by typing a keyword on the web browser. This may be the name of a patient, a date of birth, a medical condition, a drug and so on. Depending on the search objectives, the results that someone gets may vary. Once a patient is identified, the user is able to read their record and see their health status / problems, add a new diagnosis without having to record from the beginning the patient's demographic data, enter new information into their record, such as diagnostic tests or laboratory results, and so on (Sierdzinski and Karpinski, 2003). A typical example of an electronic health record is presented in figure 5.1.

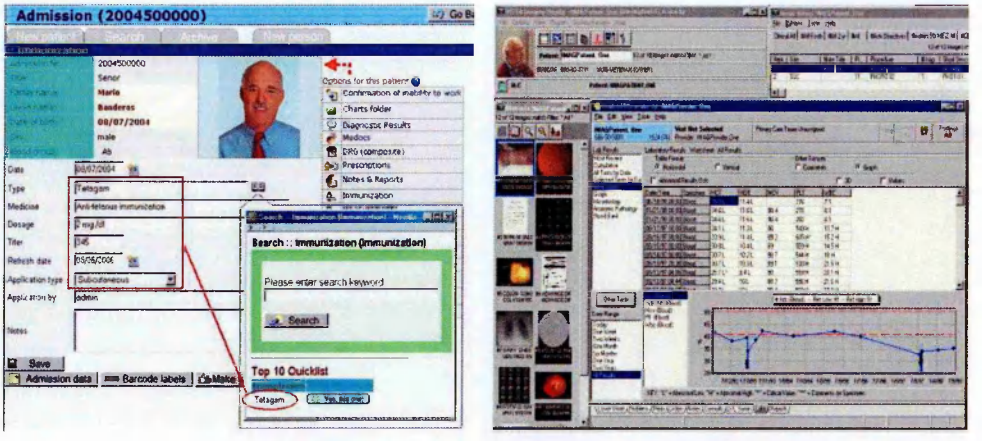


Fig. 5.1: Components of an EPR: demographics, immunization, document links (left) and diagnostic results and images (right) http://en.wikipedia.org/wiki/Electronic_health_records

As it is shown in figure 5.1, developed EPR systems are designed to combine personal data (e.g. demographics, type of insurance), data supporting the clinician's work (e.g. diagnosis, immunization, case history), as well as data from the large ancillary services, such as laboratory (e.g. diagnostic tests), radiology (e.g. images), pharmacy (e.g. prescriptions) and other clinical care components (e.g. nursing plans, physician orders and medication administration records). Users can print daily and periodical reports regarding their patients without having to record the same data manually every time they need a report. At the administrative level, registration, billing, admissions, discharge and transfer data are the key components of the system. These data contain significant information for accurate patient identification and assessment, such as name, demographics, employment information and so on (NIH National Centre for Research Resources, 2006, Sierdzinski and Karpinski, 2003).

Once a patient is registered, they get a unique patient identifier (i.e. record number) which is the core of an EPR system. This links all clinical observations and notes, laboratory / diagnostic tests, radiology data and images, results reporting, drugs prescriptions and other procedures to the patient. By logging into the system and entering a patient's record number, the potential user can access a wide set of information regarding a patient's current medication, administration records, history, problem lists, flow sheets, discharge summaries, medical records abstracts and recent visits to health care providers (Burton et al., 2004). Figure 5.2 provides an example of

an electronic health record with information about demographics, patient history and family history, which was implemented recently in a rural health centre in Greece.

Fig. 5.2: Demographics (up left), patient history (up right, down left) and family history (down right) http://users.otenet.gr/~kyiteas7/ilektronikos_fakelos_asthenon.htm

Furthermore, an EPR system allows users to access a sub-set of more sophisticated data, such as notes from patient visits, diagnostic reports and images, allergies, guidelines for appropriate care, contact information for all persons caring for the patient and clinical decision support. An image of an EPR with information about medication, immunization, allergies and diagnostic test results is provided in figure 5.3. In addition, users can order electronically laboratory, radiology and pharmacy services. Therefore, the major functions of EPR systems are health information and data storage, order entry and management, results management, decision-making support, electronic communication among different health care professionals,

departments and organizations, patient management, reporting and administrative processing (Institute of Medicine, 2003, NIH National Centre for Research Resources, 2006, Sierdzinski and Karpinski, 2003).

Fig. 5.3: Medication, immunization, allergies (up), blood/urine test results (down) http://users.otenet.gr/~kyiteas7/ilektronikos_fakelos_asthenon.htm

This section provides information about the range of functions of EPR systems as found in the literature. However, the EPR system that is used in the Mitera Hospital is simpler and provides the authorized users with access to a limited set of functions which are designed to support particular routines. The system in the inpatient facilities of the Hospital provides an administrative tool for recording, storing and accessing personal, demographic and financial data as well as medication records, physician orders and diagnostic tests. It was designed and tailored to the needs of each department which is involved in the provision of care to inpatients in order to support the performance of specific organizational routines, such as a patient's registration,

admission, transfer and discharge, billing, ordering of drugs and diagnostic tests and blood test results reporting.

Information held on the EPR in the inpatient departments does not include medical data, such as diagnosis, case history and images. The system provides users with access to a limited dataset and does not support particular functions, such as access to radiology data and images, discharge summaries and flow sheets. In the outpatient departments, however, the EPR system provides the qualified users with access to a wide set of information regarding a patient's medical status. This includes a patient's diagnosis and history, medication, diagnostic test results, clinical findings and notes, allergic reactions and previous visits to the Hospital.

5.4 Benefits and risks associated with the use of EPR systems

The introduction of Electronic Patient Records systems was – and is - an important aim of many health care systems across the developed world. At the micro level, EPR technology has the potential to bring numerous and significant benefits to patients, health professionals and hospitals. Storing and sharing patient information electronically can reduce clinical errors, speed up communication among different users, departments and organizations, as well as assist doctors in diagnosis and treatment. Furthermore, it can make information more easily accessible to patients allowing them to have more control over their health records, reduce duplication and waste, improve the cost-effectiveness of health services by offering faster access to a patient's medical data and enhance the quality of health care audit and research (Aderibigbe et al., 2007, HC, 2007). Indeed, case studies on the use of an EPR system in Salford Royal Hospital have shown that the introduction of electronic health records led to significant improvements in the way that clinicians work (Connecting for Health, 2006).

At the macro level, EPR systems enable health professionals treating patients in a variety of settings across the European Union (EU) and any other countries with compatible ICT systems. Interoperability of Electronic Patient Records systems, which is the ability of two or more EPR systems to exchange both computer interpretable data and human interpretable information, facilitates access to patient records and enhances the quality of health care throughout the EU. This is accomplished by providing health professionals and patients with up-to-date clinical

data which are presented in logical groupings that any user can easily access. In this way, EPR systems enhance cross-border cooperation between providers, purchasers and regulators of health care services (Burton et al., 2004, European Commission Recommendation, 2008).

On the other hand, EPR technology brings new risks particularly to the privacy and safety of patients' health information, which might have a negative impact on individuals' personal and professional life. Keeping health records electronically increases the risk of exposure of patient health information to unauthorized parties. EPR systems provide access to data from many locations, increasing thus the possibility of a security breach. In addition, they allow access to much more data than was previously possible, rising the risk of damage caused by system misuse. System crashes are also particularly problematic, especially in inpatient care facilities, since doctors cannot know what medications they have to administer and what treatments are required. All these risks raise doubts that EPR systems will create "a new risk scenario" (European Commission Recommendation, 2008, European Data Protection Working Party, 2007, HC, 2007).

Furthermore, the use of EPR systems might have a negative impact on the doctor-patient relationship. Studies have shown that doctors using electronic records systems preferentially structure interviews in a way that facilitates data gathering and entry to the system rather than patients' own stories (Makoul et al., 2001, Patel et al., 2002). Health professionals using an EPR technology also engage in numerous computer-related behaviours that patients find disturbing (Ventres et al., 2006). In Callen's et al. (2005) study on the impact of EPR on doctor-patient relationship 27% of respondents mentioned that the computer distracted their doctor. Finally, computer-based records rely on structured, coded data. Structured data entry can subtly change the meaning of the coded item and, thus, constrain clinical language and communication between health care providers (Walsh, 2004). Communication errors cause twice as many deaths as inadequate clinical skills do (Coiera, 2000). Kay and Purves (1996) suggest that patients' narratives are at the heart of clinical decision making and they conclude that reducing the narratives to limited codes and weakly connected phrases may generate problems in patient's diagnosis and management. Table 5.1 summarizes the benefits and risks associated with the use of electronic patient records systems.

EPR Benefits	EPR Risks
• Clinical errors reduction • Faster communication • Better diagnosis/treatment • Information accessibility • Less duplicate records • Quality improvement • Cost effectiveness • Cross-border cooperation	• Privacy issues • Information safety • Security breach • System misuse • System crashes • Doctor-patient relationship • Coding problems: risks in clinical communication, patient's diagnosis and decision-making

Table 5.1: Benefits and risks associated with the use of EPR systems

5.5 Reasons for resistance

EPR system is a complex technology relating to both individual records and a sub-set of information that is transferable across sectors. Many studies have shown that EPR systems have positive impacts upon health outcomes (Fitzmaurice et al., 2002), physicians' prescribing practices (Teich et al., 2000), prescription errors reduction due to direct physician order entry and clinical decision support (Kaushal et al., 2003) and medication errors prevention in health care settings (Bates et al., 1998). Despite its appealing characteristics, however, a number of studies have found that users' resistance to some aspects of the EPR is still evident (Bates et al., 2003). An objective of this study is to capture the users' interpretations of the EPR in order to understand their actions and potential variations in the use of the system. Thus, it is particularly interested in studies exploring the reasons for agents' resistance to use the technology.

Goorman and Berg (2000) studied the mismatch between the EPR system and the actual work practices of health professionals. They concluded that some applications of the system have a standard, predetermined way for data entry which does not reflect the empirical view of health care work. Hartswood et al. (2003) argued that this mismatch is due to a limited understanding of clinicians' work practices and the system's unrealistic assumptions. Moreover, Miller and Sim (2004) interviewed EHR managers and physicians and found that the most important reason for resistance was the extra time that takes to physicians to learn how to use the system effectively in their daily routines. Users are often concerned with whether to use or not the system

because it might generate a large workload for practices, in particular for those who may have to add new data one by one (Greenhalgh et al., 2008).

Furthermore, physicians often feel that their role is to protect their patients' data rather than to pass it to third parties (e.g. government). Ethical and legal issues about whether or not patients understand their choices they are asked to make regarding their health information entry to the electronic system are very crucial from a clinician's viewpoint. Another barrier has been found to be the patients' unwillingness to see their medical data to be shared. Health records are very sensitive data and some patients often do not want to share certain information with doctors, nurses, administrators and so on, such as history of mental or sexually transmitted diseases. It should not be neglected that there are always security issues involved in the use of electronic health records. Last but not least, the introduction of an EPR system into a complex environment, such as hospitals, requires changes in the users' roles and relationships. For many individuals, this might be convenient, while for others not. There are always personal interests involved in a decision for resistance (Burton et al., 2004, Greenhalgh et al., 2008). The main reasons for an individual's decision to resist to the use of an EPR system are presented below (table 5.2).

Reasons for resistance to the use of EPR systems
• System's incompatibility with clinicians' work
• Time-consuming
• Increase in workload
• Data protection / security issues
• Ethical and legal considerations
• Patients' unwillingness to share personal data
• Personal interests

Table 5.2: Main reasons for individuals' resistance to the use of EPR systems

5.6 Paper-based versus EPR system: changes in work practices

Medical records produce a series of well-defined narrative structures, which reflect and describe the work practices within a particular social organization. By reading a patient record, someone could easily understand the hierarchical structure of health care professionals, their daily tasks, responsibilities and the work which is performed

within the organization. Hence, it begins with a patient's admission, proceeds to a more precise diagnostic process, goes on to treatment and ends with the patient's discharge (Berg and Bowker, 1997). This research seeks to explore the impact of EPR implementation on the daily routines and professional roles operating within a health care setting. In order to do so, it is vital to draw on the literature and capture the most important differences between the two systems. This will shed light on the changes that the transition from paper-based to EPR systems induces in the everyday work practices and professional roles within a hospital (table 5.3).

Paper-based records are more user-friendly than computerized records. Using paper and pen is a familiar method for recording information and does not require any special training. In contrast to EPR, paper recording is quite flexible and users do not have to follow a specific structure for data entry. On the other hand, since the structuring of such records is personal, it might be difficult for another user to understand what is recorded. There is also increased possibility for errors, missing or inaccurate data. This affects the clinical decision-making process, since clinicians often struggle and sometimes fail to find specific data across a huge body of records. Indeed, Tang et al., (1994) studied 168 outpatient consultations and found that, while in 95% of the cases the medical record was available, data from the record were not found in 81% of these cases. Paper medical records can be cumbersome and difficult to search through, fragile to damage, used only for one task at a time, might be lying in different places and can consume a lot of space and time to request them (Coiera, 2003).

At the administrative level, using the paper-based system, administrators have to complete and store a form with information regarding a patient's registration, admission and discharge, as well as keep data about billing issues, appointment scheduling and results reporting. Patients and in particular individuals with chronic conditions visit the hospital more than once. As a result, administrators have to fill out new administrative forms each time a patient visits the hospital. This leads to multiple and duplicate administrative records which cause storage and security problems since it is difficult to keep track of a cluster of documents. These data contain significant information for accurate patient identification and assessment, such as name, demographics, employment information, and, keeping them into folders, increases the likelihood to be lost or stolen (Burton et al., 2004, Coiera, 2003).

With EPR systems, administrators have to log into the system's database, enter the patient's personal details and any other administrative information and, in the case of another visit or need for new data entry into the system, identify the patient by entering their record number. Hence, they can access a wide set of information regarding a patient's current administration records, history, problem lists, flow sheets, discharge summaries, and recent visits to health care providers. This process reduces human errors, the possibility for duplicate or lost records and saves both space and time. Furthermore, with paper health records, health care professionals have to write down manually notes, medical reports, guidelines for appropriate care, case history, initial and final diagnoses, prescriptions and so on. In addition, they have to request results of diagnostic tests and images from different departments and laboratories. With the introduction of EPR, health professionals have quick and easy access to such information facilitating hence clinical decision making (Burton et al., 2004, Greenhalgh et al., 2008, NIH National Centre for Research Resources, 2006).

The transition from paper-based to electronic system results in changes both in roles and responsibilities within a hospital. Scott et al. (2005) found that clinicians felt that they were turning to expensive order entry clerks. It also requires the recruitment of new staff. In addition, Berg and Bowker (1997) showed that, after the transition from paper-based to EPR system, nurses had to take up administrative responsibilities. They explained that denial to use the EPR system would result in further marginalization of the nursing profession.

Moreover, Aderibigbe et al. (2007) carried out a study at a London teaching hospital with the aim to investigate the extent to which EPR has supported or not the daily work practices of nurses. Nurses said that after the introduction of EPR could enact new work practices which facilitated the availability of information. Nurses could order tests and other medical data without waiting for authorization from a doctor. This led to unexpected changes in nurses' role, skills set and status, and formalized a lot of work practices. They felt more independent and they noticed that their working relationship with doctors has changed. They were not seen as subordinates anymore, but rather as colleagues. However, observations showed that, in practice, nurses did not use the technology as much as they claimed.

Changes	Paper-based records system	EPR system
Administration	• Manual data entry & storage • Duplication of records • Storage and security issues	• Electronic data entry/storage • No duplication problems, less space and time • New positions, changes in roles and responsibilities
Health Professionals Workflow and Roles	• Manually written medical documents (notes, diagnosis, case history, prescriptions, immunization etc.) • Time-consuming process for the request of results from diagnostic tests, images and so on between departments and medical/nursing staff • Cumbersome, missing, inaccurate and difficult to search through data	• All medical documents are written electronically • Quick and easy access to medical information, results from diagnostic tests, images • Changes in professional roles, status, skill sets and decision making process • Formalization of daily work practices • Faster communication between different health professionals & departments

Table 5.3: Changes in the work practices and professional roles due to the transition from paper-based to EPR systems

5.7 Summary

To sum up, EPR technologies are systems for recording, storing and retrieving information about patients. The implementation of Electronic Patient Records (EPR) systems has the potential to bring numerous and significant benefits to patients, health professionals and providers. It is commonplace, though, for several organizations to fail to assimilate new services, even those with demonstrable advantages. Health professionals often resist to the adoption of EPR systems for personal, technical, ethical and legal reasons. Moreover, patients often do not want to share certain information with health professionals and administrators. In addition, it seems that implementing EPR systems brings significant changes in both professional roles and work practices. Health professionals and administrators are expected to experience noticeable changes in their daily routines by adopting the new system. This also

results in changes in their roles, status and working relationships. However, agents always have the last word on whether or not to use the system. At the administrative level, the major changes are seen in health information and data storage, records management and time-saving. The decision to adopt and use an EPR system also brings changes in the communication across different departments in a health care setting and establishes new roles within the organization. In addition, medical and nursing staff can experience changes in their daily practices, such as medical data entry, patient management, decision-making support, communication with colleagues from different departments and test results reporting.

CHAPTER VI

6. Ontological and epistemological assumptions of the study

6.1 Introduction

Philosophy is the discipline that researchers, whether explicitly or implicitly, rely on in order to understand the meanings, logical relations and consequences of their theoretical or observational statements (Van de Ven, 2007). Different researchers adopt different ontological and epistemological positions and thus there are various ways to interpret the nature of the phenomena that people study and the methods for doing so. Good research requires making the assumptions about the nature of reality (ontology) and the best ways for understanding it (epistemology) explicit in the writing of a study (Creswell, 2007). This chapter presents the ontological and epistemological assumptions of the thesis. In doing so, it first defines '*ontology*' and '*epistemology*' and provides an overview of the dominant philosophical traditions in studying the use of technology in organizations. Then, it refers to the historical roots, ontological and epistemological assumptions of interpretivism, the philosophical approach adopted by the researcher, and closes with the rationale behind his choice to draw on this paradigm in order to address the research question and objectives.

6.2 Defining ontology and epistemology

Ontology refers to the assumptions that researchers make about the nature of the phenomenon under investigation, while epistemology represents a general set of assumptions about the best ways for understanding it (Van de Ven, 2007). Ontology is "*the study of being*" and is concerned with the nature of existence and thereby the structure of reality (Crotty, 1998, p.10). Blaikie (1993, p.6) defines ontology as "*the claims or assumptions that a particular approach to social enquiry makes about the nature of social reality*". The relationship between data and theory is an integral part of any scientific study. Failure to consider philosophical issues like this can seriously affect the quality of a particular research (Easterby-Smith et al., 2002). Before they start thinking about which research method is most appropriate to use, researchers have to make clear whether the phenomenon under study is assumed to be objective

and independent of human agents or subjective and hence exists only in and through human actions (Guba and Lincoln, 1994, Orlikowski and Baroudi, 1991).

Scientific research, whether quantitative or qualitative, is based on some underlying assumptions about what constitutes valid research and which methods are appropriate for a particular study. At the outset, thus, of a research design is very important to clarify what these assumptions are. Epistemology refers to the assumptions about what knowledge counts for and how it can be demonstrated (Mason, 2002). It is concerned with the nature of knowledge and in particular with what is regarded as acceptable knowledge in a discipline (Bryman, 2008). Epistemology provides "*a philosophical grounding for deciding what kinds of knowledge are possible and how we can assure that they are both adequate and legitimate*" (Maynard, 1994, p.10). Having an epistemological perspective is important in order to clarify issues of research design, such as the kind of data that is being gathered and how these data are going to be interpreted (Easterby-Smith et al., 2002). It helps researchers to generate knowledge and provide explanations about the ontological components of the social world. That is, ontological questions and epistemological answers / explanations should be consistent (Mason, 2002). The next section provides an overview of the prevailing paradigms in studying the use of information technology in organizations.

6.3 Dominant paradigms in studying the uptake of technology in organizations

A philosophical approach or paradigm or worldview is "*a basic set of beliefs that guide action*" (Guba, 1990, p.17), which includes three basic components: ontology, epistemology and methodology (Guba and Lincoln, 1994). Different researchers have adopted different philosophical approaches in order to study the uptake of technology in organizations. Based on the underlying research epistemology, Orlikowski and Baroudi (1991) identified three dominant perspectives in the Information Systems discipline: positivism, interpretivism and critical theory. The scope of this chapter is not to provide a thorough analysis of each paradigm. However, it is useful to describe the basic aspects of each tradition in order to understand and explain the reasons for adopting or rejecting a particular paradigm.

The first approach, positivism, shares the belief that social reality is objective and therefore independent of human activity. Organizations are seen to have a structure and reality beyond the actions of human actors. The epistemological belief of this

paradigm is that such knowledge can be demonstrated by the empirical testability of theories (hypothesis-testing), whether this requires theories to be verified (positivism) or falsified (post-positivism). In their attempt to identify causal relationships, positivist researchers usually adopt quantitative data collection techniques, such as sample surveys and controlled experiments. However, this approach limits our understanding on the role of human agents in shaping the technology use since it implies that people are not active makers of their social reality (Guba and Lincoln,, 1994, Orlikowski and Baroudi, 1991, Walsham, 1995).

In contrast to the positivist view, interpretivism holds that reality is the product of subjective human action and emphasizes the importance of subjective meanings in the process through which actors enact and re-enact their world. According to this tradition, social reality is understood to be produced and reproduced through the actions and interaction of human actors. Therefore, organizations cannot be measured in an objective way, since they do not exist apart of their members. This approach attempts to understand social phenomena through the meanings that people assign to them. Hence interpretive knowledge is generated through direct encounters with the participants in their contexts. Researchers immerse themselves into the study's setting and examine human agents within their contexts. In doing so, they employ qualitative techniques, such as interviews and observation (Golafshani, 2003, Orlikowski and Baroudi, 1991, Walsham, 1995).

Finally, critical theory holds that social reality is historically constituted and is produced and reproduced by human beings. However, critical researchers also recognize that the ability of agents to change their social and economic circumstances is constrained by objective and external social, cultural and political forces which tend to dominate human experience. In other words, critical theorists believe that there are multiple realities, socially constructed reflecting power relations and thereby they are influenced by external forces (Greenhalgh et al., 2009). The epistemological belief of critical research is that knowledge is grounded in historical and social practices and that such knowledge can be known through the interaction between a particular investigator and a particular object or group. Hence, critical researchers adopt a dialogic / dialectical methodology to reconstruct previously held constructions with the subjects of the inquiry. In contrast to the interpretive approach, this tradition holds that interpretation of the social world is not enough and emphasizes the need for

understanding and critiquing the material conditions of domination. Although they avoid a deterministic (positivist) stance, critical researchers focus on the materiality of technology and perceive it as a "conditioning" element that defines an opportunity scope (de Vaujany, 2005, Guba and Lincoln, 1994, Orlikowski and Baroudi, 1991).

Greenhalgh et al. (2009) agreed that the aforementioned paradigms form the philosophical basis of most research approaches in EPR research, although they mentioned a fourth approach, which they called 'the integrative or recursive approach' inspired by the work of de Vaujany (2005). This sub-stream of research is based on Giddens' (1984) theory of structuration, which was an attempt to bridge the gap between positivist and interpretive views of reality. Structuration theory, though, neglects epistemology and methodology (Pozzebon and Pinsonneault, 2005), which are basic components of any paradigm (Guba and Lincoln, 1994), and as such it is not considered to be a philosophical approach. Table 6.1 presents the ontological, epistemological and methodological assumptions of positivism, interpretivism and critical theory and helps to understand the logic behind the choice of the researcher to adopt an interpretive approach to best address the research topic. A detailed analysis of this paradigm and the rationale for choosing it is provided in the following sections of this chapter. The next section refers to the historical roots of interpretivism.

	Positivism	**Interpretivism**	**Critical Theory**
Ontology	Single reality independent of human activity	Multiple realities, socially constructed	Multiple realities, socially constructed, influenced by external forces
Epistemology	Knowledge is objective and has a direct link to reality	Knowledge is subjective, context-dependent emerging from the researcher-participant interaction	Knowledge is subjective, value-laden and critical (how and why the social situation arose as it did)
Methodology	Quantitative methods help to verify or falsify hypotheses. It may include qualitative methods (observation)	The use of multiple qualitative methods helps to grasp the meanings and perspectives of the subjects of the study	Qualitative / dialectical in nature, requires a dialogue between the researcher and the participants to reconstruct previously held constructions

Table 6.1: Ontological, epistemological and methodological positions of positivism, interpretivism and critical theory

6.4 Historical roots of the interpretive paradigm

The interpretive research tradition is based on the epistemology of idealism and includes a number of research approaches, which have a central goal of seeking to understand the social world (Higgs, 2001). It is often linked to the idealist approaches of Wilhelm Dilthey (1833-1911) and Max Weber (1864-1920) who are concerned with the understanding (*Verstehen*) of human behaviour (Crotty, 1998). In contrast to the emphasis given by the positivist approach on the explanation of human behaviour, Weber emphasizes the interpretive understanding of social action and suggests that social inquiry should focus on the meanings and values of human agents (Bryman, 2008, Crotty, 1998). The focus is on the processes by which these meanings are created, modified, sustained and negotiated within a particular social context (Schwandt, 1994). The conceptualization of *verstehen* gave rise to different interpretations by different schools of thought which have influenced the interpretive tradition. The most important ontological and epistemological assumptions of interpretivism stem from the German intellectual tradition of hermeneutics, the phenomenological tradition and the social psychological theory of symbolic interactionism (Bryman, 2008, Crotty, 1998, Gray, 2004, Schwandt, 1994).

Hermeneutics is a theoretical tradition which focuses on understanding people and their actions (Sarantakos, 1998). Etymologically "*hermeneutics*" derives from the Greek word "*hermeneuein*", which means to interpret, understand and translate (Crotty, 1998). According to Taylor (1987) the activity of interpretation (*verstehen*) is analogous to the interpretation of text. From an ontological perspective, the hermeneutics tradition holds that all objects in the world exist through acts of interpretation and understanding, which enable humans to experience their world. The epistemological belief of this stream of thought is that everything that can be known is known through acts of interpretation (Thompson, 1990). Interpretive inquirers view reality as socially constructed and attempt to read or interpret the meaning of social action (Gray, 2004, Taylor, 1987). Therefore, this approach argues that interpretation should be given more standing than explanation or description and calls researchers to interpret the meaning of social actions in order to achieve a deeper level of knowledge and self-understanding (Gray, 2004).

Phenomenology is concerned with the way in which human agents make sense of their world (Bryman, 2008). It holds that any attempt to understand social reality has to be grounded in people's experiences of that reality (Gray, 2004), which should be studied from the point of view or perspective of the subject (Crotty, 1998). The first application of phenomenological ideas to the social sciences is attributed to the work of Alfred Schutz (1899-1959) who argued that social reality has a meaning for human agents and therefore human action is meaningful, which in turn means that people's actions are based on the meanings that they attach to their actions as well as the actions of others (Bryman, 2008). As a result, phenomenologists view human behaviour as an outcome of how humans interpret their world and in order to understand the meanings of an individual's behaviour "*the phenomenologist attempts to see things from that person's point of view*" (Bogdan and Taylor, 1975, p.13-14).

Symbolic interactionism, a theoretical tradition in sociology and psychology, has also been regarded as an influence on interpretivism. This tradition holds that human interaction is mediated through the process of meaning and interpretation (Gray, 2004). Drawing on the work of George Herbert Mead (1863-1931), Blumer (1969) claims that symbolic interactionism rests on three main principles. First, people act towards things on the basis of the meanings that these things have for them. Second, the meaning of such things arises from the process of social interaction. Third, these meanings are handled in, and modified through, an interpretive process used by people in dealing with the things they encounter. The latter implies that meanings are not fixed but are revised on the basis of experience (Gray, 2004). This tradition views individuals as acting and purposive agents who construct social reality (Blumer, 1969). Hence, epistemological terms, such as truth and meaning, are not expressions of relationships to which people are forced to respond, but they refer to the consequences of a purposeful action (Schwandt, 1994). The epistemological position of this approach requires active involvement of the researcher in the world of those being studied in order to observe what is happening, what people take into account and how they interpret it (Blumer, 1969).

The emphasis given by the hermeneutic and phenomenological tradition as well as the symbolic interactionism approach on social actions as being meaningful to human beings and thus needing to be interpreted from their point of view contributed to a stream of thought that is referred to as interpretivism (Bryman, 2008). The section

below refers to the ontological and epistemological assumptions of the interpretive paradigm, which is the philosophical approach adopted by the researcher in order to explore how routines change when a new technology is implemented in a health care setting and how the technology is changed by the existing routines surrounding its use with the aim of illuminating the role of human agents in implementing and using information technologies in health care organizations.

6.5 Basic beliefs of the interpretive paradigm

Interpretivism (often also referred to as constructivism) "*entails an ontology in which social reality is regarded as the product of processes by which social actors together negotiate the meanings for actions and situations*" (Blaikie, 1993, p.96). It asserts that social reality is not external to human beings, but it is socially constructed in and through the ongoing interaction of social actors (Sarantakos, 1998). This paradigm emphasizes the importance of subjective meanings and interpretations in the process through which diverse people construct and reconstruct their reality (Morgan, 1983). That is, reality is not objective but it is what people see it to be (Hughes, 1990). The underlying assumption of an interpretive researcher is that individuals act towards things on the basis of the meanings that they attach to them, and these meanings arise out of social interaction through an interpretive process (Boland, 1979).

Although interpretivism does not hold that reality is constructed by the powerful to serve their needs (as critical theory does) and therefore does not posit conflict as internal to social systems, it also recognizes that meanings are negotiated and hence that interpretations of reality may change as circumstances and objectives change (Orlikowski and Baroudi, 1991, Sarantakos, 1998). In this way, knowledge is both time - and context-dependent rather than objective and generalisable (Crotty, 1998). In addition, interpretivists assume that not only is reality subjective, but it is also multiple, since different agents tend to experience the same phenomenon in different ways and construct different meanings (Gray, 2004, Guba and Lincoln, 1994). That is, there are several versions of reality, as there are several interpretations of it.

Interpretivism is the view that "*all knowledge and therefore all meaningful reality as such, is contingent upon human practices, being constructed in and out of interaction between human beings and their world, and developed and transmitted within an essentially social context*" (Crotty, 1998, p.42). Hence, the interpretive approach is

based on the epistemological belief that in order to understand social process researchers have to get inside the world of those generating it (Rosen, 1991). The use of language to describe social practices is seen very important in the constitution of these practices and thus understanding social reality requires interpretation of how practices and meanings are created and informed by the language and tacit norms shared by agents in a particular setting (Orlikowski and Baroudi, 1991).

Valid interpretive knowledge emerges through the interaction between the researcher and the participants within their social settings (Creswell, 2007). The purpose of this type of research is to interpret and understand the actors' reasons for social action and their subjective meanings of such action (Sarantakos, 1998). Such interpretation is never value-neutral and hence researchers acknowledge that their prior assumptions, values, beliefs and experiences shape their investigation (Creswell, 2007, Guba and Lincoln, 1994). In order to understand people's meanings, experiences, actions and interpretations, interpretive researchers "*watch, listen, ask, record and examine*" (Schwandt, 1994, p.119) and therefore they employ a variety of qualitative methods for data collection and analysis, such as unstructured or semi-structured interviews, document review, on-site and participant observation, content and thematic analysis as well as grounded theory (Golafshani, 2003, Gray, 2004, Greene, 1994, Mingers, 2003). The next section provides the logic behind the choice of the researcher to draw on the interpretive paradigm in order to address the research questions of this study.

6.6 Rationale for choosing the interpretive paradigm for this research

A researcher's choice of a particular paradigm depends on the research question and the nature of the phenomenon of interest (Orlikowski and Baroudi, 1991). That is, researchers draw on the paradigm that best describes their viewpoint regarding the nature of the world and the range of possible relationships between that world and its parts and represents the optimal way to address the research questions as well as illuminate the phenomenon being studied (Guba and Lincoln, 1994, Morse, 1992). This thesis adopts an interpretive approach in order to explore the impact of the implementation of an EPR technology on the routines and structures that exist in a health care setting. Seeing the world from a subjective, socially constructed viewpoint is in line with the aim of the study to explore the role of human agents in implementing, using and shaping new technologies in health care organizations.

In doing so, this study aims to understand the agents' reasons for social action and the way in which they construct and reconstruct their world by attaching meanings to their actions (Sarantakos, 1998). The purpose of this study contrasts with the aim of positivism to explain and ultimately predict and control human phenomena. Human behaviour, unlike that of physical objects, is not governed by external laws, but it rather emerges as a result of social interaction and can only be understood with a reference to the meanings and purposes that people attach to their activities (Guba and Lincoln, 1994).

The ontological belief of the researcher is that the use of information technology by different agents and the enactment, preservation or transformation of work practices and structures is not an objective phenomenon. In other words, there is no single truth about the use of technology in organizations, but different individuals have different interpretations of what a particular technology stands for and how it should be used in particular settings. Since different people experience the same phenomenon (i.e. technology implementation and use) in different ways, multiple realities (i.e. routines, structures) are likely to be constructed. The latter implies that the use of a positivist, post-positivist or critical theory approach for the purpose of this study would be problematic, since all these approaches assume the existence of a single reality, whether perfectly (positivism), imperfectly (post-positivism) or historically (critical theory) apprehended.

In addition, positivism and post-positivism focus on efforts to verify or falsify a priory set of hypotheses that are stated as quantitative propositions or propositions that can be easily converted into mathematical formulas. Such approaches are extremely useful when the aim of inquiry is the control of natural phenomena. However, the focus on selected subsets of variables diverts attention from other contextual factors that – if allowed to exert their effects – might change the findings of the research. The qualitative nature of interpretive research helps to address this problem by providing contextual information (Guba and Lincoln, 1994). Technology use and work transformation are context-dependent phenomena. Interpretive research attempts to understand the context of the technology under study and the process through which this technology influences and is influenced by the context (Walsham, 1993). Adopting an interpretive approach is appropriate for understanding human action and users' interpretation in an organizational context (Klein and Myers, 1999) and for the

purposes of this study contributes to the understanding of EPR implementation as a social process unfolding in the interaction between the technology, the users and the organizational context in which this technology is introduced (Walsham, 1993).

Mason (2002) suggests that ontological questions and epistemological propositions should be consistent. That is, the answer that is given to the ontological question constrains the answer given to the epistemological question. This study adopts an interpretive epistemological approach. An interpretive epistemology is based on the assumption that knowledge is created in the interaction between the researcher and the respondents. In contrast, positivism assumes that the inquirer and the "object" of the study are independent entities that do not influence each other (Guba and Lincoln, 1994). However, unlike physical objects, people cannot be observed and studied in an objective way (Shotter, 1984) and interaction is required to arrive at more informed constructions. A constructivist epistemological approach is in line with the study's ontological position of multiple, subjective realities and the aim of the thesis to explore how different people interact with the technology as well as how routines are performed by different agents across different parts of the organization.

In addition, an interpretive epistemology was considered appropriate because it is in concert with the information systems (as technology-in-practice) research tradition which is highly concerned with how social structures recursively shape and are shaped by human agency and focuses on the role of technology in this process. Kuhn (1962) argued that science is conducted according to a set of conceptual (what counts as a legitimate research problem), theoretical (how are the objects of the research relate to one another and to the world), methodological (ways of investigating the research problem) and instrumental (methods to be used by researchers) standards that are considered acceptable and legitimate by those working in a particular field, but they are not universally accepted.

Researchers in the information systems as technology-in-practice field of research draw on the work of scholars who applied the theory of structuration to the study of technology in organizations (e.g. Orlikowski, 2000). This group of researchers assume the existence of multiple realities, adopt an interpretive epistemological approach and use qualitative methods and methodology to best address their research question(s) and objectives (Greenhalgh et al., 2009). For instance, Østerlund (2004) drawing on an interpretive epistemology conducted a multi-sited ethnographic study using a

participant-observation technique to explore how doctors and nurses use written and electronic documents to share knowledge within and across health care settings. In addition, Bar-Lev and Harrison (2005) based on the model of technology-in-practice (Orlikowski, 2000) conducted a case study research and employed interview and observation techniques to examine how health professionals seek to shape an EPR system to fit their work practices. Finally, Rodriguez and Pozzebon (2005) adopted a constructivist case study strategy (Stake, 2000) and used data collection methods that are associated with the interpretive approach, such as participant observation and document analysis to explore the influence of CIS managers in the decision to implement a clinical information system (CIS) in two multi-hospital centres.

Based on its subjective view of technology, this study aims to explore the relationship between organizational actors, the EPR system and the organization, as well as how this changes over time. In doing so, the researcher is interested in people's meanings and interpretations of the technology as well as their descriptions of the work practices that they produce and reproduce in and through their interactions and the interaction with the technology. In order to grasp this process the researcher has to get inside the world of those individuals, observe how they perform their work and how they interact with each other and the technology, ask them questions and listen to their answers. Adopting the interpretive paradigm allows the researcher to explore how people use the technology to preserve or transform their work practices and how their interpretations are constructed and influenced within the context in which this process takes place. Table 6.2 summarizes the reasons for adopting an interpretive approach.

Criteria
• The research question and objectives (focusing on understanding people's actions and interpretations of the technology and the routines surrounding its use)
• The researcher's ontological belief that there are multiple interpretations of technology and therefore different uses of it across different settings and between diverse actors
• Technology use and work transformation are context-dependent phenomena
• The epistemological belief that knowledge is generated in and through the interaction between the researcher and the respondents
• In line with the information systems as technology-in-practice field of research

Table 6.2: Rationale for adopting an interpretive approach

6.7 Summary

Different researchers adopt different ontological and epistemological perspectives in order to study the use of technology in organizations. Their choice is influenced by the research questions of the study and the way in which they see the world; that is, whether they view social reality to be single, objective and independent of human agency or multiple, subjective and socially constructed. Their philosophical stance, however, influences the way in which they conduct their research. As Crotty (1998, p.66) points out "*different ways of viewing the world shape different ways of researching the world*". Having an epistemological perspective is important in order to clarify issues of research design, such as the research methods employed to collect data, the kind of evidence that is being gathered and how it is going to be interpreted (Easterby-Smith et al., 2002). The researcher's ontological assumptions shape the epistemological position of the study, which in turn has an impact on the methodology and the choice of appropriate methods for investigating the phenomenon of interest. The latter is the theme of the next chapter, which refers to issues of methodology and the implications of the choice of the researcher to adopt the interpretive paradigm in order to explore the impact of the implementation and use of an EPR technology on the work practices and structures existing in a health care setting.

CHAPTER VII

7. Research methods and methodology

7.1 Introduction

Every type of empirical research must have a research design. A research design is the logical sequence that connects the empirical data to the study's initial set of research questions and ultimately to its conclusions. It guides the researcher to what questions to study, what data are relevant to these questions, what data to collect, how to analyse the resulting data and its main aim is to ensure that the emergent data address the initial research questions (Yin, 1994). Poole et al. (2000) argue that research propositions require the combination of a clearly defined theory with the appropriate methodology to the theory. Thus, at the beginning of the research journey, researchers should be clear about the nature of the phenomenon under investigation and the epistemological position of their research. These issues were addressed by the researcher in the previous chapter.

This chapter focuses on the remaining elements of the research design. It first refers to the topic that this research is concerned with, stating what the researcher intends to explore and what are the objectives of the study. It then looks at the research approach and strategy adopted by the researcher to address the research question and objectives. In addition, it provides the rationale behind the choice of the research context and the sample of the study, as well as the methods used for the collection and analysis of data. It then presents the unit of analysis of the study and refers to the quality criteria that shape any scientific inquiry. Finally, it closes with a reference to the ethical issues involved in the selection of participants and the collection, processing, analysis and reporting of data.

7.2 Aim and objectives of the study

The aim of this study is to explore the way in which routines change when a new EPR system is implemented in a health care setting as well as the way in which the technology is changed by the existing routines surrounding its use, with the aim of

illuminating and exploring the role of human agency in implementing and using new technologies in health care organizations.

The objectives of the study are:

4. To examine how the system was designed to be used and how it is used in practice in order to identify any variations in the use of the EPR system.
5. To compare and analyse different routines surrounding the use of the EPR system in order to explore how the enactment of the electronic documentation of patient information routine induced changes in other organizational routines.
6. To examine how different people use the EPR system across different departments in order to explore the role of human agents in using the technology and shaping it to fit their needs.

This research is organized in two stages in order to explore the impact of the implementation of new technology on the routines and structures that exist in a health care setting. The first stage is an exploratory project, which was conducted to help the researcher obtain a better understanding of how the EPR system was used within the Hospital and identify themes which would inform the wider study in the second stage. Some exploratory work is undertaken in any scientific inquiry, whether it serves as a guide for the formulation of hypotheses (quantitative research) or is a major part of the study (qualitative research). Exploratory studies in qualitative research are carried out in order to gather sufficient information about the topic of interest, explore its feasibility, familiarize the inquirer with the context of the study and help to generate ideas, views and opinions about the phenomenon under study, which will facilitate the construction of an effective research design (Sarantakos, 1998). For all the above reasons an exploratory study was considered important in the context of this thesis.

The researcher entered the research field with little knowledge about the phenomenon of interest. Hence, during the exploratory study, he attempted to collect as rich information as possible regarding the EPR technology and the system of practice within which it was introduced, the impact of the EPR implementation on the structures, organizational routines and professional roles existing within the Hospital and the users' interpretations of the EPR system, which would serve the overall aim of the study to explore the dynamic relationship between the EPR technology and the

organizational routines surrounding its use as well as the role of human agents in implementing and using new information systems in health care settings.

The formulation of the objectives of the exploratory study was based on the theoretical framework which was described in chapter four and served as a guide for the structure of the exploratory study's interview schedule (appendix 1). As previously mentioned, the purpose of the first stage of this research was to gather sufficient information regarding the EPR system, the work practices surrounding its use, the routines surrounding the previous system as well as the role of each member of staff with regards to the documentation of patient information before and after the implementation of the new technology, which would help the researcher to obtain a better understanding of the research topic, familiarize himself with the research context and plan the second stage of the study. As a result, the main topics of the interview schedule reflect the objectives of the exploratory study. The output of this study was the development of themes which informed the second stage of this research. Table 7.1 provides a summary of the interview schedule of the first stage of the study.

Topics
1. System of practice in the pre-EPR era
• Role description in the pre-EPR era
• Description of the work practices surrounding the paper-based patient records system
• Views before the implementation of the EPR system
2. Impact of EPR implementation
• Views during and after the implementation of the EPR system
• The impact of change on the roles within the hospital
• Changes in the work practices after the implementation of the EPR system
3. Users' interpretation of the EPR implementation
• Interpretation of the new system (reasons of implementation, impact on staff / patients)
• Description of the functions of the EPR system (scope for improvement)

Table 7.1: Interview schedule summary (exploratory study)

The main study's interview schedule (appendix 2) was also based on Orlikowski's (2000) model of technology-in-practice and its topics reflect the research question and objectives. Table 7.2 lists the main topics of the interview schedule of the main study.

Topics
1. Technology as an artefact and technology-in-use
• The EPR system as an artefact (EPR functions, design, written guidelines, training)
• The EPR system as technology-in-practice (use of the EPR system)
2. The impact of the enactment of the information documentation routine on other organizational routines
• Information documentation routine as technology-in-practice (patient data recording using the EPR system, differences between the new and the old system, the role of staff)
• The impact of the enactment of the technology-in-practice (patient data documentation routine) on other organizational routines
3. Variability in the use of the EPR system
• Description of the standard operating procedure that exists in each department
• Interdepartmental variations
• Variability across different departments

Table 7.2: Interview schedule summary (main study)

7.3 Research approach: induction

The research design of the study is depicted in figure 7.1. Once the research question and the philosophical approach of the study have been clearly stated, the researcher should decide whether a hypothetico-deductive or inductive approach is more appropriate with regards to the theory and knowledge building. The former develops theories and hypotheses and then a research strategy is adopted to test these theories and hypotheses (Lancaster, 2005). The researcher is mainly concerned with the collection of quantitative data and the selection of samples of sufficient size in order to generalise their findings (Saunders et al., 2007). Moreover, they are not actively involved in the research process and use a highly structured methodology to facilitate replication and thus ensure reliability (Gill and Johnson, 2002, Saunders et al., 2007). This approach is most widely used in the natural sciences, which rely on laws in order to predict, control and explain particular phenomena (Collis and Hussey, 2003).

The hypothetico-deductive approach includes several stages through which it progresses. The researcher first observes a phenomenon that takes place in a specific environment and then gathers rich information about what is observed in order to increase the level of awareness as to what is happening and to identify how similar

issues have been tackled in other situations. Then, they integrate all the information in a logical manner so that specific concepts or variables can be formed and tested. The next step in the hypothetico-deductive process is to generate certain testable hypotheses and to collect data with respect to the variables involved in the hypotheses in order to test them. In addition, the data gathered are statistically analysed to see if the hypotheses generated have been confirmed. Finally, the researcher arrives at conclusions by interpreting the meaning of the results of the data analysis (Gray, 2004, Robson, 2002, Sekaran, 2003).

On the other hand, induction is the dominant approach in the social sciences and is mainly used when researchers are interested in understanding how humans interpret their social world. This approach implies that researchers collect data and formulate a theory as a result of the data analysis. Using this method, the researcher is part of the research process and is particularly concerned with the context of the study and less with the need for generalising their findings. Hence, the examination of a small sample of subjects may be more appropriate than a large number as with the deductive approach (Saunders et al., 2007). Its greatest strength is that it does not require the establishment of prior theories or hypotheses. On the contrary, theory-building is based on using multiple methods thereby allowing a phenomenon to be approached in several possibly different ways (Easterby-Smith et al., 2002). Finally, in contrast to the hypothetico-deductive approach which uses quantitative data, the inductive method is more likely to utilize qualitative data and allows the use of a more flexible research design, which helps to discover alternative explanations of the phenomenon of interest (Lancaster, 2005).

This study adopts an inductive research approach in order to study the uptake of technology and the transformation of work in a health care setting. This approach was chosen because the researcher was interested in understanding the interpretations that users had of the EPR system and the organizational routines surrounding its use. In addition, in line with the interpretive approach, this research focuses on understanding the context within which the EPR system was introduced and its exploratory nature implies that its purpose is not to confirm or falsify a theory, but to explore the phenomenon of interest and through the collection of qualitative data establish particular meanings. Finally, the goal of the researcher was not to generalise his findings, but gain a deep understanding of how the EPR was used in the specific

hospital. The use of a particular research approach helps to identify the research strategies and choices that are likely to work for a specific study (Easterby-Smith et al., 2002). The following section refers to the research methodology adopted by the researcher in order to address the research question of the study.

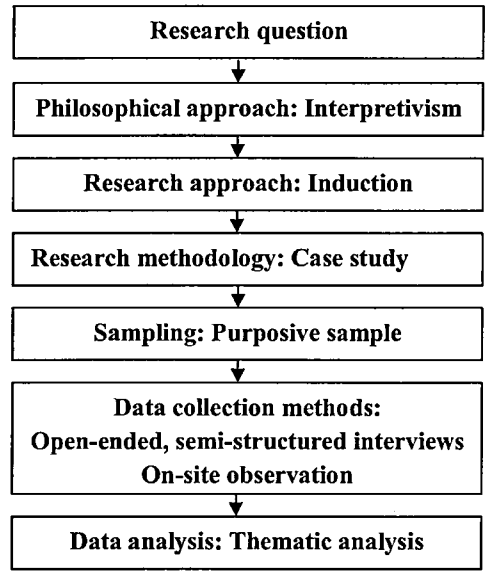


Fig. 7.1: Research design of the study (adapted from Saunders et al., 2007)

7.4 Research methodology

Methodology is the strategy, design or plan of action that lies behind the choice and use of particular methods and links them to the desired outcome. The choice and use of a particular methodology is something that reaches into the assumptions about reality that researchers bring to their work (Crotty, 1998). That is, ontological, epistemological and methodological questions are interconnected (Guba and Lincoln, 1994, Mason, 2002). In concert with the interpretive research tradition, which is premised on the view that social studies aim to understand people's actions and their experiences of the world that they create and recreate (Brewer, 2004), this study adopts a qualitative methodology in order to explore how organizational routines and structures change after the introduction of an EPR system in a private hospital in Greece and address the research objectives of the study. A qualitative methodology is appropriate when a particular phenomenon needs to be explored in a specific context and the researcher seeks a detailed understanding of people's interpretations of this

phenomenon through direct encounters with the subjects of the study in order to produce data and develop theoretical arguments (Creswell, 2007).

7.4.1 Characteristics of qualitative research

Qualitative research is concerned with answering questions which begin with "how", "why", "in what way". It is interested in developing explanations of social phenomena as they unfold in particular settings. Qualitative studies are conducted in a natural setting and involve a process of building a complex and comprehensive picture of the phenomenon of interest. In contrast to quantitative research, where the researcher is ideally an objective observer of what is being studied, in qualitative research, they can learn the most about a situation by participating or being immersed in it. Qualitative research is interested in people's opinions, experiences and feelings, producing thus subjective data and helps researchers to interpret phenomena in terms of the meanings people attach to them. Researchers emphasize the socially constructed nature of reality as well as the contextual factors that shape inquiry and they seek answers to questions that explore how social experience is created and given meaning (Creswell, 2007, Denzin and Lincoln, 1994, Hancock, 2002, Sarantakos, 1998).

7.4.2 Research strategy: case study

Case study is "*a strategy for doing research which involves an empirical investigation of a particular contemporary phenomenon within its real life context using multiple sources of evidence*" (Robson, 2002, p.178). This strategy is particularly useful when researchers wish to gain a deep understanding of the context and the processes being enacted (Morris and Wood, 1991). Case study is a strategy that is most often used in exploratory and explanatory research as it can provide answers to "why" and "how" questions and helps to understand, extend experience and increase conviction about a particular issue (Saunders et al., 2007, Stake, 2000). This approach can be used in both quantitative and qualitative studies and hence it can be deductive (hypotheses testing) or inductive (theory development) according to the purpose and research questions of a particular study (Gray, 2004). However, when a qualitative research methodology is employed, case study research tends to be inductive (Bryman, 2008).

Case study research involves the exploration of a particular phenomenon in one or more settings over time. That is, case studies can be single or multiple. In a single case study, researchers focus on an issue of interest and then select one case to

explore this issue. In multiple case studies, researchers again choose one issue, but they select multiple settings to illustrate this issue. The former type is often used when a) the case can play a critical role in testing a hypothesis or theory (critical case), b) it represents a unique or unusual situation (unique case), c) the researcher has the opportunity to investigate a phenomenon previously inaccessible to scientific research (revelatory case), d) the objective is to capture the conditions of an everyday situation and the case provides a suitable context to investigate and answer certain research questions (typical case), and/or e) it provides the researcher with the opportunity to investigate the phenomenon of interest over time (longitudinal case); at two or more stages (Bryman, 2008, Creswell, 2007, Gray, 2004, Saunders et al., 2007, Stake, 1995, Yin, 1994). The last two conditions lie beyond the choice of the researcher to conduct this study within a single case. Further discussion of the reasons for choosing the particular research setting is provided below (section 7.5).

On the other hand, multiple cases offer researchers the opportunity to generalise their findings since they can compare findings from different cases by replicating the procedures for each case (Creswell, 2007). However, case study research is context dependent and its purpose is not to generalise its findings to other settings beyond the case(s) selected by the researcher (Bryman, 2008), but to generate theory out of the findings (Yin, 1994). Researchers focus on key issues / themes in order to understand the complexity of the phenomenon and the results of the study can be used to explore or challenge existing theories or create new research questions (Saunders et al., 2007).

The purpose of this research is to explore the uptake of technology in a health care setting and in particular its impact on the routines and structures existing within the organization with the aim of exploring the role of agents in implementing, using and shaping technologies to fit their needs. The research question of the study implies that an exploratory case study is the appropriate strategy in order to generate valid data, since the researcher seeks new insights and understandings of what is happening (Robson, 2002), is interested in answering why and how questions, has little control over events and investigates a contemporary phenomenon within its real-life context (Yin, 1994). Moreover, case study research is suitable for research questions that require a detailed description of organizational processes (Hartley, 2004).

The main advantage of this strategy is that it is flexible and adaptable to change, allowing researchers to change their direction as new data and insights appear

(Saunders et al., 2007). Therefore, the initial focus of the pre-study on capturing users' interpretations of the technology in order to understand their actions and potential resistance to use the system was later (main study) changed to specifically examine why variability in the use of the EPR occurred as new data emerged from the first stage of the study and indicated that a deeper exploration is required in order to understand the role of agents in using technologies and enacting structures that fit their needs or interests. However, the nature of the study and the initial research question were not diverted as the researcher investigated the reasons lying behind agents' decision to use the EPR system in particular ways. Changing a study's research question(s) as new data arise is a very serious danger of case study research, which researchers should always consider to ensure that their research produces valid knowledge (Yin, 1994). Table 7.3 lists the reasons for using a case study strategy.

Criteria
• Exploratory nature of the study (why and how questions)
• Limited control over events (investigating a complex phenomenon in a real-life situation)
• Interest in understanding the context of the study
• Need for detailed description of organizational processes
• Generalisation is not sought
• Flexibility to explore new issues as new data and insights emerge

Table 7.3: Rationale for using a case study strategy

7.5 Case selection: process and rationale for the choice of the research context

Perhaps the most challenging aspect of case study research is the selection of case(s) to study. Different cases represent different opportunities to study a particular phenomenon and a proper selection of case(s) is required to gain the best possible explanations of it. As a result, researchers should select the case that offers – or is felt that it offers - the opportunity to learn the most about the phenomenon of interest and is the one that they can spend the most time with (Patton, 1990, Stake, 1994, Yin, 1994). In addition, as it was previously mentioned, the selection of a single case study is based on the premise that the case provides a suitable context to investigate and answer certain research questions of an everyday phenomenon as well as offers the

opportunity to the researcher to investigate the phenomenon of interest at two or more stages (Bryman, 2008, Saunders et al., 2007).

This research took place at Mitera Hospital in Athens, Greece, a private organization that provides maternity, paediatrics and general services to the population of Greece. The logic for conducting this research in Greece was based on the fact that little has been known about the use of health information systems in Greece, since research has mainly focused on the design of such systems rather than their use and their impact on the work practices of staff. In addition, due to the lack of technological infrastructure in the Greek hospitals only eight clinics used to maintain and store electronic health records by the end of 2004 (Orfanidis et al., 2004). Therefore, the first criterion for the choice of the research context was the availability of an EPR technology.

The researcher gathered information regarding the hospitals that use EPR systems and shortlisted the ones that are located in Athens. Due to budget and time restrictions, this study could only be conducted in a context close to his birthplace, since this would reduce the accommodation, commuting and living costs. Then, he contacted the IT Departments of these hospitals and collected information regarding the systems in use. In some hospitals the EPR implementation was in the initial stage and the system was used for the performance of basic functions. These hospitals were rejected since they did not offer the opportunity to learn a lot about the uptake of EPR systems in Greek health organizations.

Three hospitals were found to meet the criteria (table 7.4) of the study, two of which (Mitera Hospital and Hygeia Hospital) belong to the same company (Hygeia Group). The researcher contacted the Marketing and Communications Director of the company and expressed his interest in conducting fieldwork in these hospitals. The latter replied that it was not feasible to conduct research in both hospitals and offered to help the researcher to get access and collect data over a long period in one hospital, preferably the Mitera Hospital. As a result, two hospitals were selected and a formal process was followed to request access to explore the EPR adoption. The researcher submitted a protocol, an information sheet and an interview schedule to the General Manager of each hospital (for further details see section 7.11). One application was rejected on the premise that the research was too long and the use of qualitative techniques would disrupt the work of staff and one was accepted. For all the above reasons, this study was conducted in the Mitera Hospital in Athens. Table 7.4 presents

the reasons for conducting a single case study in Mitera Hospital. The next step in the research design is the choice of sample, which is the theme of the following section.

Criteria
• Availability of an EPR technology • Opportunity to learn the most about the uptake of EPR systems in Greek hospitals • Location and access

Table 7.4: Rationale for the choice of the research context

7.6 Sampling issues: non-probability purposive sample

One of the most significant issues that researchers have to consider when designing a particular research project is the type and size of sample. Sampling is "*the process of choosing the units of the target population which are to be included in the study*" (Sarantakos, 1998, p.139). In any scientific inquiry, researchers should explicitly refer to the type of sampling strategy that they use. That is, they should make clear whether a probability or a non-probability sampling strategy is employed. The former implies that all cases have an equal probability of being selected from the total population. This means that it is possible to answer research questions and address research objectives that require one to estimate statistically the characteristics of the population from the sample. This method is mainly used in survey and experimental studies and offers a high degree of representativeness and therefore generalisability of the research results (Sarantakos, 1998, Saunders et al., 2007). However, this sampling strategy is not appropriate for this research since it is not a reliable method for obtaining in-depth information about a particular phenomenon (Cohen et al., 2000).

On the other hand, non-probability sampling does not claim representativeness and is usually employed for exploration and qualitative analysis. The probability of each case being selected from the total population is not known and researchers using this method cannot provide answers to research questions and objectives that require one to make statistical inferences about the characteristics of the population. The lack of representativeness implies that researchers cannot claim empirical generalisation, but they can generalise their findings theoretically. Therefore, non-probability sampling is a strategy that is mainly used when adopting a case study research approach (Sarantakos, 1998, Saunders et al., 2007, Yin, 1994). The following section provides

an overview of the different types of non-probability sampling in order to understand the rationale behind the choice of the researcher to use a non-probability purposive sampling strategy to address the research question and objectives of the study.

7.6.1 Types of non-probability sampling

There are four main types of non-probability sampling: quota, convenience, snowball and purposive sampling. The first technique is based on the premise that the sample will represent the population as the variability in the sample for various quotas (variables) is the same as that in the population. Its main advantages are that it is less costly, can be set up quickly and does not require a sampling frame. It is commonly used in surveys with a large sample size (between 2000 and 5000) to ensure sufficient responses in each quota, which allow subsequent statistical analysis to be undertaken. The second type is used when representativeness is not an issue and involves selecting those cases that are the easiest or most convenient to obtain. However, this method is prone to bias as the cases which are included in the sample appear only because of the ease of obtaining them. The third technique, snowball sampling, is used when the researcher struggles to identify members of the desired population. Researchers start with few, available cases and ask them to identify further respondents who in turn are asked to identify further new cases until the topic is saturated. However, bias is likely to be introduced as participants identify other cases similar to themselves, resulting in a homogeneous sample (Lee, 1993, Sarantakos, 1998, Saunders et al., 2007).

The last type of non-probability sampling, purposive sampling, is the strategy adopted by the researcher to answer the research question and address the research objectives. It is commonly used when researchers work with very small samples and wish to select cases that are particularly informative (Newman, 2000). The logic for the selection of cases is based on the judgement of the researcher, which is in turn informed by the research question(s) and objectives. Such samples cannot be statistically representative to the total population and as such are mainly used in case studies, where researchers do not usually make claims for empirical generalisation of their findings (Saunders et al., 2007). However, researchers can increase representativeness by selecting information-rich cases and ensuring maximum variation (heterogeneous samples) to increase the possibility that the findings of the study will reflect different perspectives (Creswell, 2007, Patton, 2002). The logic behind the choice of the researcher to select a purposive sample is provided below.

7.6.2 Rationale for choosing a purposive sampling strategy

The adoption of a purposive sampling strategy was based upon the need to select individuals that were considered to be particularly informative and would help the researcher to address the research question and objectives of the study as well as to generate and analyse data that would produce theoretical propositions which would confirm or develop the theoretical position of the thesis (inductive reasoning). The exploratory nature of the research question and objectives implied that a rich description of the phenomenon being investigated was required. This in turn indicated that information-rich cases (intensity sampling) should be selected for detailed investigation. The use of purposive samples for the selection of intensity sampling cases in exploratory case study research has been recommended by several scholars (Creswell, 2007; Denzin and Lincoln, 1994, Llewellyn et al., 1999, Patton, 2002) and a number of researchers have adopted a purposive sampling strategy to explore the use of technology and the transformation of work in organizations (Aderibigbe et al., 2007, Bar-Lev and Harrison, 2005, Jansen and Aanestad, 2007, Orlikowski, 1996).

In addition, the researcher should interview particular individuals who met specific criteria in order to explore how the organizational routines and structures surrounding the recording and storage of patient records had changed after the implementation of the EPR system. Moreover, the limited resources available to the researcher and the focus on the context of the study indicated that a small sample should be used to investigate the phenomenon of interest. The selection of small samples - due to the costs involved in terms of time and money - is a typical characteristic of purposive sampling (Creswell, 2007). For all the above reasons the researcher employed a purposive sampling strategy for the selection of the units of the study. The following section informs the reader about the size of the sample and the criteria for the selection of the respondents and the departments that participated in this research.

7.6.3 Sample size and criteria

Once they have selected a sampling strategy, researchers have to decide about who or what will be sampled and how many units need to be sampled. As previously mentioned (section 7.3), qualitative studies using an inductive approach use small samples since they are mostly concerned with the context of the study and the interviewing process is time consuming. The sample size is flexible and the researcher

can add new units to the sample – justifying their purpose of inclusion in the study - until no new data are produced through the analysis of new cases. When a purposive sample is used, the sample size is evaluated in the research context on the basis of criteria and theoretical principles that are not known to the researcher at the initial stage of the study (Sarantakos, 1998). For this reason, a pre-study is considered a good way for making more informed decisions about sampling issues (Mason, 2002).

The sampling frame of the exploratory study included interviews with six individuals (appendix 3) who were chosen in order to provide rich information about the EPR system and the work practices of staff as well as the paper-based system and the system of practice surrounding its use. The logic for the selection of participants was based upon the objectives of the pre-study to obtain a good understanding of the way in which the new system was used across different departments within the Hospital, its impact on the staff's daily routines and the role of agency in the implementation and use of the system. It was planned to recruit participants who had experienced the pre-EPR era and the sample frame was constructed to ensure heterogeneity across clinical, administrative and managerial staff as well as age and gender. However, the majority of participants had not experienced the pre-EPR era since staff changes had taken place since 2001 and the management of the Hospital provided the researcher with access to speak to particular individuals. This was a limitation of the pre-study which the researcher considered and tried to avoid in the second stage of the study.

One aim of the pre-study, though, was to familiarize the researcher with the research context and build a relationship of trust with the participants and the management of the Hospital, which would help him with the exploration of the uptake of the EPR system in the second stage of the study. This goal was achieved and the sampling frame of the main study included sixteen interviews with managerial, clinical and administrative staff (appendix 4) in order to ensure maximum variation and describe in depth multiple perspectives about the phenomenon of interest. The selection of participants was based on their role with regards to the use of the EPR system and the work practices surrounding its use, experience of the paper-based and the electronic system and department in order to inform the research how the introduction of the EPR system brought changes to other organizational routines identified during the first stage of the study, how it was designed to be used and how it was actually used across different departments within the Hospital as well as why variability occurred.

The majority of the participants of the main study (13/16) had experience of the pre-EPR era. The researcher also interviewed three participants who lacked experience of the pre-implementation stage because they were working at departments that were created after the implementation of the EPR, but offered useful insights regarding the use of the technology in their departments. When a theory-saturation point was reached and a good understanding of the phenomenon under study was obtained, the researcher stopped recruiting new participants. The saturation point is reached when the data stop providing new information about the topic under investigation and the researcher can provide an appropriate explanation of it (Mason, 2002).

Departments were chosen on the availability of an EPR technology. The EPR system had not been implemented in all the departments of the Hospital and hence the number of suitable cases was limited. Departments were also chosen with regards to the access provided to interview the staff. For instance, access to the Microbiology Department was refused because the researcher was told that there was no time to speak to the staff as well as space to observe how they interact with the system and perform their tasks. It would be ideal to interview members from all the departments of the Hospital that are involved in the electronic documentation of patient data, but this was not feasible due to the limited time available to the researcher to collect and analyse his data. A list of the departments that took part in this study is provided in appendix five. Table 7.5 informs the reader about the sample size and the criteria for the selection of the individuals and departments that participated in this study.

Sample units	Size	Criteria
Participants	22	• Rich-information cases to provide a deep understanding of the phenomenon of interest • Heterogeneity (age, gender, occupation) to ensure maximum variation and reflect different perspectives • Experience of the routines surrounding the patient records system in the pre-EPR era • Working at a department that uses an EPR system • Access and time
Departments	12	• Availability of an EPR system • Access to the department

Table 7.5: Sampling frame

7.7 Data collection: qualitative methods

Research methods are "*the techniques or procedures used to gather and analyse data related to some research question or hypothesis*" (Crotty, 1998, p.3). Case studies tend to focus on the exploration of a contemporary phenomenon. As a result, researchers collect in-depth, up-to-date information by using multiple methods, such as interviews, observation or document analysis (Gray, 2004). The use of multiple methods, which is often called triangulation, to explore one set of research questions is a strategy suggested by many scholars (Golafshani, 2003, Gray, 2004, Mason, 2002, Mathison, 1988) to control bias and address issues of construct validity and reliability (see section 7.10). The research design of this study was based on a series of open-ended, semi-structured interviews as well as non-participant, direct, on-site observations to explore how routines changed after the implementation of a new EPR system in a Greek private hospital as well as how the technology was changed by the existing routines surrounding its use and address the research objectives of the study.

The researcher also intended to analyse documents that would describe the formal organizational routines surrounding the use of the EPR system and the guidelines regarding the use of the technology. Company documents are particularly important in sociological studies since they are meaningful elements of the representation of the social organization. They help researchers to understand, confirm, support, verify, clarify or contextualize information produced during observations and interviews (Mason, 2002). Unfortunately, such documents (protocols) were not available due to confidentiality issues and the researcher obtained information about the standard operating procedures and the formal guidelines regarding the use of the EPR system through interviews. The sections below refer to the techniques used by the researcher to collect his data and provide answers to the research question and objectives as well as the rationale for the choice of each method.

7.7.1 Semi-structured interviews

An interview is a purposeful discussion between the investigator and one or more subjects of the study (Kahn and Cannel, 1957) and can help researchers to gather valid and reliable data that are relevant to their research questions. The former implies that different research questions, objectives, strategies and purposes of inquiry require different interview techniques in order to produce valid data. Although there is some

overlap between the different types of interviews and researchers may use more than one typology for their study, each technique is used to address particular research questions and should be consistent with the research strategy and the purpose of a particular study. There are three interview types that are based on different interview guide structures: structured, semi-structured and unstructured interviews (Bryman, 2008, Gray, 2004, Saunders at al., 2007).

Structured or standardized interviews are based on a predetermined, fixed set of questions that respondents answer and the researcher records on a standardized schedule, usually with pre-coded answers. This typology is often used as part of a survey strategy to collect data for quantitative analysis and for this reason structured interviews are also referred to as quantitative research interviews. The interaction between the researcher and the interviewees is minimal and questions are asked in the same tone of voice so as not to influence answers and introduce bias. The quantitative nature of structured interviews implies that are mainly used in descriptive studies to identify general patterns and employed by researchers that adopt a positivist view of knowledge. As a result, this type of interview is not appropriate for this study (Fontana and Frey, 1994, Gray, 2004, Saunders, 2007).

On the other hand, unstructured interviews are informal and flexible and are used to explore in depth a general area of the interest of the researcher. In contrast to the type of interview described above, this technique is not based on a predetermined list of questions and respondents are invited to freely talk about events, behaviour and beliefs related to the topic area. The interaction between the researcher and the interviewee is sometimes non-directive with the perceptions of the latter guiding the conduct of the interview (informant interview). This technique is mainly used in exploratory studies to investigate what is happening in a particular setting and seek new insights by researchers who are concerned that the use of even the most basic interview guide will not facilitate the exploration of the views of the members of a context. However, the clear focus of this study – rather than a general idea on a topic of interest - implies that a rudimentary interview guide structure is required to provide answers to the research question and objectives (Bryman, 2008, Easterby-Smith et al., 2002, Ghauri and Grønhaug, 20005, Robson, 2002, Saunders et al., 2007).

This study uses a semi-structured interview technique. Unstructured and semi-structured interviews are often considered as one category and are referred to as non-

standardized (Healey and Rawlinson, 1994) or qualitative research interviews (King, 2004). They are mainly used in qualitative, exploratory, case study research when the researcher has a list of issues and questions to be covered (interview guide). However, the interview guide is not standardized; it is flexible and allows the researcher to change the order of the questions according to the interview flow and ask additional questions as new issues arise in order to address the research question and objectives. This type is adopted by researchers who have a clear understanding of what they are investigating from the beginning of their research in order to address specific issues. In contrast to the structured interviews type, the degree of interaction between the researcher and the respondent is high and provides them with the opportunity to clarify issues and correct misunderstandings (Bryman, 2008, Gray, 2004, Robson, 2002, Sarantakos, 1998, Saunders at al., 2007).

In line with the assumptions of the interpretive research tradition, this study focused on the subjective descriptions of users' work practices, as well as their sense-making of the EPR system and their work. Open-ended, face-to-face, semi-structured interviews with twenty-two key informants from the Mitera Hospital were conducted at two stages to address the research question and objectives. An interpretive approach implies that conducting interviews is the most valid way to explore people's understandings about the social world that they produce and reproduce through their daily activities (Blaikie, 2000). The choice of qualitative interviewing is supported by the study's ontological position, which suggests that people's knowledge, interpretations, experiences and interactions are significant properties of the social reality that this study is designed to explore, as well as epistemological position, which argues that a meaningful way to generate data on these ontological assumptions is to talk to people, ask them questions and listen to their answers (Mason, 2002).

The choice of a particular method is also linked to the strategy adopted by the researcher and the purpose of the study. Interviews are an essential source of case study evidence, since the majority of case studies are about human affairs (Yin, 1994). In addition, when the purpose of the study is exploratory in nature or it includes an exploratory element, then non-standardized, qualitative interviewing is likely to be the best approach (Blumberg et al., 2005). Semi-structured interviews are also necessary when the researcher seeks to understand the reasons for the decisions and actions of the research participants (Saunders at al., 2007). This type of interviews was the most

appropriate and valid method for data collection since, giving the exploratory nature of the study, it can provide a greater depth of data and give to the researcher the flexibility to ask subsequent questions (Fontana and Frey, 1994). Provided the contextual and situational nature of the information sought and the complexity of the phenomenon under investigation, which might lead some of the participants to ask questions and seek clarifications, a structured interview schedule was not appropriate.

Semi-structured interviews also allow researchers to 'probe' for more detailed answers when they identify important issues in the participants' responses. This is very important when an interpretivist epistemology is adopted in order to understand the meanings that people ascribe to various phenomena. 'Probing' these meanings adds significance and depth to the data and may help to identify issues that were not previously considered and are important for addressing the research questions and objectives (Saunders et al., 2007). Finally, part of interviewing involves looking how people articulate their understandings and responses, and the researcher should take clues from them so as to use prompts and build on their responses in order to gather particularly informative data (Fontana and Frey, 1994, Mason, 2002). The reasons for conducting (semi-structured) interviews in this study are listed in table 7.6.

Criteria
• The interpretive position of the study (exploring subjective interpretations)
• The exploratory nature of the research question and objectives (why and how questions)
• The research strategy adopted by the researcher (exploratory case study)
• Clear understanding of the purpose of the study (semi-structured interviews)
• Providing clarifications and correcting misunderstandings (semi-structured interviews)
• Probing and building on particular responses (semi-structured interviews)
• Observing non-verbal behaviour

Table 7.6 Rationale for using an interview data collection method

7.7.2 Non-participant observation

Observation is a major technique of data collection in social research, which is mainly focused on the actions and interactions of individuals in their natural setting (Russel, 1999). Morris (1973, p.906) defines it as "*the act of noting a phenomenon, often with instruments, and recording it for scientific or other purposes*". Thus, it involves the systematic viewing of people's actions and interactions and the recording, description,

analysis and interpretation of their behaviour (Gray, 2004). There are several types of observation, which differ from each other in the degree of the participation of the observer and those being observed, the degree of awareness of the subjects of the study, in the setting that it takes place and the structure in which it is organized. That is, observation can be participant or non-participant, direct or indirect, overt or covert, natural or laboratory and structured or unstructured (Saranatakos, 1998).

Participant observation requires the researcher to participate fully in the activities of the group being researched in order to understand their situation by experiencing it. The role of the observer may vary in involvement. Thus, researchers may become members of the group they are researching without though revealing their identity and purpose (covert observation) to the group members (complete participants). However, this method raises questions of ethics. The group members may share information with the researcher that they would not share if they knew their real identity. On this ground the complete participant role is a role that should not be adopted by the researcher. Instead, researchers who wish to fully participate in the group they are observing and overcome the ethical issues arising from not having their identity known adopt a participant-as-observer role. The members of the social setting are aware of the purpose and the status of the researcher (overt observation) and in this way the observer can gain the trust of the group and ask questions to enhance their understanding (Bryman, 2008, Gill and Johnson, 2002, Gold, 1958, Gray, 2004).

Participant observation, though, is costly, time consuming and requires access to get involved in the everyday work activities of the subjects of the study (Gans, 1999, Saunders et al., 2007). Thus, this strategy could not be adopted by the researcher. In contrast, in non-participant observation researchers are not involved in the activities of the subjects. Their position, identity and purpose of the study are clearly defined from the beginning of the investigation (overt observation). Researchers may choose to observe without or with minimal involvement in the activities of those being observed (observer-as-participant). The observer's interaction with the subjects of the study is non-directive while engaging in their observational pursuits and the observation time is brief due to considerations of interrupting the operation of the organization (access issues). Sometimes, however, the purpose and objectives of the study (e.g. observing consumer behaviour) requires adopting a role that does not involve any interaction with people and allows researchers to keep their identity

unknown (covert observation) to the members of the setting in which observation takes place. In this case, the researcher acts as a complete observer (Adler and Adler, 1994, Bryman, 2008, Gill and Johnson, 2002, Gold, 1958, Gray, 2004).

Furthermore, observations can be direct or indirect. The former type requires the researcher to observe the subject that intends to explain, while the latter does not involve the subject of the study either because it refuses to participate or because it is not possible to do so. In addition, observations differ according to the setting in which they unfold; that is, whether they take place in a natural setting (natural observation) or they are performed in an artificial setting (laboratory observation). They also vary according to the degree of predetermined structure. In particular, researchers may enter the research setting with the aim to understand the meanings of those being studied without a detailed plan (unstructured observations) or employ a formal and strictly organized procedure with well-defined categories (structured observations), which is characterized by high levels of control and differentiation. The latter type, however, is largely quantitative and focuses on the frequency of people's actions (Delbridge and Kirkpatrick, 1994, Gray, 2004, Sarantakos, 1998).

The researcher conducted over twenty hours of observation in the departments that participated in the study examining how staff interacted with the EPR system and with each other in order to perform their tasks. The use of this method was based on the ontological perspective of the study, which sees the world as socially constructed and is interested in people's actions, interactions and behaviours in particular contexts. In addition, the use of observations is in line with the epistemological position of the thesis, which suggests that valid knowledge can be generated by observing human interaction in natural settings, which reveal issues that cannot be fully articulated in an interview. This view is shared by many scholars and is based on the premise that sometimes people say different things from what they do in practice (Argyris and Schön, 1974, Feldman and Pentland, 2003, Mason, 2002) and the use of observations provide the researcher with the opportunity to get beyond the self-interpretations of the respondents about the EPR system and the routines surrounding its use towards an evaluation of their actions in practice (Gray, 2004).

In addition, the appropriateness of a particular method is always guided by the research question(s) and objectives (Saunders et al., 2007). This study focuses on analyzing the organizational routines surrounding the use of the EPR system as well

as examining how different people with different interpretations and roles interact with each other and use the EPR system in their everyday activities. Observation is an ethnographic technique that can reveal details of the workflow that other methods might miss (Kaplan and Duchon, 1988). Workflow describes the processes that people follow to complete tasks and incorporates the way in which these individuals interact with other people, processes and a particular technology to accomplish their tasks (Unertl et al., 2006). In order to capture this interaction and address the research question and objectives, the researcher had to observe how users act and interact with each other and the EPR system within their context.

A non-participant observation technique was used due to the limited time available to the researcher to conduct his fieldwork and analyse his data as well as the lack of access due to considerations of interrupting the work activities of staff and therefore the operation of the Clinic. The interaction between the researcher and the subjects of the study was minimal and mainly consisted of asking questions and seeking clarifications on particular issues that were considered important in order to avoid bias due to incorrect subjective interpretations of the researcher. In addition, a direct observational approach was employed since the researcher observed the groups of people that he intended to explore. Moreover, in line with the interpretive paradigm, the qualitative approach and the case study strategy adopted by the researcher, the observation took place in the natural setting of those being observed (natural, on-site observation) and was unstructured in nature. Table 7.7 summarizes the reasons for conducting non-participant (observer-as-participant) observations.

Criteria
• The interpretive position of the study (exploring human interaction in natural contexts)
• The research question and objectives (capturing the performative aspect of routines)
• The methodology and research strategy adopted by the researcher (qualitative technique)
• The need to increase the validity and reliability of the study by verifying the interview data
• The limited time and access provided to the researcher (non-participant observation)
• The need to clarify issues and enhance understanding, as well as control bias and build a relationship of trust (ethical issues) between the researcher and those being observed (observer-as-participant role)

Table 7.7: Rationale for using a non-participant observation data collection method

7.7.3 Data collection process

The researcher attended a series of interview and observation workshops and seminars to acquire knowledge and develop the required skills related to collecting and recording data accurately. He also practised his interviewing and observing skills with his supervisor who provided him with constructive feedback. Once obtaining access to conduct fieldwork, the researcher created a list with the individuals that would be invited to take part in the study. Then, he scheduled meetings with each participant in their work setting, provided them with information about the topic and purpose of the study, their role, confidentiality issues, the interview questions, likely duration and the recording method and sought cooperation. Once an informed consent was obtained, an interview was arranged at a date, time and place convenient to the participant.

Observation arrangements took place after the collection of the interview data in each department. This decision was based on the premise that during the interview stage the researcher would have the opportunity to introduce himself and build a good relationship with the staff, which would help him to be viewed as a trusted person rather than a "spy". In this way, it was felt that participants would not change their behaviour in the way in which interact with each other to perform their work because they would feel that they are being observed (Gray, 2004). A date and time was set in cooperation with a representative from the management of the Hospital, the head of each department and the department's staff. The data collection flowcharts of the first and second stage of the study are presented in table 7.8 and table 7.9 respectively.

• Providing the Hospital with a research protocol	November 08'
• Obtaining access (ethical approval)	
• Providing participants with information sheet / interview schedule	
• Obtaining informed consent	
• Conducting first interview (EPR Manager)	
• Conducting next three interviews with two receptionists and one doctor from the Dermatology and Mammography Departments	
• Conducting observation at the Dermatology / Mammography Departments	
• Conducting last interview (receptionist from Maternity Clinic)	
• Conducting observation in the Maternity Clinic	
• End of data collection process	December 08'

Table 7.8: Data collection flowchart (stage one)

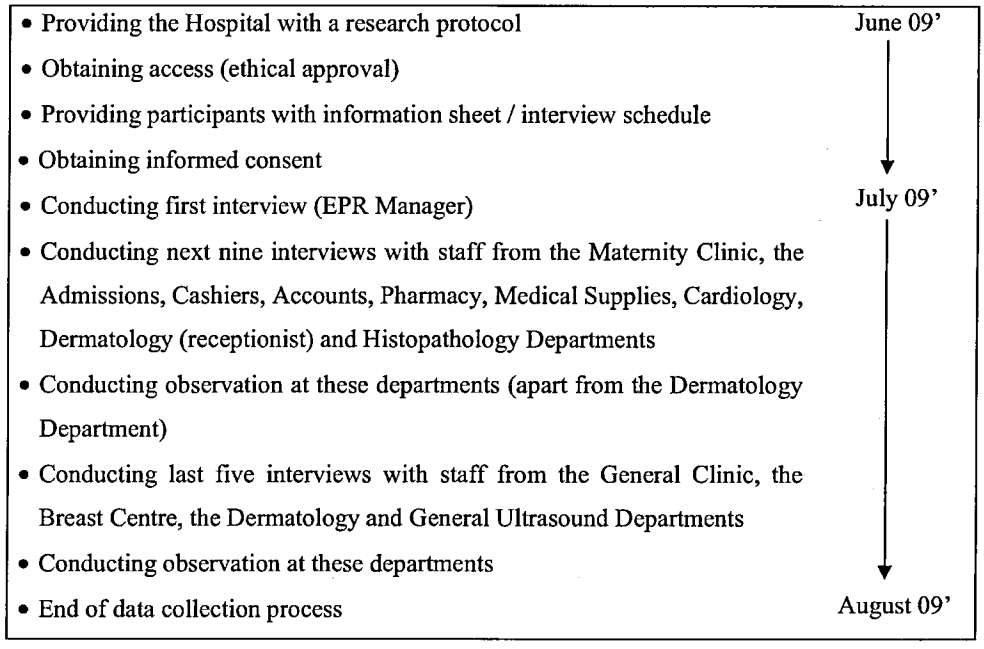


Table 7.9: Data collection flowchart (stage two)

The following section informs the reader about the strategies followed by the researcher for the recording and storage of the interview and observation data.

7.7.4 Data recording and storage

Audio recording was the primary method used by the researcher for the recording of the interview data. The advantage of this method is that it provides an accurate documentation of the conversation between the researcher and the participant as well as allows the inquirer to focus on the process of listening, interpreting and refocusing the interview (Gray, 2004). All interviews were recorded with the consent of the interviewee using a digital voice recorder and notes were taken to make respondents feel that their views are taken seriously and encourage reflection and detailed description of experiences (Sarantakos, 1998). Taking notes was considered useful in order to write down important issues mentioned by the interviewee, which needed further exploration, without interrupting them for clarifications. Each interview was transcribed verbatim at the end of each interview. All transcripts were double-checked for accuracy by listening to the recordings twice.

Objective and careful field notes were taken and written in a field notebook in as much detail as possible with regards to the observation sessions. The observational notes described the context, the participants, the discussions and interactions between

them, the actions of each member of staff, the routines existing in the department and anything important or not that happened during the observation session. According to Eisenhardt (1989), researchers should record all the events as they unfolded rather than keep notes on what seems to be important. Each set of field notes was dated, the time of occurrence (sequence of events) was noted and at the end of each observation session were transcribed verbatim using a Word processor program.

The interview and observation notes along with the transcripts were stored in paper-based folders and locked in a cabinet. In addition, an electronic folder was created for each participant and department on a security-protected computer and all data (i.e. interview guide, audio-recordings, interview and observation transcripts) belonging to this participant / department were stored there. The aforementioned methods for data recording and storage facilitated easy access and effective back-up, maintained participant confidentiality at all times and helped with the analysis of data (see section 7.9). The next section refers to the unit of analysis of the study.

7.8 Unit of analysis

The unit of analysis of a case study refers to the major entity that is being studied and is related to the way in which the initial research questions have been defined (Yin, 1994). In this study, the focus is on the organizational routines existing in the Hospital before the implementation of the EPR system as well as the work processes enacted by diverse users across different departments after the implementation of the new system. Participants were asked to describe the everyday work practices surrounding the recording of patient information before the implementation of the technology and how these routines changed after the implementation of the EPR system. In addition, on-site observations were conducted to inform the research about the processes surrounding the use of the EPR system that individuals followed to complete their tasks, the way in which these individuals interacted with each other and the technology, as well as the identification of any variations in the use of the system, which would highlight the role of human agents in enacting new structures due to the recurrent use of the technology. Therefore, the unit of analysis of this study is the organizational routines (technologies-in-practice) surrounding the use of the EPR system within the Hospital.

7.9 Analysis of data: thematic analysis

The case study's research design is very flexible and as such it is difficult to say where data gathering stops and data analysis begins (Feldman, 2004). There are always opportunities for acquiring new knowledge and researchers should always be ready to examine themes that emerge during the data collection process. For instance, in several cases the researcher had to revisit the research context and seek clarifications on particular issues. The objective of the researcher was to go out and find as much information as possible about the organization, its members, the EPR system and the work practices surrounding the use of the system. This method was in line with Feldman's (2004) approach on data analysis and Eisenhardt's (1989) argument that modifications in the research design are acceptable as long as they are consistent with the purpose and objectives of the study and they are well documented.

The systematic analysis of the data waited until the end of the data collection period. Data were analysed thematically using the Ritchie and Spencer's (1994) Framework approach, which was developed at the National Centre for Social Research in the United Kingdom. This method was chosen because it is a robust, well-established and pragmatically feasible method of analysis within the time and resource constraints of the empirical work. Framework is described as a "*matrix based method for ordering and synthesizing data*" (Ritchie at al., 2003, p.219). It involves a number of different but interconnected stages and, although is presented as following a specific order, it is mainly dependent upon the conceptual ability of the researcher to determine meaning, salience and connections from the data, which raises concerns of subjectivity and distortion of reality. However, all approaches to qualitative data analysis have their critiques. Its major strength is that it helps researchers to reconsider and rework earlier ideas, since the analytical process has been documented and thus is accessible. The process that was followed by the researcher to analyse his data is described below.

7.9.1 Familiarization with the data

The first step was to become familiar with the large volume of diverse data collected in the field. The Framework approach suggests that although the researcher has probably identified key issues and emergent themes during the data collection stage, it is important to gain a feel for the material as a whole. This means that the researcher had to immerse himself in the data by listening to the audio-recordings, reading

transcripts and studying observational notes. During the process of listening to and reading through the data the researcher identified and listed key ideas and recurrent themes. This helped him with the next stage of the process, which is the identification of a thematic framework (Ritchie and Spencer, 1994).

7.9.2 Identification of a thematic framework

In this stage, the researcher returns to the notes made during the first stage and attempts to identify the key issues and themes according to which the data can be examined and referenced (thematic framework). The development of the framework comes partly from the data and partly from the research objectives of the study which are based on the theoretical framework identified from the literature review. Hence, it consisted of a priory issues, which were the key topic areas included in the interview schedule, emergent issues raised by the participants and / or analytical themes arising from the recurrence of particular views or experiences. This process involved making logical judgements about the meaning, relevance, importance and connections of issues and the researcher had to make sure that the original research questions were fully addressed (Ritchie and Spencer, 1994).

7.9.3 Indexing of transcripts

Indexing is the process whereby the thematic framework is systematically applied to the data in the form of text. Indexing references were recorded on the margins of each interview and observation transcript numerically based on the framework's topics. The thematic framework developed in stage two was used to index each interview transcript. The next step in the Framework approach was to present a picture of the data as a whole by charting the data according to core themes (Ritchie and Spencer, 1994).

7.9.4 Charting

Charting is the process by which data are transferred from their original context and rearranged according to the appropriate thematic reference. An Excel spreadsheet was used to create charts with headings and subheadings based on the topic areas of the interview schedule and the thematic framework respectively. Charts were developed according to subject headings with the themes reading across the rows and across all respondents. Then, the researcher recorded a summary of each respondent's view on

the chart according to particular themes. Each entry was referenced back to the relevant transcript so that sources could be traced (Ritchie and Spencer, 1994).

7.9.5 Mapping and interpretation

Once all the data were shifted and charted according to core themes, the researcher pulled together the key characteristics of the data to map and interpret the data set as a whole. This process involved i) reviewing the charts, ii) comparing and contrasting the perceptions, views or experiences of each case and iii) searching for connections and explanations within the data. This helped the researcher to develop explanations for groups of similar themes and to look for associations both within and across participants (Ritchie and Spencer, 1994). Table 7.10 provides a summary of the data analysis process. The following section refers to the most important test of any scientific inquiry, which is the assessment of its quality.

Stages
1. Familiarization with the data (listening to tapes, reading transcripts and studying observational notes)
2. Identification of a thematic framework (identifying key issues, concepts and themes according to which the data can be examined and referenced)
3. Indexing of transcripts (indexing references are recorded on the margins of each transcript)
4. Charting data according to core themes
5. Mapping and interpretation (interpreting the data set as a whole)

Table 7.10: Data analysis process

7.10 Quality criteria

Validity and reliability are two factors that any qualitative researcher should take into account while designing a study, analyzing results and evaluating the quality of the study (Patton, 2002). The quality criteria of a particular inquiry should be consistent with the philosophical and methodological assumptions on which a study is based and judged by its own paradigm terms (Healy and Perry, 2000, Koch, 1996). Thus, while quantitative paradigms use the terms reliability, validity and generalisability (external validity) as essential criteria for judging quality, qualitative researchers adopt a different terminology by using concepts such as credibility, dependability and

transferability to evaluate the quality of their work (Guba and Lincoln, 1994). This is based on the premise that reliability and validity presuppose that a single, absolute truth of social reality is feasible, which is in contrast to the philosophical assumptions of interpretive researchers who argue that can be several accounts of social reality (Guba and Lincoln, 1994).

7.10.1 Credibility

Credibility is the equivalent to internal validity in quantitative research; that is, the investigator should demonstrate that their research is conducted according to the rules of good practice in a professional, systematic and accurate manner, as well as that they have correctly understood the social world of the respondents (Bryman, 2008). In doing so, the researcher employed an informant validation technique. That is, he provided the respondents with the written accounts from the observation at their department, their interview transcript as well as a list of themes and interpretations that came from the raw data, so that they could check the accuracy and credibility of the findings. This technique is considered to be "*the most critical technique for establishing credibility*" (Lincoln and Guba, 1985, p.314). In addition, the researcher submitted the research findings to a representative from the management of the Hospital and the EPR Manager and sought confirmation. This technique helped to clarify ambiguous issues and misunderstandings, ensure that the interpretations of the researcher were based on real facts and control bias.

Another way to ensure credibility and reliability (see next section) was the use of multiple data collection techniques and sources in order to enhance the depth and richness of the data (triangulation). The use of multiple sources and methods reduces systematic bias in the data and thus adds credibility to interpretive research (Denzin and Lincoln, 1994). This method has been proposed by a number of researchers (Erlandson et al., 1993, Lincoln and Guba, 1985, Merriam, 1988, Patton, 1990). Data were collected over a long period of time (November 2008 - August 2009) to ensure that the findings from the first stage were confirmed in the second stage of the study (time triangulation), from different departments (space triangulation) and individuals with diverse characteristics, such as age, gender and professional background (person triangulation), to ensure that different perspectives were heard and thus maximize the authenticity of the study (Lincoln and Guba, 1985). Furthermore, data were gathered

using multiple methods (methodological triangulation) to examine if the themes that arose using one method also emerged using a different method.

Credibility is also promoted through supplying relevant information to the participants before the interview and obtaining their informed consent (Saunders et al., 2007). The researcher entered the research context and provided the participants with an information sheet where he explained clearly the research purpose and objectives, his theoretical framework, the length of each interview, their role, the setting, issues of anonymity and confidentiality and so on. In addition, he supplied them with an interview schedule, which listed the interview topics and questions that derived from the literature (Orlikowski's model of technology-in-practice) allowing the informants to prepare themselves for the interview and sought their consent. The researcher also ensured rigour in the collection of data by repeatedly visiting and interacting with the participants over a long period, establishing thus rapport and gaining trust, which gave the participants the comfort to discuss their views and highlight as many aspects of the topic as possible increasing thus the trustworthiness of the findings.

7.10.2 Dependability

Dependability is equivalent to reliability and refers to the ability of an instrument to produce consistent results (Sarantakos, 1998). This means that any research should comply with rules of objectivity and freedom of bias as well as be precise and able to produce stable findings across time and methods (Miles and Huberman, 1994). In the context of qualitative research, objectivity is referred to as confirmability and is concerned with ensuring that the researcher has not overtly allowed personal values or theoretical inclinations to influence the conduct and the outcomes of the research (Bryman, 2008). In this study, objectivity, precision and replication of findings was enhanced by:

- Obtaining detailed field notes, using a digital voice-recorder to ensure good quality of data and accurate transcription.
- Supplying the participants and other experts from the Hospital with the findings and seeking feedback (informant verification).
- Ensuring that meticulous and accurate records of the research process (case study protocol describing the purpose, objectives and theoretical stance of the study, the data collection and analysis, the interview questions, dissemination and

confidentiality issues) and the data collected by the researcher (transcripts, field notes, audio-recordings) are kept in an accessible and safe place.

- Specifying the research methods adopted by the researcher while providing clear justifications for the choice of each method.
- Using diverse sources as well as multiple and clear methods for data collection and providing justifications for these choices.
- Collecting data at two different periods to examine if the findings of the first stage were replicated in the second stage of the study.
- Ensuring consistency between the purpose of the research, the philosophical and methodological assumptions of the study as well as the methods used to collect and analyse the data.
- Reviewing the findings with the research supervisors who ensured that the data collection and analysis methods, meanings and interpretations of the researcher are objective and precise.
- Conducting interviews using a neutral tone of voice and avoiding comments and gestures that might influence the response of the participant and introduce bias.
- Referencing each entry back to the relevant transcript during the analysis of data so that sources could be traced and the process of abstraction can be replicated.

7.10.3 Transferability

The justification of the methods of the study shows their credibility and dependability and serves as a starting point for generalising the findings of the study. Single cases are thought to offer poor basis for generalisation since they entail the intensive study of a single context using a small sample that cannot be representative of the total population (Yin, 1994). However, this refers to the difficulty to empirically generalise their results. Empirical generalisation refers to the ability of a researcher to make generalisations from the analysis of the study's population to a wider population on the logic that the population is statistically representative of the wider population (Mason, 2002). Qualitative case study research is unable to claim generalisation in this way, but it can allow readers to judge its transferability to other settings "*because of shared characteristics*" (Erlandson et al., 1993, p.32) by providing rich descriptions of the participants or research setting (Lincoln and Guba, 1985).

However, case study research does claim theoretical generalisation. In this case the researcher generalises a particular set of results to a broader theory (Bryman, 1988, Yin, 1994). This is achieved by making strategic choices about which methods and sources are the most valid for answering the research questions and why (Mason, 2002). As it was mentioned earlier (section 7.6 and 7.7), the selection of sample and methods for data collection was based upon particular scientific criteria. In addition, the researcher related his research project to existing theories and demonstrated that his findings have a broader theoretical significance (Marshall and Rossman, 1999) by grounding the theoretical inferences of the study in the literature (see chapter 10). Therefore, this study intends to generalise its findings by adding knowledge to the Information Systems as technology-in-practice field of research which is concerned with the social aspects involved in the implementation and use of a particular technology in specific contexts. Table 7.11 presents the methods used by the researcher in order to ensure credibility, dependability and transferability.

Credibility	• Informant validation (confirmation of results by the respondents) • Triangulation (use of multiple methods and sources over time) • Providing respondents with an interview schedule, information sheet and obtaining informed consent • Establishing rapport and building relationships of trust
Dependability	• Detailed field notes, verbatim transcription and audio-recording • Informant verification (confirmation of results by the informants) • Meticulous recording of the research procedures and data • Justification of the research methods used by the researcher • Triangulation (use of multiple methods and sources over time) • Consistency between the purpose, philosophical and methodological assumptions of the study, data collection and analysis methods • Peer review • Conducting interviews in a professional and neutral manner • Demonstrating links between the themes and the transcripts in the analysis of data
Transferability	• Rich description of the participants and the research setting • Grounding the inferences drawn by the researcher in the literature

Table 7.11: Criteria of credibility, dependability and transferability

7.11 Ethical considerations

Ethical issues refer to the appropriateness of the researcher's behaviour in relation to the rights of those who become the subject of their work. The researcher followed all the appropriate procedures for the conduct of his research according to the University of Surrey's code on good research practice (code of ethics). A number of ethical issues arise across all the stages of a research project. Therefore there are ethical issues related to how researchers formulate and clarify their research topic, design their investigation, gain access to the context they intend to study, collect, transcribe, store and analyse their data as well as present their findings (objectivity). In addition, there are issues related to the subjects of the study, such as the privacy of participants, the voluntary nature of participation and the right to withdraw from the research process, obtaining informed consent and ensuring confidentiality and anonymity (Bryman, 2008, Sarantakos, 1998, Saunders et al., 2007).

The researcher entered the research context twenty days prior to the beginning of the data collection period and provided the General Manager and the Scientific Board of the Hospital with a research protocol. The protocol included information regarding the nature, purpose, location and likely duration of the study, as well as information about the use of data and confidentiality / anonymity issues. Once the Scientific Board approved the study, the researcher provided the participants with an information sheet, which included all the above information and explanations of the selection criteria. He also provided both the interviewees and the Hospital with a list of the interview questions (interview schedule) and his supervisor following a request from the General Manager sent a letter to confirm that he was aware of his student conducting research at Mitera Hospital. The researcher ensured that all participants were given the opportunity to ask questions related to the research process and their participation in the study and provided them with a verbal explanation of the information included in the information sheet and the interview schedule.

All participants were informed about their right to refuse participation. It was also made clear that participants might withdraw at any stage or refuse to answer specific questions explaining that in this case their data would not be used. Furthermore, confidentiality of the information gathered and anonymity of the respondents were ensured. Informed consent of all participants was obtained prior to commencement of

data collection and a consent form was signed by both the research and the informants at the end of each interview. The researcher also provided the participants with a copy of their responses (interview transcripts) and the relevant sections that were included in the findings chapter, the themes that emerged from their answers as well as with a copy of the field notes (observation transcripts) and sought their consent.

The data collection, transcription, storage, analysis and reporting process was characterized by accuracy and objectivity. The researcher conducted interviews in a neutral way without pressing the participants for a response. Moreover, observations were conducted in a professional manner respecting the privacy of those being observed. Therefore they focused on the actions and interactions of staff with regards to the EPR system and the system of practice surrounding its use with respect to the private life of the participants (e.g. personal telephone calls, conversations). All personal data were processed fairly and lawfully in accordance with the Data Protection Act (1998). Objectivity was maintained in the transcription of interviews and observation notes as well as the analysis of data throughout the research process.

The researcher also attempted to ensure anonymity in the reporting stage of the study. However, the nature of the data gathering techniques used by the researcher implied that participants may be identified by piecing together the characteristics that are revealed by the researcher in the findings chapters. For this reason the researcher requested and obtained permission from the organization and the participants to reveal their identity and sent them copies of their responses and the relevant sections that were included in the findings to help them understand the context within which their identities will be revealed. Table 7.12 provides a list of the actions taken by the researcher to ensure good research practice.

Actions
• Obtaining approval from the Hospital
• Providing the participants with an information sheet and an interview schedule
• Obtaining informed consent from the participants and ensuring confidentiality / anonymity
• Providing the informants with the their answers and the sections relevant to their responses
• Seeking consent and permission to reveal their identity
• Maintaining objectivity in the data collection, transcription, analysis, storage and reporting

Table 7.12: Ethical issues

7.12 Summary

The choice of an appropriate methodology and methods for the collection and analysis of data is essential in order to ensure that the outcome of the research is valid and that the inferences drawn by the researcher address the research question(s) and objectives that were formulated in the beginning of the research process. This thesis is based on a qualitative methodology and the strategy adopted by the researcher to provide answers to the research question and objectives is case study research. This choice was informed by the exploratory nature of the research questions and the need to produce rich accounts of both the phenomenon and the context of the study. In line with a qualitative case study research approach, a purposive sample was used to recruit rich-information cases that would provide a deep understanding of the phenomenon of interest and address the research question and objectives. In addition, in concert with the interpretive position of the study, the exploratory nature of the research question and objectives and the research strategy adopted by the researcher, qualitative techniques were employed for the collection and analysis of data.

Semi-structured interviews were held to capture the subjective interpretations of agents and observations were conducted to examine their interactions in the social world that produce and reproduce through their actions, verify the interview data and enhance the validity and reliability of the study. The results of these encounters with the participants were analysed thematically using the Framework approach, a rigor and well-established method of analysis within the time and resource constraints of the study. Finally, the researcher tried to ensure that his study is conducted in a scientific, professional and objective manner and meets particular criteria of quality, as well as that he behaves and acts according to the University of Surrey's code of ethics throughout the research process. The research design of this study is presented in appendix six. Based on the methodology and methods described in this chapter, the researcher collected and analysed his initial data (exploratory study). The outcome of this analysis is provided in the next chapter of this thesis.

CHAPTER VIII

8. Exploratory study: interview and observation findings

8.1 Introduction

This research is conducted in two stages: first, an exploratory study and second, the main part of the field work which explores the uptake of EPR in much greater depth. The first stage of this research is an exploratory study which examines the key issues of the study with six informants from the Mitera Hospital in Athens, Greece. The pre-study is based on qualitative case study methodology and uses methods often associated with this strategy to explore the implementation and use of the EPR system in the Hospital. Open-ended, audio-recorded interviews, which lasted from sixty to ninety minutes, were held with one member from the IT department, one physician, one midwife and three receptionists. Interviews were then transcribed verbatim and analysed thematically using the Ritchie and Spencer's (1994) Framework approach.

In addition, the research design included observations to explore how different people with different roles interface with and use the EPR system in their everyday activities. Observation is a qualitative method with roots in ethnographic studies. Ethnographic techniques, such as observation, can reveal details of the workflow that other methods would miss (Kaplan and Duchon, 1988). Workflow describes the processes that individuals follow to complete tasks and incorporates the way in which these individuals interact with other people, processes and technology to accomplish their work (Unertl et al., 2006). Observational methods used in social science involve a systematic and detailed observation of what people do and say; and, while observation differs from a qualitative interview, it can involve asking questions and analyzing documents (Mays and Pope, 1995).

Observations took place at the Maternity Clinic, the Dermatology and Laser Department, as well as the Breast Centre (Mammography Department). A direct non-participant observation technique was employed to inform this research about the way in which the system was used and what it was used for and identify any discrepancies between what users said and what they did in practice. During each observation, objective and careful field notes were taken and written in a field notebook in as much

detail as possible. At the end of each day, observation notes were transcribed and organized following the sequence of events.

This chapter discusses the themes that emerged from the analysis of the interview and observation findings. The data also include informal discussions with key members of staff from the departments which participated in the study. It starts with a reference to the research context and the innovative capability of Mitera Hospital and proceeds with a presentation of the demographic characteristics of the sample as well as a brief description of the departments in which observation took place. It then presents the emergent themes from the participants' responses under main thematic categories that follow the sequence of the interview schedule provided to the respondents and shows how the observation findings agree or not with the interview data. Appendix seven and eight provide examples of an interview and an observation transcript respectively.

8.2 Research context

This study took place at Mitera Hospital in Athens, a private organization, member - along with Hygeia and Lito - of the Hygeia Group. It provides maternity, children / paediatrics and general services to the population of Greece, with approximately 450 beds capacity, 800 salaried employees and a network of 1,500 collaborating doctors across 30 specialties. It is considered to be the biggest Obstetrics Clinic in Greece and one of the biggest in Europe and worldwide. Mitera hospitalizes 33,000 inpatients and 230,000 outpatients, its staff carry out 1,000,000 tests per year and it is considered to be on the front line of innovations in the field of telecommunications, computerization, medical equipment and scientific research.

The Hospital opened in 1979 with 300 beds capacity with an initial focus on Obstetrics and Gynaecology. However, its operations soon expanded to other fields of medicine such as Plastic Surgery, Ophthalmology, Otorhinolaryngology, Cardiology, Urology and Dermatology. More than 11,500 births take place every year at the Maternity (Obstetrics / Gynaecology) Clinic and its Premature Babies Department is ranked among the safest Neonatal Intensive Care Units in Europe. The General and Pediatrics Clinics of the Hospital began their operation in 2003 with 343 and 99 beds capacity respectively. The Dermatology and Laser Department of the Hospital offers services that range from General and Surgical Dermatology to Laser Epilation and Aesthetic Dermatology. Finally, the Mammography Department, a specialized unit

within the Hospital's Breast Centre, is equipped with a digital mammography device of third generation with a great distinctive capacity and provides valuable services to all women regarding prevention and diagnosis of breast diseases leading to the appropriate therapy and treatment.

8.3 The innovativeness of "Mitera"

Company documents show that "Mitera" could boast of being one of the largest innovative organizations in Greece. The staff of the Hospital laid the groundwork for technological success in 2000. It was a turning point during which the healthcare provider decided to move its business technology infrastructure into a new environment to meet the organization's modern operating needs. The management of the Hospital decided to leave the familiar and reliable IBM AS/400 operating system and move to a Windows environment with SAP enterprise resource planning applications. The SAP system went into operation on the 1st of January 2001 and turned out to be very efficient accommodating double the number of users - and many times the functions - supported by the IBM system in 2000. The IBM system supported the accounting and patient management operations of the Hospital, while the new system also covers a wide range of processes concerning the financial and administrative management of the Hospital (HP Customer Case Study, August 2008).

In 2004, Mitera signed a three-year Microsoft Open Value Licensing Agreement with the Company with the option to simplify license management, gain greater control over the software upgrade cycle, and manage software costs more efficiently. The main objective of the project was to integrate the IT systems of the Hospital in order to ensure a secure and stable work environment, cut down software acquisition costs and reduce license management time. One of the requirements of the Hospital was the ability to provide immediate clinical information to health care professionals. As a result of this agreement, the medical staff of the Hospital got quick access to critical patient information, such as lab results (Microsoft Customer Solution Healthcare Industry Case Study, June 2008).

In 2006, a part of the Hospital's IT equipment was enhanced and expanded dynamically. Hewlett-Packard (HP) installed two programs in order to support the old HP servers to perform new operations. Based on a Microsoft SQL Server 2005 the SAP system performs accounting, financials, business warehouse, human resources,

patient management and web portal applications. Financial, information, medical and imaging systems are integrated in order to provide a unified electronic patient record for each patient of the Hospital. SAP is the system used by the administrative and nursing staff in the inpatient departments in order to carry out their everyday work practices, such as ordering pharmaceutical / medical supplies and diagnostic tests, charging patients for services provided, accessing patient administrative and health information and so on (Microsoft Customer Solution Healthcare Industry Case Study, June 2008, HP Customer Case Study, August 2008).

"Mitera" is also equipped with the most advanced diagnostic technologies. In 2007, a new Open Magnetic Tomography scanner was installed in "MITERA" General Maternity and Children's Hospital. It is considered to be one of the state-of-art Magnetic Tomography systems in the world. It allows receipt of high resolution Magnetic Tomography pictures in a small time of examination and in a truly open and friendly environment for the patients ("New Open Magnetic", 2007). Moreover, the Hospital is equipped with a new Digital Mammography scanner of third generation, a PET/CT scanner, modern radiology devices and four ultrasounds machines (www.mitera.gr). Finally, in 2008, the Hospital expanded its operations in advertising. Intelligent Media Ltd implemented a Digital Signage application. Plasma screens were placed in fifteen key spots within the Hospital to inform the customers of "Mitera" about new products, services and so on ("Greek Healthcare Sector", 2008).

8.4 Demographics

The purposive sample of the pre-study consisted of six individuals who were invited to highlight as key elements in the story in a series of open-ended questions and included the EPR Manager of the IT Department and IT Security Officer of Singular Logic (the IT company which implemented the EPR system), a midwife and a receptionist from the Maternity Clinic, one receptionist and one doctor from the Dermatology and Laser Department and a receptionist from the Breast Centre (Mammography Department). The sample strategy included individuals - male and female – who were viewed to be particularly informative. It was planned to interview people who had been working at the inpatient facilities of the Hospital since or before 2001, when the EPR system was implemented, in order to have experienced the pre-EPR system of practice. In addition, the sampling strategy included interviewing

individuals from the outpatient departments of the Hospital who had experience of the paper-based system for the documentation of patient information. However, staff changes had taken place since 2001 and the management of the Hospital provided the researcher with access to speak to particular individuals. Thus, the majority of the participants did not have experience of the pre-EPR era (table 8.1).

Nevertheless, the participants in this study offered useful insights regarding the work practices surrounding the use of the EPR system and the majority provided answers to questions about the system of practice surrounding the paper-based system since they claimed that they were aware of the previous system. Therefore, the aforementioned sampling limitations did not strongly influence the findings of the study.

Pre-EPR staff	1) EPR Manager 2) Receptionist (Breast Centre)
Post-EPR staff	1) Receptionist (Maternity Clinic) 2) Midwife (Maternity Clinic) 3) Receptionist (Dermatology and Laser Department) 4) Doctor (Dermatology and Laser Department)

Table 8.1: List of the participants according to their experience of the pre-EPR era

In addition, the sampling frame was designed in order to ensure diversity across IT, clinical and administrative staff (table 8.2), as well as age (table 8.3) and gender (table 8.4). Table 8.2 informs the reader about the professional background of the respondents.

Managerial staff	1) EPR Manager
Clinical staff	1) Midwife (Maternity Clinic) 2) Doctor (Dermatology and Laser Department)
Administrative staff	1) Receptionist (Maternity Clinic) 2) Receptionist (Dermatology Department) 3) Receptionist (Breast Centre)

Table 8.2: List of the participants according to their professional background

As it was previously mentioned, staff changes had taken place since 2001; and young, enthusiastic and competent individuals had taken up administrative and clinical

positions in the Hospital. Table 8.3 shows that the age of the majority of the participants ranges from thirty to thirty-five years-old. The new generation is most of the times familiar with computers and new technologies, which might mean that they would exert a positive attitude towards the use of the system.

25-30	1) Receptionist (Dermatology and Laser Department)
30-35	1) Receptionist (Maternity Clinic) 2) Midwife (Maternity Clinic) 3) Doctor (Dermatology and Laser Department) 4) Receptionist (Breast Centre)
35-40	1) EPR Manager

Table 8.3: List of the participants according to their age group

Table 8.4 shows that the majority of the respondents are females, which is partly attributed to the nature of the receptionist and midwife professions and the Human Resources Department's policy to recruit females for these roles.

Male	1) EPR Manager
Female	1) Receptionist (Maternity Clinic) 2) Midwife (Maternity Clinic) 3) Receptionist (Dermatology and Laser Department) 4) Doctor (Dermatology and Laser Department) 5) Receptionist (Breast Centre)

Table 8.4: List of the participants according to their gender

8.5 Observation sites at a glance

Observations took place in one inpatient (Maternity Clinic), one outpatient (Dermatology and Laser Department) and one diagnostic department (Breast Centre). The choice of these sites was based on the availability of an EPR system, the access to speak to the staff and observe how they interact with the technology and with each other to perform their tasks as well as the premise that studying different departments, which provide different types of care and services, would offer a good opportunity to understand how the EPR is used within the Hospital, capture the routines surrounding its use and examine the role of each member of staff regarding the use of the system.

The Maternity Clinic is situated on the seventh floor of the Hospital's main building overlooking the Olympic Athletic Centre, which hosted the Olympic Games of 2004 in Athens. The Clinic's atmosphere seems to be very warm and hospitable for the patients and their escorts and the relationship among the staff working at the Clinic exceptionally friendly. The idea of carrying out observations at the department was pleasantly welcomed by the clinical and administrative staff. All members of the staff were willing to help and provide information about the EPR system and the system of practice surrounding its use. The observation session lasted ninety minutes.

The Dermatology and Laser Department is situated on the ground floor of the Hospital. It is a relatively new department with specialized personnel and modern equipment, which covers all the spectrum of dermatological conditions. The department provides its services to the outpatient customers of the Hospital. However, the doctors of the Dermatology and Laser Department also treat skin problems that might appear to inpatients of any clinic or department of the Hospital. The medical, nursing and administrative staff welcomed the idea of carrying out observations at their department. The observation session lasted approximately two hours.

The Breast Centre is situated on the ground floor of the Hospital and is staffed by five administrators and experienced radiologists, radiotherapists, oncologists and breast surgeons. It is a specialized department with advanced technological equipment. The department is equipped with a digital mammography device, which offers a safer and more accurate service to the patients by decreasing the radiation dose in relation to the analogical mammography by 30-40% and facilitating future comparison due to its digital database. The Mammography Department serves the outpatient customers of the Hospital and shares the same front desk with the Osteoporosis Department. The administrative and medical staff were happy with the idea of conducting observations at their department. The observation session lasted approximately one and a half hours. The following sections present the themes that emerged from the analysis of the interview and observation data.

8.6 Paper-based system evaluation

This section looks at the use and utility of the paper-based records in the Maternity, Clinic. These findings are based on the responses of the members of the Clinic and the observation that followed the interview process. According to the EPR Manager, the

electronic system was implemented in 2001 with the aim to modernize and facilitate the administrative and financial services of the Hospital, improve the quality of care given to patients and help health care professionals in their everyday individual work practices. However, the interview and observation data show that in the inpatient facilities of the Hospital along with the electronic system is still in use the traditional paper-based system.

Patients first enter the Admissions Department and provide the receptionist with their personal details. Then the Senior Nurse of the Department asks questions about their personal and medical history, she records them and places them into their file. Once they have been operated on, their doctor writes guidelines for their post-surgery treatment. Each file includes the patient's demographics, diagnosis, personal history, vital readings, diagnostic tests, electrocardiogram and the doctor's guidelines. The Senior Nurse of the Admissions Department ensures that all the required documents are included in the patient's file, which is then sent to the inpatient wards. Observation at the Maternity Clinic revealed that a patient arrives at the Clinic with her paper-based file and, when available, the Senior Nurse of the clinic opens the patient's file, searches through documents and finds the doctor's guidelines. She first writes them down in a nursing plan book and then copies the instructions for dispensing drugs in a medication card. When the Senior Nurse is busy, a member of the nursing team performs this process.

The clinical and administrative staff of the Maternity Clinic seem to be happy with using paper-based files in their daily activities. In particular, they find the system's functionality satisfactory and think that there is no reason for them to use the EPR system for the aforementioned information entry. One of the respondents referred to the compatibility of the paper-based system with the midwife's role. This respondent said that midwives are mainly trained to provide the best possible quality of care to their patients. She mentioned that performing administrative duties was seen as of secondary importance. One respondent stated that the electronic health records system is relatively complex and alien to her; and that she is used to following conventional methods for accomplishing her tasks. She stated that overall the paper-based health records system suits her role and facilitates her daily work activities in the clinic.

The midwife from the Maternity Clinic said:

"The paper-based system supports my role. I believe that I have everything I need. I can have an overall picture of the patient. There is no reason for me to use the electronic system for seeking information like the doctor's diagnosis and guidelines, as well as the patient's history and vital readings. In my opinion, it would be very complicated and is not helpful for my role".

An informal discussion with a doctor working at the Osteoporosis Department revealed that keeping paper-based records was a matter of practice. Senior doctors, he commented, are used to writing their patients data on a piece of paper. In addition, it is not their role to enter information into the system. In other words, they are not administrative clerks, but clinical employees. Entering information into the system, he felt, is an administrative job which is performed by the receptionists of the department. Finally, according to the same doctor, a possible explanation for keeping paper-based records is that doctors working at specialized units and outpatient departments do not require anything more sophisticated.

The doctor working at the Osteoporosis Department explained:

"My specialty does not require anything more sophisticated. The EPR system would be useful for the clinicians. Every time I require information, I either go back to the paper-based folder to search for it or I ask the receptionist to print out the form that is electronically stored...Senior doctors, like me, do not use the system because it is not our role to do so. The receptionists are responsible for entering data and updating the system".

8.7 Advantages and disadvantages of the paper-based system

The interviews explored the participants' views regarding the paper-based system, and respondents were asked to describe the advantages and disadvantages of the paper-based method for the documentation of patient records. The majority of the informants in this study stated that it was extremely time-consuming writing in paper-based health records. In addition, they noted that part of their job is to search through files and find a particular document for information on a particular patient. They said that writing health records manually and searching through files takes a lot of time and results in an increase in both workload and required time for the completion of their daily tasks. Paper-based records were also viewed by respondents to be

cumbersome. They require a lot of space although they are transferred at the end of each month to the Archive Department for scanning and entry into the Hospital's central electronic database and they are then destroyed. Furthermore, two of the respondents mentioned that there is always the danger of losing or damaging important documents with sensitive and confidential information about an individual's health status and demographics respectively.

The receptionist from the Breast Centre stated:

"..I believe that the main disadvantage of the old system is the danger of loss or damage of important documents. In addition paper-based records take space and it takes time to search through them".

The receptionist from the Dermatology Department referred to the previously mentioned disadvantages of the paper-based system and explained that the Hospital should also take account of environmental issues in the extensive use of paper:

"...there is an increase in workload since everything is written manually...there is always the possibility of losing some important documents. Moreover, the paper-based records take a lot of space and the wide use of paper does not contribute to the protection of the environment. The process for writing paper-based health records is time-consuming and there are many people involved in this process".

On the other hand, only two participants were positive about the paper-based system. One informant emphasized the need for using less organizational resources when the old system is in operation. She said that using paper and pen for recording patient information is a familiar method which does not require any special training and hence economizes on time, money and staff who would be responsible for providing the training. Furthermore, another respondent felt that the paper-based system is simpler, does not require an information technology literate personnel and that it is an easy method for the collection, documentation and storage of patient health records.

The receptionist from the Dermatology and Laser Department commented:

"...the main advantage of the paper-based system is that it does not require any training...it takes time to provide training to people who are not very familiar with computers".

And the midwife from the Maternity Clinic added:

"The reason that I am still using the paper-based system is that...it is easier to use".

The emergent themes from these sections are presented in table 8.5 and provide a summary of the respondents' views about the paper-based way for data collection, documentation and storage.

Topic	Themes
Paper-based system evaluation	• The paper-based system is compatible with the clinical staff's role • Clinical and administrative staff are happy with the paper-based system's functionality
Advantages of the paper-based system	• Low complexity • No need for using organizational resources
Disadvantages of the paper-based system	• Time-consuming • Increase in workload • Data loss • Space • Environmental issues

Table 8.5: Participants' views on the paper-based method for data collection and recording

8.8 Reasons for moving from the paper-based to the electronic system

Participants were also asked to express their views regarding the reasons for moving from the paper-based to the EPR system. Respondents stated that "*going electronic*" does not simply mean replacing the paper-based system with an electronic one. Many respondents identified that paper-based records and the new electronic system coexist in the Maternity Clinic of the Hospital. They also identified that the new system acts as a mechanism for change in organizational work practices and procedures.

Examples of this were provided by two informants who said that the main reason for the introduction of the EPR was the need to change the work practices in the financial services of the Hospital. They said that the new system offers advanced functionality with better interconnection between departments and clinics, and facilitated better data storage and dissemination. One described how every time a staff member in a particular clinic charges a patient for a service provided in the department, the clinician's name, the clinic, the service provided and the date appear on the system in

the Accounts Department. This, it was stated that changed and improved the billing routine for the Hospital.

The receptionist from the Maternity Clinic said:

"I think that the electronic system was introduced in order to facilitate the charging of the patients as well as the Accounts Department with regards to billing issues. For example, every time we charge a patient for a drug, the drug's name, the name of the patient and her doctor, the clinic name as well as the date of the charge appears on the system in the Accounts Department".

Another respondent mentioned that the EPR system was implemented in order to improve and speed-up the coordination between the clinics, the Pharmacy, the Medical Supplies and the Accounts Departments. This respondent said that the EPR system allowed the ordering of drugs, medical supplies and diagnostic tests for patients. He also said that this allowed the Hospital to charge patients for the items of treatment received. He also described how the EPR system had also changed the ordering, payment and invoicing routines within the Hospital. Participants said that it has been recognized that these routines needed modernizing and that installing a new IT based system was one way of achieving this. Most respondents did not mind this change process and felt that modernization was an inevitable consequence of organizational change. They did say that while they expected changes it was still a change and therefore involved disruption and resistance from colleagues.

Two of the respondents articulated the need for modernization of the Hospital. One informant focused on the modernization and change of specific administrative procedures, which would improve the Hospital's administrative services.

The EPR Manager said:

"From an administrative point of view, it has been designed to assist in the automatism of charges, patients' payments, admissions and discharges, and in the whole process involved from the time that a patient enters the hospital and he is transferred to a room, until the time he leaves the hospital".

Respondents stated that the electronic records system was also introduced in order to improve the quality of care provided to patients, help health professionals in their daily activities and speed-up the work processes within the Hospital. They went on to say that the EPR was one mechanism for change in the quality of service provision.

The majority of the participants in the study stressed the importance of providing a high standard service to the patients of the clinic. They believed that the electronic records system contributes to the provision of a better, faster and more accurate service to the patients who are customers of the Hospital.

In addition, they said that the EPR system was bought in order to help health care professionals in their everyday activities and also change the way in which work processes are performed. One respondent gave an example of when in the past doctors used to prescribe drugs by writing them on a piece of paper and give them to the patients who in turn had to go to the pharmacy and buy them. The patient usually threw away the paper after the drugs were dispensed. This, it was reported, meant that there were often incomplete records of the medication that a patient had received. Table 8.6 summarizes the main reasons giving by the respondents for moving from the paper-based to the EPR system.

Topic	Themes
Reasons for moving from the paper-based to the electronic patient records system	• Financial services accommodation • Coordination between clinics, pharmacy and financial departments • Modernization of the Hospital's services • Improvement of the quality of service provided to patients / health professionals

Table 8.6: Reasons for moving from the paper-based to the EPR system

8.9 Advantages and disadvantages of the EPR system

The majority of the respondents stated that one of the main reasons for going electronic was the need to provide a "*gold medal*" service to the patients. They felt that it was the ability to provide a fast, accurate and high standard service provision to the patients that convinced them of the actual and potential advantages of using the EPR system. In particular, they stated that the EPR offers a better customer service to the patients who are no longer involved in any bureaucratic procedures.

The EPR Manager provided an example of this view:

"...test requests are sent electronically through the system...in the past they (i.e. patients) had to ask their doctor for a test order, then take it, go to the labs, give the

paper and perform the test. With EPR, they just have to go to the lab and tell their name".

One informant referred to the potential of EPR to reduce clinical errors. The electronic system provides health care professionals with a range of information, such as medication history, current medication and prescriptions issued. Respondents stated that it offered the opportunity for better diagnosis and treatment as well clinical errors reduction. Therefore having the right information readily available, respondents felt, allowed a better level of service to patients. Furthermore, it was reported, the availability of information to health professionals not only provides them with a complete picture of their patients, but also contributes to information sharing among doctors and departments. This, it was felt, helped with audits and research activities. Respondents also said that one of the EPR system's functions is that it offers interconnection and dissemination of information between departments and individuals. Many users can work simultaneously on the same set of records from their computers. Therefore, the system is constantly updated by different departments also providing the staff with easy and quick access to the required information.

All the respondents agreed that EPR speeds-up and automates the work practices that take place within the Hospital. The receptionists in the outpatient departments can easily and quickly search for patients' information and check through the system for patients' payments. Customers pay at the Cashiers Department and their name and reason for visiting the department automatically appear on their screen. The administrative and nursing staff of the clinics can easily and swiftly order drugs, medical supplies and tests, and clinicians can quickly look for any required information about their patients. Many respondents described the EPR system as being well organized and user-friendly. A midwife from the Maternity Clinic described the speed with which the system provides them in their everyday activities, as well as the automatism of their work practices and the ease of use.

She said:

"I can easily and quickly order medication, medical supplies and tests...By using the electronic system I do not have to contact the lab or write down on a piece of paper the name of the required test and then send it to the appropriate lab to carry out the

requested test. Everything is stored electronically in the patient's record and sent directly to the labs in order to carry out the test".

In contrast to the paper-based system, a major advantage of the EPR, as described by all participants, is that there is greatly reduced possibility for data damage or loss. The clinical and administrative staff working at the outpatient departments stressed this point, as data integrity and protection is a key part of their responsibilities. Moreover, the receptionist from the Dermatology Department who used to work at the Marketing Department added that the data stored into the system could be used for statistical and financial analyses by the Marketing and the Finance Department respectively.

On the other hand, some respondents said that, in contrast with the paper-based system, the EPR system requires training and especially for people with limited IT skills. Training was provided to all the new users by the members of the IT Department. They also felt that some of this training was a time-consuming and – in some cases - tiresome and costly process. The organization has to invest money, time and human resources in order to provide appropriate training and employees who are not very familiar with computers have to exert effort in order to learn how to use the system. However, in the case of the receptionist from the Dermatology and Laser Department the training lasted only a few minutes. There were also concerns from the EPR Manager about the way that the EPR system might be used. As a result, there was an increased need for monitoring from the IT Department and the doctors of each department in order to avoid mistakes due to unauthorized entries.

The EPR Manager mentioned that:

"... (EPR) is closely tied to the hospital's procedures, and thus doctors have to constantly monitor the individuals who enter the data into the system in order to ensure that they have not done any mistakes, and IT services have to monitor the users of the system to check who enters what information and intervene in any unusual or unauthorized entry".

While most of the participants agreed that EPR provides them with fast access to patients' tests, medication and personal details and speeds-up the work practices within the Hospital, one informant said that the EPR system was quite slow in terms of access to patient data; and this, she finds, is quite frustrating. She said that the name of the patients' doctor was not displayed on the main page and she had to click

on the patient's name to view who her doctor was. In addition, respondents identified some problems regarding slow speed of access when two different departments were trying to access the same record. The system's ability to be simultaneously updated by different departments causes some further problems. As the receptionist of the Breast Centre reported simultaneous use from two departments might lead to mistakes.

She explained that:

"The system is updated from both our department and the Ultrasound department. In case that the system freezes in their department we cannot have access to the ultrasounds of a patient. Furthermore, the receptionist of the Ultrasound department might change by mistake some mammography results and vice versa".

There were also concerns about what would happen if the whole system broke down. Respondents worried that an outage would mean that there was no access to any patient record. Another disadvantage of the system is that it often freezes resulting in delays in the performance of their daily activities, such as the ordering of drugs and medical supplies, seeking of required information and provision of diagnostic test results to the patients. The freezing of the EPR system was a disadvantage reported only by the administrative staff; clinical staff, for example, did not raise it as an issue. The receptionists explained this by saying that they were the members of staff who had most contact with the EPR system throughout their shift. Table 8.7 presents the emergent themes regarding the advantages and disadvantages of the EPR.

Topic	Themes
Advantages of the EPR system	• Service provision (quality) improvement • Reducing clinical errors • Information access, provision and sharing • Time-efficiency and ease of use • Automatism of work practices • Data protection • Statistical / financial analysis of data
Disadvantages of the EPR system	• Slow access to patient data • System's breakdown • Need for extra training and monitoring

Table 8.7: Advantages and disadvantages of the EPR system

8.10 EPR system evaluation

Participants were asked to provide their opinion about the EPR system and evaluate its efficiency. Overall the data show a positive attitude towards the electronic system. In an attempt to prove the system's efficiency, the EPR Manager emphasized its technical characteristics and its potential for comprehensive information sharing and reporting, which seemed to be very practical in the users' daily activities. The clinical staff who participated in the study referred to the system's efficiency with regards to how it supports and changes their everyday work processes. The midwife respondent stressed the importance of being able to ordering drugs, medical supplies and diagnostic tests electronically.

Moreover, the doctor from the Dermatology and Laser Department was excited about the system's functionality and potential to provide users with thorough information, contributing to the provision of an efficient and secure health care service to patients. The EPR system, she felt, provided her with easy and quick access to information regarding previous laser sessions, such as comments, laser power that she used during these sessions, the patients' personal history which is related to her specialty, any problems that might have emerged, findings from test results, as well as the dermatologist's name who requested the laser treatment. She also said that the EPR was very functional; each patient's electronic health record includes one form for new sessions and another one for the previous ones. Once the information from the new session has been entered, it is automatically saved on the patient's form with the previous sessions. Hence, she said that she did not have to transfer her patients' data from one form to the other. This process was automatically performed by the system.

The doctor from the Dermatology and Laser Department explained:

"I believe that the paper-based system would not have so many details as the electronic one, such as how long the laser session lasted. In addition, it is more functional and sophisticated...Laser sessions differ from one iteration to another. Viewing on the system the results / comments from previous sessions helps me to provide the appropriate therapy".

Most of the participants were happy with the time-efficiency of the EPR system. Respondents with a clinical background believe that the system helps them to easily and quickly have access to health information about their patients. The administrative

staff's responses slightly vary. That is, while the receptionists at the outpatient departments replied that the implementation of the electronic system resulted in less work and required time for the completion of their tasks as well as faster and easier access to patients' data, the receptionist at the Maternity Clinic characterized it as slow. However, her overall opinion about the system's efficiency was positive.

The receptionist from the Maternity Clinic said:

"When being utilized by many users simultaneously the system goes down. In addition, it is quite slow and when you log on you can view the personal details of the patients but the name of the doctor is not displayed...Apparently, the new system is more efficient".

The participants' responses demonstrate compatibility between the EPR system and the clinical / nursing and administrative roles. One receptionist noted that the EPR is compatible with their role and assists them to fast and easily inform physicians about patients' previous visits and therapies and thus help them to schedule the next visits for their patients. The midwife working at the Maternity Clinic stated that her role is to take care of the patients and not deal with administrative issues, adding that the new system supports their role regarding this aspect. Likewise, the doctor from the Dermatology Department mentioned that the system supports the doctors' role and went beyond that by referring to the system's compatibility with her daily activities regarding the documentation of health data and the seeking of required information.

The doctor working at the Dermatology and Laser Department commented:

"The new system facilitates my daily work for patient records collection and storage... (I can) record some personal data of my patients that are related to the laser session (history), enter a brief diagnosis with some comments about the power that I have used and possible reactions (e.g. dermatitis) that might have emerged, as well as record any significant findings from diagnostic tests".

Respondents felt that overall the advantages of the EPR system seem to outweigh the drawbacks of the system and they demonstrated a positive attitude about the efficiency of the EPR system. Table 8.8 summarizes the respondents' views of the EPR system.

Topic	Themes
EPR system evaluation	• Efficiency ✓ Comprehensive information sharing and reporting ✓ Accommodation of the staff's everyday work practices ✓ Provision of an excellent customer service • Time-efficiency ✓ EPR speeds-up work processes ✓ Quick access to information • Compatible with the clinical / nursing and administrative role • Compatible with daily routines

Table 8.8: EPR system evaluation

8.11 Changes in roles

Although the EPR system was considered to be efficient and compatible with the nursing and medical's staff role in terms of facilitating and supporting their work, one of the respondents felt that there was a conflict between their clinical and administrative responsibilities. At the clinics, it was reported that nurses and midwives use the system for charging patients for pharmaceutical and medical supplies as well as ordering tests from the labs during the evening hours when the receptionist of the clinic is either not available or absent. Respondents described how the paper-based system coexists in the clinics and nurses / midwives record the patients' medication in the nursing book. The receptionist is then responsible for entering medication data into the system. They said that when the receptionist is not in or available, the nursing staff's responsibilities include recording a patient's medication both in the nursing book and the EPR system. This is extra work for the nurses / midwives as well as it conflicts with their professional identity. The midwife from the Maternity Clinic reported that her role should be patient-oriented and not involve administrative duties, such as ordering drugs and medical supplies.

She explained that:

"My role involves using the system during the evening hours when the receptionist of the ward who is responsible for entering data into the system is not in. My role during these hours includes charging patients for drugs and medical supplies as well as requesting electronically tests from the labs. Needless to say, my job is to provide high quality care to the patients, but unfortunately sometimes I have to get involved in administrative procedures such as entering data into the system".

Moreover, the implementation of the EPR system brought changes in the physicians' role. After the introduction of the electronic system, physicians, it was reported, had the option to take up administrative responsibilities and use the system for data entry, such as their patients' medication and personal history, comments about the therapy session and findings from diagnostic tests which are relevant to their specialty and their patients' needs. While the clinicians at the Maternity Clinic did not make use of this facility, the doctor from the Dermatology and Laser Department welcomed this change and said that she used it. In addition, the nursing staff at the clinics said that they had been trained in order to know how to use the system when the receptionists are not available. The introduction of the EPR system seems to have resulted in changes in their scope of practice, since their role includes administrative duties. Table 8.9 lists the changes that the EPR system brought in the roles of the clinical and nursing staff of the Hospital.

Topic	Themes
Changes in roles	• Role conflict (clinical-administrative role) • Extra work for midwives / nurses • Change in the doctor's role • Clinical staff take up administrative responsibilities

Table 8.9: The impact of the introduction of EPR on the roles of the medical / nursing staff

8.12 Changes in work practices

Respondents described how the introduction of the new electronic system was inevitably followed by reorganization in the way in which individuals perform their everyday activities. Respondents said that before the implementation of the EPR system in the Maternity Clinic, patients' medication was recorded only in the clinic's

nursing book as well as medication card. After the introduction of the electronic system, it is also recorded into the patients' electronic records. However, they said that they also keep a paper-based record for medication dosage and the paper-based file with a patient's diagnosis, personal history, doctor's guidelines, diagnostic tests, vital readings and electrocardiogram is still in use.

Observation at the Clinic showed that the process for prescribing drugs is performed in two stages. First, the Senior Nurse or a midwife prescribes the drug(s) manually by writing it down in the nursing plan book. Then, they tell the receptionist to charge and order it electronically. The receptionist finds the patient's name on the EPR system, clicks on it and enters the drug's code. Once she has entered the code, she clicks on it and a tab with the patient's name, room number, code and name of the drug appears on the screen. In the end, she clicks "complete" to confirm the prescription.

Respondents said that in the outpatient departments, the changes in staff's daily routines regarding information documentation are more noticeable. Observation at the Breast Centre showed that receptionists enter the doctor's diagnosis, patient history and the results of the mammography into the patients' electronic record. In the past, they said that they used to use typewriters for the documentation of patient data. Participants said that doctors used to write a patient's diagnosis on a piece of paper and then give it to receptionists who in turn used to type it and give one copy to patients and keep another one for the department's paper-based records. Furthermore, after the implementation of the EPR system in the Dermatology Department, the doctor who was specialized in the performance of laser sessions said that she could now enter and regularly update information about their patients. In the past, she would have to record her patients' information manually and keep it in paper-based files.

Moreover, the data show that the introduction of the EPR system resulted in changes to the way staff sought out information. In the Maternity Clinic, receptionists could easily and quickly search on the system and find a patient's doctor and corresponding medication. They simply had to type on the search engine either the name of the patient or the number of her room. In the pre-EPR era they would have to spend time and search through patient files and department books to find the previously mentioned information. In the outpatient departments, physicians who use the system can easily look for their patients' data, such as personal details, previous visits, diagnosis, history and diagnostic findings, without searching through papers and files

or asking for the receptionists' assistance. In addition, receptionists can check for payments without asking for receipts, seek information about a patient's demographics and inform the department's doctors for any required information.

The receptionist from the Breast Centre said:

"(A patient) pays for the service and automatically her personal details, the name of the test and the time of the transaction appear on my screen...In case that a doctor requests a previous diagnosis or results of a previous mammography, I can search on the system, find the required information and then either tell him verbally or print them out".

Respondents said that some of the most common standardized work practices in an inpatient department are the ordering of pharmaceutical and medical supplies, the ordering of diagnostic tests, as well as the charging of patients for these services. In the past, it was reported that receptionists and health professionals had to either call or send a doctor's order manually to the required departments. In addition, they had to charge patients for these services. Respondents said that the process for ordering medicines, medical supplies and charging patients for these services either manually or over the phone was time-consuming and that there was always the danger of losing a voucher and over- / under- charging a patient. Respondents felt that the EPR has changed the way in which patients are charged and drugs or tests are requested.

The midwife from the Maternity Clinic described how the ordering routine is performed:

"Her doctor requests the necessary tests to the receptionist of the ward who in turn requests them electronically to the labs / outpatient departments. The receptionist opens the electronic files of the departments / labs that are going to carry out the tests and a barcode is sent with the name of the patient and the test written on it".

However, observation at the Maternity Clinic revealed that sometimes the process for ordering drugs varies. That is, drugs are not always requested electronically. Receptionists write the name of the drug(s) on a piece of paper, which is later sent to the Pharmacy. The receptionist of the clinic explained that pharmaceutical supplies are ordered manually when the daily supply of drugs has been dispatched to the department and they need extra drugs for one or more patients. She said that if they order the drugs electronically, they will be sent to the Clinic the following morning.

Thus, they complete a voucher and a member of the nursing staff visits the Pharmacy, hands the voucher to the staff of the department who in turn provide them with the requested drugs.

The interview and observation data also show that the new system offers staff the opportunity to access, view and print out test results. The availability of test results was considered to be one of the most significant changes in how the daily work at the clinic was performed. Patients or health professionals often ask for a copy of a particular test. In the past, a receptionist or a midwife used to go to the lab, ask for the particular test, photocopy it and then return to the department and provide it to the patient or doctor. With the EPR, receptionists log on the system, browse the patient's name, click on the patient's diagnostic tests icon and the tests appear on the screen. They then open the particular test, print it out and provide it to the patient or health professional who requested it. Respondents said that the EPR has also modified the discharge process. Information about a patient's discharge is entered into the system by the receptionists working at the inpatient departments. The patient's discharge then appears on the system of the Accounts Department, which is responsible for providing the document to the patient. The most significant changes in the work practices after the introduction of the EPR system are presented in table 8.10.

Topic	Themes
Changes in work practices	• Information documentation ✓ Medication, diagnosis, history and diagnostic tests' results entry • Information Seeking ✓ Demographics, payment details, previous therapies / visits, diagnoses, findings • Charging ✓ Pharmaceutical / medical supplies and diagnostic tests • Ordering ✓ Drugs, medical supplies and tests • Availability of test results • Linkage with discharge process

Table 8.10: The impact of the introduction of the EPR system on the work practices

8.13 Variations in the use of EPR

The interview data show a variance regarding the level of EPR adoption in different departments. In particular, in the Maternity Clinic, the EPR system is used for charging patients, ordering drugs and medical supplies, as well as requesting, accessing and printing out test results. The staff described how they simultaneously use the paper-based records for reading a patient's diagnosis, personal history, old diagnostic tests, vital readings and the doctor's guidelines. The midwife respondent said that entering into the system and accessing a patient's diagnosis, history and the guidelines provided by her doctor would not make any difference. In contrast, she felt that it would be more complicated and less helpful for her role.

Observation at the Clinic showed that the system has a function for diagnosis, case history and comments entry. When the receptionist and the midwife were asked to explain why they had not used that function, they replied that they were not aware of that and they were not advised to do so. However, it seems that the function for medical information entry had not been activated. The last argument was later confirmed by the EPR Manager. One, though, would easily wonder why such an important function had not been activated. One of the most important reasons for going electronic, according to the participants' responses, was the provision and dissemination of a comprehensive set of information to health professionals, which would help them in their everyday work processes and offer them the opportunity for better diagnosis, case management and clinical errors reduction. It seems therefore that, although there was a potential to make fuller use of the EPR system, there were no instructions from the management team to do so.

On the other hand, in the outpatient departments, staff said that the use of the system was different and that its use varied across different departments. Observation at the Dermatology and Laser Department revealed that the EPR system is mainly used by the receptionist of the department for information seeking. That is, the receptionist checks on the system for a patient's doctor, type of therapy / consultation that they are going to perform, payments and date of transaction, previous visits and reasons for visiting the department in the past. The software that is used in the Dermatology and Laser Department provides the opportunity for diagnosis, personal history and comments entry. It also has more advanced functions for medication, allergies,

diagnostic tests results and images entry. The potential user can either choose from a set of fixed and brief diagnoses in order to enter a diagnosis or type a detailed diagnosis on the form provided. Nevertheless, this is not the method that is used for the documentation of diagnosis in the department, but the receptionist uses a book where she writes the patients' personal details, their doctor, the date of visit and a brief diagnosis provided by the doctor at the end of the visit.

Respondents from the Breast Centre, though, said that they do not keep any paper-based records. They reported that the introduction of the EPR system brought changes in the information seeking, recording and reporting routine. Observation at the Breast Centre showed that the receptionists who work at the department use the system for browsing patients' names, checking for payments, recording a patient's diagnosis, history and results of the mammography and providing doctors with any required information about their patients, such as previous tests' diagnoses and results.

Respondents felt that the variance in the use of the EPR system across different departments could be explained by many factors, such as the nature of the work performed in the department and the absence of a policy from the management which would force the staff to make full use of the EPR system. One informant mentioned that they do not use the whole range of functions on the system because they are not asked for and the management team encourage them to keep paper-based records. The receptionist from the Dermatology and Laser Department said that she could enter into the system the diagnoses provided by the doctors, but she did not use to do so because she did not have the time to both enter diagnoses into the system and write them in the department's book.

She explained that:

"Although I would like to, I have not used yet the function for entering the diagnoses into the system...Due to lack of spare time I cannot do both. I will either write them in the book or I will enter them into the system...The system has many functions that I might not remember because I do not use them in my everyday activities...At this point, I would like to mention that the system could be widely used by the doctors and other members of the hospital, if there were such instructions from the management...In contrast, they encourage us to keep paper-based records and therefore we have to follow their orders".

Another respondent provided a different explanation for not keeping electronic records for their patients. An informal discussion with a dermatologist during the observation session revealed that they did not use to enter diagnoses into the system because it was not necessary to do so. The doctor said that patients usually visit them once and then they follow their instructions. He explained that doctors provide a diagnosis to their patients who are in turn responsible for keeping it safe. Entering the diagnoses into the EPR system, he said, would not bring better clinical results.

Furthermore, the interview and observation data show that there are inter-departmental variations in the use of the EPR system. That is, in the Dermatology and Laser Department, the doctor responsible for the laser sessions does not follow the paper-based method for information documentation. Instead, she uses the EPR system in order to keep health records for her patients. Although using the EPR system is not part of the clinical staff's daily routine, this doctor regularly enters and updates patient information. Unfortunately, access was not permitted in the Laser Lab and therefore it was not possible to observe how the doctor interacted with the EPR system. However, when a laser session ended and the patient left the department, the doctor did not provide the receptionist with a diagnosis. Keeping patient records electronically is an important variation from the department's routine for information documentation.

One dermatologist said that this could be explained by the fact that keeping electronic records for laser sessions brings better results. In contrast to dermatological consultations, laser sessions have some rules that can be easily monitored through the system. For example, the doctor can view on the system a patient's previous visits, comments / results, techniques that have been used and possible reactions in order to provide the appropriate therapy. Therefore, the electronic system facilitates the performance of laser sessions and contributes to the provision of a safer and more effective service, making the doctor more enthusiastic about using the system for the documentation of heath information.

In addition, in the Breast Centre, the system of practice for the provision of diagnosis differs. That data show that different doctors use different ways to provide their patients' diagnoses to the receptionists of the department. Some doctors provide them verbally, others manually and others in a digital voice recorder device. Observation at the department confirmed that there is a variation in the provision of diagnosis. One doctor stood next to the receptionist and provided the diagnosis verbally. Another

doctor entered the department and gave the receptionist a digital voice recorder. A third doctor provided the receptionist with a form with the patient's diagnosis, personal details and some comments. Then, the receptionist found the patient's name on the system, clicked on it, opened the patient's electronic form and recorded the diagnosis.

The observation also revealed that the information entry procedure is not always performed in the same way. While the majority of the doctors working at the department provide a different diagnosis for each case, one doctor has created a fixed electronic form for all her patients, which is updated by the receptionists according to the results of the mammography. This form includes the patient's personal details, the family history of the patient, the results of the mammography, a diagnosis and a comparison between the current and the previous mammography. When a mammography is completed, the doctor who carries out the test tells the receptionist to open the patient's electronic form and make the appropriate changes. Respondents reported that when a receptionist is not available or present, some doctors enter their patient's data into the system, while others do not know how to use it.

The receptionist working at the Breast Centre noted:

"One doctor has created an electronic form for the patients, which we update according to the results of the mammography and the diagnosis. Another doctor gives me the diagnosis on a piece of paper and I enter it into the system. A third doctor finally records the diagnosis in a voice recorder device and I enter it then in the system...In case that the receptionists are not in, some doctors (2) enter the data in the system. The rest do not know how to use it".

In contrast to the Dermatology and Laser Department, the standard operating procedure for the documentation of health information at the Breast Centre involves entering a patient's diagnosis, family history and results electronically into the system. This procedure is common for both the Mammography and Osteoporosis Department which share the same front desk. However, an informal discussion with a doctor working at the Osteoporosis Department revealed that while some doctors keep only electronic health records for their patients, other doctors keep both electronic and paper-based records. In particular, the doctor said that he first writes a patient's personal details, diagnosis and some comments in a form, which then gives to the

receptionist of the Breast Centre in order to enter the data into the patient's electronic health record. In the end, the receptionist returns the form to the doctor who then stores it in a paper-based records folder.

The doctor said:

"I still keep paper-based records for my patients as well as save my patients' x-rays on my computer along with a CD copy. I write a patient's diagnosis, personal details and some comments in a form, which I then give to the receptionist in order to enter the data into the patient's electronic health record. Then, the receptionist returns the form and I store it in the paper-abased records folder".

Table 8.11 summarizes the participants' views regarding the variations in the use of the EPR system between different specialties, as well as different users who belong to the same department.

Topic	Themes
Variations in the use of the EPR	• Specialty / sub-specialty variations ✓ Inpatient departments: the EPR is used for the performance of particular business processes. Health information is recorded manually and stored in paper-based files ✓ Outpatient departments: limited use of the EPR. Health data are recorded manually and stored in the department's book ✓ Diagnostic departments: full use of the EPR. Staff record on the EPR a patient's diagnosis, history and test results • Inter-departmental variations ✓ A doctor who provides laser treatments uses the EPR to record health information ✓ Different ways for the diagnosis provision ✓ Variance regarding the doctors' capability to use the system ✓ Variance in the performance of the health information entry routine (fixed forms)

Table 8.11: Summary of variations in the use of the EPR system

8.14 The impact of the EPR system upon the direct / indirect users

Participants were then asked to describe the impact of the EPR implementation upon themselves, their colleagues and the patients of the Hospital (table 8.12). Their responses varied according to their occupation. That is, while the administrative and clinical / nursing staff of the Hospital thought that the new system carried positive implications regarding their work and the quality of service provision to the patients, the EPR Manager reported an increase in the IT Department's workload, since they had to deal with more IT systems. The majority of the respondents mentioned that EPR had a positive impact on them and their colleagues. In particular, the new system facilitated their work by speeding-up the pace at which work processes, such as ordering drugs and diagnostic tests or charging patients, were performed.

Respondents felt that the new system was found to have a positive impact on the customer service provision. They said that patients were not anymore engaged in any bureaucratic procedures and they were not expected to remember their previous visits or the results of previous tests. In addition, midwives and nurses could spend more time with their patients, since the new system decreased the time dealing with administrative issues. The implementation of EPR was also beneficial for the staff of the Hospital with regards to access issues. Receptionists said that they could easily browse patients' names, check for payments and previous visits, as well as have access to patients' demographics, rooms and doctor's name. Medical and nursing staff were able to view important information about their patients, such as what medication they are on, previous tests, diagnoses, results, comments, patient history, as well as to print out any required documents.

The doctor working at the Dermatology and Laser department commented:

"After the introduction of the EPR system I can easily find any information regarding their (i.e. patients) previous sessions...the EPR system provides better customer service, since they are not engaged in any bureaucratic procedures, more effective therapy and more security. Laser sessions differ from one iteration to another. Viewing the results / comments from previous sessions on the system helps me to provide the appropriate therapy. In addition, patients do not have to remember their last visit or what they did during the last session. Everything is shown on their electronic health record".

Topic	Themes
The impact of the EPR system on the direct / indirect users	• Increase in workload ✓ More work for the IT department • Time efficiency ✓ EPR speeds-up work processes • Customer service improvement • Easier access to patients' data

Table 8.12: The impact of the EPR implementation on the Hospital's staff and patients

8.15 Scope for improvement / reasons for resistance

The participants reported concerns about the EPR system's software design as well as its technical deficiencies. One informant mentioned that the main software deficiency was that users cannot have access to images, such as MRIs and x-rays. He explained that image entry would contribute to better and easier diagnosis and treatment. Another respondent referred to the lack of an e-booking function. Booking appointments online would facilitate their job and would rule out the possibility for errors regarding the personal details of a patient. In addition, another respondent complained about the design and the pace of the system.

She said that:

"I would like to view on the system more detailed information regarding the patients' charges...it is quite slow and when you log on you can view the personal details of the patients but the name of their doctor is not displayed. You have to click on the name of the patient and then another window opens which shows the doctor's name. I would prefer to see it on the main page because every time I have to click and this is time-consuming".

Other participants referred to managerial issues regarding the use of the system. One informant mentioned that they used to keep paper-based records for their patients' diagnoses and make limited use of the system because they were not advised by the management of the Hospital to do otherwise. She clarified, though, that the main reason for not entering diagnoses into the system was the lack of spare time. Another respondent spoke about the need for two independent systems for the Ultrasound Department and the Breast Centre in order to minimize mistakes due to unauthorized

entries. Finally, one participant suggested that receptionists should be responsible only for one department throughout their shift.

She explained:

"Sometimes mistakes happen in entering the personal details of a patient as well as in the numbering of the rooms and the ordering of drugs. For instance, when I arrive in the morning they contact me from the Pharmacy to inform me about wrong drugs orders. This is not my fault...In some occasions I have to cover other wards when another colleague has called in sick and when I am not present some mistakes might happen...I believe that better training should be provided and the rest of the staff (i.e. nurses / midwives) should be more accountable in the use of the system".

Table 8.13 presents the participants' responses regarding some functions of the system that could be improved as well as about any managerial action that could be taken in order to achieve more efficient use of the EPR system within the Hospital.

Topic	Themes
Scope for improvement / reasons for resistance	• Software design issues ✓ Imaging ✓ E-booking ✓ Pace • Managerial issues ✓ Instructions for wide use of the system ✓ Staff multitasking across departments • IT department's issues ✓ Independent systems

Table 8.13: Scope for improvement / reasons for resistance

8.16 Summary

The exploratory study's findings show that the EPR system was mainly bought in order to improve the financial and administrative processes within the Hospital, speed up the communication and the coordination of patient activities across different departments, provide a good standard of care quality to customers as well as facilitate staff in their everyday work activities. With its advantages outweighing its

disadvantages, the EPR system has been found very efficient in the staff's everyday work practices and interviewees believe that it is compatible with their role and ways of practice. The implementation of the electronic system has also resulted in changes in roles and increase in the workload of the nursing and medical staff, which have taken up administrative responsibilities. Although the majority of clinical staff is happy with using the system, other respondents emphasize the need for more training for non-administrative employees as well as for software design modifications.

The data also show that the introduction and use of the EPR system also improved the productivity of staff. Midwives can spend more time with their patients; doctors can have fast access to information about their patients; and receptionists can more easily charge and order drugs, medical supplies and diagnostic tests. However, the most important finding of the pre-study was the variation in the use of the system across different departments and between diverse individuals. The data reveal that, in some departments, doctors use different ways for the provision and recording of health information; and while some asserted that they were "fully electronic", it seems that "fully electronic" may mean different things to different users. All the above issues will be further explored in the main study and discussed in the conclusions chapter.

CHAPTER IX

9. Main study: interview and observation findings

9.1 Introduction

This chapter presents the findings of the main study organised in particular thematic categories, which are based on the theoretical framework identified from the literature review. Figures 9.2 onwards (apart from fig. 9.6) provide a summary of the enactment of each technology-in-practice and link to Orlikowski's (2000) process of enactment shown in figure 4.3 (p.85). It starts with a description of the sample frame as well as a brief description of the departments which participated in the study and proceeds with an analysis of the findings of the face-to-face interviews and the on-site observations. The findings are grouped under three main categories, inertia, application and change, which refer to the different types of enactment of technologies-in-practice. This categorization helps the researcher to identify any variations in the use of the EPR system (application is the expected by the designers type of enactment, while inertia and change refer to variations introduced by the users of the technology) and highlight the role of human agents in using the technology and shaping it to fit their needs.

The main study explores the design and uptake of the EPR system with sixteen individuals from the Mitera Hospital. The research design is based on exploratory case study methodology, which facilitates in-depth exploration of the implementation and use of the EPR system within the Hospital. The researcher conducted sixteen open-ended audio-recorded interviews with key members of staff involved in the implementation and use of the EPR system to explore i) how the EPR was designed to be used and how it is used in practice, ii) the impact of the EPR implementation on other organizational routines and structures and iii) the role of agents in the change process. Each interview lasted approximately sixty minutes, was transcribed verbatim and analysed thematically using the Ritchie and Spencer's (1994) Framework approach. Appendix nine provides an example of an interview transcript.

In addition, the research design of the main study included over twenty hours of on-site observation in order to examine how different people with different professional backgrounds interact with and use the EPR system across different departments. This

method was used to i) capture the performative aspect of routines surrounding the use of the EPR, ii) explore the impact of the EPR implementation on other organizational processes, iii) examine how different people use the EPR across different departments and iv) identify any variations between what people said in the interviews and what a they did in practice. Appendix ten provides an example of the field notes taken from the Dermatology and Laser Department. Observation notes were transcribed and translated verbatim and are presented following the sequence of events.

9.2 Demographics

The researcher followed a patient's journey within the Hospital (fig. 9.1), starting from the Admissions Department, proceeding to the outpatient departments, moving on to the inpatient facilities of the Hospital and ending with the Accounts Department. The sampling strategy included interviewing participants with experience of the pre-implementation stage of the EPR system in order to inform the research how the introduction of the EPR system brought changes to other organizational routines, which have been identified during the first stage of the study, how the EPR system was designed to be used and how it is actually used, as well as why variability occurs.

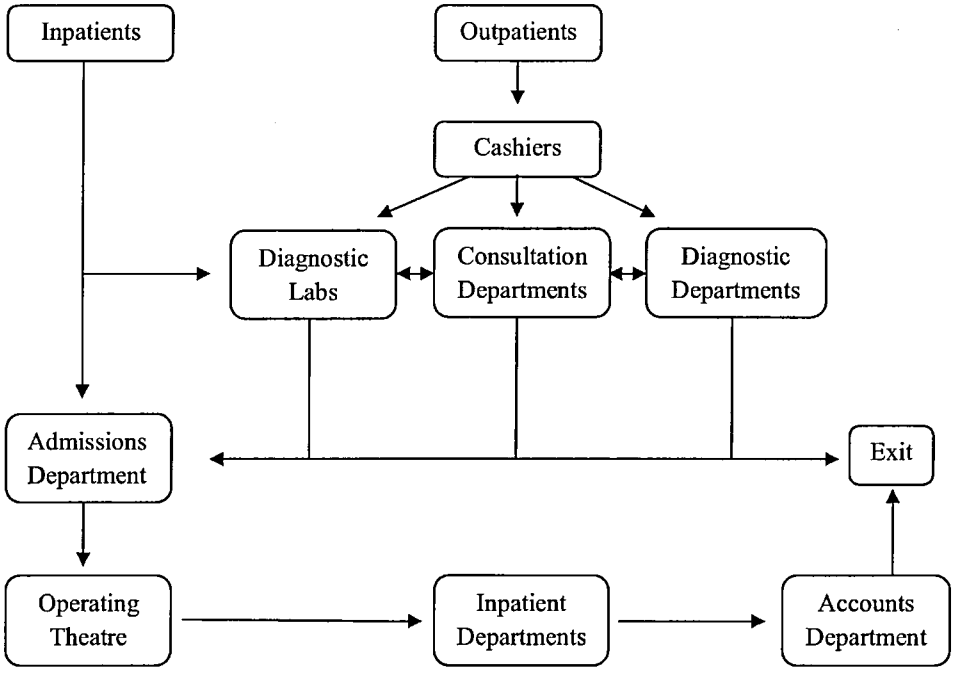


Fig. 9.1: A patient's journey in Mitera Hospital

The majority of the participants (13) had experience of the pre-EPR era (table 9.1). The EPR Manager who has been working for the Hospital since 2005, was - and is still - working for the company that implemented the EPR during the implementation stage. The researcher also interviewed three participants who lacked experience of the pre-EPR era, but offered useful insights on the use of the EPR in their departments. The departments that took part in the study were chosen on the availability of an EPR system. The EPR has not been implemented in all the outpatient departments of the Hospital and hence the number of suitable participants was limited. Departments were also chosen regarding the access provided to interview the staff. For instance, access to the Microbiology Department was not granted because the researcher was told that it is a very busy department and there was no time to speak to the staff as well as space to observe how they interact with the system and perform their tasks.

Pre-EPR staff	1) EPR Manager 2) Obstetrician / gynaecologist 3) Accounts Department Manager 4) Receptionist (Maternity Clinic) 5) Administrator (Admissions Department) 6) Administrator (Medical Supplies Department) 7) Administrator (Pharmacy Department) 8) Receptionist (Histopathology Department) 9) Receptionist (General Ultrasound Department) 10) Receptionist (General Clinic) 11) Nurse (General Clinic) 12) Doctor (Dermatology and Laser Department) 13) Receptionist (Breast Centre)
Post-EPR staff	1) Administrator (Cashiers / Admissions Department) 2) Receptionist (Cardiology Department) 3) Receptionist (Dermatology and Laser Department)

Table 9.1: List of the respondents according to their experience of the pre-EPR era

The second stage of this research included sixteen interviews with the EPR Manager from the IT Department, the Manager of the Accounts Department, two doctors, one nurse, seven receptionists and four administrators. The sample frame was constructed to ensure a maximum diversity across managerial, clinical and administrative staff

(table 9.2), as well as age (table 9.3) and gender (table 9.4). Table 9.2 informs the reader about the professional background of the respondents.

Managerial staff	1) EPR Manager 2)Accounts Department Manager
Clinical staff	1) Obstetrician / gynaecologist 2) Doctor (Dermatology and Laser Department) 3) Nurse (General Clinic)
Administrative staff	1) Receptionists (7) 2) Administrators (4)

Table 9.2: List of the respondents according to their professional background

Table 9.3 lists respondents according to their age group. The age of the majority of the participants ranges from 30 to 40 years-old. The Marketing and Communications Director of the Hygeia Group revealed a shift in the company's recruitment strategy towards young, competent and qualified individuals who would contribute to the improvement of the services provided by the Hygeia Group's hospitals.

20-29	1) Receptionist (Dermatology and Laser Department) 2) Doctor (Dermatology and Laser Department)
30-39	1) EPR Manager 2) Receptionist (Maternity Clinic) 3) Administrator (Cashiers / Admissions Department) 4) Receptionist (Cardiology Department) 5) Receptionist (Histopathology Department) 6) Nurse (General Clinic) 7) Receptionist (Breast Centre)
40-49	1) Accounts Department Manager 2) Administrator (Admissions Department) 3) Administrator (Medical Supplies Department) 4) Administrator (Pharmacy Department) 5) Receptionist (General Clinic)
50-70	1) Obstetrician / gynecologist 2) Receptionist (General Ultrasound Department)

Table 9.3: List of the participants according to their age group

The sampling strategy was designed to include a balance of males and females. However, this was not feasible since the majority of the respondents were receptionists and administrators working at front desks, which are female dominated posts. Table 9.4 lists participants according to their gender.

Male	1) EPR Manager 2) Obstetrician / gynaecologist 3) Accounts Department Manager
Female	1) Receptionist (Maternity Clinic) 2) Administrator (Cashiers / Admissions Department) 3) Receptionist (Cardiology Department) 4) Administrator (Admissions Department) 5) Administrator (Medical Supplies Department) 6) Administrator (Pharmacy Department) 7) Receptionist (Dermatology Department) 8) Receptionist (Histopathology Department) 9) Receptionist (General Ultrasound Department) 10) Receptionist (General Clinic) 11) Nurse (General Clinic) 12) Doctor (Dermatology Department) 13) Receptionist (Breast Centre)

Table 9.4: List of the participants according to their gender

Information about the participants, their roles and the reasons that were chosen to contribute to this research can be found in appendix 4. The following section provides a brief description of the observation sites that were chosen to take part in this study.

9.3 Observation sites at a glance

The departments which participated in the study were chosen on the basis of the use of an EPR system, ease of access to speak to the staff as well as observe how they work and interact with each other to complete their everyday tasks. The Admissions Department of the Maternity and General Clinics is a busy department situated on the ground floor of the Hospital and staffed by two administrators. All inpatients provide the staff with their personal details and proceed with the admission to one of the Hospital's inpatient departments. On the ground floor is also located the Cashiers and

Admissions Department of the Paediatrics Clinic. Customers first visit the Cashiers Department where they inform the staff about the service provided, the patient's personal details and doctor and then walk in the particular outpatient department.

The Cardiology Department is the only outpatient department of the Paediatrics Clinic that uses an EPR. It is a new department with specialized personnel and modern equipment, which provides services to children – and occasionally adults – with heart conditions. Facing the Admissions Department, on the ground floor is situated the General Ultrasound Department. The department is staffed by two receptionists and medical staff that carry out heart, thyroid, soft tissues, hip, abdominal and eye ultrasound scans. On the same floor are situated the Dermatology and Laser Department and the Breast Centre. The Dermatology and Laser Department has been operating since 2004 and provides consultation services and laser treatment to the outpatient customers of Mitera. However, the medical staff also treat dermatological conditions that might appear to inpatients. Very close to the Dermatology Department is situated the Breast Centre. The department is staffed with new and enthusiastic administrative staff as well as experienced medical staff and has been equipped with the latest generation of ultrasound and digital mammography devices.

Observation was also conducted at the Histopathology Department as well as the Pharmacy and the Medical Supplies Departments that are all situated in the basement of the Hospital. The medical and technical staff of the Histopathology Department provides histology examinations to the patients of Mitera. The Pharmacy and the Medical Supplies Departments are situated in the second basement of the Hospital and are staffed by administrative personnel and pharmacists. They play a key role in the in the supply of the inpatient departments with pharmaceutical and medical supplies.

Once a patient has been diagnosed and admitted, they are transferred to an inpatient department of the Hospital (see fig. 9.1). The researcher conducted observation at the General and Maternity Clinics. The General Clinic – along with the Paediatrics Clinic - is situated on the fifth floor of the Hospital, while the Maternity Clinic is on the seventh floor. They are both staffed by administrative and clinical employees who kindly welcomed the idea of the researcher to conduct observations at their departments. Finally, observation was carried out at the Accounts Department in order to explore the linkage between how patients are charged using the EPR system in the inpatient departments and billed – and eventually discharged – by the administrative

staff in the Accounts Department. The following section refers to the technological properties of the EPR system that users draw upon to enact technologies-in-practice.

9.4 The EPR as an artefact: technological properties of the EPR system

The EPR system (which is used in all the inpatient departments, the Cashiers, the Admissions, the Accounts, the Pharmacy and the Medical Supplies Departments) is an administrative tool for recording and storing finance and management information produced by SAP, a leading provider in software and IT solutions. It also provides users with the ability to access healthcare-specific business information which range from medical treatment results to laboratory data and billing data. The SAP system has been also implemented in the outpatient departments of the Hospital; however, it is mostly used for supply chain management (SAP for Healthcare, 2008).

The EPR system that is used in the outpatient and diagnostic departments is the MedLab system. This system is a tool to manage the recording, analysis and reporting of patient information. All the diagnostic departments use the MedLab system for the documentation of the results from diagnostic tests. However, the majority of the departments which provide consultation services have not requested and thus do not use an EPR. Respondents said that the lack of an EPR system in these departments is due to the limited needs that they have with regards to the recording and reporting of patient data. Exceptions are the Dermatology Department as well as the Cardiology Department of the Pediatrics Clinic (where interviews were conducted with the receptionist of each department and one doctor who performs laser treatments). Analytical information about the technical characteristics of the EPR system that is used across the departments of the Hospital is provided in the subsections below.

9.4.1 Data entry and edit

Respondents reported that one function of the EPR system is the recording of clinical orders. In particular, in the inpatient departments, users can log on the system, open a patient's record and enter the codes of drugs, medical supplies and diagnostic tests requested by the clinical staff. Respondents also stated that the receptionists from the inpatient departments use the EPR system to edit information about new admissions, discharges and transfers to their department. Furthermore, participants from the Admissions and the Cashiers Department said that they use the EPR to record a

patient's first name, family name, maiden name, spouse and father's name, address, telephone number, date of birth, gender, marital status, occupation and I.D. number, their room and bed number, referrer doctor, attendant doctor and insurance details.

The EPR is also used for recording health information. However, this function is not available in the inpatient departments. Respondents said that medical information is recorded in the outpatient departments and is then sent to the Admissions Department where the senior nurse places it into the patient's paper-based file. Recording this data electronically, they felt, would result in duplication of effort. Moreover, it was stated that keeping paper-based records in the inpatient departments is compulsory. The EPR Manager said that the use of the paper-based system in the inpatient facilities of the Hospital is due to the Government's legislation that obliges them to keep paper-based records for their patients. Respondents also referred to confidentiality issues involved in the decision to keep paper-based records. They said that some information should be known only by the doctor and the patient and receptionists who are responsible for entering data into the system should not have access to sensitive information.

The receptionist from the Maternity Clinic said:

"Receptionists responsible for entering a patient's information into the system should not have access to sensitive issues that regard the patient and their doctor.

In the outpatient and diagnostic facilities of the Hospital, respondents said that the system provides any qualified user with the ability to record the actions that have been taken in diagnosing, managing and treating patients. In particular, they stated that they can record on the EPR a patient's diagnosis, diagnostic test results, clinical findings and notes, personal and medical history and allergic reactions to particular drugs.

9.4.2 Information search

Respondents referred to the function of the EPR system that allows them to browse patient names, open their records and access information relevant to their role. The receptionists from the inpatient departments said that they can view information about the patients of their department, which has been recorded by the administrators in the Admissions Department, such as their personal details, spouse name, ID number, telephone number, address and insurance, as well as their doctor and admission date. In addition, they can access laboratory test results in order to print them and provide them to the doctors of the department or the patients. In the outpatient and diagnostic

departments, it was reported that authorized users can browse patient records, view a list with the tests that a particular patient has undergone within the Hospital and access diagnostic findings from tests that have been performed in their department.

9.4.3 Integration

Another function of the EPR system is the integration of patient-related information from different departments and systems within the Hospital. Participants reported that once staff enter data regarding a service provided in their department, this information is stored on a data warehouse and may be later used by a) the staff in the Pharmacy and the Medical Supplies Departments for pharmaceutical and medical supplies chain management, b) the staff in the Accounts Department for billing patients for services provided within the Hospital and providing them with discharge and c) the staff in the diagnostic or outpatient department that will provide the requested service.

9.4.4 Electronic referrals

The doctor from the Dermatology Department described the function of the EPR that allows them to send electronic referrals. However, she added that in the outpatient departments, this function is not used. On the other hand, in the inpatient departments, respondents said that this function applies only to requests for blood test results, since it was built on an application (LabTrack) which was added on along the way in order to facilitate lab results recording and reporting. Table 9.5 provides a list with the material properties available to the users of the EPR system in the Mitera Hospital.

Elements	Technological properties
Clinical order entry	• Recording of codes for services provided within the Hospital
Administrative data entry	• Recording of patient demographics
	• Editing admission, transfer and discharge records
Medical data entry	• Recording information related to a patient's diagnosis, management and treatment
Information search	• Browsing and accessing patient-related information
Integration	• Online information sharing across different departments
Electronic referrals	• Online requests of diagnostic tests (outpatient departments)
	• Online requests of blood tests (inpatient departments)

Table 9.5: Technological properties of the EPR system

9.5 The EPR system as an artefact: cultural properties of the EPR system

Orlikowski (2000) argues that technological innovations have also cultural properties chosen by their designers, which guide users about the way in which a particular technology should be used. The interviews explored how the EPR system was designed to be used in the inpatient, outpatient and diagnostic departments of the Hospital. The researcher requested protocols which would describe the formal guidelines regarding the use of the system and the work practices surrounding its use, but he was told that such documents were not available due to the restriction policy of the Singular Logic (the IT company which was responsible for the implementation of the EPR system and the training provided to staff) regarding access to company confidential information. However, the EPR Manager who works for Singular Logic and was involved in the development of the protocols provided the researcher with thorough information about the design of the EPR system.

Subsequent communication with the EPR Manager revealed that the Singular Logic held a series of meetings with the Chief Executive Officer, the General Manager, the Medical Director, the Nursing Director, the Finance Director and the Patient Services Director in order to design the EPR system and tailor it to the needs of the Mitera Hospital. The representatives from the Hospital described the flow of the work practices that should be embedded in the system (e.g. billing, admission, discharge, diagnosis and test results recording, supply chain management, clinician order entry, lab results reporting) and the company analysed these work practices and designed the software to meet the Hospital's needs. The EPR Manager reported that the representatives from the implementation company did not visit the departments of the Hospital to observe how these routines were performed. The design of the system was based on the information provided during the meetings with the previously mentioned stakeholders from the Hospital.

The EPR was introduced to the Hospital in 2001. The decision for the implementation of the system was made one year before the introduction of the EPR and six months later a one-month pilot with the participation of receptionists and administrators was conducted in a lab environment using ten computers with SAP software to test the design of the system and its functionality. This was the stage during which the EPR was communicated within the Hospital. The manager of each department informed

their staff about the upcoming change and provided information about the innovation, explained the reasons for the introduction of the new system, the changes that was expected to induce in the daily tasks and routines existing in the department and the work flows within the Hospital and tried to make their staff more receptive to the implementation of the EPR system. The next step in the diffusion process was to make users familiar with the functions of the system. Training sessions took place one month before the implementation of the EPR system and as will see below (section 9.6) they varied in duration and content.

9.5.1 Rules regarding the use of the EPR system in the inpatient departments

The technical functions of the EPR system reflect the expected (by the designers of the system) range of activities associated with the use of the technology (Orlikowski, 2000). The data shows that, in the inpatient departments, the EPR system in use is rigid with specific functions that facilitate the performance of particular work processes (e.g. ordering drugs and medical supplies) and hinder others (e.g. recording medical information). Therefore it does not give users much room for flexibility, since they have to follow the work flows that are dictated by the EPR. In particular, respondents said that the system was implemented to improve the quality of coding for services provided during a patient's stay, as well as ensure accurate patient billing. Respondents also stated that the designers of the EPR embedded into the system mechanisms for more effective coordination of patient activity as it is reflected in the management of drugs, medical supplies, referrals and laboratory results. In addition, the data shows that the EPR was designed to be used for accessing and managing administrative data, such as allocating patients to the rooms of each ward and updating the department's patient list regarding new admissions and discharges.

Respondents stated that the guidelines regarding the use of the EPR were to use the system in order to (a) charge patients for services provided (b) order drugs and medical supplies (c) order diagnostic tests (d) access lab results and (e) update the patient list regarding the daily admissions and discharges. They also said that the EPR as software has functions for recording health information, but the EPR Manager made clear that, in the inpatient departments, the EPR system should not be used for entering medical data. The EPR Manager reported that entering medical information into the system might have an adverse effect on the work flow, since different people might record data in different ways.

The receptionist from the General Clinic referred to the guidelines regarding the use of the system in the inpatient departments:

"In the inpatient departments, the EPR system was designed to be used for charging patients and e-ordering drugs, medical supplies and diagnostic tests, updating the admission list by transferring patients to our department [i.e. patient list], updating the system regarding discharged patients and accessing blood test results".

9.5.2 Rules regarding the use of the EPR system in the outpatient departments

In the outpatient departments of the Hospital, the EPR Manager said that the system was designed to be used for recording health information, but he added that the use of the system for the documentation of patient medical data is currently optional. The last statement describes the underlying philosophy regarding the use of the system in the outpatient facilities of the Hospital. The design of the EPR system provides staff with flexibility which is reflected in the performance of the work practices surrounding its use. Indeed, in the Dermatology and Laser Department, the data show that different individuals have found different ways to record and store patient data. Some dermatologists record their patients' diagnosis manually and provide it to the receptionist of the department who then records it in the department's book, other consultants provide it verbally and three doctors enter it into the EPR system. This variation, however, does not influence the performance of other work processes.

In the outpatient departments that provide consultation services, the data reveal that the EPR system was designed to be used for effectively recording administrative and medical information. Respondents said that the EPR was designed to be used by the administrators in the Cashiers Department to record administrative data and inform the receptionists of the outpatient departments about the patients' demographics as well as their referrer, attendant doctor and the service that they have paid for. The EPR Manager also stated that the instructions regarding the use of the system in the outpatient facilities included recording a patient's history, diagnosis provided by the doctor, clinical notes as well as entering images from clinical findings. However, he said that the use of the system for these activities was optional.

The EPR Manager referred to the norms regarding the use of the EPR system in the outpatient departments:

"In the outpatient departments, the EPR was designed to be used for diagnosis, patient history, clinical notes, comments, images and demographics entry. The use of the system was optional and hence some departments opted to keep medical records manually".

9.5.3 Rules regarding the use of the EPR system in the diagnostic departments

In the diagnostic departments, respondents agreed that the EPR system was designed to be used for recording the results of the diagnostic tests carried out in each department, the doctor's diagnosis and in some cases the patients' medical history. Moreover, respondents said that the formal guidelines involved using the system to record patients' demographics, their doctor and service provided. Participants mentioned that this information was designed to be recorded by the administrators in the Cashiers Department and then checked by the receptionists of each department to view if a patient has paid for the service provided. One informant added that receptionists were also advised to use the system for accessing and reporting to the medical staff the results of previous tests that have been performed in the department.

The receptionist from the Histopathology Department said:

"In the diagnostic labs, the system was designed to be used for recording a patient's demographics, the type of test he/she has paid for and the name of the attendant doctor, as well as for changing this information in case that a mistake has been made, accessing previous test results and entering the results of the test, the doctor's diagnosis and sometimes the patient's history".

9.5.4 Rules regarding the role of staff in the inpatient departments

The EPR system was designed to be mainly used by the receptionist of each inpatient department to (a) charge patients and order drugs, medical supplies and diagnostic tests (b) access lab results and (c) update the patient list regarding the daily admissions and discharges. In addition, the EPR should be used by the nursing staff during the evening shifts when there are no receptionists in the wards. Nurses were advised to use the system in order to (a) charge patients for drugs, medical supplies and diagnostic tests as well as (b) in some cases update the patient list about new admissions or discharges. All respondents mentioned that the formal guidelines regarding the use of the EPR system stated that doctors' role was not to use the system.

9.5.5 Rules regarding the role of staff in the outpatient departments

Participants stated that the instructions regarding the role of receptionists in the outpatient and diagnostic departments were to use the EPR system in order to (a) record a patient's diagnosis (b) check their demographics and their doctor as well as (c) view on the system if a patient has paid for the service provided. In the diagnostic departments, their role also involved entering into the system diagnostic test results as well as accessing and reporting to doctors their patients' previous test results. Respondents also said that, in the outpatient and diagnostic departments, nurses and doctors were not supposed to use the system. Table 9.6 provides a summary of the respondents' views about the guidelines regarding the use of the EPR system.

Topic	Findings
Cultural properties: design of the EPR system in the inpatient departments	✓ Authorized staff should enter data on the EPR to ensure accurate billing and manage patient activity processes ✓ Staff should access blood test results to ensure effective lab results reporting ✓ Staff should edit administrative data to effectively manage admission, transfer and discharge records
Cultural properties: design of the EPR system in the outpatient departments	✓ Receptionists should record on the EPR a patient's diagnosis to ensure effective health records keeping ✓ Administrators in the Cashiers should enter on the EPR administrative data to ensure effective online information sharing with the outpatient departments ✓ Receptionists should check on the system administrative data entered in the Cashiers
Cultural properties: design of the EPR system in the diagnostic departments	✓ Receptionists should enter a patient's diagnosis and test results to ensure effective record keeping and reporting ✓ Administrators in the Cashiers should enter on the EPR administrative data to ensure effective online information sharing with the diagnostic departments ✓ Receptionists should check on the system administrative data entered in the Cashiers

Table 9.6: Participants' views on the cultural norms regarding the use of the EPR system

9.6 Interpretive conditions: training methods, shared knowledge and experience

Interpretive conditions refer to the conventional understandings and shared meanings that the users of a particular technology construct to make sense of the technology and its use in their everyday activities (Orlikowski, 2000). This section provides information about the training methods applied to help users obtain knowledge regarding the EPR system that might be later used to enact technologies-in-practice. Respondents were asked to describe how the EPR implementation was communicated within the organization in the form of training or any other method applied to make them familiar with the system. Respondents said that the Singular Logic team provided training to the receptionists and nurses of each inpatient department. The training team showed them how to charge patients for drugs, medical supplies and diagnostic tests, transfer patients from the Operating Room, Admissions or any other department's patient list to their department's list, access and print blood test results, as well as update the system regarding discharged patients.

In the outpatient departments, the training team provided seminars and on site training sessions to the receptionists of each department. The receptionist from the Histopathology Department said that they showed them how to log on the system and check a patient's personal details, doctor, service provided, enter the results of the diagnostic tests and the diagnosis provided by doctors, as well as access previous test results. In addition, the receptionist from the General Ultrasound Department mentioned that they used to visit the IT Department in pairs, one hour per day for a week, where they showed them how to log on the system, browse their record, enter the results of the test, as well as access previous test results and diagnoses.

9.6.1 Inadequate training resulting in limited knowledge of the EPR's functions

Many respondents felt that the training provided to the staff of the inpatient departments was inadequate. Hence, staff stated that their knowledge of the functions of the EPR system was limited and this, it was reported, resulted in coding errors and problems related to the discharge of patients. The Manager of the Accounts Department also felt that the training provided to the receptionists of the inpatient departments was inadequate. In addition, he mentioned that the training which was given to the staff of his department was quite poor and they found out how to use the system effectively along the way.

During a subsequent communication, the Manager of the Accounts Department explained that:

"In the early implementation stage patients were mischarged resulting in delays in the discharge process. In addition, the training provided to the staff of the Accounts Department was inadequate due to time constraints as the deadline was approaching and was not sufficient time to train the team. In the beginning, we faced problems with the way in which patient charges are organized on the system. The IT Department had added on the previous system a function which facilitated our work. With the new system, patient charges were grouped in different ways. The training team did not have the time to explain what the differences between the new and the old application were. It took us a while to get used to the new system and learn how to use it effectively".

In addition, although the receptionist from the General Ultrasound Department was happy with the training provided, in other departments staff said that the training was short and inadequate.

The doctor from the Dermatology and Laser Department stated:

"The company that implemented the system provided training to the receptionists of the outpatient departments. The training lasted approximately an hour. They showed them how to log on the system, browse patients, access results from previous tests that have been performed in the department, check if the patient has paid for the consultation or test and enter the diagnosis provided by the doctor".

9.6.2 Senior receptionists train new staff

On site training sessions and seminars provided to the users of the EPR system during the implementation stage were the main methods used to familiarize them with the technology. However, in the post-implementation stage, guidance on the use of the EPR system was provided to new employees by the senior staff of each department. The receptionists from the inpatient departments stated that, after the implementation of the EPR system, they were responsible for the training of new employees. In addition, in the outpatient departments, no formal documentation was available with new staff relying on word of mouth instructions from their senior colleagues. Indeed, the receptionists from the Cardiology and the Dermatology Departments who were

recruited after the implementation of the EPR system said that the previous receptionist showed them how to use the system.

9.6.3 Staff draw on their own knowledge of IT to learn how to use the EPR

Another finding of the study was that some employees used their own knowledge of information technology to learn how to use the system effectively in their everyday activities. In particular, the Doctor from the Dermatology and Laser Department said that the Hospital did not provide any training and she learnt how to use the system on her own. However, it would be fair to mention that the system was not designed to be used by the medical staff of the Hospital and therefore no training was provided to doctors. Nevertheless, the fact that individuals draw on their own knowledge, skills and expectations of the EPR system to use the technology in their everyday work practices is interesting and will help to understand how different people enacted different technologies-in-practice in some departments. Table 9.7 summarizes the participants' responses regarding the communication of the EPR system.

Topic	Findings
Training issues	✓ The training provided was inadequate resulting in limited knowledge of the EPR system ✓ Senior receptionists train new staff ✓ Staff draw on their own knowledge of IT to learn how to use the EPR system

Table 9.7: Participants' views on the methods used to make them familiar with the EPR

As it was previously mentioned in chapter four (see section 4.7), technologies come with a set of properties, but how these properties are going to be used depends on what users do with them in their ongoing activity and how they interpret the properties and functionality of a technology. This is the main point that differentiates the model of technology-in-practice from other structurational models which treat technology in an objective way. When people use a technology, they draw on the technological properties (see section 9.4) of the technology and its functionality inscribed by its designers (see section 9.5). In addition, as it was mentioned above, they use their knowledge, skills, assumptions and expectations of the technology, influenced by communication, training methods and previous interactions with the

technology. In this way, agents enact a set of rules and resources in practice that is then used to structure their future interactions with the technology in their recurrent activities. (Orlikowski, 2000, Orlikowski and Gass, 1994)

The following sections present the findings of the study regarding the use of the EPR system within the Mitera Hospital and the impact of its implementation on the everyday work practices of the staff, the structures that exist within the Hospital and the organizational processes surrounding its use. In the end of each section, readers can find a summary of the structuration process, which helps to understand how people draw on particular technological (EPR functions), institutional (norms, guidelines) and interpretive (training, experience, interpretations) conditions associated with the use of the EPR system to enact particular technologies-in-practice, which in turn may have an impact on other organizational structures and processes as well as the technology itself.

9.7 Enactment of technologies-in-practice: inertia

Orlikowski (2000) argues that users might choose to use a particular technology to retain their existing ways of doing things. Such a limited use of the technology results in reinforcement and preservation of the structural status quo, with no changes to the technology or the work practices surrounding its use. The data suggest that in the outpatient departments the enactment the technology-in-practice may be characterized in terms of inertia. The findings reveal that in the outpatient departments the use of the EPR system is minimal and involves staff using the EPR to check for patient demographics, previous visits and payments. However, the data show that health professionals do not follow the written guidelines regarding the provision of diagnosis and receptionists break the rules and do not record a patient's diagnosis electronically.

The EPR Manager revealed that the work practices surrounding the use of the EPR system were embedded during its design. Respondents said that in the outpatient and diagnostic departments the EPR system was designed to be used for the documentation of health information, such as a patient's diagnosis. Doctors, it was reported, should record their patients' diagnosis on a digital voice-recorder and provide it to the receptionist of their department to enter it into the system. In the diagnostic departments, the data show that users follow the rules regarding the use of the EPR system for the documentation of medical data. However, participants stated

that in the outpatient departments, medical information, such as the diagnosis or the medical history of a patient, is not recorded electronically.

Indeed, the data show that staff do not follow the written guidelines regarding the documentation of medical information. In particular, in the Dermatology and Laser Department, while the standard operating procedure (i.e. written guidelines) about the recording of health information includes entering a patient's diagnosis into the system, participants stated that the ostensive (i.e. what everyone knows that happens) routine regarding the documentation of a patient's diagnosis is to record it in the department's book, which is then stored for twenty years. Some doctors, however, although they are not required to use the system, enter their patients' diagnosis, clinical and diagnostic findings, history and other information that is of their interest into their patients' electronic health record (see section 9.9).

The receptionist from the Dermatology and Laser Department said:

"In the Dermatology Department some doctors record diagnoses, diagnostic test results, notes and patient histories. Others provide the diagnosis manually and few do not provide any diagnosis. Out of the eight dermatologists who work in the department, solely one enters patient information into the system. In addition, the doctors who provide laser treatments use the system to record information about their patients".

Furthermore, in the outpatient departments, participants said that the majority of doctors provide the diagnosis of their patients either verbally or manually and the receptionist of the department records it in the department's book. According to the EPR Manager, however, the standard operating procedure for diagnosis provision involves recording the diagnosis on a digital voice recorder. Providing a patient's diagnosis verbally or manually is a departure from the Hospital's norms that suggest that a diagnosis should be recorded on a digital voice recorder and provided to receptionists to enter it into the EPR system.

On the other hand, observation at the Cardiology and the Dermatology Departments revealed that receptionists follow the written guidelines and use the EPR system to access administrative data and check if a patient has paid for the service provided, their personal details, referrer and attendant doctor as well as previous visits to the department. Respondents said that this information is entered by the administrators in

the Cashiers Department. As it is shown in figure 9.1, outpatients first go to the Cashiers Department where they pay for the service provided and they then visit the particular outpatient department. The aforementioned information then appears on the system of the department that provides the service.

The data suggest that the limited use of the EPR system in the outpatient departments was enacted for five different reasons. First, some health professionals had doubts about the value of the EPR system for the recording and storing of medical data in the outpatient departments. They said that doctors examine their patients and advise them on the appropriate action that should be taken. Patients then follow their guidelines and might not visit them again. On the other hand, they said that in the diagnostic departments, patients undergo tests. The results of those tests are then recorded in order to be reported to the patient and used by other doctors. In addition, they will be used the next time that the patient will undergo the test in order to compare the results of the previous test with the ones of the new test.

The Obstetrician / Gynaecologist noted:

"In the outpatient departments storing patient information electronically is not of a great importance. A patient consults his doctor who in turn provides him with guidelines regarding his treatment and then the patient departs. He might not visit the department again in his whole life or do it after a long period. Therefore there is no need to keep electronic records of the consultation for the next doctor that the patient will consult. Diagnostic departments carry out tests. The results of those tests are then recorded electronically in order to be used later by the doctor who ordered the test, the doctors in the outpatient departments or the patients themselves".

Second, the findings show that senior doctors were sceptical about the use of information technology (IT) in general and they preferred to use the traditional paper-based system for the documentation of health information. In the Cardiology Department, respondents said that junior doctors who are familiar with computers and technology in general are keener to use the EPR system, while senior health professionals show no interest in using the technology.

The receptionist from the Cardiology Department said:

"In my department, the doctor that does not use the system is over sixty years old. He is not used to working with the electronic system. Therefore, I could say that it is a

matter of age and practice. Younger doctors who are more familiar with computers and technology in general, are keener to use the EPR system, while senior health professionals prefer to work with the traditional way".

Third, the training provided to the receptionists of the outpatient departments who are responsible for the recording of a patient's diagnosis was inadequate resulting in limited knowledge of the EPR's functions. The receptionist from the Dermatology Department said that her training was provided by the former receptionist and it lasted approximately ten minutes. She also stated that her colleague showed her how to browse patient records and check for payments, but she did not train her in how to record a patient's diagnosis, since she would not use this function in her work.

Fourth, the flexible design of the EPR system in use in the outpatient departments and the absence of a strong leadership which would enforce a particular use of the system facilitated the limited use of the EPR system for the documentation of diagnosis. The receptionist from the Dermatology Department said that while the managerial staff of the Hospital recommended use of the EPR system for recording a patient's diagnosis, they let them keep paper-based records for their patients. This statement was also supported by the EPR Manager who said that while health information should be recorded electronically, the use of the EPR system for that activity was currently optional.

Finally, the data show that consultants who collaborate with the Hospital bring into the organization their own work patterns. That is, part-time doctors do not follow the Clinic's guidelines and procedures, but they have their own ways of working. Although they are all acceptable ways of clinical practice, they inevitably introduce interdepartmental variations in the performance of particular routines. For example, in the Dermatology and Laser Department, it was reported that the majority of dermatologists provide their patients' diagnosis manually; others do not provide any diagnosis, while one dermatologist and two doctors who provide laser treatments use the EPR system to record patient information. While the EPR Manager said that consultants should provide their patients' diagnoses on a digital voice recorder, part-time doctors get legitimation from their profession and use their own ways of working for the provision and recording of medical information. As a result, they change the organizational norms that are reflected in the Hospital's formal guidelines regarding

the organizational routines surrounding the use of the EPR system in the outpatient departments.

Overall, the findings indicate that in the outpatient departments the implementation and use of the EPR system did not change the everyday activities of most staff. Figure 9.2 shows that receptionists and health professionals drew on their limited interest in using the EPR system, their assumptions of computers as unhelpful in clinical practice, the lack of adequate training and strong leadership that would enforce the use of the system, their understanding of their rights and obligations that comes from their professional status as well as the information search function of the system, to enact a minimal set of rules and resources that did not influence their existing work practices regarding the way in which medical information is documented.

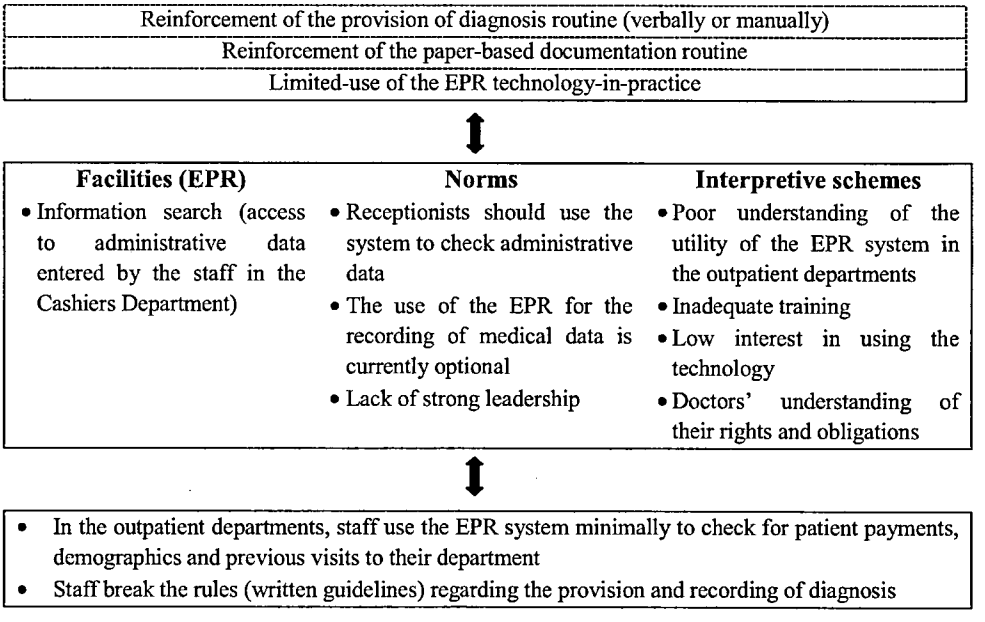


Fig. 9.2: Limited-use of the EPR technology-in-practice in the outpatient departments

9.8 Enactment of technologies-in-practice: application

The second type of enactment, which may be characterized in terms of application, refers to the decision of individuals to use a particular technology in order to improve their existing ways of doing things (Orlikowski, 2000). As a result, users reinforce and enhance the structural status quo, change aspects of the tool and improve the work practices surrounding the use of the technology. The findings show that in the

Admissions and the Cashiers Departments, as well as the inpatient and diagnostic departments, the use of the EPR system resulted in improvements to the work practices and staff activities. The subsections below refer to the organizational routines associated with the use of the EPR system in the aforementioned departments and their impact on other organizational processes surrounding its use.

9.8.1 Administrative data documentation technology-in-practice

Participants were invited to describe how administrative data are documented in their departments. Starting with a patient's admission the administrators from the Admissions Department described how administrative data are recorded using the EPR system. The data show that the process surrounding a patient's admission is very specific and users follow well defined steps in order to record administrative information. Customers provide the patient's personal details to the administrators of the department who then search for their name on the system. In the case that a patient has already been registered, they open their record, double-check their demographics, record the department that they will be transferred at, their room and bed number, referrer doctor, attendant doctor and insurance. If a patient has not been registered before, the administrator said that they create a new record, where they also enter information about a patient's first name, family name, maiden name, date of birth, gender, as well as spouse and father's name. Then, it was reported, they record the patient's address, telephone number, marital status, occupation and I.D. number.

The administrator from the Admissions Department of the Pediatrics Clinic said:

"Every time a child's guardian comes to my department for admission, she tells us the child's name and we browse it on the system to access his record. If the patient has already been registered, I open a new case, check his demographics, and then enter the room category, the department he will be transferred at, his referrer doctor, his attendant doctor and insurance fund... If a patient has not been registered before, I create a new record. In this record, I enter information about the child's name, family name, date of birth, gender, father's name, address and telephone number".

The documentation of administrative data in the Admissions Department improved the collaboration and communication with the inpatient departments of the Hospital. The data show that the recording of administrative information in the Admissions Department provides the receptionists of the inpatient departments with access to a

wide range of information, such as a patient's demographics, room and bed number, doctor, insurance and admission date. This, it was reported that freed time from the receptionists in the inpatient departments, as they do not have to copy the information that was written on the admission document to the department's book.

In addition, the enactment of the admission routine using the EPR system facilitated the management of admission and transfer records in the inpatient facilities of the Hospital. Respondents said that administrative data, which are entered by the staff in the Admissions Department, are later used by the receptionists in the inpatient departments to transfer patients to their department's patient list. Respondents described how they update their department's patient list with regards to new admissions. Every time a patient is transferred to an inpatient department, the receptionist of the department logs on the system and opens the list with all the departments of the Hospital. The receptionist then ticks the box next to the Admissions Department (or any other department that the patient was transferred from) and clicks "transfer. This then makes the record available to the inpatient departments.

The EPR Manager referred to the impact of the enactment of the admission routine using the EPR system on the communication with the inpatient departments:

"The use of the EPR system resulted in more effective communication with the inpatient departments, since through the system the Admissions Department informs the inpatient departments about new admissions".

On the other hand, the implementation and use of the EPR system in the Admissions Department was followed by an increase in the time required to admit a patient and therefore an increase in the staff's workload. Respondents said that while the new system is more efficient with regards to the communication between the Admissions Department and the inpatient facilities of the Hospital and very useful in their everyday activities, it is also more complicated and time-consuming, since it requires more data to perform an admission. They also said that it takes extra time to access a patient's record while admitting another patient. As a result, respondents stated that they developed workarounds by writing down a patient's personal details, doctor, room number and bed on paper in order to be able to provide this information to

patients and staff while performing another patient's admission on the system. In this way, they said that they save time.

The administrator from the Admissions Department stated:

"The only difference is that it takes me longer to admit a patient because I have to enter more data into the system. It used to take me one minute, while now it takes me three minutes... We also write the patient's name, doctor, room and bed in a notebook in case that someone asks us and we do not want to open a new window, browse his/her name and find the aforementioned information. In this way, we save time".

Figure 9.3 shows that staff drew on the administrative data entry, information browsing and integration functions of the EPR system, the guidelines regarding its use, which are based on the management's objective to ensure effective record keeping and information sharing with the inpatient departments, their familiarity and experience with IT systems since they used to use a similar system to admit a patient before the implementation of the EPR and their interpretation of the EPR as useful in their work to enact a set of rules and resources that provided effective administrative data documentation, which in turn improved the communication with the inpatient departments and facilitated the management of admission and transfer records in the Hospital's wards.

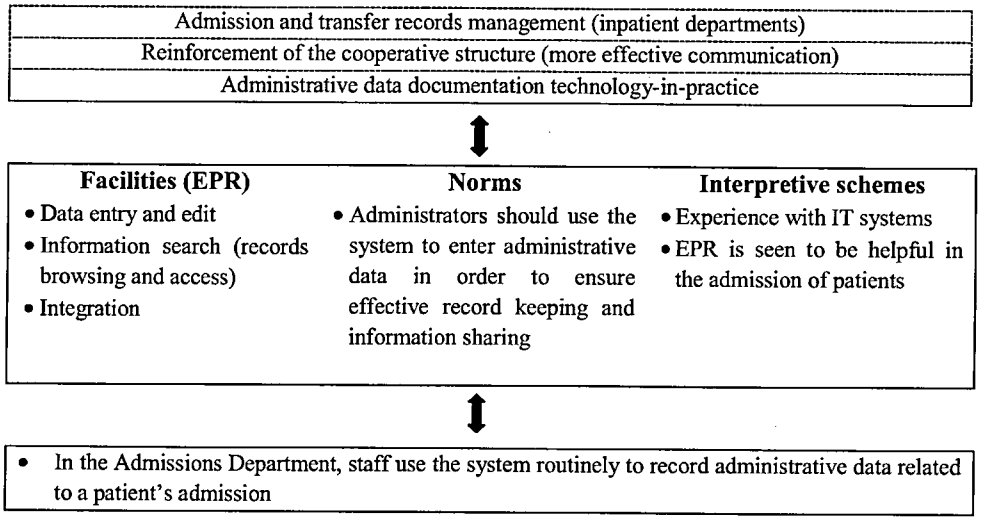


Fig. 9.3: Administrative data documentation technology-in-practice (Admissions Department)

Furthermore, it was reported that the documentation of administrative data in the Cashiers Department improved the communication with the outpatient and diagnostic

departments of the Hospital and changed the way in which administrative data are documented in the outpatient and diagnostic departments. In the past, respondents said that patients used to pay at the Cashiers Department and provide the administrator of the department with their personal details, doctor and service provided. They then had to visit the department that would provide the service and hand their receipt to the receptionist of the department.

After the implementation of the EPR system, the data shows that patients first pay at the Cashiers Department where staff browse their name or date of birth, access their record with their demographics, insurance and history of visits to the Hospital and record the service provided as well as their referrer and attendant doctor. In case that a patient does not have a record, staff have to create a new record in order to enter their demographics and insurance status. This information may be later accessed by the receptionist of the department, which will provide the service.

The enactment of the recording and storage of administrative data in the Cashiers Department had an impact on how receptionists record the patients' personal details, service provided and doctor in the outpatient and diagnostic departments. Respondents said that, in the past, receptionists had to keep records about the patients' personal details, doctor, service provided and receipt number. Once a patient had paid at the Cashiers Department and showed the receipt to the receptionist of the department that would provide the service, the receptionist used to record the aforementioned information in the department's book which was then stored. With the EPR system, it was stated that this information appears on the system. As a result, receptionists do not have to record and store this data. However, the data show that, in some departments, receptionists still record administrative information manually or on Outlook (Breast Centre) because it is easier to access it while using the EPR system.

The receptionist from the General Ultrasound Department said:

"We had to keep records about our patient personal details, type of test, date, doctor and receipt number. I still write this information in the notebook, but I do not keep it".

Although some receptionists opt to record administrative information manually, the majority makes use of the new facility and checks a patient's personal details, doctor, type and date of test on the EPR system. Respondents said that the electronic

documentation of administrative data in the Cahiers Department resulted in faster and easier communication with the outpatient and diagnostic departments. In this way, it was reported that receptionists can more efficiently manage outpatient appointments and provide a better customer service to patients.

The doctor from the Dermatology and Laser Department noted:

"In the past, patients used to pay at the Cashiers and then show the receipt to the receptionist of the department. She then used to record the patient's personal details in the department's book, which was then stored. After the documentation of patients' demographics by the staff in the Cashiers, the receptionist can view on the system our patients' personal details".

Figure 9.4 shows how the enactment of the administrative data documentation routine improved the communication between the Cashiers Department and the outpatient departments and brought changes to the way in which outpatient appointments are managed. The administrators in the Cashiers Department drew on the information entry, integration and information search functions of the EPR system, the formal guidelines regarding the use of the system and their knowledge of computers to enact the administrative data documentation technology-in-practice, which in turn enhanced the communication with the outpatient and diagnostic departments, changed the way in which patient information is recorded in those departments, and improved the quality of service provided to patients.

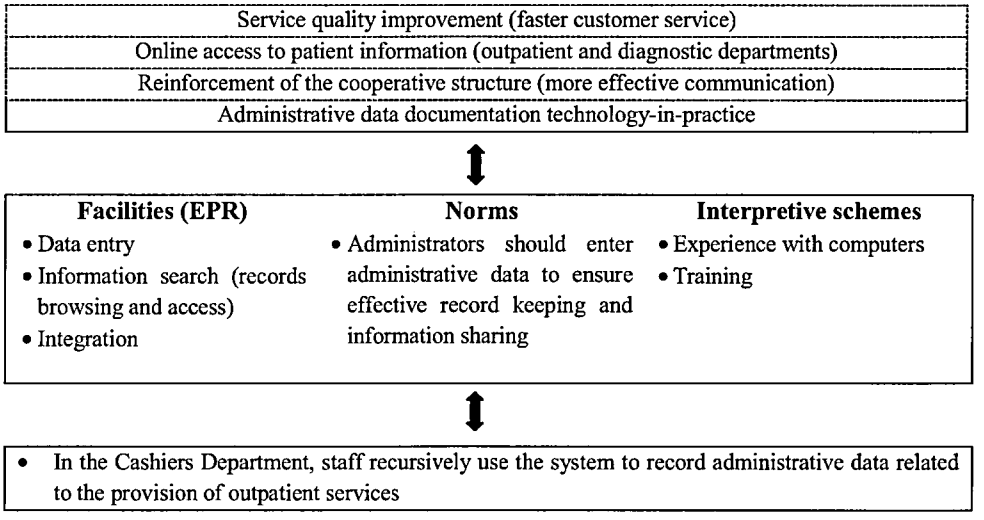


Fig. 9.4: Administrative data documentation technology-in-practice (Cashiers Department)

9.8.2 Clinical order documentation technology-in-practice

Respondents described how the introduction of the EPR system induced changes in how patient information is documented in the inpatient departments. Respondents said that before the implementation of the EPR system the documentation of drugs, medical supplies and diagnostic tests provided to patients was performed manually using vouchers and referrals. Receptionists, it was reported, used to write the name and the quantity of the requested drug or medical supply, the patient's personal details, the department and the date of request on a voucher. In addition, doctors used to provide referrals for the performance of a particular diagnostic test or clinical examination.

Using the EPR system to record information for services provided in the inpatient departments is seen by the receptionists to be helpful, since they do not have to record patient-related data manually. Observation revealed that staff use the clinical order entry function of the EPR to record information for services provided. Each time a member of the clinical staff requests a drug, medical supply or diagnostic test for a patient, the receptionist of the department logs on the system, browses the patient's name, accesses their record, opens the drugs, medical supplies or diagnostic tests list, enters the codes and the quantity of the particular service and charges the patient.

The receptionist from the Maternity Clinic described the scope of the use of the EPR system in the inpatient departments:

"We enter into the system information regarding a patient's medication, medical supplies, diagnostic tests and physical examinations that have been provided to the patient during her stay at the department".

Participants also stated that the use of the EPR system in the inpatient departments improved the communication with other departments and supported the performance of specific business processes, such as the patient billing. The Manager of the Accounts Department said that, in the past, nurses used to hand in the Accounts Department vouchers with a patient's charges on drugs, diagnostic tests and medical supplies. With the EPR system, respondents said that receptionists charge patients for services provided and these charges appear on the system in the Accounts Department. In this way, it was stated that nurses can save time and use it in the provision of patient care.

The documentation of clinical requests in the inpatient departments had also a great impact on how drugs, medical supplies and diagnostic tests are ordered. With regards to the ordering of pharmaceutical supplies, respondents said that in the past nurses used to hand in the Pharmacy Department vouchers about their patients' medication. As a result, respondents said that there were problems with issuing wrong prescriptions due to misreading or loss of vouchers and nurses' productivity levels were low, since they did not have enough time to spend with their patients, which in turn affected the quality of care provided to patients. With the EPR system, staff said that every time they record information regarding a patient's needs for drugs, this information is stored and sent to the system in the Pharmacy Department.

The receptionist from the General Clinic described how staff used to request drugs before the implementation of the EPR system:

"With regards to a patient's medication, we used to write the drug, the patient's name, the department and the date of request on a voucher and send it to the Pharmacy".

In addition, the administrator from the Pharmacy Department referred to the changes in the way in which drugs are requested:

"With the EPR system, drugs are ordered online. The receptionists from the inpatient departments charge their patients for drugs, and then the drug, the patient and the department appear on our system".

Moreover, the implementation of the EPR system induced changes in the way in which medical supplies are ordered. Respondents said that nurses used to provide the Medical Supplies Department with vouchers regarding the needs of the department for medical supplies. This meant that nurses used to waste valuable time on non-clinical duties, which in turn affected their productivity and the quality of service provided to patients. With the EPR system, respondents described how the receptionists from the inpatient departments, the Intensive Care Unit or the Operating Room enter the codes of the requested medical supplies and charge patients for medical supplies or order the department's medical supplies that are free of charge and this information appears on the system in the Medical Supplies Department.

The data also show that the use of the EPR system for the documentation of clinical orders changed the way in which diagnostic and clinical tests are requested.

Participants described how diagnostic tests used to be ordered before the implementation and use of the EPR system in the inpatient departments. They said that nurses used to hand in the outpatient and diagnostic departments referrals to request a diagnostic test or a clinical examination for their patients. As a result, they used to waste valuable time in activities that are not related to their profession. After the implementation of the EPR system, though, diagnostic tests are requested online.

Observation at the Maternity and General Clinics revealed how diagnostic and clinical tests are ordered. Doctors request a particular test and receptionists log on the system, browse the patient's name, access their record, open the test list, tick the box next to the particular test and press "confirm". They can also search by alphabetical order, find the particular test, enter its code and order it. Then, the test appears on the list with the patient's charges and can be accessed by the staff of the department that will carry out the test. However, it was stated that receptionists also call to confirm that the request has gone through and set a time for the patient's transfer. Once the results are out, nurses and in some cases doctors go the outpatient department that carried out the test, collect the results and place them into the patient's paper-based file.

Participants said that the use of the EPR system for ordering drugs, medical supplies and diagnostic tests improved the quality of service provided to patients and the productivity of the nursing staff. As previously described, nurses used to hand vouchers in the Pharmacy and the Medical Supplies Departments to provide them with their patients' medication and medical supplies. In addition, they used to send referrals to the outpatient and diagnostic departments to request a particular test. With the EPR system these services are ordered online. Therefore, nurses, it was stated, can save time and spend it with their patients. The e-ordering of patient services was found that helped nurses to provide a better quality service to patients.

The nurse from the General Clinic said:

"In the past, we used to send vouchers to the Pharmacy and the Medical Supplies Department in order to provide us with drugs and medical supplies. We also used to send referrals to the outpatient departments and diagnostic labs in order to carry out a test... With the EPR system, this procedure is performed online... As a result, we can save time on administrative tasks and spend it instead with our patients, providing thus a better service".

Figure 9.5 shows that staff draw on the text entry, search, integration and electronic referrals for blood test results functions of the EPR system, the management's aim to improve the quality of coding and provide a better customer service to patients, their interpretation of the EPR system as helpful in their everyday activities and their technical knowledge, which came from training and experience with using the system to enact the clinical order documentation technology-in-practice. In turn, the enactment of this routine enhanced the communication within the Hospital, supported the performance of other organizational processes and improved the productivity of nursing staff as well as the quality of service provided to patients.

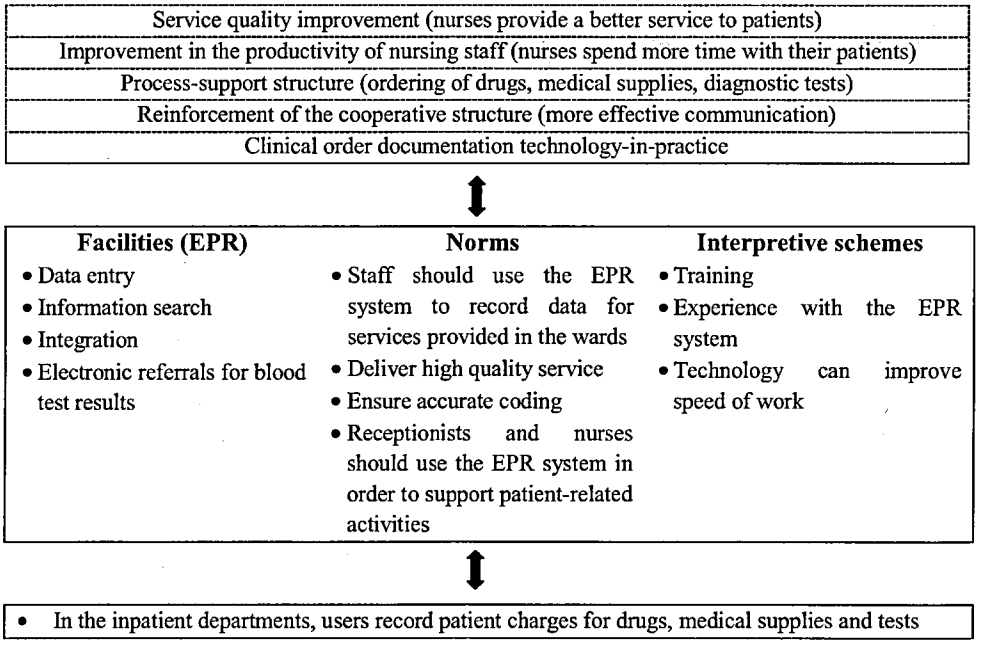


Fig. 9.5: Clinical order documentation technology-in-practice

9.8.3 Patient billing technology-in-practice

Respondents said that with the previous system there were inaccurate charges for services provided and vouchers were missing resulting in inefficiencies in the billing and discharge processes. Participants stated that the use of the system in the inpatient departments improved the communication with the Accounts Department. Receptionists charge patients for services provided within the Hospital and the staff in the Accounts Department can then log on the system, browse their record number and access their record. The administrative information on the record, though, is entered by the cashiers. Observation showed that the staff in the Admissions Department print

and send barcodes to the Accounts Department with the personal details of inpatients. They then create a new record and enter the information that is written on the barcode.

The patient's record and case numbers, admission date, room category, number and bed, demographics and doctor are recorded on the billing record (fig. 9.6). All the services that have been provided within the Hospital are listed along with their code, quantity, cost and date, starting with the operating room, doctor and anesthesiologist fees, processing with the hospitalization (i.e. patient stay) fees and ending with the patient's charges for drugs, medical supplies and diagnostic tests.

Hospital.....:	Mitera				
Case Number.....:	1726xxx	Admission Date: 0.00.00	Category: xx	Bed: xxx-y	
Personal Details....:	1533xxx	N.	M.	M.	
Address.....:		xx y St.	Athens		
Occupation.....:		xxxxxxxx			
Attendant Doctor...:	801xxx	M.	A.		
Insurance.....:		xxxxxxxxx			
Service Code	Department	Service Provided	Quantity	Date	Cost
19214xxx	10101xxx	Caesarean (expenses)	0001	00.00.00	0,00
.....	.....	.....	.....	.....	.....

Fig. 9.6: An example of a billing record

Observation at the Accounts Department revealed that once a patient is to be discharged, a relative of theirs visits the department and provides the cashier with the patient's personal details. The cashier browses and accesses their record on the system, ensures that there are no outstanding services and prints the invoice. The customer pays and they provide them with the discharge document. They then show the discharge to the receptionist of the inpatient department who in turn logs on the system, opens the patient list, ticks the box next to the patient's name and clicks "discharge". The name of the patient ceases to appear on the list. In this way, respondents said that a patient's billing and discharge are managed more effectively, saving time, reducing the possibility of error and providing a better service to patients.

The EPR Manager referred to the changes to the billing routine:

"In the past, vouchers from all the departments that were involved in a patient's care used to be sent to the Accounts Department in order to manage the patient's discharge. As a result, a huge bulk of paper was stored in the shelves of the department, vouchers were missing and patients' were mischarged. Charging patients

electronically solved these problems. Every time a patient is charged, the service he has been charged for appears on the system in the Accounts Department".

The documentation of information for services provided in the inpatient departments of the Hospital also resulted in a decrease in the workload of the staff in the Accounts Department. Respondents said that vouchers from all the departments of the Hospital used to be sent to the Accounts Department and the staff of the department used to enter this information into the computer and proceed with the billing and the discharge of the patients. In addition, they had to file these documents and store them in the selves of the department in case that a customer asked for clarifications regarding their bill. Participants stated that the implementation of the EPR system saved them time and improved the quality of service provided to patients.

The Manager from the Accounts Department said:

"With the electronic system all the information regarding a patient's charges automatically appears on the system. This saves us time, contributes to better customer service and reduces the possibility of error".

The data show that in the Accounts Department staff draw on the billing records access and data entry functions of the EPR system, the management's goal to ensure accurate billing and provide a better customer service to patients, as well as their knowledge of the technology, which came from training and experience with using the system to enact the patient billing technology-in-practice, which in turn speeded up the discharge process and improved the quality of service provided (fig. 9.7)

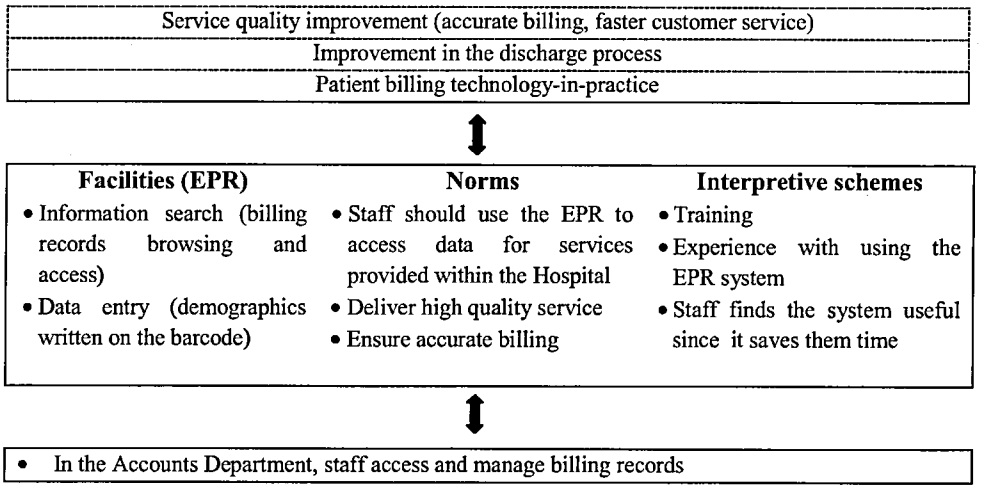


Fig. 9.7: Patient billing technology-in-practice

9.8.4 Pharmaceutical and medical supplies technology-in-practice

In the first stage of the study, respondents said that the EPR was implemented in order to modernize the Hospital's services. It was stated that one of the management's goals was to improve the procurement processes of the Hospital. The data show that the documentation of clinical requests for drugs and medical supplies in the inpatient departments speeded up the communication with the Pharmacy and the Medical Supplies Departments and had a great impact on the management of pharmaceutical and medical supplies within the Hospital. After the introduction of the EPR system, it was stated that the staff in the Pharmacy Department can access data about a patient's medication, which are entered by the receptionists in the departments that provide services to inpatients.

Participants described how the staff of the Pharmacy Department access information about a department's needs for drugs in order to ensure effective pharmaceutical supplies management. Observation at the Pharmacy Department showed that every morning the staff of the department log on the EPR system and then access and print the list that refers to all the departments' needs for pharmaceutical supplies. On the list, one can see the drugs along with their code and quantity, the code of each department and the date of request. Furthermore, they open and print each department's list as well as each patient's list, where are written the patient's personal details and record number, their department and its code, the drugs and their code, the quantity and the date. Simultaneously, they print and attach the barcode of each drug on the list next to the name of the drug. Once they have finished, they place the list in a box. Another member of staff then takes all the lists, finds the drugs and places them in boxes. These boxes along with each department's list are finally sent to the departments.

The administrator from the Pharmacy Department described the use of the EPR system in her department:

"Every morning at 6 am we view on the system and print three drug lists. The first regards the sum of the drugs requested by all the departments of the Hospital. We use it for stock/supply management purposes. The second list regards the drugs requested by each department, which we place into the box with the department's medicines and

send it to the department in order to check if there are any drugs missing. Finally, the third list regards the drugs that each patient has been charged for.

In addition, observation within the Medical Supplies Department offers insights on how staff use the EPR system to supply the departments of the Hospital with medical supplies. The administrator of the Medical Supplies Department logs on the system, opens the main list and each department's list, where are written the name of each department and its code, the medical supplies and their code, the quantity requested and the date of request, and prints them out. Then, she hands each list to her colleagues who in turn find the medical supplies, place them in boxes and deliver them to the departments.

The administrator from the Medical Supplies Department described how staff use the EPR to supply the inpatient departments of the Hospital with medical supplies:

"The receptionists from the inpatient departments request medical supplies. Everyday at 7 am I view on the system what medical supplies have been requested in the last twenty-four hours... we print out the list, find the requested medical supplies and send them to the department".

The data show that in the Pharmacy and the Medical Supplies Departments the EPR system is designed in a way that does not allow different users to introduce variations in the performance of the pharmaceutical and medical supplies routine. Users follow well-defined steps (they log on the system, open each department's list with regards to their requests for drugs or medical supplies, print the lists, find the requested drugs or medical supplies and send them to the departments), similar to the ones that they used to follow with the paper-based system, but the whole procedure is more specific, bureaucratic and rigid.

Figure 9.8 shows that the administrators in the Pharmacy and the Medical Supplies Departments use the information search function of the EPR system to access patient-related data, which are recorded by the staff in the departments that provide inpatient services. They also draw on the management's objective to improve the procurement processes of the Hospital, as well as their technical knowledge, which came from training and experience with using computers to enact the pharmaceutical and medical supplies technology-in-practice, which in turn improved the quality of the procurement processes within the Hospital.

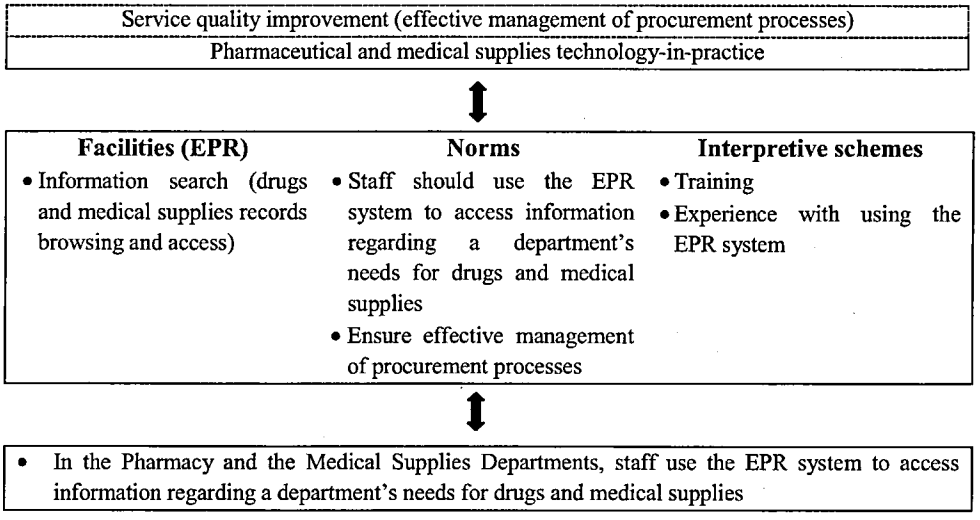


Fig. 9.8: Pharmaceutical and medical supplies technology-in-practice

9.8.5 Referral management technology-in-practice

The documentation of clinical requests in the wards or any other department that provides care to inpatients (e.g. Intensive Care Unit) improved the communication with the outpatient and diagnostic departments and changed the way in which requests for diagnostic tests are managed. In the past, respondents said that they used to send referrals to the outpatient departments to request a particular test. In addition, receptionists had to keep records about the patients' personal details, department, doctor, test and date of request. This process, it was reported, was time consuming.

After the implementation of the EPR system and the enactment of the clinical order documentation routine, the aforementioned information appears on the system in the outpatient department that will carry out a particular test. As a result, receptionists do not have to record and store this data manually. In this way, the can save time and use it in other activities. However, observation at the General Ultrasound and the Histopathology Departments revealed that some receptionists also record information about test requests manually because it is easier to access it while using the system.

Figure 9.9 shows that receptionists use the information access function of the EPR system to check for test requests. They also draw on the formal guidelines regarding the use of the EPR and their moderate technical knowledge, which was obtained through training and experience, to enact the referral management technology-in-practice, which in turn resulted in more effective management of test requests.

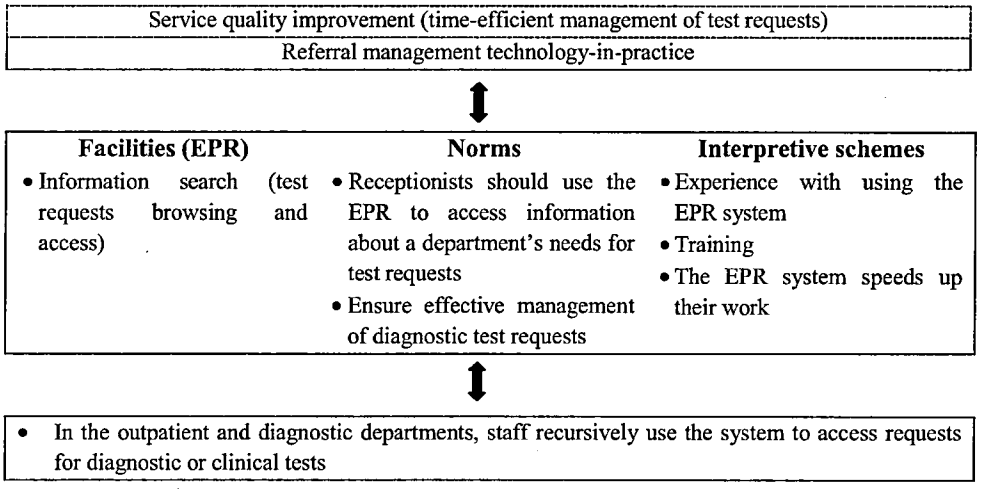


Fig. 9.9: Referral management technology-in-practice

9.8.6 Medical information documentation technology-in-practice

At the outset, it is useful to clarify that in the inpatient facilities of the Hospital the EPR system is not used for recording medical information. In the wards, medical information, such as a patient's results of diagnostic tests, diagnosis, medical history and clinical guidelines, is not entered into the patient's electronic record. According to the EPR Manager the system was not designed to be used for health information entry. This information is recorded manually and placed into the patient's paper-based file by the senior nurse of the Admissions Department. Once a patient's file arrives at an inpatient department, it was reported that the staff of the department is responsible for updating it regarding clinical guidelines and results of diagnostic tests.

The receptionist from the Maternity Clinic said:

"In my department patient information, such as her diagnosis, history, diagnostic tests, pre-surgery tests, electrocardiogram, anaesthesia chart and clinical guidelines, is placed in the patient's paper-based file".

On the other hand, in the diagnostic departments, a patient's diagnosis and test results are documented electronically using the EPR system. Respondents referred to the differences in the way in which health information is recorded using the EPR system. The receptionist from the Histopathology Department mentioned that they used to save the results of a histological test in a CD, which they used to keep in the department. In addition, the receptionist from the General Ultrasound Department stated that in the beginning receptionists used to record manually the diagnosis and

the results of the ultrasound test. They then used to keep one copy for the department's records and provide one copy to the patient. Later on, they used typewriters to record the results of ultrasounds.

After the implementation of the EPR system, the receptionists from the diagnostic departments said that they record the diagnoses provided by the doctors and the results of the diagnostic tests into the patient's electronic record. The data show that users changed one aspect of the technology in order to meet their needs. Participants stated that in the beginning receptionists used to open a blank electronic form and record the diagnosis and the results of a particular diagnostic test. However, after a request from the head of each diagnostic department, the company that implemented the system created fixed electronic forms adapted to the needs of each department.

The EPR Manager said:

"A significant change was that gradually, after a request from the medical staff of each department, electronic forms were created in order to meet the needs of the users and improve the efficiency of the department".

This change, it was reported, speeded up the reporting processes and improved the efficiency of each department. Observation revealed that patients visit a department to undergo a test. The doctor provides the receptionist of the department with the results of the test and the receptionist enters the results into the patient's electronic record. She then prints them out, passes them on to the doctor to sign them, places them into a folder and provides them to the patient. In the Histopathology Department, though, this process is longer and receptionists inform the outpatients that they will contact them as soon as the results of the biopsy are available for collection.

In the Histopathology Department, this change took place one year after the implementation of the EPR system. The receptionist from the Histopathology Department said that in the first year they used to record the results of each biopsy analysis on a blank electronic form, resulting in delays in the reporting of the histological test results. In the General Ultrasound Department and the Breast Centre, however, fixed electronic forms were created and implemented six years after the implementation of the EPR system.

The receptionist from the Breast Centre said:

"The EPR system was implemented in 1999. Four years ago, a radiologist placed a request to the IT Department for creating fixed electronic forms for the results of mammography tests in order to facilitate our work and save us time. We do not have anymore to type the diagnosis from the beginning. We solely make the appropriate changes according to the diagnosis and the results of the mammography provided by the doctor. Then, the rest of the doctors also requested fixed electronic forms".

Respondents highlighted the role of doctors in the change process. They said that, while they placed a request to the IT Department to create electronic forms in order to save time, their request was not granted. It was only when the doctors of each department requested to create and add on the system fixed electronic forms for their patients' test results recording and reporting that the management of the Hospital decided to change the technology.

The receptionist from the General Ultrasound Department stated:

"I had requested from the IT Department to create these forms in order to work faster. However, they did not do it. In 2004, a doctor requested from the IT Department to create a form for the results of his patients. Then, I told the rest of the doctors to make a request for electronic forms too, because the system with the forms was very efficient. Their request was granted".

The data also show that staff can use the information search function of the EPR to access their patients' previous test results. In this way, it was stated, that staff can save time, since they do not have to search through patient files. Respondents described how they record and access medical information using the EPR system. They said that receptionists log on the system, browse a patient's name and access their record, where are listed the patient's previous visits and they can see the results of diagnostic tests that were carried out in their department. They then open the appropriate fixed electronic form, which is used for diagnosis and test results entry and reporting, type the diagnosis and the results of the test or make the appropriate changes on the form, save it into the patient's record, print it out and pass it on to the doctor to sign it.

The receptionist from the General Ultrasound Department said:

"In my department, we enter into a patient's record the results of the ultrasound test that he/she has undergone. Our patients' demographics are recorded by the receptionists in the Cashiers. We use fixed forms and we make the appropriate

changes when it is necessary. Doctors' diagnoses are provided verbally. We view on the system the patient list, click on the name of the patient we are interested in, open the particular electronic form and type the diagnosis provided by the doctor".

Along with the enactment of the medical information documentation technology-in-practice in the diagnostic departments, staff changed the provision of diagnosis routine. The EPR Manager said that after the implementation of the EPR system doctors should provide their patients' diagnosis on a digital voice-recorder. In the Breast Centre, the findings reveal that medical staff follow the written guidelines and record their patients' diagnosis on a digital voice recorder. They then provide it to the receptionist of the department who in turn connects it to the computer, opens the appropriate electronic form, enters the patient's personal details, record number, date and doctor, listens to the doctor's diagnosis and records it on the form.

Figure 9.10 shows that, in the Breast Centre, receptionists draw on the data entry, edit (fixed electronic forms that staff edit according to the results of a particular test) and information search functions of the EPR, their understanding of the technology as useful in their work, their moderate technical knowledge and the management's goal to ensure effective record keeping to enact the medical information documentation routine, which in turn changed the diagnosis provision routine and improved the reporting of diagnostic tests as well as the productivity of staff.

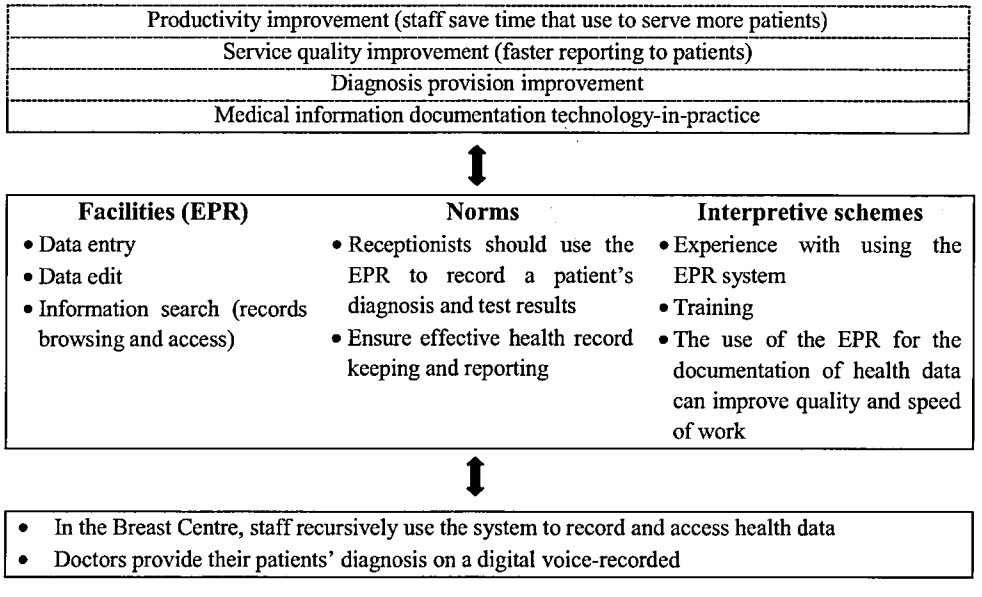


Fig. 9.10: Medical information documentation technology-in-practice (Breast Centre)

However, in other departments, staff preserved the traditional way for the provision of diagnosis. While the written guidelines regarding the provision of diagnosis were to record it on a digital voice recorder and provide it to the receptionist in order to enter it into the patient's electronic health record, observation revealed that the majority of doctors do not follow the written guidelines and provide their patients' diagnosis either verbally or manually. Observation at the Histopathology Department showed that doctors hand to the receptionist of the department a referral where is written the patient's diagnosis, date of birth, department, room and bed number as well as the barcode with their personal details. On the other hand, in the General Ultrasound Department, the data show that doctors provide their patients' diagnosis verbally. Receptionists then log on the system, access the patient's record, open the appropriate electronic form and make the appropriate changes.

Figure 9.11 shows that, in the Histopathology and the General Ultrasound Departments, receptionists draw on the data entry, edit and information search functions of the EPR system, their understanding that the EPR system can improve quality and speed of work, their moderate technical knowledge and the management's objective to ensure effective record keeping to enact the medical information documentation routine, which in turn preserved the diagnosis provision routine and improved the reporting of diagnostic tests as well as the productivity of staff.

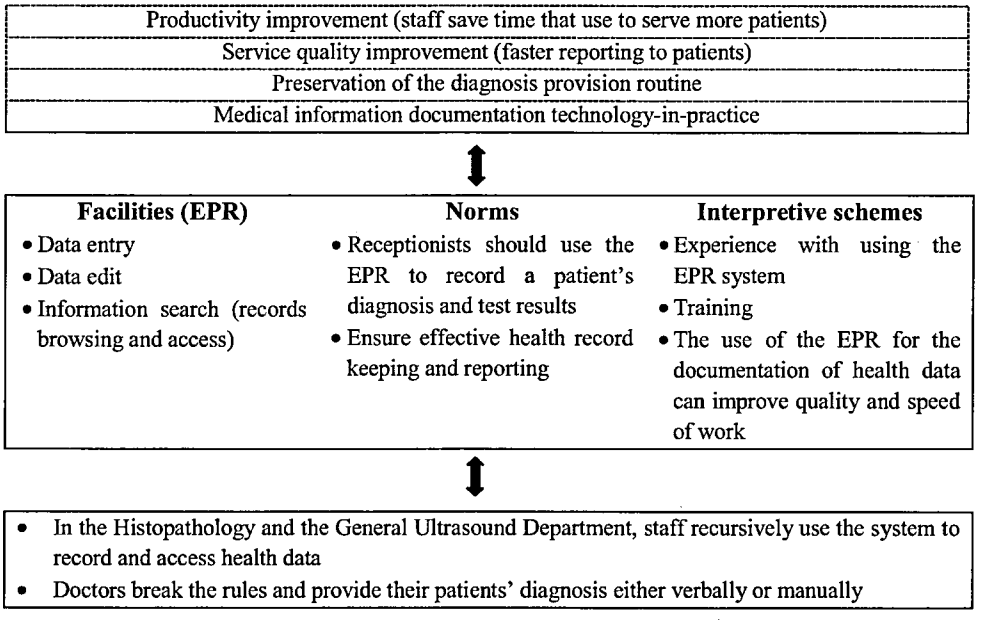


Fig. 9.11: Medical information documentation technology-in-practice (diagnostic labs)

9.8.7 Online blood test results reporting technology-in-practice

The data show that the case with the reporting of blood test results is slightly different than the one described above with regards to the reporting of diagnostic tests. Respondents said that receptionists charge patients for blood tests and a barcode with the patient's personal details, type of test, department and date is sent to the Microbiology Department. Then, a nurse from the department visits the patient, carries out the test and, once the results are available (unfortunately access to the Microbiology Department was not granted in order to observe how staff uploads blood test results on the system), they appear on the patient's electronic health record. Simultaneously, a copy of the results of the blood analysis is printed and the receptionist informs the clinical staff of the department and then places it into the patient's paper-based record.

However, the staff from the inpatient departments said that in the first two years of the EPR use in their department they used to order blood test results, but they could not access the results of those tests online. Nurses used to go to the Microbiology Department and collect the results of blood tests. The decision to change the way in which blood test results are requested and reported was taken after a request of the medical staff with the aim to minimize errors and improve the quality of the Hospital's services. In 2006, a new application (Labtrack) was installed in order to speed up the blood test results reporting process and help nurses to save time on duties that are not directly related to their profession.

The receptionist from the General Clinic referred to the changes in the use of the EPR system since its implementation:

"In 2006 the IT Department of the Hospital installed a new application (Labtrack) in order to access and print our patients' blood test results. We type a patient's record number, click on test tab, open the test and press "print". In the past, we could not print our patients' blood test results. In addition, it used to take longer to provide us with the results of the test. This decision was taken by the management of the Hospital after a request from the Head of the inpatient departments and the Director of the Microbiology Department".

In addition, the nurse from the General Clinic said:

"We had to go to the Microbiology Department and collect the results of our patients' blood tests... With the EPR system, this procedure is performed online".

Observation at the General and the Maternity Clinics also revealed how blood test results are reported to the medical staff. Clinicians request their patients' blood test results and the receptionist of the department opens the patients' record, clicks on the tests tab, opens the test and then presses "print". She then provides a copy of the test results to the doctor. In addition, the data showed that in the inpatient departments blood test results are also reported to patients. Patients complete an application form and provide it to the receptionist of the department who then browses their name on the system, accesses their electronic record, opens the test, prints it out and provides it to the patient.

Figure 9.12 shows that, in the inpatient departments, receptionists and nurses used the information access function of the EPR system, their understanding of the EPR system as helpful in their job, their technical knowledge of the system that came from training and experience with using the EPR as well as the management's objective to minimize errors, ensure effective blood test results reporting and improve the quality of service provision within the Hospital to enact a set of rules and resources that provided online reporting of blood test results, which in turn helped staff to provide a better quality of service to patients and improved the productivity in the inpatient departments.

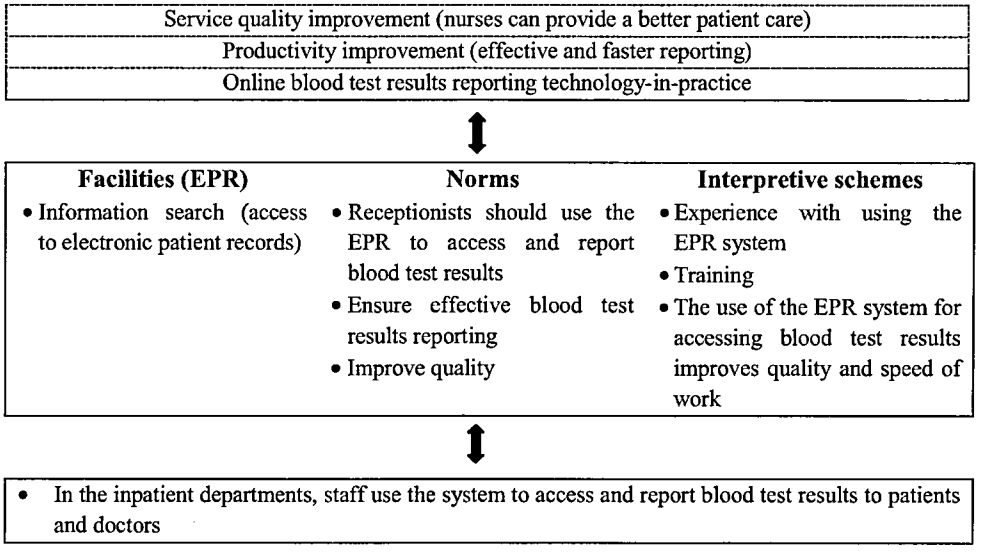


Fig. 9.12: Online blood test results reporting technology-in-practice

9.9 Enactment of technologies-in-practice: change

The third type of enactment refers to the use of the technology that induces changes in the existing work practices and roles (Orlikowski, 2000). People use the technology to transform the structural status quo and as a result they change the work practices surrounding the use of the technology as well as the artefact itself. The data show that in the Dermatology and Laser Department some individuals introduced variations in the use of the EPR system and the work practices of the department. Their example was then followed by some of their colleagues and resulted in the enactment of two different technologies-in-practice for the documentation and provision of medical information in the department.

The data show that, in the Dermatology and Laser Department, although the provision and recording of diagnosis routine is performed manually, some individuals created a different work process. In particular, respondents said (and observation confirmed) that one dermatologist and two doctors who provide laser treatments systematically use the EPR system to record their patients' diagnosis, personal history, medication and diagnostic findings that might be important, such as high testosterone or cholesterol.

The doctor from the Dermatology and Laser Department referred to how she records patient data on the EPR system:

"I view on the system the list with our patients, I open the record of the patient I am interested in and I record the number of the laser session, the power that I used, pathological and hormonological findings from diagnostic tests, the therapy that it was provided and some comments".

By recording health information electronically doctors not only changed the way in which medical information is documented in their department, but they also altered the way in which a patient's diagnosis is provided to the receptionist of the department. While the formal guidelines regarding the use of the EPR system in the outpatient departments state that doctors are not required to use the EPR and receptionists should record on the system the diagnoses provided by the doctors on a digital voice recorder, some doctors change the rules and enter their patients' diagnosis into the system. This resulted in changes in the provision of diagnosis process and faster communication with the receptionist of the department who logs on

the EPR system, opens the patient's record and records their diagnosis in the department's book.

In addition, one doctor who provides laser treatments changed the technology and created a new work process for recording and storing clinical images. Observation revealed that she uses her camera to take pictures of skin irritations or any other clinical findings of her interest and then connects the camera to the system and enters the file in which the picture is stored into the patient's electronic record. In this way, she altered the use of the technology by adding an additional function (image entry). Moreover, the doctor from the Dermatology and Laser Department said that in the early implementation stage, the head of the department requested to add on the system a diagnosis list in order to allow users to choose one diagnosis from the list every time a patient is diagnosed. In this way, she said that that they can work more efficiently, since they do not have to type the whole diagnosis.

The data suggest that the provision and recording of medical information technology-in-practice was enacted by the doctors of the department for two reasons. First, participants said that the variation in the use of the system could be explained by the different needs that each individual has with regards to the documentation of health information. The doctors who use the technology felt that the EPR system offers the opportunity for better documentation of medical data, which in turn would help them in the diagnosis and treatment of patients. The doctor from the Dermatology and Laser Department stated that the new system allows her to record richer health data about her patients as well as quickly retrieve information in case that a patient does not remember what was the treatment provided in the previous laser session. In addition, she stated that keeping electronic patient records saves them time from searching through paper-based files to find any required information.

The doctor from the Dermatology and Laser Department said:

"I believe that it depends on the needs that a user has regarding the documentation of patient information. That is, with regards to the laser sessions it is necessary to use the system in order to record the power that we used or any skin irritations that appeared during the laser session...The EPR system helps me to record more information about my patients and go back and access easily and quickly the information that I need".

Second, the flexible design of the EPR system in the outpatient departments allows doctors who collaborate with the Hospital to bring into the organization their own ways of doing things. The data show that part-time doctors get legitimation from their profession and use their own ways for the provision and recording of medical information. As a result, they introduce interdepartmental variations and change the norms that are reflected in the Hospital's written guidelines regarding the organizational routines surrounding the use of the EPR system in the outpatient departments. Structuration theory suggests that rules lie in practice and as Taylor (1993, p.58) puts it *"the rule is at any given time, what the practice has made it"*.

Figure 9.13 shows that, in the Dermatology and Laser Department, three doctors used the data entry, search, diagnosis list and image entry properties of the EPR system to record patient data. They also drew on the flexible design of the system and the legitimation that they get from their profession, their interpretation that technology can improve the quality of medical data, save them time from searching through paper-based records and help them in the diagnosis and treatment of patients, as well as their knowledge of computers to enact a set of rules and resources that provided electronic recording of medical information. In turn, this technology-in-practice changed the way in which doctors provide their patients' diagnosis to the receptionist of the department, speeded up the communication with the receptionist of the department and improved the quality of service provided to patients.

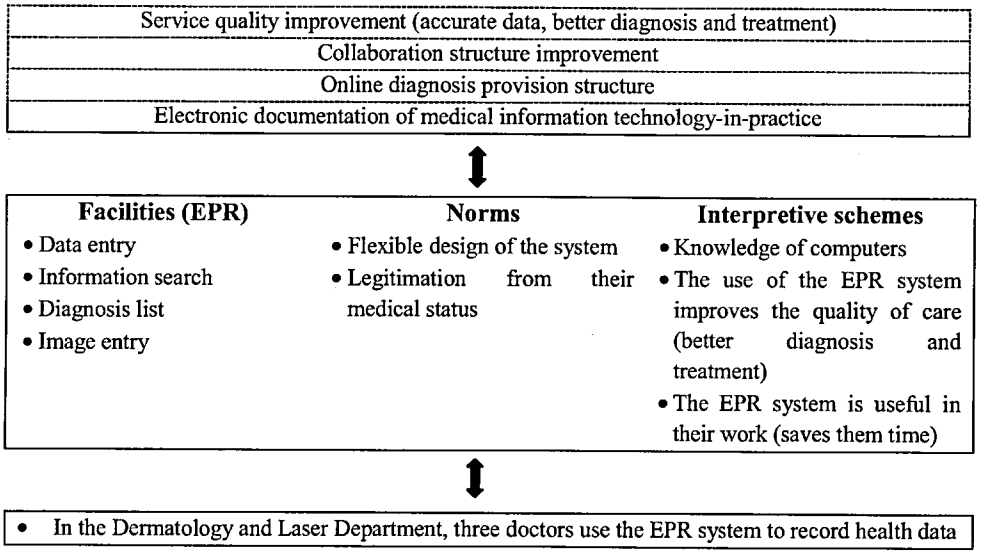


Fig. 9.13: Electronic documentation of medical information technology-in-practice

9.10 Summary

The findings show that the EPR system was implemented in order to facilitate the performance of particular business, clinical and administrative processes, contribute to the modernization of the Hospital and improve the quality of services provided. The use of the EPR system led to more effective management of the billing, discharge, supply chain, tests ordering and reporting processes. It also facilitated the management of admission and outpatient records and improved the recording of medical information in the outpatient and diagnostic departments. Furthermore, the enactment of the clinical order documentation routine speeded up the communication across different departments and helped nurses and midwifes to spend more time with their patients and improve their productivity as well as the quality of patient care.

The data show that in large and complex social systems, where individual actions are interdependent, organizational processes are interconnected and variations in the performance of a particular routine would have a great impact on other business processes as well as the operation of the organization overall, application is expected to be the most likely type of enactment. In particular, in the departments that participate in the delivery of care to inpatients, the findings reveal that the EPR system is rigid with specific functions that facilitate the performance of particular work processes (e.g. ordering and delivering drugs and medical supplies) and hinder others (e.g. recording medical information). Therefore, it does not give users the opportunity to introduce variations in the performance of these work processes, since they have to follow the work flows that are dictated by the EPR.

On the other hand, in the outpatient departments, the design of the EPR system provides staff with flexibility which is reflected in the performance of particular work practices surrounding its use. That is, the data show that different health professionals who collaborate with the Hospital do not follow the Clinic's guidelines and procedures, but they have their own ways of clinical practice. As a result, they introduce variations in the performance of particular routines (e.g. health information provision and recording). However, these variations do not have a negative impact on other work processes. In contrast, variations in the recording of patient information in the inpatient departments would have a profound effect on other organizational routines, such as the ordering of drugs, medical supplies and diagnostic tests.

The latter shows that in smaller systems, where individual actions are independent and the use of a given technology varies according to the needs, assumptions and expectations of individuals, the use of a technology may produce a wide range of outcomes that vary from inertia to change. For example, in the outpatient departments, the findings reveal that the use of the EPR system is limited with no changes in the work processes and structures surrounding its use (inertia). In the Dermatology and Laser Department, however, some doctors change the norms regarding the use of the system and record health information, transforming in this way the medical information documentation routine and collaboration structure of the department and improving the service quality provided to patients.

The data also show that the limited use of the EPR system for the documentation of health information in the outpatient departments may be attributed to the inadequate training provided to the receptionists of these departments. Respondents said that staff had limited knowledge of the EPR's functions, which in turn influenced the adoption of the technology. The absence of a strong leadership which would enforce a particular use of the EPR system further contributed to the limited use of the technology. The training provided by senior employees was considered ineffective by many respondents and some individuals used their own skills to learn how to use the system effectively in their everyday activities. The latter along with the flexible design of the EPR system are important points which help to understand why and how different people enacted different technologies-in-practice in some departments.

The data also highlight the role of clinicians in the technical modifications of the EPR and the change process overall. In the inpatient departments, an application was added on the system after a request from the clinicians to speed up the blood test results reporting process and help nurses to save time on administrative duties. In addition, in the diagnostic departments, fixed electronic forms were created and adapted to the needs of each department after a request of the medical staff to improve the reporting process and the efficiency of each department. The fact that a similar request from the administrative staff was refused shows the power that the doctors who collaborate with the Hospital have and their influence in the decision making process. This issue along with the previously mentioned issues will be further discussed in the following chapter.

CHAPTER X

10. Discussion of findings

10.1 Introduction

This chapter discusses the key findings of the study, which reflect the contribution of the thesis to the Information Systems as technology-in-practice field of research. In doing so, it starts with a summary of the study, which provides a brief overview of the phenomenon under investigation, the theoretical framework that the study draws on, the purpose and the objectives of this research, the type of investigation undertaken to explore the research question, the methods used for data collection and analysis and the themes that came from the interviews and on-site observations in the Mitera Hospital. Then, the emergent themes are further discussed and analysed. The first five themes have greater importance since they are directly related to the aim of the thesis to explore the role of agency in the uptake of technology, while the last two themes refer to practical issues associated with the implementation and use of technology in health care organizations and they arose from the participants' responses.

10.2 Overview of the study

The idea of conducting this research came from a review of the literature which indicated that our knowledge needed to be strengthened in the area of the role of human agents in using technologies and changing the existing ways of doing things in complex social systems. The link between technology and organizational change in complex contexts, such as health care organizations, is poorly understood and further theoretical development is needed to advance our current knowledge. This study draws on Orlikowski's (2000) model of technology-in-practice (see chapter 4), which suggests that structures of technology are not embodied within the technology, but rather they emerge as people interact with specific properties of the technology over time and thus they shape the technology structure that in turn shapes their interaction.

However, the model of technology-in-practice carries particular technological, institutional and cultural specificities. First, Orlikowski (2000) studied the adoption of a flexible artefact. The Notes software (a program which supports communication via

electronic mail and shared discussion databases) was designed to support - but not replace - the existing ways of communication among different users and provide them with freedom to build new applications within it. Second, Notes software was implemented in software development and consulting firms, where the choice to use the technology would mostly affect the productivity of individuals, but would not have an impact on indirect users - for example, patients, in this study - with all the consequences that a variation in the use of the technology under investigation could carry (e.g. issuing wrong prescriptions, ordering incorrect diagnostic or blood tests, mischarging patients for services provided and so on). Although very useful in understanding the relationship between structure, agency and technology, her model requires further research to evaluate its application in different and more complex contexts, such as health care organizations.

Orlikowski also acknowledged that her model carries particular cultural limitations. She explored the uptake of technology in the United States and called for other studies which would examine the implementation and use of new information systems in other countries. Examining other kinds of technology, such as an EPR system, with different technological properties (EPR functions) and in different cultural (Greece) and institutional (healthcare) contexts would expand our understanding on how people recursively structure their use of technologies in different circumstances (Orlikowski, 2000). In Greece, the use of EPR systems is limited and research has focused on the design of the technology. For example, Orfanidis et al. (2004) looked at data quality issues, such as measurement of data quality, acceptance of data quality mechanisms, integrity, accessibility and availability of data, and proposed ways for addressing data quality issues in the development of an EPR system. However, more research is needed to examine the uptake of EPR systems in Greece. This is the first study that takes place in Greece and explores the implementation and use of an EPR system and helps to understand how advanced technologies are adopted in different countries.

This study was undertaken in order to explore how routines change when a new EPR system is implemented in a health care setting and how the technology is changed by the existing routines surrounding its use, with the aim of exploring the role of agency in implementing and using new technologies in health care organizations. The research took place at Mitera Hospital in Athens, Greece, a private organization, which provides maternity, paediatrics and general services to the population of

Greece. A qualitative methodology was used and an exploratory case study strategy was adopted to investigate the phenomenon under study. Open-ended, semi-structured interviews with twenty-two key informants from the Mitera Hospital and over twenty hours of on-site observation were conducted and analysed thematically using the Ritchie and Spencer's Framework Approach (1994) to:

a) Examine how the system was designed to be used and how it is used in practice in order to identify any variations in the use of the EPR system.

b) Capture and analyse different routines surrounding the use of the EPR system in order to explore how the enactment of the recording information electronically routine induced changes in other organizational structures and routines.

c) Examine how different people use the EPR system across different departments to explore the role of agents in using the technology and shaping it to fit their needs.

Seven themes were identified from the analysis of data. There is some overlap between these themes, but there are also sufficient differences to justify keeping them separate. First, the findings show that technology structures are not embedded within the technology but they rather emerge in practice and become routines through the ongoing and situated interaction between the users and the technology. Second, the data indicate that, when a technology is integrated in large and complex networks where organizational processes are interconnected, individual actions are interdependent and variations in the performance of a particular routine affect the smooth operation of the organization, then the freedom available to users to modify aspects of the technology decreases and application is the most likely type of enactment. In contrast, when a technology is introduced in contexts where individual actions are independent and variations in the use of the technology at hand would not have an impact on other organizational processes, users tend to enact different structures that meet their needs. As a result, the use of a technology may produce a wide range of outcomes, which vary from inertia to change.

Fourth, this study emphasizes the need for designing technologies that meet the needs of end users. The data show that in order to fully adopt a particular technology, it has to demonstrate a relative advantage compared to the existing ways of doing things. In addition, the data emphasize the influence that clinicians have in the decision to adopt and change a particular technology and stress the need for engaging them in the

change process. Sixth, the data indicate that in contexts, which are characterized by independency in the activities of agents, the lack of adequate training contributes to variations in the use of the technology. Finally, the findings suggest that, in organizational contexts where diversity in practice is evident, managers should clarify the expectations of the organization regarding the use of a particular technology, provide users with strict guidelines and monitor their performance in order to enforce a particular use of the technology and reduce variability in the organizational routines surrounding its use. Table 10.1 provides a list of the themes that emerged from the data analysis and indicate how routines change after the implementation and use of an EPR technology and why variability in the use of the system occurs. These themes will be further discussed in the following section.

Themes
1. The use of a particular technology is situated and embedded in practice as people interact with the technology and preserve, reinforce or transform their existing work practices
2. When a technology is integrated in complex networks, where organizational processes are interconnected and individual actions are interdependent, its use is less malleable and application is the most likely type of enactment
3. When a technology is introduced in contexts, where individual actions are independent and organizational processes are not interconnected, users may enact a wide range of technologies-in-practice, which vary from inertia to change
4. Meeting the perceived and actual needs of end users helps to successfully adopt the technology at hand and transform the work practices surrounding its use
5. Engaging consultants and clinicians in the change process is a driver for adopting and changing a particular technology to improve the existing ways of doing things
6. The adoption of a leadership style which would set acceptable practice, clarify goals, monitor performance and provide ongoing support in contexts where diversity in practice is evident further decreases variability in the use of the technology
7. Providing users with adequate training reduces variations in the use of a particular technology and the work practices surrounding its use

Table 10.1: Emergent themes from studying how routines change and why variability in the use of the technology occurs

10.3 Discussion of findings

This section discusses the themes that emerged from the interview and observation data analysis. As it was previously mentioned, some themes overlap with each other, but they also have differences. The analysis of each theme contributes to a deeper understanding of how routines and structures change when a new technology is implemented in a health care setting and emphasizes the role of agents in designing, implementing and using technological innovations in complex organizations. In addition, it informs readers about why the use of a particular technology varies across different departments and between diverse individuals and highlights the role of human agents in using and changing the technology to meet their needs and improve their existing work practices as well as the performance of the organization overall.

10.3.1 Theme 1: *"The use of a technology is situated and embedded in practice as users interact with the technology and preserve, reinforce or change their existing practices"*

This research explored the uptake of the EPR system in different departments of the Hospital that participate in the provision of care to patients in order to examine how routines have changed since the implementation of the EPR system and why the use of the system varies across different departments. The findings of the study confirm Orlikowski's (2000) position that structures emerge in practice as users recurrently interact with the material and cultural properties of a given technology and drawing on specific interpretive conditions preserve, reinforce or change their existing ways of doing things (see section 4.7). This point is illustrated by the fact that in different departments, which use the same system and staff are instructed to use the EPR in similar ways, different individuals used the EPR in diverse ways and enacted different technologies-in-practice, which in some cases did not agree with the expectations of the designers and managers.

While in the diagnostic departments staff followed the management's instructions and used the EPR system as it was designed to record a patient's diagnosis and test results provided by the doctors, in the outpatient departments, receptionists and doctors did not follow the guidelines of the Clinic and used the EPR system in ways not anticipated by its designers. The EPR Manager made clear that the EPR was designed to be used by the receptionist of each department to record and store the diagnoses

provided by the doctors. However, in the outpatient departments, receptionists did not follow the written guidelines and used to record this information manually. In addition, in the Dermatology Department, some doctors made use of the new facility, although their role was not to use the system, in order to enter, store and retrieve information (i.e. diagnosis, history, test results and so on) about their patients.

The findings agree with Orlikowski's (2000) subjective viewpoint on the uptake of technology and the enactment of structures and help to understand how different individuals engage in the structuration process. Orlikowski (2000) argued that the structures surrounding the use of a technology are not embedded during its design, but they rather emerge in practice as different people draw on the functions of the technology, the power at their disposal, the guidelines regarding the use of the artefact and their understanding of how it should be used in specific contexts to enact particular routines. In their interaction with the technology, receptionists drew on their interpretation of how the EPR system should be used in their department, which was influenced by their knowledge of its functions that came from training, as well as the support and instructions given by the doctors of their department and their manager respectively, to enact particular routines. The technology and power that comes from their status within the Hospital (facilities / resources) and the guidelines regarding the use of the system (rules / norms) were similar. However, the training provided to the receptionists of these departments and their interpretations of the EPR system (interpretive schemes) differed. As a result they enacted different routines in practice.

On the other hand, the doctors who decided to use the system drew on their power that came from their professional status and their role within the organization as well as their interpretation of the EPR as useful in the provision of a better clinical outcome to enact particular work practices that fitted their needs. The fact that in some departments users chose either to ignore functions of the technology and the guidelines crafted by its designers (e.g. recording of diagnosis in the outpatient departments) or improvise and invent new ways that facilitate them in their daily activities (e.g. recording of medical data by the consultants in the Dermatology and Laser Department) shows that it is not the structures that are embedded within the technology that determine how it will be used in specific contexts but the people who recurrently interact with the properties of the technology by using particular functions

and ignoring others and enact specific routines that fit their ways of working, needs, interests and expectations of the technology at hand.

10.3.2 Theme 2: *"When a technology is integrated in complex networks, its use is less malleable and application is the most likely type of enactment"*

An interesting finding of the study was that, when a technology is integrated in complex networks, there are some limitations in people's actions, which are reflected in their interaction with the technology and the enactment of the work practices surrounding its use. In such contexts, the data reveal that "application" (people use and may change aspects of the technology to improve their existing ways of doing things by reinforcing the structural status quo and improving the work practices surrounding its use) was the dominant type of enactment. In particular, in the Admissions, Cashiers and Accounts Departments, as well as the inpatient departments and the departments that support the operation of the wards (Medical Supplies Department, Pharmacy, diagnostic departments) staff used the EPR system as it was designed, while in other departments (Cardiology Department, Dermatology and Laser Department) they either ignored specific functions of the system or invented new ones that met their needs and facilitated them in the performance of their everyday work activities. Why does this variability in the use of the EPR occur? Why is the system used as it was designed to be used in these departments? Why do users follow the written guidelines regarding the use of the system and enact the routines which are expected by its designers?

Orlikowski (2000) acknowledged that her study carries particular technological and institutional limitations (see section 10.2), which this study intends to overcome by exploring the uptake of a more complicated technology in a complex social context, where people's practices are interdependent and modifications in the use of the technology by one user or group of users would affect the work activities of other individuals within the organization. Orlikowski (2000, p.424) assumed that the interconnection of multiple systems within a particular setting or across different organizations, which increases interdependence and complexity, reduces the freedom available to users to change the technology and shape it to fit their needs and argued that "*as users become more dependent on using integrated technologies, the variety of technologies-in-practice that they will enact may decrease*".

The findings of the study extend Orlikowski's (2000) model of technology-in-practice by providing empirical evidence on the use of an integrated technology in a complicated social system, which supports her assumption that the interconnection of multiple artefacts reduces the degrees of freedom available to users to enact different technologies-in-practice. In addition, this study goes beyond that by suggesting that such integration not only decreases the number of technology structures enacted in a particular context, but also implies that users have to follow the workflows dictated by the technology and enact the technologies-in-practice intended by its designers, which are characterized in terms of what Orlikowski (2000) calls "application". An examination of how users interact with the EPR system and their colleagues across different departments that participate in an "*inpatient's journey*" (see fig. 9.1) within the Hospital provides a good example of how integration increases interconnection and interdependence and results in enacting routines that agree with the expectations of the designers of the technology at hand.

The data show that in the Admissions Department the process surrounding a patient's admission is very specific and users follow well defined steps to record patient data. The system of the department is connected with the systems in the inpatient departments. Such interconnection facilitates the sharing of administrative information with the wards. When patients are transferred to an inpatient department, the receptionist of the department accesses their admission records in order to transfer the patients to the department's patient list. Staff activities are interdependent. In addition, the receptionists from the wards update the records created by the staff in the Admissions Department by entering information regarding services provided to the patients during their stay in the department. This information is then stored and sent to the systems in the Pharmacy, the Medical Supplies and the Accounts Departments as well as the diagnostic departments that will carry out the requested tests, and is used by the staff of these departments for the performance of procurement (i.e. pharmaceutical and medical supplies management), financial (i.e. billing), clinical (i.e. referral management) and administrative (i.e. discharge) processes.

Failure to record administrative information in the designed way in the Admissions Department would affect the management of transfer records in the inpatient departments and would hinder the electronic documentation of patient data. In turn, variation in the recording of patient information in the wards would jeopardize the

performance of the previously mentioned work processes within the Hospital. Hence, it seems that in the departments that participate in the provision of care to inpatients users' freedom is limited and they have to follow the work flows that are dictated by the EPR.

The data show that across all the above departments systems are integrated, staff activities are interdependent and organizational processes are interconnected. It seems thus that when a technology is integrated in large and complex networks, which involve interconnection of work processes and interdependency of individual activities, the freedom available to users to depart from the designers' intentions and the inscribed properties of the technology and introduce variations in the use of the technological artefact in their recurrent interaction with the technology decreases. In this case the use of the technology is compatible with designers' expectations and the expected type of enactment is "application". In such contexts, the role of users is passive since they have to follow the work flows that are dictated by the technology. The latter implies that in some cases it is the technology structures that determine how it will be used in specific contexts. This finding contrasts with Orlikowski's (2000) subjective viewpoint on technology use, since it emphasizes the role of technology over agency in the adoption of technological innovations, and carries important theoretical implications, which will be further discussed in section 10.5.

10.3.3 Theme 3: *"When individual actions and organizational processes are independent, the enactment of technologies-in-practice may vary from inertia to change"*

Contrary to what described above, in the outpatient departments, the data show that the design of the EPR system provides staff with flexibility which is reflected in the resulting outcomes from the use of the technology which ranged from "inertia" (people use the technology to retain their existing ways of doing things and their resulting practices preserve the structural status quo and the work practices surrounding the use of the technology with no changes to the functions of the artefact) to "change" (people use the technology to transform the structural status quo and as a result they change the work practices surrounding the use of the technology as well as the artefact itself). The EPR system that is used in the outpatient and diagnostic departments provides users with the same set of functions. However, the outcome of

the interactions of individuals in the diagnostic departments was different than the one in the outpatient departments.

In the Breast Centre as well as the Histopathology and the General Ultrasound Departments staff used the EPR system as it was designed to check administrative information and record their patients' diagnoses and test results, enacting technologies-in-practice that are characterized in terms of "application". In contrast, in the Cardiology and the Dermatology Department, while staff followed the written guidelines and used the EPR to check administrative information entered by the staff in the Cashiers Department, they departed from the designers' instructions and did not record the diagnoses provided by the doctors on the EPR. In addition, some doctors decided to use the technology to change their work practices and improve the collaboration and productivity structure of the department. Why do variations in the use of the EPR system occur in these departments? Why is the system used as it was designed to be used for the performance of specific routines (e.g. checking patient information online)? Why do some users depart from the written guidelines regarding the use of the system and enact routines that were not anticipated by its designers?

In the diagnostic departments, the researcher identified three routines directly associated with the use of the EPR system. That is, receptionists use the system i) to check administrative information, such as a patient's personal details, doctor, type of test and date of payment as well as ii) to record health information, such as a patient's diagnosis and test results, and iii) to access and report the results of diagnostic tests either to their colleagues in the inpatient departments (in case that the patient is hospitalized in the wards of the Hospital) or to the patients (in case that a patient visited the Hospital to undergo a diagnostic test).

It is not surprising that the enactment of the previously mentioned routines is characterized in terms of "application". The data show that all these routines involve a degree of interdependence and interconnection between the activities of agents. The administrators in the Cashiers Department browse patient names on the EPR system, access their record with their demographics, insurance details and history of visits and record the service provided, their referrer and attendant doctor. The system in the Cashiers Department is connected with the systems in the diagnostic departments and the receptionists of each diagnostic department access the information entered by the staff in the Cashiers to manage the outpatient appointments.

In addition, receptionists use these records to record the results of the diagnostic tests that are performed in their department. Doctors provide their patients' diagnoses and test results to the receptionists of the department who in turn record them on the EPR. The documentation of health information links with the reporting to both patients and clinicians. Once the receptionists have recorded the results of a patient's test, they print the form and provide it to the doctor who carried out the test in order to sign it. They then place it in a folder and provide it to the patient or the clinician that requested the test. Individual actions are interdependent and work processes are interconnected. Variations in the recording of patient data by the staff in the Cashiers Department (i.e. recording administrative data manually) would hinder the electronic documentation of health information in the diagnostic departments (i.e. receptionists would not be able to access the patients' records), which in turn would slow the reporting process (i.e. receptionists would have to record data manually, produce two copies, keep one for the records of the department and give one to the patient) and therefore the productivity of the department. It seems thus that when individual activities are interdependent the possibility to enact a technology-in-practice that significantly varies from the expectations of the designers of the system is small.

On the other hand, in the outpatient departments, the findings show that the EPR was implemented in order to i) help receptionists to check online a patient's personal details, doctor, date and service provided with the aim of improving the management of outpatient appointments, the productivity of the department and the service quality, as well as ii) record the diagnoses provided by the doctors of each department with the aim of speeding up the work of staff in the department by helping health professionals to easily and quickly retrieve information about their patients. The data reveal that, in the Cardiology and the Dermatology Departments, the EPR system was used by the receptionists as it was designed with regards to accessing and checking administrative information entered by the staff in the Cashiers Department. As it was previously mentioned, the recording of administrative data and the checking of this information by the staff in the outpatient departments require interdependence of staff activities. Not surprisingly, the enactment of the documentation and checking of administrative information technology-in-practice took the form of "application".

However, the most important finding of the study was that, in the outpatient departments, receptionists and consultants introduced interdepartmental variations in

the use of the EPR system with regards to the documentation of health information. In particular, in the Dermatology and Laser Department, the majority of dermatologists provide their patients' diagnosis either verbally or manually to the receptionist of the department who in turn records it in the department's book. This is a departure from the written guidelines which state that doctors should record a patient's diagnosis on a digital voice-recorder and provide it to receptionists in order to enter it into the EPR. A good starting point in order to understand why staff enacted a limited use technology-in-practice in the Dermatology and Laser Department would be to examine the reporting process for outpatients and inpatients with regards to the outcome of dermatological consultations. The two paragraphs below illustrate the factors that have led to a limited approach to the use of the EPR and provide an example of what Orlikowski (2000) calls "inertia".

The flexibility of the EPR system in the outpatient departments as it is reflected in the lack of link between the recording and the reporting process allowed consultants to use their own ways of clinical practice and provide the results of the consultation to the receptionists and their patients in the most convenient way. In the outpatient departments, the data show that doctors who collaborate with the Hospital examine their patients and provide them with guidelines regarding the appropriate action that should be taken. The interaction is between the consultant and the patient. There are no other individuals involved in the process and therefore no interdependency of actions. The outcome of the consultation is then provided to the receptionist of the department for internal use (record keeping).

In contrast to the diagnostic departments, where patients undergo tests and the results of these tests are recorded in order to be reported to the patients and used by other doctors, there is no formal reporting process in the outpatient departments. The latter provides staff with freedom to use their own ways for the documentation of medical information that fit their needs. As a result, a limited use (inertia) technology-in-practice was enacted in the department with regards to the documentation of diagnosis, since the receptionist of the department felt that recording patient data manually would save her time. In addition, in the outpatient departments, consultants do not carry out any tests that they have to report to their colleagues from the inpatient departments. Clinical examinations take place in the inpatient department that a patient is hospitalized. The results are recorded manually and provided directly to the

clinician who is responsible for the particular patient. It seems therefore that, as with the reporting process for outpatients, the reporting process for inpatients does not involve any interdependency and interconnection of individual actions and work processes through the EPR system, allowing thus agents to use their own ways of practice that meet their needs.

Along with the limited use technology structure enacted by the receptionist and the consultants of the department, another routine was enacted in the department with regards to the documentation of health information. Three doctors found the use of the EPR system for the recording, storage and retrieval of information extremely useful and decided to ignore the management's instructions, which stated that doctors were not to use the system for the recording of medical information, and systematically used it to record their patients' diagnosis, allergic reactions, medication, clinical observations and diagnostic test results. In addition, one doctor modified aspects of the technology and recorded images from clinical findings.

The flexibility in the design of the EPR system in the outpatient departments increases clinical autonomy and therefore the possibility for introducing variations in the performance of particular work practices surrounding the use of the system. The use of the technology relies on the value that health professionals attach to the EPR and its contribution to the provision of a better clinical outcome. These doctors felt that the EPR system facilitated their work and drawing on the independency of their activities regarding the use of the system decided to use it for the recording of patient data. The lack of interconnection between the recording and the recording process allowed agents to introduce variations in the use of the technology. In the first case (inertia), receptionists and consultants decided to preserve their existing ways of doing things because that met their needs, work patterns and expectations of the technology. In the second case, which is an example of Orlikowski's (2000) concept of "change", doctors chose to use the EPR to improve their work because that agreed with their expectations of the technology and their interpretation that it would provide a better clinical outcome.

The previously mentioned show that in contexts where individual actions are independent and the use of a technology varies according to the needs, assumptions and work patterns of individuals, the use of the technology may produce a wide range of outcomes that vary from "inertia" to "change". Health professionals who are not

salaried employees but collaborate with the Hospital and play a key role in the increase of the Hospital's revenue work in an environment with increased autonomy of individual actions. As a result, they use their own ways of clinical practice and introduce variations in the performance of particular routines (e.g. health information recording). However, these variations do not have a negative impact on other work processes. In contrast, variations in the recording of patient data in the inpatient departments would hinder the performance of other organizational routines, such as the ordering of drugs, medical supplies and diagnostic tests (see previous section).

10.3.4 Theme 4: *"Meeting the perceived and actual needs of end users helps to successfully adopt the technology at hand and transform the work practices surrounding its use"*

The findings show that in the departments that the EPR system was successfully adopted users expressed a positive opinion about the technology and its ability to help staff improve their work practices as well as the productivity of their departments and the service quality. On the other hand, in the outpatient departments, health professionals questioned the value of the EPR system in the provision of a better clinical outcome and enacted a limited use technology-in-practice. What is the lesson learnt from this finding? Why is the EPR system fully used in the inpatient departments, whilst in the outpatient departments its use is limited? What is the role of the technology in the decision of human agents to use it in their daily activities?

Orlikowski (2000) argues that when people interact with a particular technology they use their assumptions and understandings of the technology regarding its usefulness in the way that they perform their tasks (see section 4.7.2). The data from the pre-study (chapter 8) show that in the inpatient departments the administrative and nursing staff (who are the users of the EPR system) expressed a positive attitude towards the new system since they felt that it would speed up the performance of particular routines (e.g. ordering of drugs, medical supplies and diagnostic tests, patient records management) and improve the communication with other departments of the Hospital. In addition, clinicians were happy since they could have fast access to blood test results. It seems thus that there was compatibility between the EPR functions and the needs of the direct (nurses, midwives and receptionists) and indirect (clinicians) users of the system. They felt that they would benefit from the use of the technology since it would improve their existing ways of doings things, save them time and drive quality

and productivity. As a result, they embraced the EPR system and used it in the designed way, enacting thus structures of "application".

In common with previous research (Bar-Lev and Harrison, 2005, Greenhalgh et al., 2005, Orlikowski, 2000), the data from the diagnostic departments suggest that agents decide to adopt a technology when they believe that it will improve their ways of working. The EPR system was greatly appreciated by the staff in the diagnostic departments. Receptionists felt that the EPR system could speed up the workflow in their departments and improve the productivity of staff and the patient experience within the Hospital. This interpretation motivated them to make full use of the new facility and even change some of its functions in order to take the most out of it in their everyday activities. The latter agrees with Orlikowski's (2000, p.423) finding that users enact structures which are characterized in terms of "application" when they use the technology "*with the intention of improving or enhancing their existing work processes*".

However, Orlikowski (2000) argues that users may decide not to use a particular technology if they feel that it does not fit with their needs and their existing work practices. A number of studies have shown that when a technology is incompatible with users' needs and professional values and does not facilitate their everyday activities, people decide either to minimally use the technology at hand or abandon it and preserve their existing ways of working (Aderibigbe et al., 2007, Greenhalgh et al., 2008, Jensen and Aanestad, 2007). In the outpatient departments, the findings indicate that the majority of the medical staff perceived that the EPR system would not improve their existing ways of working and would not offer better clinical results. For instance, in the Dermatology and Laser Department, a dermatologist reported that doctors had doubts about the relative advantage of the EPR system over the paper-based system with regards to the recording and reporting of medical data. This interpretation led them to the decision to keep using the paper-based method for the documentation and reporting of health information. The latter was also supported by Orlikowski (2000, p.421-422) who found that the limited use of the technology "*was associated with interpretive conditions that included users [...] being sceptical of the technological properties available to them*".

Another way to support the conclusion that the limited use of a technology is related to its failure to demonstrate a relative advantage and meet the needs of end users is to

think about the reasons that some doctors decided to use the EPR in their everyday activities. The two doctors from the Dermatology and Laser Department who provide laser treatments use the EPR system because they find it extremely useful in the provision of a better clinical outcome. Laser sessions differ from dermatological consultations. They have some rules that can be easily monitored through the system. For example, the doctor can view on the system a patient's previous visits, techniques and laser power that have been used and skin irritations that emerged in order to provide the appropriate therapy. Therefore, the EPR system helps health professionals to provide a safer and more effective service. As a result, they are more enthusiastic about using the technology for the recording, storage and retrieval of medical data.

Moreover, the EPR Manager said that the system was implemented in the outpatient departments that requested it and that the decision to request its implementation was made by the medical staff of each department. However, the data reveal that the EPR system has not been implemented in the majority of the outpatient departments. The latter shows that the medical staff of these departments were sceptical about the value of the technology in the provision of better clinical results and the improvement of their existing ways for the documentation and reporting of health information. This interpretation led them to the decision to maintain the familiar and reliable paper-based system for the performance of the aforementioned routines.

It seems therefore that the decision to use or not a particular technology lies on the interpretations that agents have about the advantages of the technology over the existing methods used for the performance of particular work practices. Failure to design artefacts that demonstrate a relative advantage compared to the existing ways of doing things and meet the needs of direct and indirect users leads to preservation of the work practices and the structural status quo and limited or no use of the technology at hand. In this study, the decision made by the majority of doctors to either not implement an EPR system or use it minimally was found to be related to their understanding that the technology would not provide any tangible improvements in their everyday activities and would not lead to the provision of better clinical outcomes. On the other hand, in other departments, where staff thought that the use of the EPR system would improve particular work processes, such as the recording and reporting of test results or the ordering of pharmaceutical and medical supplies, as well as the productivity of staff and the quality provided to patients, the EPR system

was successfully adopted and users reinvented the technology in order to obtain the maximum benefit out of its use.

10.3.5 Theme 5: *"Engaging consultants and clinicians in the change process is a driver for adopting and changing a technology to improve the existing ways of doing things"*

The data also emphasize the need for engaging individuals who are perceived as having particular influence on the actions of their colleagues in the change process. Opinion leaders have been found to play a crucial role in the implementation of innovations (Greenhalgh et al., 2005). However, their role is rarely ongoing and they typically intervene in the initial stage to establish the importance of the implementation of a particular technology and motivate users to embrace it in their daily routines (Orlikowski et al., 1995). The findings of this study, though, show that the role of doctors as opinion leaders was ongoing. Opinion leadership in the context of this study does not refer to an organized intervention to influence the use of technology. In contrast to a deliberate attempt made by the management of an organization to shape staff's initial and ongoing use of a particular technology, which Orlikowski (1995) calls technology-use mediation, opinion leadership in this study was found to be emergent and refers to the influence – intended or unintended - that powerful individuals have in the decision to implement, adopt or change the technology at hand.

In private health care organizations, such as the Mitera Hospital, clinicians and consultants who collaborate with the Hospital are powerful individuals with great influence in the decision making process. Their role is not solely clinical, but it also includes some marketing elements. They have to sell a product (i.e. services provided by the Mitera Hospital) to their patients-clients who visit them in their clinics in order to increase the Hospital's clientele. Therefore they bring money into the organization and play a very important role in the increase of the Hospital's revenue. The Hospital needs them and treats them like clients, providing them with additional rights and power compared to the rest of the staff. Hence, they exert a lot of influence in the decision making process. Their power is further increased by the fact that, in Greece, clinicians and consultants have high professional and socio-economic status, while nurses, midwives and administrators do not enjoy similar recognition by both their colleagues and the public.

In particular, the data show that doctors played a key role in the decision to implement an EPR system, modify aspects of the technology and use it to improve the staff's existing work practices. The EPR Manager said that, in the outpatient departments, EPR systems were implemented after a request from the head of each department. The majority of senior consultants opted to keep the paper-based system for the recording and reporting of their patients' diagnosis in their department, because they felt that the new system would not provide better clinical outcomes and would not improve their existing ways for the performance of the aforementioned processes (see section 10.3.4). According to Orlikowski (2000), the limited use of a particular technology is associated with the scepticism of agents with regards to the usefulness of the technology in their work. The decision of the medical staff to preserve their existing work practices hindered the implementation of the EPR system in these departments.

In some departments, though, such as the Dermatology Department, the clinical leader decided to replace the paper-based system with the electronic one. This was found to improve the communication within the department as well as the diagnosis and treatment of patients. However, the majority of senior staff did not support the transition from the paper-based to the electronic health records system. As a result, the new technology was not fully adopted in the department and different technologies-in-practice were enacted (see section 9.7 and 9.9). According to Locock et al. (2001) opinion leaders can negatively influence the decision of their colleagues to adopt a particular innovation. In the Dermatology Department, the lack of support by the majority of dermatologists, which was based on their doubts of the value of the EPR system in the recording and storage of medical information, in combination with the factors discussed in previous sections (e.g. lack of adequate training, absence of strong leadership, independence of work activities) had a negative impact on the decision of the receptionist of the department to use it for the documentation of health information. In contrast, the support of the EPR system by the doctors in the diagnostic departments had a positive impact on the receptionists' decision to adopt and use it for the recording of a patient's diagnosis and test results. It seems therefore that doctors play an important role in the adoption of a particular technology.

The data also highlight the role of clinicians and consultants in the technical changes of the EPR system. In the inpatient departments, an application was added on the EPR after a request from the medical staff to speed up the blood test results reporting

process, minimize errors, improve the quality of the Hospital's services and help nurses to save time on administrative duties. Furthermore, in the diagnostic departments, fixed electronic forms were created and adapted to the needs of each department and consultant to improve the recording and reporting process as well as the productivity of the department. Respondents said that a similar request by the receptionists of each department was refused. The latter shows the power that part-time consultants who collaborate with the Hospital have and their influence in the decision making process. It seems thus that engaging powerful individuals – in the case of health care organizations, consultants and clinicians - in the implementation and adoption process is a driver for improving the routines surrounding the use of the technology at hand. The contribution of opinion leaders (in this study, health professionals) to the adoption and modifications of technology was a factor which was not identified by Orlikowski (2000) and will be further discussed in the theoretical implications section.

10.3.6 Theme 6: *"Providing users with adequate training reduces variations in the use of a particular technology and the work practices surrounding its use"*

Orlikowski (2000) argues that users draw on their knowledge of the functions of a given technology that comes from training and experience with using the technology in order to use it in particular ways and enact structures in practice. The provision of sufficient and ongoing training to familiarize users with the properties of a particular technology has been considered by many researchers to be a success factor for the implementation and use of technology (Greenhalgh et al., 2008, Orlikowski et al., 1995, Sanchez et al., 2005). The findings suggest that training practices are powerful tools for adopting a technology and using it in the way that it is designed to be used, while poor training, word of mouth guidance and individual knowledge lead to variations in the use of the technology. The latter does not necessarily mean that people will enact a limited use technology-in-practice. People may draw on their knowledge of IT and decide to modify the technology and change the work practices surrounding its use producing thus structures that are characterized in terms of "change".

In the Admissions Department, the data show that the training provided to the staff of the department was adequate. The administrators of the department used to go to the IT Department of the Hospital where the staff from Singular Logic (the IT company

that implemented the EPR system) showed them how to use the system to perform a patient's admission. Not surprisingly, the enactment of the administrative information documentation technology-in-practice was compatible with the designers' expectations. On the other hand, in the Accounts Department the training was poor because the deadline for the use of the system was approaching and there was limited time to train the staff. However, this did not affect the routines of the department because the problem was mainly with the design of the new software and the way that patient charges were grouped. The functionality of the new tool was similar to the old one. The lack of training had only an impact on the productivity of the department because staff needed more time to perform the billing and discharge processes since they had to get used to the design of the new system. This problem, though, was quickly sorted and staff started using the system efficiently.

In the inpatient departments, the Singular Logic team provided training to the receptionists and nurses of each department. Staff said that the training provided was inadequate and felt that they needed more training in order to become familiar with the functions of the system. This resulted in patients being mischarged which in turn caused delays in the discharge process. However, the problems that emerged from the lack of adequate training were more technical than procedural in nature. This means that staff had a good understanding of the procedures that they had to follow using the EPR system (they had to follow the work flows dictated by the EPR) but because they were not trained enough they used to make technical errors in the recording of data. This, however, did not cause variations in the work practices surrounding the use of the technology, but it temporarily decreased the productivity of the Accounts Department (it used to take them longer to bill and discharge a patient because of the coding errors made by the staff in the inpatient departments).

The fact that the training provided to the staff of the inpatient departments was inadequate but did not cause variations in the routines that are associated with the use of the EPR system does not mean that it was an acceptable practice. It is not though in the scope of this study to evaluate the training methods applied to make staff familiar with the EPR system. What is important here is to examine the training methods used and understand the relationship between the lack of adequate training and the variations that arose in the routines surrounding the use of the technology in different departments. The finding that the training provided to the nurses and receptionists was

technically but not procedurally inadequate stresses the importance of using training methods that help users understand the work processes that are designed to be performed through the use of a particular technology. The latter has been acknowledged by many researchers in the innovation adoption field (Orlikowski, 1992b, Scott et al., 2007).

The problems with inadequate training practices were more evident in the outpatient departments. While in the diagnostic departments receptionists were happy with the training provided by the Hospital, which was reflected in the use of the EPR system and the performance of particular routines (e.g. diagnosis and test results recording), in the outpatient departments staff said that the training provided was short and inadequate. In particular, the data show that in the Dermatology and Laser Department as well as the Cardiology Department of the Pediatrics Clinic there was no formal training method applied and staff had to rely on instructions from their senior colleagues or their knowledge and experience with using information systems. The EPR system was implemented in these departments in the post-implementation period and the receptionists of the departments who joined the Hospital after the introduction of the new system were trained by their predecessors in the post.

The data, however, suggest that this training practice was ineffective since the previous receptionists did not emphasize that the system should be used for recording patients' diagnoses, but they advised them to record this information manually and use the system for checking patient information entered by the staff in the Cashiers. As a result, the new staff preserved the work practices existing in the departments and enacted a limited use technology-in-practice which conflicted with the designers' intentions. The EPR Manager made clear that the system was designed to be used for diagnosis recording, but the lack of training (staff said that it lasted approximately ten minutes) and the failure to inform users about the work practices that are designed to be performed through the use of the system led to variations in the use of the technology and the performance of the medical information documentation routine.

In their interaction with the EPR system, users were influenced by their limited technical knowledge (interpretive conditions) which was a result of the inadequate training provided by their predecessors in the post. The latter confirms Orlikowski's (2000, p.421-422) finding in the study of the uptake of the Notes system within a consulting firm that the limited use of the technology by the consultants "*was*

associated with interpretive conditions that included users having limited understanding [...] of the technological properties available to them". A number of studies have shown that the lack of adequate training is a major barrier to successful implementation and adoption of EPR systems (Aderibigbe et al., 2007, Baron et al., 2005, Greenhalgh et al., 2008).

In addition, in the Dermatology and Laser Department, other individuals drew on their own knowledge in order to use the EPR system effectively in their everyday work activities. In particular, three doctors motivated by their interest in using the technology to improve the recording of medical information and collaboration (with the receptionist) structures in the department learnt how to use the EPR system on their own. However, the system was not designed to be used by the medical staff of the Hospital and therefore no training was provided to doctors. Nevertheless, the flexible design of the EPR system in the outpatient departments allowed doctors to change the norms and use the technology to enact structures that introduced variations in the recording of medical information in the department. While the ostensive routine of the department was to record a patient's diagnosis in the department's book, these individuals used to record it on the patient's electronic record.

It seems therefore that the lack of adequate training which would help users to understand how the technology should be used to perform specific work practices contributes to variations in the use of the technology. While in the inpatient departments the rigid design of the EPR system coupled with the users' understanding of the organizational routines that should be carried out through the use of the technology did not cause any variations in their performance, in the outpatient departments the data reveal that the inadequate training resulted in limited knowledge of the EPR functions and the work practices surrounding its use and consequently the enactment of a limited use technology-in-practice.

In addition, the fact that the Hospital did not provide training to the doctors in the outpatient departments but simultaneously gave them the freedom to use the EPR system in their work resulted in individuals using the technology in different ways, introducing thus variations in the performance of particular work practices in their department. The lack of effective training practices in the outpatient departments helps to understand how and why different people enacted different technologies-in-practice in these departments. The findings of this study agree with Orlikowski's

(2000) position that the agents' decision to use a technology is strongly influenced by their understandings of the technological properties and functionality (i.e. work practices that are designed to be performed through its use) of the technology, which in turn are influenced by the training practices employed to make them familiar with the system.

10.3.7 Theme 7: *"The adoption of a leadership style which would set acceptable practice, clarify goals, monitor performance and provide ongoing support in contexts where diversity in practice is evident further decreases variability in the use of the technology"*

The data show that in contexts, where the design of the technology is flexible (i.e. individual actions and organizational processes are independent) and different people can use their own ways of working to perform their tasks, managers should clarify the objectives of the organization, provide users with clear and strict guidelines and constantly monitor their performance in order to ensure that the technology is used in the designed way. Many researchers in the change management tradition have found that a strong leadership style is required in order to successfully adopt an EPR system in health care organizations (Greenhalgh et al., 2009). For instance, Doolan et al., (2003), argued that although the commitment of leadership might not be important at the initial stage, a strong leadership is needed thereafter to support a particular use of the technology.

In the inpatient departments, the system was mainly used by the administrative staff (clinicians did not participate in the use of the EPR and nurses used to minimally interact with it during the evening shift) and the organizational processes which were performed through the system were very simple and specific (e.g. documentation of clinical requests for drugs, medical supplies and diagnostic tests) limiting thus the users' alternatives and the possibility for introducing variations. There were strict rules regarding the use of the technology that receptionists had to follow. Users knew that failure to comply with these rules may result in termination of employment.

On the other hand, in the outpatient and diagnostic departments, the system was designed for recording medical information. The data reveal that, in the diagnostic departments, receptionists follow the Clinic's guidelines and record the patients' diagnoses and test results on the EPR system. In the outpatient departments, however,

receptionists do not conform to the Hospital's regulations and record the diagnoses provided by the doctors of their department in the department's book. One respondent said that they did not record their patients' diagnosis on the EPR system because they were not asked to do so by their manager. The lack of clear and strict guidelines by the management team that would enforce the use of the system for the recording of medical information was found to be associated with the variations in the use of the technology in the outpatient departments. Many studies have shown that the lack of a strong leadership leads to a limited use of the technology at hand. For instance, Aderibigbe et al., (2007) found that the inability of the management to enforce a particular use of the EPR system led to a limited use by the nursing staff.

Orlikowski (2000) refers to the value of external influence exerted by trainers, champions, experts and managers during the implementation stage. However, she does not make any reference to the importance of ongoing support by the management and its contribution to the successful adoption of technology. Other researchers within the change management tradition have highlighted the role of ongoing support by the management in the successful adoption of innovations in health care settings (Greenhalgh et al., 2005). For example, Green (1998) and Gustafson et al. (2003) stressed the importance of leadership in supporting change by creating a culture of support, providing ongoing guidance to users and monitoring the process in order to successfully implement and adopt a particular technology.

The findings of this study indicate that the lack of ongoing support and influence by managers in contexts where diversity in practice is evident leads to variations in the use of the technology. In particular, in the Dermatology Department, the absence of clear and strict guidelines and support by the management team allowed staff to employ different methods for the performance of their tasks that met their needs and personality. It was not surprising thus that different consultants used different ways for the provision of their patients' diagnosis. The use of the technology relied on the value that direct and indirect users attached to it with regards to its usefulness in their daily activity. When users have limited understanding (i.e. lack of training and ongoing support in the form of follow-up sessions for users who have limited technical knowledge) and are sceptical regarding the value of the technology at hand, they are likely to enact a limited-use technology-in-practice (Orlikowski, 2000).

The findings show that while the management of the Hospital recommended electronic documentation of medical data, they let users record this information manually. The receptionist from the Dermatology Department stated that, if there were specific instructions from their manager, she would happily record the patients' diagnoses on the EPR and added that they had to make clear which was the acceptable practice for the documentation of medical information because she could not record it both manually and electronically due to lack of spare time. Sanchez et al., (2005) highlighted the role of managers in providing clear signals to any doubts regarding the use of EPR systems. It seems thus that the flexible design of the EPR system coupled with the weakness of the leadership to guide users and enforce a particular use of the system in the department further contributed to the variations in the use of the technology and the routines surrounding its use.

The point that the presence of a strong leadership is very important in order to avoid variations and use a particular technology in the designed way is further illustrated by the example of the Breast Centre. In the first stage of the study, an interview with one receptionist from the department and observation revealed that radiologists used to provide their patients' diagnosis, history and test results either verbally or manually and receptionists then used to record them on the EPR system. The director of the outpatient departments, though, decided to change the way in which a patient's diagnosis and test results are provided to the receptionists of the department as well as the way in which a patient's history is recorded. That is, she made clear that radiologists should record their patients' diagnosis and test results on a digital voice-recorder and provide it to the receptionists of the department who in turn should connect it to the EPR system, listen to the doctors' diagnosis and record it on the patient's electronic health record. In addition, she gave instructions to the staff of the department to record a patient's history manually and place it in paper-based files by alphabetical order.

The findings of the second stage of the study show that invariably the staff of the department followed her instructions because they said that they had to comply with the rules of the Hospital. The interdependency of the recording and reporting process (see section 10.3.2) combined with the presence of strict rules and clear guidelines regarding the use of the system and the organizational routines surrounding its use led to the enactment of work practices that agreed with the expectations of designers and

managers. On the other hand, the high degree of individual autonomy in the outpatient departments and the resulting diversity in practice coupled with the lack of clear and strict rules from the management side regarding the use of the EPR system led to variations in the use of the technology and the work practices surrounding its use. It seems thus that leadership style is an important indicator of technology use in different contexts.

10.4 Conclusions

The aim of this thesis has been to examine how routines and structures change when a new technology is implemented in a health care context and how the use of the technology is changed by the existing routines surrounding its use, with the aim of exploring the role of agents in implementing and using technological innovations in complex social systems. This study shows that routines and structures change as people interact with the technology and influenced by particular technological (i.e. rigid or flexible design of technology), organizational (i.e. leadership style) and interpretive (i.e. their understandings of the value of the technology in their work, interpersonal influence exerted by powerful individuals and training) conditions enact particular social practices, which either agree or not with the designers' objectives as reflected in the guidelines regarding the use of the system, which in turn preserve, reinforce or change other hospital structures. A more thorough analysis of the practical and theoretical implications of the thesis as well as its contribution to current knowledge is provided in the following chapter.

CHAPTER XI

11. Conclusions

11.1 Introduction

This chapter discusses the implications of the thesis for the management of advanced information systems in healthcare organizations as well as the theoretical implications of the study, particularly in relation to Orlikowski's (2000) work. It also refers to the methodological and contextual limitations of this research and provides a set of recommendations for future research in the area of the implementation and use of new technologies in health care settings. Finally, it summarizes the overall contribution of the thesis and closes with a reference to the most important research findings and their relationship to the work of other researchers in the field.

11.2 Implications for practice

This study provides insights into how different people interact with a technology and enact work practices in their recurrent use of the technology in health organizations. The findings of the study carry four implications for the management of information systems in organizations: a) designers should consider what the organization intends to achieve with the implementation and use of a particular technology and ensure that the design of the technology fits and supports the organizational goals, b) designers and managers should engage users in the design and implementation of the technology to ensure that the technology meets their needs and facilitates their work practices, c) managers should constantly monitor how the technology is being used and provide guidance to users to ensure compatibility between the use of the technology and the objectives of the organization and d) organizations should provide adequate training to the users of the technology, communicate the management's objectives, identify gaps and support staff who face difficulties in the use of the technology. The managerial implications of the study are discussed below.

11.2.1 Organizational goals should be reflected in the design of the technology

At the outset, it is useful to clarify that the lessons drawn in this section are applicable to information and communication technologies (ICT) that can be tailored to the work

flows of the context in which they are introduced. In contrast to other technologies that come with a set of fixed functions and therefore cannot be drastically changed, the EPR software in the Mitera Hospital was slightly changed and adapted to the needs of the Hospital. The findings indicate that when designers have a clear understanding of what the organization intends to achieve through the implementation of a given technology and this understanding is reflected in the design of a rigid technology with specific functions that facilitate and coordinate the performance of specific work practices, the resulting technologies-in-practice are likely to be compatible with the designers' intentions and the objectives of the organization. This point is illustrated by the examples below, which refer to the differences in the design of the EPR system in the inpatient and the outpatient facilities of the Hospital.

In the inpatient departments, the EPR was implemented in order to improve the administrative, procurement and financial processes of the Hospital as well as the productivity of staff and the quality provided to patients. The designers of the system embedded into the EPR specific functions which facilitate the recording, storage and dissemination of patient-related data and provide better interconnection and faster coordination across different departments. The rigid design of the EPR system dictated how the technology should be used and reflected the objectives of the management. The interconnection of specific work processes (e.g. supply chain management, billing, admission, discharge and transfer records management) and the interdependency of users' actions ensured that the technology would be used in order to facilitate the performance of these processes. This helped users to have a clear understanding of how the EPR should be used and what the organization intended to achieve. As a result, they adopted the technology successfully and enacted the organizational routines expected by the designers of the EPR system.

On the other hand, in the outpatient departments, there was ambiguity in the management's objectives regarding the use of the system. This uncertainty was reflected in the flexible design of the EPR, which provided users with alternative uses, and was further supported by the EPR Manager's statement that, while the system was implemented in order to improve the recording of medical information, the use of the system for this activity was optional. The flexible design of the EPR, the lack of interconnection between work processes and the independency of users' actions in the outpatient departments resulted in people either ignoring specific functions of the

technology and preserving the paper-based method for the recording and storage of health information or using the EPR in ways that met their needs and interests. The findings reveal that when the design of the EPR is flexible, users can depart from the inscribed - by the designers – ways and shape the technology to fit their needs.

In addition, designers built into the EPR system functions which supported the performance of routines which were not intended to be performed by the staff of these departments and were not included in the formal guidelines which reflected the organizational objectives. For instance, the EPR in use in the outpatient departments had a function for sending electronic referrals. However, the system was not designed to be used for the performance of this process. It seems thus that there was uncertainty regarding the use of the EPR, which was reflected in the design of the system and resulted in variations in the use of the technology. In the outpatient departments, the design of the EPR did not match with the objectives of the Hospital and thus its use did not result in noticeable improvements in the performance of each department.

It seems thus that when the organizational goals are reflected in the functions and the work flows dictated by the artefact, the use of the technology is compatible with the designers' intentions and the organization's expectations. Managers and designers should consider the following in order to avoid variations and ensure a successful implementation of an information technology in complex organizations:

a) Be clear about what the organization intends to achieve through the implementation and use of the technology.

b) Make sure that the design of the technology is rigid with a high degree of interconnection and its functions reflect the work processes that are intended to be performed through the use of the technology.

11.2.2 Engaging users in the design and implementation of technology is critical

This study also informs designers and managers about the importance of engaging direct and indirect users in the design of a particular information system. Many studies have emphasized the need for designing technologies that are compatible with users' needs, professional values and work practices (Bar-Lev and Harrison, 2005, Greenhalgh et al., 2005, Jensen and Aanestad, 2007). Doolan et al. (2003) found that the involvement of clinicians in the design and modifications of the EPR system in five hospitals in the United States led to a successful implementation and adoption of

the technology. Moreover, Body et al. (2009) highlighted the importance of involving those affected by an e-health project in its planning, design and implementation.

The findings of this study indicate that users' decision to adopt or not a technology is based upon their understanding of the advantages of the artefact over the existing methods used for the performance of their daily activities. In this study, health professionals were sceptical about the use of the EPR system in their clinical work and the consequences of such use. Some doctors expressed doubts regarding the value of the technology in the provision of a better clinical outcome. Engaging direct (e.g. receptionists) and indirect (e.g. consultants) users in the design of the technology would have helped managers to design an EPR system which would meet their needs and facilitate the performance of their everyday work practices.

In the outpatient departments, receptionists and health professionals were not involved in the design of the EPR system. As a result, their recommendations of how the technology should be used to improve the efficiency and the productivity of each department were not considered and the designers' understanding of users' reactions to the technology implementation was limited. It was not surprising then that a limited technology use was enacted in these departments regarding the recording of medical data. People are knowledgeable agents who use the technology in a mindful way to achieve specific outcomes. Failure to meet the needs of end users and facilitate their daily activities leads them to either abandon the technology and preserve their existing work practices or work around and change it to meet their needs. In order to ensure active participation and cooperation of staff in the implementation process, managers should engage users in the design process. This will help them to have a clear understanding of users' needs as well as a detailed analysis of their workflow. In this way, they will be able to design artefacts that match users' expectations and work practices and eventually increase the possibilities for successful technology adoption.

In addition, this study informs managers about the need for engaging powerful individuals in the implementation and adoption of a particular technology. The findings show that, in the diagnostic departments, part-time consultants who collaborate with the Hospital had a great influence in the decision to modify aspects of the EPR system and improve the productivity and efficiency of their departments. The engagement of doctors in the change process led to more effective use of the technology and successful adoption of the EPR system in their departments. The work

practices of staff were improved, receptionists were happy with using the technology in their daily activities and the uptake of the system led to the provision of a better and faster service to patients. It seems therefore that engaging powerful agents in the implementation and adoption process helps to identify inefficiencies, intervene and improve ineffective work practices surrounding the use of the technology and eventually increase the productivity of the organization.

The findings of the study inform managers and designers about the need for engaging direct and indirect users throughout the "*innovation journey*" (Van de Ven et al., 1999). Managers should pay attention to the following recommendations in order to ensure a successful implementation and use of a particular information system in their organization:

a) Involve direct and indirect users in the design of the technology.

b) Make sure that the technology facilitates the needs and everyday work practices of direct and indirect users.

c) Engage powerful individuals in the implementation and adoption process and use them to identify inefficiencies, reinvent the technology and increase the productivity and efficiency of the organization.

11.2.3 Adopting a strong leadership style can support a particular technology use

A key finding of the study was that in contexts, where the design of the technology is flexible and different individuals can use their own ways of practice to perform their tasks, a strong leadership is required to ensure that the system is used in the designed way. Strong leadership in the context of this study is defined as setting acceptable practice, clarifying the objectives of the organization, providing staff with strict and clear guidelines, monitoring performance, providing ongoing support and enforcing a particular use of the technology when users depart from the designed ways and introduce variations in the use of the artefact and the surrounding routines.

The aforementioned leadership characteristics can be mainly found in authoritarian and transformational leadership approaches. The authoritarian leadership style focuses on power, need for authority and obedience of decisions (Furnham, 2005, Gopee and Galloway, 2009), while transformational leaders raise the awareness of their team about intended outcomes and focus on merging the goals and interests of the organization and their followers into a common goal (Bass, 2006, Furnham, 2005).

They are considered to be catalysts for creating innovative ways of working and competent in breaking professional boundaries to develop a multidisciplinary approach to the provision of patient care (Murphy, 2005).

In the outpatient departments, consultants who collaborate with the Hospital used their own ways of clinical practice, introducing thus variations in the performance of particular routines (e.g. diagnosis provision, medical data recording) surrounding the use of the EPR system. However, no attempt was made by the managers to inform the users of the EPR about the acceptable practice for the recording of medical information and enforce a particular use of the system. They neither provided staff with specific guidelines nor evaluated their performance (feedback) and let them use their own ways for the performance of their tasks. As a result, different technologies-in-practice were enacted and the EPR system was not used in the anticipated by the designers and managers way.

On the other hand, in other departments (e.g. Breast Centre) managers informed staff about the acceptable ways of practice and provided them with clear instructions regarding the use of the system. This resulted in staff having a good understanding of how the technology should be used and using it in a way that agreed with the designers and managers' expectations. The adoption of a strong leadership style in contexts where diversity in practice is evident is very important to successfully adopt a particular technology (Aderibigbe et al., 2007, Doolan et al., 2003). Managers should consider the following in order to avoid variations in the use of an information technology:

a) Clarify the goals of the organization and provide users with strict and clear guidelines about the acceptable ways of technology use.

b) Constantly monitor how the technology is being used, identify variations and enforce a use of the system that fits with the objectives of the organization.

c) Provide ongoing feedback on users' performance.

11.2.4 Employ effective training practices and constantly support staff

The findings show that when the users of the EPR system were decently trained, the use of the technology produced social practices that agreed with the intentions of the designers and the objectives of the organization. Adequate training helped users to become more knowledgeable regarding the use of the technology and enact work

practices that supported their work and improved the productivity of their department. In the diagnostic departments, users were happy with the training provided by the Singular Logic team. They had a clear understanding of the objectives of the organization and their role regarding the use of the EPR system and used the system in the designed way to check administrative data, record and store medical information and report the results of diagnostic tests to patients and doctors.

In the outpatient departments, however, the training provided was quite poor and users had a limited knowledge of the EPR functions and the expectations of the organization. As a result, they did not use the EPR system in the way that was anticipated by the designers and managers and enacted a limited use technology-in-practice with regards to the documentation of health information. In common with previous research (Greenhalgh et al., 2008, Orlikowski et al., 1995, Sanchez et al., 2005, Scott et al., 2007), the findings of this study show that organizations should provide adequate training to familiarize users with the technology at hand and constantly support staff who seem to have a limited understanding of the system and their responsibilities regarding its use for the performance of particular work processes. In order to ensure a successful adoption of a particular technology, managers should consider the following training issues:

a) Provide adequate training to the users of the technology and make sure that they have sufficient knowledge of its functions and the routines that is designed to support.

b) Communicate the management's objectives and the intended outcomes from the use of the technology.

c) Identify knowledge gaps and support staff who face difficulties in the use of the technology.

11.3 Implications for theory

The model of technology-in-practice carries particular technological, institutional and cultural limitations. That is, Orlikowski (2000) studied the implementation and adoption of a flexible artefact (Notes technology) designed to support - but not replace - the existing ways of communication among different users from the same professional background. That is, there was no diversity of agency; consultants were

interacting with consultants, technologists with technologists and so on. In addition, she explored the uptake of the Notes technology in software development and consulting companies where individuals were working independently and their decision to use the technology would influence their productivity, but it would not affect the productivity of the organization and would not disrupt the workflows within these contexts. Finally, the underlying philosophy of decentralized control which was embedded in the technology by the designers of the system in conformance with the software development company's culture provided users with independence over their work and encouraged them to experiment with the technology and build new applications within it.

This study, however, explored the uptake of technology in a health care organization, which is a more complex context compared to the software and consulting firms, where different individuals from diverse professional backgrounds work together to perform particular activities with the aim of providing the best possible care to their patients. The EPR system was implemented in the inpatient facilities of the Hospital in order to coordinate and improve patient-related activities, such as the ordering of drugs, medical supplies and diagnostic tests, as well as facilitate the financial and administrative processes of the Hospital. In contrast to the case of Notes technology, the EPR was implemented to replace and not just support specific processes. Systems from different departments were interconnected in order to coordinate multiple processes, individual actions were interdependent and designers embedded into the system mechanisms for centralized control which were reflected in the rigidity of the technology which did not allow users to introduce variations in the performance of the routines which were performed through the EPR system. A different use of the EPR would have a negative impact on the indirect users of the system (i.e. patients) as well as the productivity and the operation of the organization.

The results of this study suggest that the degree of freedom available to users to ignore specific properties of the artefact or modify aspects of the technology and preserve, reinforce or change their work practices varies across different contexts according to particular technological, organizational and interpretive conditions. In this way, this study expands researchers' understanding regarding the implementation and use of information systems in complex organizations. It helps researchers better understand how and why in some contexts (e.g. outpatient departments) users

introduce variations and enact different technologies-in-practice that do not agree with the expectations of designers, while in other contexts (e.g. inpatient departments) agents use the technology in the designed ways.

With regards to the technological conditions influencing the uptake of technology, the findings of this study indicate that the integration of multiple systems in complex networks, which require interconnection of organizational routines and interdependence of individual actions, limits the freedom available to users to enact technologies-in-practice which differ from the designers' intentions. It is important to understand that the involvement of agents from different departments in the performance of interdependent, complicated and interconnected work activities reduces the possibility for introducing variations in the use of the technology and the organizational routines surrounding its use. In such contexts, researchers should focus on the workflows dictated by the technology since the freedom available to users to introduce variations is limited.

In contrast, in contexts where the design of the technology is flexible and reflects the organization's philosophy for independence over the users' work, researchers should pay attention to the way in which human agents interact with the technology at hand and abandon, work around or change aspects of the artefact to enact structures in practice. In such contexts, the findings of this study agree with Orlikowski's (2000) position that structures emerge in practice as people recursively interact with the functions of the technology and drawing on the cultural properties of the artefact as well as specific interpretive conditions produce social practices that preserve, reinforce or change their existing ways of doing things. The results of this study from the outpatient departments help researchers better understand how and why different individuals use the same technology in different ways and introduce variations in the work practices surrounding its use. The analytical distinction between technology as an artefact and technology-in-practice explains the process of enactment of routines as well as the role of human agents in this process.

The technological conditions discussed above suggest that researchers who are interested in studying the uptake of information systems in complex organizations should first capture and analyse the work processes surrounding the use of a particular technology in order to identify the degree of interdependence and interconnection of organizational routines and individual actions. The theory of organizational routines

(Feldman and Pentland, 2003) provides a powerful tool for analyzing the work processes existing in a particular setting and distinguishing between the standard operating procedures described in protocols, the ostensive routines described by the participants of a study and the performative routines carried out by a specific group of people in a particular context. In the Dermatology Department, for instance, the standard operating procedure for the recording of medical information described by the EPR Manager significantly differed from the actual routine existing in the department.

Moreover, this study extends Orlikowski's (2000) model by emphasizing the role of organizational factors in the implementation and adoption of a particular technology and the transformation of the work practices surrounding its use. The findings of the study indicate that the leadership style is an important indicator of how a technology is used. Clarifying organizational objectives and placing them first, providing users with strict and clear guidelines, monitoring their performance and ensuring that the use of the technology is aligned with the organizational goals were the main leadership characteristics identified in this study with regards to the adoption of the EPR system, which have been considered by many researchers (Aderibigbe et al., 2007, Doolan et al., 2003, Furnham, 2005, Gopee and Galloway 2009, Green, 1998, Gustafson et al., 2003, Sanchez et al., 2005) to be important factors for the management of technological innovations and change in organizations.

Furthermore, this study calls researchers to explore the interpretive conditions associated with the adoption of technology. Previous research has highlighted the importance of training in the adoption of technology (Aderibigbe et al., 2007, Greenhalgh et al., 2008, Orlikowski, 2000, Sanchez, 2005, Scott et al., 2007). In particular, the findings of the study indicate that providing users with adequate technical and procedural training is important in order to help them understand the functions of the technology and the work practices surrounding its use. For example, the limited training provided to the receptionists in the outpatient departments resulted in having limited knowledge of the EPR functions and the work processes that were designed to be performed through the use of the technology. Thus, researchers should focus on the methods applied to familiarize users with a particular technology and explore whether or not users have a good understanding of the technology and the routines that are carried out through its use.

This study also informs researchers about the role of opinion leaders in the decision to adopt and change a technology. Consultants and clinicians, drawing on the power that comes from their role in the increase of the Hospital's revenue as well as their high professional and socio-economic status compared to the status of their colleagues (e.g. nurses, receptionists), played a key role in the decision to implement, use or modify aspects of the technology. Opinion leaders in the context of this study are perceived as those having particular influence - whether positive or negative - on the beliefs and actions of their colleagues, which is in line with Locock et al. (2001) definition of opinion leaders in the study of their role in clinical effectiveness. In contrast to other studies (Orlikowski et al., 1995), where a deliberate and organizationally sanctioned intervention was made to support the adoption of technology and influence the interactions of users with the technology at hand, the engagement of clinicians and consultants in the adoption and change process was emergent and unplanned. The findings of this study indicate that the fortunes of a particular technology depend on the ongoing influence that particular individuals have on the beliefs and decisions of their colleagues. In the context of this study, the power at the disposal of clinicians and consultants allowed them to influence the management's decision to implement or change aspects of the EPR as well as the users' decision to adopt the technology.

The influence that doctors had on the management's decision to implement or change the technology was direct and intended, while their influence on the users' decision to adopt the technology was indirect, unintended and influenced by their perceptions and beliefs about the value of the technology in their everyday activities. Clinicians and consultants are shaped by particular professional norms that allow them to have a high degree of autonomy over their work (Scott et al., 2007). Previous research has shown that if they perceive that a particular technology does not fit with their needs, work practices or professional values, they do not embrace it and preserve their existing ways of working (Aderibigbe et al., 2007, Bar-Lev and Harrison, 2005, Greenhalgh et al., 2008, Jensen and Aenestad, 2007). In this study, the perceptions of the EPR system by the majority of the dermatologists as not useful in their everyday activities and their decision to preserve their existing work practices led to a limited use of the system by the receptionist of the department. The latter shows that researchers who look at the adoption of technology in organizations should explore the interpretations

that powerful users (direct or indirect) have and how these understandings influence the use of the technology by their colleagues in particular settings.

11.4 Contribution of the thesis

This study adds knowledge to the information systems as technology-in-practice research tradition by exploring the relationship between organizational routines, structures, the EPR system and the users of the technology, as well as how this changes over time. The model of technology-in-practice carries particular limitations which were thoroughly discussed in the previous section along with the theoretical implications of the study in relation to Orlikowski's (2000) work. The theoretical contributions of the thesis have a greater significance than the practical implications of the study due to the methodological and contextual limitations of this research (see section 11.5).

This study intended to overcome the technological, institutional and cultural limitations of Orlikowski's (2000) model of technology-in-practice and provide new insights into the relationship between structure, agency and technology by exploring the uptake of a rigid and integrated technology, in a complex organization and in a different cultural context. In this way, it informs readers about how people structure the use of technology in diverse technological, institutional and cultural circumstances and in particular about the technological, organizational and interpretive conditions influencing their interpretations and resulting actions. Its major difference - and therefore contribution - with Orlikowski's (2000) work is that it shows that when the design of a technology is rigid and involves interconnection of work processes and individual actions, the freedom available to users to introduce variations decreases and the resulting technologies-in-practice are likely to agree with the designers' intentions since users have to follow the workflows dictated by the technology.

In addition, this was the first study that explored the implementation and use of an EPR system in Greece, since research has mainly focused on the design of such systems, and provides useful insights into how EPR systems are implemented and adopted in this country. The findings of this study may be used to inform future EPR projects in Greece. The Greek Government has announced plans for implementing EPR systems in the NHS hospitals and this study provides information on how such technologies have been adopted in the private sector.

11.5 Limitations of the study

This study carries particular methodological limitations. The first limitation refers to fact that the researcher had to rely on historical data in order to explore how the EPR system was designed to be used within the Hospital. The first stage of this study was conducted in 2008, seven years after the implementation of the EPR in the inpatient departments. As a result, the researcher did not have experience of the implementation stage, which would have helped him better understand the objectives of the Hospital, experience the training practices applied to make users familiar with the system and identify potential problems related to the implementation and use of the EPR system by different individuals in different departments. As a result, this study relied on the memory of the participants, which in some cases was limited due to the lack of experience with using the EPR system. Sampling limitations were more evident during the first stage of the study due to the policy of the management of the Hospital to provide the researcher with access to speak to particular individuals. However, the sampling problems were overcome in the second stage of the study and the researcher had the opportunity to speak to individuals who had experience of the pre-implementation era.

The problem with calling on historical data is that people may either deliberately or not omit information which may be very important in the identification of factors associated with the design, implementation and use of the technology in different stages. This problem was further increased by the refusal of Singular Logic (the IT company which implemented the EPR system) to provide the researcher with documents (protocols) which describe the objectives of the management and the organizational routines which were designed to be performed through the EPR system by different actors across different departments of the Hospital. Such documents would have facilitated a deeper understanding of the organizational processes and structures surrounding the use of the EPR system in the Mitera Hospital and would have increased the validity of the study by supporting and verifying the interview data. Due to the lack of protocols the researcher's conclusions were based upon the information provided by the respondents during the interviews.

In addition, the lack of access to speak to particular individuals from the management team due to their heavy workload, such as the General Manager and the Director of

the outpatient departments, did not allow a deeper exploration of the phenomenon. These individuals would have informed the research about the organizational goals and guidelines regarding the use of the EPR in the outpatient departments where the researcher identified significant variations in the use of the technology. The majority of the interview data came from the users of the EPR system who revealed their story about the instructions of the management team regarding the use of the system. Although the contribution of the EPR Manager was very important to understand the objectives of the Hospital and the responsibilities of users, the opinion of the aforementioned individuals would have been very useful in order to verify the interview data.

Furthermore, the EPR system had not been implemented in all the departments of the Hospital. The majority of the outpatient departments were not using an EPR system, which did not allow a deeper exploration of its adoption. Moreover, the management of the Hospital did not provide the researcher with access to explore the uptake of the EPR system in particular departments, such as the Microbiology Department. Access to the Microbiology Department was not granted because the researcher was told that it is a very busy department and there was no time to speak to the staff as well as space to observe how they interact with the EPR system and perform their tasks. Access to the department would have revealed how users interact with the technology and enter blood test results into the EPR system and would have facilitated a better analysis of the online test results reporting process.

Another methodological limitation of the study arises from the fact that single cases offer poor basis for generalisation (Yin, 1994). Single case study research is concerned with the study of one case and on the basis of the analysis of the findings arrives at specific conclusions. Hence, the scope of the current study for empirically generalising its results is limited. In addition, the philosophical approach of the study also limits the generalisation of its findings. The interpretive paradigm reduces the ability of researchers to generalise their results to other settings since there is no single truth or one way of seeing things (Crotty, 1998). In interpretive studies generalisation is not sought and the goal of the researcher is to understand the deeper structure of the phenomenon under study, which might then be used to inform other settings (Orlikowski and Baroudi, 1991). According to Hammersley (1992), the knowledge generated from interpretive studies can be transferred to other settings as

an important indicator of the phenomenon under study. Therefore, the applicability of the findings of this study has to be tested by managers in their own contexts.

Single cases have contextual specificities that have to be taken into account when considering their theoretical and practical inferences. This does not mean that single cases do not produce valid knowledge; and the quality of the present study has been thoroughly discussed in chapter seven. In contrast, some of these limitations can be seen as opportunities for future research (see next section). Organizational research on the implementation, adoption and sustainability - routinisation or "normalisation" - of technological innovations has been consistently found that an organization's structural complexity measured as functional differentiation, specialisation and professionalism, has a positive impact on organizational innovativeness (Greenhalgh et al., 2005).

The findings of this research are shaped by the structural complexity of Mitera and may be used by health organizations operating under the same characteristics. The Hospital is divided into different departments, which in most cases are characterized by high work interdependence (e.g. inpatient departments, diagnostic departments, Pharmacy, Admission Department, Accounts Department) and other departments that work independently (e.g. Dermatology and Laser Department). In addition, although it specialises in maternity care, it also offers a wide range of services across a large number of specialties, which inevitably increases the expertise of the health care professionals working at the Hospital. The researcher cannot assume that the structural complexity of Mitera has not influenced the uptake of the EPR system and thereby the outcome of the study. For example, the findings show that the enactment of different technologies-in-practice was influenced by the interdependence or not of work practices across different departments. This means that other researchers exploring the uptake of technology in contexts with different structural characteristics may come up with different interpretations. Future research is recommended to confirm or challenge the findings of this study (see section 11.5).

In addition, the cultural properties of the EPR system which is used in the Mitera Hospital are context-specific and reflect the organizational norms about legitimate and appropriate behaviour. The researcher cannot assume that similar technologies will be adopted in an analogous way by different actors in other hospitals where the organizational culture and the underlying philosophy regarding the use of the system are different. For instance, the cultural properties of the EPR system in the inpatient

departments did not allow users to experiment with the technology and introduce variations in the use of the artefact and the routines designed to support. In contrast, in the software development firm studied by Orlikowski (2000), the organizational culture encouraged users to experiment with the Notes technology and build new applications within it. As a result, users ignored some properties of the system and invented new ways to perform their work, enacting technologies-in-practice which ranged from inertia to change.

Finally, the results of this study cannot be easily applied in other countries since each country has its own cultural specificities in terms of rules and regulations and health care may be organised in different ways. For example, respondents said that they were obliged to keep paper-based records for their patients who were hospitalised in the wards for legal reasons. In other countries, the legislation may be different and hospitals may opt to keep only electronic records for their patients and use a wide range of EPR functions, offering in this way the opportunity to future researchers for deeper exploration of the prevailing role of agency or technology in the enactment of routines in complex social contexts. All the above limitations inevitably influence the generalisability of the results of the study. However, the scope of this research was to examine how things work in the particular hospital and the researcher sought theoretical generalisation by applying the findings of the study to a broader theory - Orlikowski's (2000) technology-in-practice model - using methods adopted by other researchers within this field and grounding his findings in the literature to show that other researchers have come up with similar findings and give theoretical significance to his interpretations.

11.6 Recommendations for further research

This study sought to explore the role of human agents in implementing and using new technologies in health care organizations. However, as previously mentioned, the scope of the study for generalisation of its findings is limited. One of the most important findings of the study was that in the inpatient facilities of the Hospital the design of the EPR system was rigid limiting thus users' freedom for alternative uses. The designers of the EPR embedded into the system specific functions that increased control and limited users' actions by facilitating the performance of particular routines and hindering other more complicated work practices, such as the recording of health

information. As a result, receptionists and nurses used the system as it was designed, since they could not do otherwise. The EPR did not offer the opportunity to improvise or work around and introduce variations in the use of the technology and the routines surrounding its use. It had limited functions and was mainly implemented to improve the financial, procurement and administrative processes of the Hospital.

The latter limited the scope of the study to the exploration of the use of an inflexible technology. Further research may examine the uptake of an EPR that facilitates the recording of medical data by different health professionals in the inpatient facilities of a hospital. The involvement of diverse groups of individuals (receptionists, nurses and clinicians) in the recording of health information may increase the variability in the use of the EPR system and the work practices surrounding its use. This inference emerges from the findings in the outpatient departments where the participation of diverse users in the recording of patient data resulted in people either ignoring particular properties of the EPR system in order to preserve their ways of doing things or changing the technology to meet their needs and transform their everyday work practices. However, the design of the EPR system in the outpatient departments was flexible and did not involve interconnection of work processes and interdependency of users' actions. The exploration of the uptake of an EPR technology with high degree of interconnection of work practices and participation of multiple professionals which would support the performance of more complicated work processes (e.g. medical data recording) would inform scholars about the prevailing role of agency or technology in the enactment process in complex organizational contexts.

In addition, future research could explore the implementation and adoption of an EPR system across all the departments of a hospital. This study examined the uptake of the EPR system in specific departments. Although the researcher would like to explore the interaction between the users, the technology and the organizational structures across all the departments of the Mitera Hospital, the fact that the EPR was not implemented in all the outpatient departments, the refusal of the management of the Hospital to provide him with access to investigate the phenomenon under study in particular departments (e.g. Microbiology Department) and the limited time available to collect and analyse his data did not allow him to do so. A deeper exploration of the adoption of the EPR system would have provided a comprehensive picture of the EPR

uptake, which might have then helped to identify additional factors related to the adoption of technology and transformation of organizational routines.

The current research was undertaken in a single private hospital, which is located in the urban centre of Athens and is considered to be highly innovative with regards to the implementation and use of new technologies. As a result, the generalisation of its findings to other contexts is limited. Future research may explore the implementation and adoption of new information systems and the role of human agents in this process in multiple organizations, from the private and the public sector, across different regions in Greece (or any other country), which provide a wide (e.g. acute hospitals) or limited (e.g. mental hospitals) range of services to their patients. In this way, researchers will be able to compare the results from various settings which operate under different principles and explore the organizational factors that were identified in this study to be related to the use of the technology (e.g. leadership, training, power of health professionals), increasing thus the generalisability of their findings.

In addition, the main limitation of the study was the lack of access to protocols and the use of historical data in order to examine how the EPR system was designed to be used and how different members of staff were advised to interact with the technology in different departments. The use of historical data was unavoidable due to the limited time available to the researcher to explore the uptake of technology. Future studies should employ a longitudinal method for data collection in order to investigate and shed light to the most crucial factors related to the different stages of the innovation-adoption process. It is recommended that future researchers should ideally collect their data over four periods:

1. At the period when the idea for the implementation of a new technology is generated in order to capture the initial perceptions and feelings of the potential users regarding the innovation, the involvement or not of end users in the design of the system, the objectives of the management and the work practices that are designed to be performed through the system (as described in protocols).
2. At the period when the organization communicates the introduction of the technology by applying training practices or any other methods to familiarize users with the new system in order to examine the extent to which users feel ready to use the new technology and have a good understanding of its functions.

3. At the early implementation stage in order to investigate how different users interact with the technology, the changes in the way that services are delivered and individuals perform their tasks, as well as the role of particular individuals in possible variations in the use of the system and the routines surrounding its use.
4. At the late implementation stage in order to explore how things have changed since the implementation of the technology, whether the system is used or has been abandoned by its users and why there are variations (if there are any) in the use of the technology across different departments of the organization.

11.7 General research conclusions

The findings of this research support Orlikowski's (2000) subjective viewpoint in contexts where individual actions and organizational routines are independent, variations in the use of the technology do not have an impact on other work processes and the design of technology is flexible and encourages improvisation. In these contexts researchers and managers should expect the enactment of different technologies-in-practice, which range from inertia to change. Users interact with the properties inscribed by the designers of the artefact and decide either to ignore some functions of the technology or change the technology to facilitate their needs and their daily work activities. In this way "*users shape the technology structure that shapes their use*" (Orlikowski, 2000, p.407).

However, this study poses questions regarding the applicability of her theory in complex organizations where the technology is rigid, with specific functions and is integrated in networks which are characterized by a high degree of interdependency of agents' actions and interconnection of organizational processes. The results of the study indicate that in such contexts users cannot use the technology in different ways since they have to follow the work flows dictated by the artefact. They can request to change aspects of the technology to facilitate the performance of particular activities (e.g. online blood test results reporting), but they cannot abandon the technology and use different ways to perform their tasks. However, the EPR system in the inpatient departments was very rigid with limited functions and further research is needed to explore the uptake of an EPR technology with functions that support more complicated processes, such as the recording of medical data, in order to obtain a

better understanding of the role of technology in the enactment process in complex social contexts.

This study emphasizes the need for involving direct and indirect users in the design and implementation process. Technological innovations are not introduced in a vacuum. They influence the daily work activities of different groups of individuals whose actions are shaped by different professional norms. Many studies have shown that, when an EPR system is not compatible with users' needs and professional values and does not facilitate their everyday activities, users do not embrace the technology and make it part of their everyday work practices, which in turn leads to a limited or no use of the technology at hand (Bar-Lev and Harrison, 2005, Budgen, 2008, Jensen and Aanestad, 2007). Users have to actively participate in the design and implementation of new information systems to inform designers about the routines that will be affected by the implementation of new technology and make sure that the design of the technology matches with their work processes and needs.

This research also stresses the importance of engaging opinion leaders in the implementation and adoption of a particular technology. In particular, in health care organizations, clinicians and consultants are powerful individuals who are highly respected by both their patients and their colleagues. The findings show that they can influence their colleagues' perceptions of the technology, support its adoption, identify potentials for improvement and eventually change aspects of the technology. Drawing on the diffusion of innovations theory, Greenhalgh et al. (2008) found that opinion leaders exert positive influence on users' attitudes towards the adoption of an EPR system. In this study, the involvement of clinicians and consultants in the implementation and adoption of the EPR system led to successful use and reinvention of the technology, as well as productivity and efficiency improvements. However, in some departments, consultants were not engaged in the change process and did not support the use of the technology. Their perception of the EPR system as not useful in the provision of a better clinical outcome and their decision to introduce variations in the routines surrounding the use of the system (e.g. diagnosis provision) had a negative influence on the receptionists' attitude towards the EPR system. It was not surprising therefore that the EPR was not fully adopted in these departments.

In addition, this research informs managers and designers about the importance of designing artefacts that reflect the organizational objectives. Organizations should

help designers to have a clear understanding of what the organization intends to achieve through the implementation and use of the technology and designers should craft rigid artefacts that reflect the goals of the organization. Moreover, the objectives of the management have to be communicated effectively across the organization. That is, managers have to employ effective training methods to help users better understand their role regarding the use of the technology. Other studies have also emphasized the importance of training in the successful adoption of EPR systems (Aderibigde et al., 2007, Baron et al., 2005). The findings suggest that when the organizational goals are reflected in the design of the system and users feel that the training provided was adequate to make them familiar with the use of the technology and the routines surrounding its use the resulting technologies-in-practice are likely to meet the objectives of the organization.

In common with previous research in the change management tradition, this study informs managers about the importance of adopting a strong leadership style in contexts where diversity in practice is evident. When the design of the technology is flexible and different individuals from different professional backgrounds can use their own ways of practice to perform their tasks, a strong leadership is required to set acceptable practice and enforce a particular use of the technology. The absence of a strong leadership has been identified by many researchers as a barrier to the successful implementation (Scott et al., 2007) and adoption of EPR systems in health care organizations (Aderibigde et al., 2007, Doolan et al., 2003). The findings help managers to understand that when they provide users with clear and strict instructions regarding the use of the technology and monitor their performance, users follow their guidelines and use the artefact in the anticipated ways.

Appendix 1: Interview schedule (exploratory study)

The Electronic Patient Record (EPR) as Technology-in-Practice: The "Mitera" General, Maternity and Children's Hospital case

Interview Schedule: open-ended questions interview

Expected duration 60-90 minutes

Please note: this is a semi-structured, open-ended questions interview. Inherent to this type of research is that the interview schedule is flexible, allowing new questions to be brought up during the interview as a result of what the interviewee says.

1. System of practice in the pre-EPR period

a) Role description in the pre-EPR era

- ✓ Please describe your role regarding the patient records system before the introduction of the EPR system.
- ✓ Please describe your daily activity (-ies) regarding the documentation of health information and records.
- ✓ What was your role in respect to working with other people involved in the patient records collection and storage?

b) Description of the work practices surrounding the paper-based patient records system

- ✓ Could you describe to me the method for patient records documentation before the implementation of EPR?
- ✓ How many stages did the old system have? Please describe to me each stage in detail.
- ✓ How many people/departments were involved in the past for the documentation of patient records?

c) Views before the implementation of EPR system

- ✓ What is your opinion of the old paper-based system?
- ✓ Please describe to me the advantages and disadvantages of the old method.
- ✓ What in your opinion was (were) the reason(s) for moving to the EPR system?

2. Impact of EPR implementation

a) Views during and after the implementation of EPR

- ✓ What did you think about the EPR system as it was being implemented?

✓ Please describe to me the advantages and disadvantages of the new method.

✓ What are the differences between the new and the old system? Which one do you think that it is more efficient?

b) The impact of change from paper-based to EPR system on the roles within the hospital

✓ Could you describe to me your role regarding the patient records system after the introduction of EPR?

✓ Please describe your everyday activity (-ies) after the implementation of EPR.

✓ What was your role in respect to working with other people involved in the patient records collection and storage? Has it changed?

c) Changes in work practices after the implementation of EPR

✓ Could you describe the method for data entry of patient records after the implementation of EPR?

✓ How many stages does the new system have? Please describe to me each stage in detail.

✓ How many people/departments are now involved in the collection and storage of health records?

✓ Have you noticed any significant changes in the way in which the daily work for patient records collection and storage is performed? What are they?

3. Users' interpretation of the EPR implementation

a) Interpretation of the new system

✓ Why do you think that the EPR system was introduced?

✓ What impact has the EPR had on i) you ii) your colleagues iii) the patients?

✓ Please describe to me the "tools" (functions) of the system that you have used more and why?

b) Description of some elements/functions of the EPR (if any) that could be improved

✓ Please describe to me any elements that could be improved. Justify your opinion.

✓ How many "tools" (functions) have not you used yet and why?

Appendix 2: Interview schedule (main study)

The Electronic Patient Record (EPR) as Technology-in-Practice: The "Mitera" General, Maternity and Children's Hospital case

Interview Schedule: open-ended questions interview

Expected duration 60-90 minutes

Please note: this is a semi-structured, open-ended questions interview. Inherent to this type of research is that the interview schedule is flexible, allowing new questions to be brought up during the interview as a result of what the interviewee says.

1. Technology as an artefact and technology-in-use

a) The EPR system as an artefact

✓ Please describe to me the functions of the EPR system in a) inpatient departments and b) outpatient departments.

✓ How was the EPR system designed to be used in the inpatient facilities of the hospital? Did the hospital provide any training? If yes, how were you advised to use the system? Otherwise, how did you become familiar with the system?

✓ What were the instructions of the training team regarding the role of a) receptionists, b) nurses and c) clinicians with regards to the information documentation routine in the inpatient departments?

✓ How was the EPR system designed to be used in the outpatient departments and diagnostic labs? Did the hospital provide any training? If yes, how were you advised to use the system? Otherwise, how did you become familiar with the system?

✓ What were the instructions of the training team regarding the role of a) receptionists, b) nurses and c) physicians with regards to the information documentation routine in the outpatient departments?

b) The EPR system as technology-in-practice

✓ Please describe to me how the EPR system is used in the inpatient departments. What are the daily activities and the role of each member of the department with regards to the use of the EPR system?

✓ Have you noticed any changes in the use of the system in the inpatient departments since the early implementation stage? What are they? Who were the individuals involved in the decision to change the way in which the EPR was used? Why?

✓ Please describe to me how the EPR system is used in the outpatient departments. What are the daily activities and the role of each member of the department with regards to the use of the EPR system?

✓ Have you noticed any changes in the use of the system in the outpatient departments since the early implementation stage? What are they? Who were the individuals involved in the decision to change the way in which the EPR was used? Why?

2. The impact of the enactment of the information documentation routine on other organizational routines

a) Information documentation routine as technology-in-practice

✓ Please describe how patient information is documented in your department using the EPR system.

✓ What are the differences in the way in which health information is recorded between the electronic method and the old method which was used for the documentation of health information and records?

✓ Please describe to me your role regarding the documentation of health information and records. Has it changed?

b) The impact of the enactment of technology-in-practice on other organizational routines

✓ How does storing patient information link with other activities / work practices that take place within the hospital?

✓ What changes did the enactment of the documentation of health records routine induce in other organizational routines? Please describe thoroughly.

✓ Have you noticed any changes in the way that other organizational routines are performed since the early implementation stage? What are they? Why do you think that this happened and who were the individuals involved in the decision to change the way in which these routines were performed?

3. Variability in the use of the EPR system

a) Description of the standard operating procedure that exists in each department

✓ Please describe the main aspects of the written guidelines for use of the EPR system in your department.

✓ Please describe to me how other people use the EPR system in your department.

b) Inter-departmental variations

✓ Have you noticed any variations in the use of the system? What are they? Who are the individuals who use the system in a different way?

✓ Why do you think that different individuals make use of the system in different ways?

c) Variability across different departments

✓ How is the EPR system used across different departments in the hospital? Have you noticed any differences with regards to the use of the EPR system?

✓ Why do you think that in some outpatient departments health information, such as a patient's diagnosis and history, is stored electronically while in the inpatient departments the same information is recorded manually using the paper-based system?

✓ Why do you think that the use of the EPR system varies across different outpatient departments and diagnostic labs?

Appendix 3: List of participants (exploratory study)

Occupation	Age	Gender	Role and reasons for participation
EPR Manager / IT Security Officer of Singular Logic (EPR design, implementation and maintenance company)	37	Male	Monitoring the use of the EPR (access control and database entry), working for Singular Logic and thus knowing a great deal about how the EPR is designed to be used as well as its main technical characteristics
Midwife (Maternity Clinic)	33	Female	Participating in the work practices surrounding the paper-based system and periodically interacting with the EPR system in terms of charging patients and ordering services as well as accessing blood test results. Invited to provide information regarding the use of the EPR system in her department and her role with regards to the use of the EPR
Receptionist (Maternity Clinic)	31	Female	Responsible for charging patients and ordering services, accessing diagnostic test results and managing admission, transfer and discharges records. Selected to inform the study about the use of the EPR in the inpatient facilities and the role of receptionists with regards to the use of the EPR
Receptionist (Dermatology and Laser Department)	27	Female	Using the EPR system to manage outpatient appointments. Recording patient information manually and storing it in paper-based records. Invited to describe how the EPR is used in the outpatient departments
Doctor (Dermatology and Laser Department)	31	Female	Systematically using the EPR to record her patients' medical data. Critical case

			identified by the researcher while visiting the department to inform the participants about the research process (she introduces variation in the use of the EPR and the routines surrounding its use in the department)
Receptionist (Breast Centre / Mammography Department)	35	Female	Managing outpatient appointments, recording and updating patient information and reporting test results to both patients and doctors. Selected to provide information regarding the EPR and the routines surrounding its use in the diagnostic departments

Appendix 4: List of participants (main study)

Occupation	Age	Gender	Role and reasons for participation
EPR Manager / IT Security Officer of Singular Logic (EPR design, implementation and maintenance company)	37	Male	Monitoring the use of the EPR (access control and database entry), working for Singular Logic and thus knowing a great deal about how the EPR is designed to be used as well as its main technical characteristics
Obstetrician/Gynaecologist	62	Male	Participating in the work practices surrounding the paper-based and the EPR system. Selected to inform the research about the use of the EPR in the inpatient facilities of the hospital and the role of clinicians
Manager of Accounts Department	45	Male	Selected to inform the study about the impact of the implementation of the EPR on the billing and discharge process which is performed by the staff in his department
Receptionist (Maternity Clinic)	33	Female	Responsible for charging patients and ordering drugs, medical supplies and tests, accessing diagnostic test results and managing admission, transfer and discharges records. Selected to inform the study about the use of the EPR in the inpatient facilities and the role of receptionists, midwives and clinicians
Administrator (Cashiers / Admissions Department)	30	Female	Invited to provide insights regarding the use of the EPR for the management of outpatient appointments and the admission of patients in the Paediatric Clinic. Responsible for recording administrative data on the EPR

Receptionist (Cardiology Department)	32	Female	Using the EPR to manage outpatient appointments as well as record and report health data to patients / doctors. Selected to provide information about the use of the EPR in the outpatient departments and the role of staff with regards to the use of the EPR system
Administrator (Admissions Department)	41	Female	Responsible for the admission of patients. She uses the EPR to record administrative data. Selected to describe the process surrounding a patient's admission
Administrator (Medical Supplies Department)	37	Female	Using the EPR system to view each department's needs with regards to medical supplies. Invited to provide information about the impact of the implementation of the EPR on the ordering of medical supplies (supply chain management)
Administrator (Pharmacy Department)	49	Female	Using the EPR system to view each department's needs for drugs. Selected to inform the study about the impact of the EPR implementation on the ordering of drugs (supply chain management)
Receptionist (Dermatology and Laser Department)	27	Female	Using the EPR system to manage outpatient appointments. She records patient data manually and keeps paper-based records. Invited to describe how the EPR is used in her department and the role of each member of staff regarding the use of the EPR system
Receptionist (Histopathology Department)	39	Female	Using the system to record, update and report results from biopsies. Selected to provide information about the use of the EPR in the diagnostic departments

Receptionist (General Ultrasound Department)	60	Female	Responsible for recording on the EPR system the diagnoses provided by the doctors and the results of the ultrasound tests. Invited to provide information about the use of the EPR system in the diagnostic departments and the role of staff with regards to the use of the EPR
Receptionist (General Clinic)	48	Female	Responsible for charging patients and ordering drugs, medical supplies and tests, accessing diagnostic test results and managing admission, transfer and discharges records. Selected to highlight as many aspects regarding the use of the EPR in the General Clinic and identify any variations in the use of the EPR across different inpatient departments
Nurse (General Clinic)	37	Female	Participating in the work practices surrounding the paper-based system and periodically interacting with the EPR system in terms of charging patients and ordering services as well as accessing blood test results. Invited to provide information regarding the use of the EPR system in her department and the role of the nursing staff with regards to the information documentation routine
Doctor (Dermatology and Laser Department)	29	Female	Systematically using the EPR to record her patients' medical data. Critical case identified by the researcher while visiting the department to inform the participants about the research process (along with two other doctors she introduces variation in the use of the EPR and the routines surrounding its use in the department)

Receptionist (Breast Centre / Mammography Department)	36	Female	Managing outpatient appointments, recording and updating patient information and reporting test results to both patients and doctors. Selected to provide information regarding the EPR and the routines surrounding its use in the diagnostic departments and the role of each member of staff with regards to the use of the EPR system

Appendix 5: List of departments

Department	Organizational routines using the EPR
Admissions Department	• Registration / admission of inpatients
Admissions / Cashiers Department (Paediatric Clinic)	• Registration / admission of children • Recording of outpatient appointments
Maternity Clinic	• Recording and ordering of patient services • Management of admission, transfer and discharge records • Blood test results management
General Clinic	• Recording and ordering of patient services • Management of admission, transfer and discharge records • Blood test results management
Accounts Department	• Billing and discharge
Pharmacy Department	• Pharmaceutical supplies management
Medical Supplies Department	• Medical Supplies management
Dermatology & Laser Department	• Outpatient appointments management • Medical information recording *
Cardiology Department	• Outpatient appointments management • Test results recording and reporting **
Breast Centre / Mammography Department	• Outpatient appointments management • Test results recording and reporting
General Ultrasound Department	• Outpatient appointments management • Test results recording and reporting
Histopathology Department	• Outpatient appointments management • Test results recording and reporting

* This is not the rule in the department but the EPR is used in this way by particular people (performative aspect of the routine)

** The EPR is used in this way only in the lab which is located in the department and its staff performs heart ultrasounds for children and adults with cardiac conditions

Appendix 6: Research Design

Research Design	Justification
Research Question	• Recent technological developments in health care and the attractiveness of the EPR technology • Identification of a gap in the literature with regards to the role of human agents in using technologies and changing their work practices in health care contexts • Interest, experience and background of the researcher • Limited knowledge with regards to the use of health information systems in Greece
Interpretive approach	• In line with the research question and objectives • Multiple realities (subjective interpretations of technology) • Context-dependent (understanding of the research context) • Knowledge is generated in and through the interaction between the researcher and the respondents • The focus is on people's meanings and interpretations of the technology and the routines surrounding its use • In line with the IS as technology-in-practice research field
Qualitative Methodology	• In like with the study's philosophical position, theoretical perspective, research question and objectives as well as need for producing subjective, context-dependent data
Inductive Approach	• Interest in understanding how people interpret their world • Gaining a deep understanding of the topic and the context • Theory-building as a result of the data analysis
Case Study Strategy	• Exploratory nature of the study (why and how questions) • Limited control over events • Interest in understanding the context of the study • Need for detailed description of organizational processes • Generalisation is not sought • Flexibility
Purposive Sample	• In line with the case study research approach • Rich-information cases that meet particular criteria • Access and time

Interviews	• Exploratory nature of the research question / objectives • Interpretive epistemological and ontological position • Qualitative interviewing is an essential source of case study evidence
Observation	• Exploratory nature of the study (capturing the performative aspect of routines) • Interpretive epistemological and ontological position • In line with the qualitative approach used by the researcher • The need to increase the validity and reliability of the study by using different methods to verify the findings
Thematic Data Analysis (Framework Approach)	• Rigor method for data analysis • Providing inquirers with flexibility to rework earlier ideas • Feasible method within the time and resource constraints of the study • It enhances reliability by demonstrating links between the themes and the transcripts (sources can be traced and the process can be repeated to check for consistency of results)

Appendix 7: Interview transcript (exploratory study)

UNIVERSITY OF SURREY

The Electronic Patient Record (EPR) as Technology-in-Practice: The "Mitera" General, Maternity and Children's Hospital case

Name / Role: INT 02 / Midwife (Maternity Clinic)

Age / Gender: 33 / female

Working at the Hospital since: 2004

Date: 01/12/08

Interview Schedule: open-ended questions interview

Expected duration 60-90 minutes

Please note: this is a semi-structured, open-ended questions interview. Inherent to this type of research is that the interview schedule is flexible, allowing new questions to be brought up during the interview as a result of what the interviewee says.

1. System of practice in the pre-EPR period

a) Role description in the pre-EPR era

✓ Please describe your role regarding the patient records system before the introduction of the EPR system (because the paper-based system is still operating within the hospital I asked her about her role regarding the paper-based patient records system).

The health records file of a patient is transferred to our ward from the Admissions Department with the patient. This file includes her demographics, case history, diagnostic tests, the doctor's guidelines, her vital readings and an electro-cardiogram. These records are placed into the file by the senior nurse of the Admissions Department. The patient's doctor and the employees working in the diagnostic labs/departments also participate in this process. As soon as I receive the file, I read the guidelines written by the doctor and I record them together with the patient's medication into a nursing book. I also record the medication dosage in a medication card. The nursing book is updated both by the doctor and the senior

nurse. My role involves receiving the patient's file and writing down in the nursing book all the data relevant to my role (medication, allergies and any health problems). Once the patient is discharged from the hospital, I organize the file and store it in the patients' file storage unit of the ward. Every month the ward's receptionist organizes the files and sends them down to the Archive Department.

✓ Please describe your daily activity (-ies) regarding the documentation of health information and records.

As soon as I receive the file, I read the doctor's guidelines and I record them together with the patient's medication into a nursing book. I also record the medication dosage in a medication card. My role involves receiving the patient's file and writing down in the nursing book all the data relevant to my role (medication, allergies and any health problems). Once the patient is discharged from the hospital, I organize the file and store it in the patients' file storage unit of the ward.

✓ What is your role in respect to working with other people involved in the paper-based patient records collection and storage?

My role is clear. I am engaged in providing nursing care and medication. Once I receive the file I write down in the nursing book the medication that should be provided to the patient as well as the treatment that a patient should receive. The patient's doctor writes the guidelines, in the Admissions Department the senior nurse obtains the patient's history and the receptionists write down the demographics and place into the file the diagnostic tests from the labs.

b) Description of the work practices surrounding the paper-based patient records system

✓ Could you describe to me the method for patient records documentation before the implementation of EPR (the paper-based method is still in use)?

Patients first enter the Admissions Department. They give the receptionist their personal details and then the senior nurse of the department ensures that all the required information (demographics, history, diagnostic tests, doctor's guidelines, vital readings and electro-cardiogram) is included in the file. This file is sent to the wards and is constantly updated by the doctor and the senior nurse of the ward.

✓ How many stages does the paper-based system have? Please describe to me each stage in detail.

Patients first enter the Admissions Department and give the receptionist their personal details. Then the senior nurse asks questions about their personal and medical history, she records them and enters them into the file. Once the patient has been operated on, the doctor writes guidelines for the post-surgery treatment. Then the senior nurse of the department ensures that all the required information (demographics, history, diagnostic tests, doctor's guidelines, vital readings and electro-cardiogram) is included in the file. This file is sent to the wards and is constantly updated by the doctor and the senior nurse of the ward.

✓ How many people/departments are involved for the documentation of patient records?

The file is always with the patient wherever they go throughout the hospital. All the health care professionals of the department where the patient is being treated have access to the file. The documentation process starts from the Admissions Department, then moves to the Surgery Department and reaches the Maternity, Paediatric or General wards.

c) Views before the implementation of EPR system

✓ What is your opinion of the paper-based system?

The paper-based system supports my role. I believe that I have everything I need. I can have an overall picture of the patient. There is no reason for me to use the electronic system for seeking information like the doctor's diagnosis and guidelines, as well as the patient's history and vital readings. In my opinion, it would be very complicated and is not helpful for my role.

✓ Please describe to me the advantages and disadvantages of the paper-based method.

A disadvantage of the paper-based system is that I sometimes have to search for the file as well as the records included within it, which might be time-consuming. For instance, I first have to find a patient's file and then look for her history. However, for finding test results I use the electronic system since it helps me to quickly and readily find and print them. The reason I am still using the paper-based system is that it suits my role and I am accustomed to it. In addition, it is easier to use.

✓ What in your opinion was (were) the reason(s) for moving to the EPR system?

The main reason for moving from the paper-based to the electronic system was to charge patients in terms of medicine and medical supplies (dressings, plasters,

gauzes, bandages etc) as well as the faster and better coordination between the wards, the pharmacy and the Accounts Department.

2. Impact of EPR implementation

a) Views during and after the implementation of EPR

✓ What did you think about the EPR system as it was being implemented?

I joint the hospital in 2004. The electronic system had already been implemented. My expectations were to make my job easier. That is, if I needed to charge a patient for a drug or any medical supplies, I could do it easily through the system. This is my role regarding the use of the electronic system (SAP); charging patients for medicine and medical supplies, printing out test results when requested and having access to the patients' demographics.

✓ Please describe to me the advantages and disadvantages of the new method.

The main advantage of the system is the speed which it provides to the user with regards to the day-to-day activities as well as the facilitation of the everyday workflow. For example, I can easily and quickly order medication, medical supplies and tests from the Pharmacy, Medical Supplies Department and Diagnostic Labs respectively. By using the electronic system I do not have to contact the lab or write down on a piece of paper the name of the required test and then send it to the appropriate lab to carry out the requested test. Everything is stored electronically in the patient's record and sent directly to the labs in order to carry out the test. When I have to charge a patient for a drug, I log on the system, I open his record, I insert the code of the drug and the Pharmacy sends me the drug as soon as possible without having to contact them. Furthermore, it is very important that I can have access to a patient's tests, medication and demographics for a three-month period. That is the period that a patient's record is kept on the system. After this period I have to request it from the central archive system. As for the disadvantages, I would not say that there are any drawbacks of the system. In my opinion it is very user-friendly.

✓ What are the differences between the new and the old system? Which one do you think that it is more efficient?

I cannot refer to the differences between the paper-based and the electronic system since they co-exist. The electronic system helps me with ordering drugs and medical supplies as well as requesting tests and printing out previous test results.

The rest of the patient's data are enclosed in the paper-based file which is transferred with the patient and provides information about their history, diagnosis, previous tests etc. The paper-based file is sent in the end of the month to the Archive Department where they scan it and then throw it. We do not have access to these scanned electronic records.

b) The impact of change from paper-based to EPR system on the roles within the hospital

✓ Could you describe to me your role regarding the patient records system after the introduction of EPR?

My role involves using the system during the evening hours when the receptionist of the ward who is responsible for entering the data into the system is not in. My role during these hours includes charging patients for drugs and medical supplies as well as requesting electronically tests from the labs. Needless to say, my job is to provide high quality care to the patients, but unfortunately sometimes I have to get involved in administrative procedures such as entering data into the system.

✓ Please describe your everyday activity (-ies) after the implementation of EPR.

Once a patient is transferred to the ward, the paper-based file is sent to us. This file includes information about the operation that has been carried out, the patient's history, previous tests and the doctor's guidelines. As soon as I receive the file, I have to record the patient's medication into their electronic record. I open the system, log on using a different passport for the system and different for my department / ward, I find the patient's record and I charge both medicine and medical supplies to the patient's electronic record. There are two distinct sub-records for the mother and the child, which is really helpful for charging them. Moreover, I can see their medication history (what they have been charged) and the departments where they have undergone their treatment.

✓ What is your role in respect to working with other people involved in the patient records collection and storage? Has it changed?

Everyone working in the department has to know how to use the system since sometimes the receptionists are not available. Sufficient training has been provided to both receptionists and midwifes / nurses. Doctors do not use the system since they just visit their patients.

c) Changes in work practices after the implementation of EPR

✓ Could you describe the method for data entry of patient records after the implementation of EPR?

When a patient is transferred to the hospital the receptionist in the Admissions Department enters a new admission into the patient's record. If she has already had one, she just enters a new case in her health record. Then it is examined and written who is the doctor who admitted her to the clinic, what tests should be done, what is the care/treatment that should be provided and the patient is then transferred to her room in the specific ward. Her doctor requests the necessary tests to the receptionist of the ward who in turn requests them electronically to the labs / outpatient departments. The receptionist opens the electronic files of the departments/labs that are going to carry out the tests and a barcode is sent with the name of the patient and the test written on it. A health care professional then visits the patient in her room to perform the test (e.g. blood or urine test) or the patient is transferred to the lab (e.g. x-ray) and the results of the test are stored electronically into her health record. In addition, ward's receptionists and nurses / midwifes request medicine and medical supplies and sometimes print out test results. In the end, the patient will be given a discharge, which in turn is entered into her electronic health record.

✓ How many stages does the new system have? Please describe to me each stage in detail.

When a patient is transferred to the hospital the receptionist in the Admissions Department enters a new admission into the patient's record. If she has already had one, she just enters a new case in her health record. Then it is examined and written who is the doctor who admitted her to the clinic, what tests should be done, what is the care/treatment that should be provided and the patient is then transferred to his room in the specific ward. Her doctor requests the necessary tests to the receptionist of the ward who in turn requests them electronically to the labs/departments. The receptionist opens the electronic files of the departments/labs that are going to carry out the tests and a barcode is sent with the name of the patient and the test written on it. A health care professional then visits the patient in her room to perform the test (e.g. blood or urine test) or the patient is transferred to the lab (e.g. x-ray) and the results of the test are stored electronically into her health record. In the end, the patient will be given a discharge, which in turn is entered into her electronic health record.

✓ How many people/departments are now involved in the collection and storage of health records?

The departments that are involved in the collection and storage of health records are the Admissions department, the specific Ward / Clinic (General, Maternity, and Paediatric), the Labs and Diagnostic departments, the Accounts department and the Discharge department. The people who are involved in the collection and storage of health records are respectively receptionists, Ward's receptionists / midwives / nurses, health professionals (medical devices and systems operators), administrators / accountants and administrators / receptionists.

✓ Have you noticed any significant changes in the way in which the daily work for patient records collection and storage is performed? What are they?

Time is a very important factor in our everyday activities. Time is money. The new system has contributed to the facilitation of our daily tasks. Simple and easy use of the system enables me to spend more time with my patients. It is an issue of serving the customer in the best way possible.

3. Interpretation of EPR

a) Interpretation of the new system

✓ Why do you think that the EPR system was introduced?

The main reason for the introduction of the electronic health records system was to save time. The system enables me to have better and faster access to information about the patient. There is less time dealing with administrative issues. I was hired by the company in order to provide high quality care to the patients. My role is not to handle administrative issues. In this way I can spend more time with my patients. The new system supports my role.

✓ What impact has the EPR had on i) you ii) your colleagues iii) the patients?

The new system provides me with better and faster access to information about my patients. I spend less time dealing with administrative issues and hence I can devote more time to my job. In regards with my colleagues in the ward, the electronic system has speed up the pace at which tasks are carried out. For instance, the receptionist does not have to call the Pharmacy to order a drug. Everything is entered into the patient's record electronically and sent directly to the Pharmacy. As for the patients, the new system offers better customer service since they do not get involved in any bureaucratic procedures. In the past they had to

visit their doctor, get a test request, go to the appropriate lab /department, give it to the receptionist and perform the test. Other than that they can have access to their test results. For example, they can visit our ward and ask for their test results. The receptionist or a nurse / midwife can log onto the system, open their record and print out the test results. In the past, the receptionist or nurse / midwife used to go down to the labs, ask for the customer's results, print them out, return the original copy to the lab and give them to the customer / patient.

✓ Please describe to me the "tools" (functions) of the system that you have used more and why?

The characteristics of the system that I have used more are browsing a patient's and her infant's data – in other words their name and their room -, finding their doctor, charging and ordering drugs and medical supplies as well as printing out their test results.

b) Description of some elements/functions of the EPR (if any) that could be improved

✓ Please describe to me any elements that could be improved. Justify your opinion.

I do not think that there are any characteristics of the system that need to be improved. I have access to all the necessary information.

✓ How many "tools" (functions) have not you used yet and why?

I have used all the functions of the system which are relevant to my role and I described before. I do not think that I need to use anything else.

Appendix 8: Observation transcript (exploratory study)

DEPARTMENT: MATERNITY CLINIC

DATE: 09/12/2008

TIME IN: 13:00 pm

TIME OUT: 15:00 pm

13:30-13:45 There are one receptionist and one midwife at the front desk of the department. A patient is transferred to the Maternity Clinic and the midwife takes her paper-based health records file. She opens the file and writes the doctor's guidelines in the nursing plan. She also writes the patient's medication in a medication card. The midwife provides the receptionist of the department with the paper-based file. The receptionist opens the list with the departments, finds the Operating Theatre, accesses the patient list of the Operating Theatre, ticks the box next to the name of the patient, presses "transfer" and her name then appears on the department's patient list. The midwife passes the medication card to the receptionist and tells her to order the drugs for the new patient. The receptionist accesses the department's patient list, finds the name of the patient and opens her record. She then finds the drug and its code by alphabetical order, records the code and the quantity on the patient's list of drugs and presses "ok". The name of the drug and the quantity appear on the patient's medication list.

13:45-14:00 The senior nurse of the department comes to the front desk and tells the receptionist to add a drug to the daily medication of a patient. She takes the medication card and writes the name of the medicine, the quantity and the date. She also writes this information in the nursing plan. She then gives the card to the receptionist of the department and asks her to record the new drug on the patient's electronic record. The receptionist opens the department's patient list, finds the name of the patient and accesses her medication record. She then finds and records the drug and its code, enters the quantity and presses "ok". The senior nurse also asks her to order some blood tests a patient. The receptionist finds on the list the patient's name, opens her record, enters the code of each test and presses "ok".

14:00-14:15 The midwife requests a copy of a patient's blood test results. The receptionist accesses the patient's electronic record, clicks on the tests tab, opens the test and then presses "print". She then prints it out and places it in the paper-based

patient records file. The receptionist, using the medication card, is entering medication data into the system. She first finds the name of the patient on the list, clicks on it and accesses their medication record. She then ticks the box next to the drug and presses "ok". In this way, she explains, orders drugs from the Pharmacy and charges patients.

14:15-14:30 With the midwife's assistance I had a look at the system in order to understand its functions. I found that there is a possibility for diagnosis, case history and comments entry. When I asked both the receptionist and the midwife if they knew that there is a potential for using more functions of the system (diagnosis, history and comments entry) they told me that they did not know that they could use more characteristics of the system and they were not told to do so. An orthopaedist enters the department and asks the receptionist to provide him with a list of the treatments that have not been provided. The receptionist gives him a paper with the name of a patient, her room number and the treatment that should be provided. I asked her what was this piece of paper and she answered that in this way they inform doctors about any treatments that emerged during the day.

14:30-14:45 A doctor requests a drug. The midwife asks the receptionist to order the drug for the particular patient. The receptionist does not order it electronically, but she writes the patient's details, the drug and the quantity in a medication form. When I asked her why she did not request it electronically, she told me that when the Pharmacy and Medical Supplies Departments have closed they order drugs and medical supplies manually. The receptionist enters information regarding the room number of new patients into the system. She opens the record of the patient and accesses their information. She then enters the room number into the patient's record.

14:45-15:00 At the end of the observation session, the receptionist checks for the patients of the department who are expected to be discharged on that day. She opens the patient list, finds the name of the patients and organizes the daily discharges by changing their status from inpatient to discharged.

Appendix 9: Interview transcript (main study)

UNIVERSITY OF SURREY

The Electronic Patient Record (EPR) as Technology-in-Practice: The "Mitera" General, Maternity and Children's Hospital case

Name / Role: INT 15 / Doctor (Dermatology and Laser Department)

Age / Gender: 29 / female

Working at the Hospital since: 2006

Date: 05/08/09

Interview Schedule: open-ended questions interview

Expected duration 60-90 minutes

Please note: this is a semi-structured, open-ended questions interview. Inherent to this type of research is that the interview schedule is flexible, allowing new questions to be brought up during the interview as a result of what the interviewee says.

1. Technology as an artefact and technology-in-use

a) The EPR system as an artefact

✓ Please describe to me the functions of the EPR system in a) inpatient departments and b) outpatient departments.

In the inpatient departments, they use the SAP system in order to charge patients on drugs, medical supplies and diagnostic tests. However, I do not know the rest of the functions of the system. In the outpatient departments, we use the Medlab system. Our system was implemented in 2006. The administrators in the Cashiers can enter the demographics of the patients and the tests that he/she has performed in the hospital. We cannot access the results of these tests, but only the ones that were carried out in our department. Other functions of the system include entering diagnoses, diagnostic and clinical findings, patient histories, images, allergies and test results, notes regarding the power that we have used during the laser sessions, as well as completing and sending online electronic referrals.

- ✓ How was the EPR system designed to be used in the inpatient facilities of the hospital? Did the hospital provide any training? If yes, how were you advised to use the system? Otherwise, how did you become familiar with the system?

  I do not know.
- ✓ What were the instructions of the training team regarding the role of a) receptionists, b) nurses and c) clinicians with regards to the information documentation routine in the inpatient departments?

  I do not know.
- ✓ How was the EPR system designed to be used in the outpatient departments and diagnostic labs? Did the hospital provide any training? If yes, how were you advised to use the system? Otherwise, how did you become familiar with the system?

  In the outpatient departments and diagnostic labs that the EPR system has been implemented, it was designed to be used in order to help receptionists to check the type of test that the patient will undergo, previous tests that the patient has undergone in the particular department, his/her demographics that are entered by the staff in the Cashier, as well as according to the needs of each department record the results of the diagnostic tests and the diagnoses provided by the doctors. The EPR system has been introduced only to the departments that had requested its implementation. For instance, the Dermatology Department, the Endocrinology Department and the Angiology Department share the same reception but the system is only used by the Dermatology Department. The doctors from the other departments record their patients' information either manually or electronically using the Word program. The company that implemented the system provided training to the receptionists of the outpatient departments. The training lasted approximately an hour. They showed them how to log on the system, browse patients, access results from previous tests that have been performed in the department, check if the patient has paid for the consultation or test and enter the diagnosis provided by the doctor. Doctors have not been trained on using the system. I am self-taught.
- ✓ What were the instructions of the training team regarding the role of a) receptionists, b) nurses and c) physicians with regards to the information documentation routine in the outpatient departments?

In the outpatient departments and diagnostic labs, health information is recorded by the receptionist of each department. Doctors are not required to use the system, but only if they wish so. The role of receptionists is to check the patients' demographics and once the consultation or therapy or test has been completed enter the diagnosis provided by the doctor. The training team showed them how to browse patients, access previous tests and enter the doctor's diagnosis. The role of nurses and doctors does not involve using the system. In our department, however, two doctors and I use the system in order to enter information regarding our patients. The rest of the doctors do not use it.

b) The EPR system as technology-in-practice

✓ Please describe to me how the EPR system is used in the inpatient departments. What are the daily activities and the role of each member of the department with regards to the use of the EPR system?

I do not know details about the use of the system in the inpatient departments. The system is used for charging patients and ordering diagnostic tests, drugs and medical supplies. The role of receptionist is to charge the diagnostic tests, drugs and medical supplies that are requested by the clinical staff. The role of nurses is to use the system when the receptionist of the department is absent to charge patients for the services provided. Clinicians do not use the system. When, for instance, an inpatient presents a dermatopathy, we record the diagnosis and the clinical guidelines manually and we place them into his/her paper-based medical record.

✓ Have you noticed any changes in the use of the system in the inpatient departments since the early implementation stage? What are they? Who were the individuals involved in the decision to change the way in which the EPR was used? Why?

I have not noticed any changes.

✓ Please describe to me how the EPR system is used in the outpatient departments. What are the daily activities and the role of each member of the department with regards to the use of the EPR system?

In the outpatient departments, the EPR system is used for checking a patient's demographics, the type of test or consultation he/she has paid for and the doctor who will see him. In some departments, users also enter diagnoses, clinical notes and other information that is of the doctor's interest. In the diagnostic departments and labs, it is also used for entering the results of the test and the doctor's diagnosis. Each department has different needs and the information that is recorded

electronically varies. The role of receptionists is to check on the system the patient's demographics, the test he/she will undergo and his/her doctor, as well as enter into the patient's record the diagnosis or the results from the diagnostic test according to the needs of the department. Nurses do not use the system. Finally, doctors are not required to use the system, except if they want themselves to record some information regarding their patients or access previous test results, clinical findings or notes.

✓ Have you noticed any changes in the use of the system in the outpatient departments since the early implementation stage? What are they? Who were the individuals involved in the decision to change the way in which the EPR was used? Why?

The Medical Director of the department requested to add to the system's functions a list with all the possible diagnoses in order to choose one every time a patient is diagnosed. In this way we do not have to type the whole diagnosis and if we want to add something, we record it in the notes section. This change took place at the very beginning of the system's operation in the department. In addition, in October 2007, I requested from the IT Department to create fixed forms with the diagnoses that we provide in order to save time, but my request was rejected.

2. The impact of the enactment of the information documentation routine on other organizational routines

a) Information documentation routine as technology-in-practice

✓ Please describe how patient information is documented in your department using the EPR system.

In our department, there are many ways for documenting patient information. The first way is the one used by the majority of the doctors. That is, they provide the diagnoses of their patients either verbally or manually. The receptionist then records it in the department's book. This book is used in order to record the appointments of the department and next to the name of the patient is written the doctor's diagnosis. However, we do not keep this book as official record for our patients. Other doctors do not keep any kind of records. They do not even provide diagnoses to the receptionists in order to write them in the book. Finally, one dermatologist, one doctor who performs the laser sessions in the morning shift and I keep electronic health records. Every time a patient visits the department and pays

for a consultation or laser therapy, his name, type of therapy or consultation and his/her doctor appear on the system. A patient's demographics are entered by the staff in the Cashier. This, however, cause us problems, since female customers are registered using their husband's surname. For instance, if a patient has taken a divorce, she provides the cashier with her maiden name. The cashier browses her name, but she cannot find her record. Thus, she believes that the patient has not been registered before and that she has to create a new record for the particular patient. As a result, the patient registers again with a different name, but all the information that was recorded in her previous record is gone. My colleague and I use the system in order to record how many times the patient has visited the department for a laser session, what was the power that we used during the previous session, any diagnostic findings from tests that the patient has undergone, such as high testosterone or cholesterol, which might be important, the therapy that we provided and some comments.

✓ What are the differences in the way in which health information is recorded between the electronic method and the old method which was used for the documentation of health information and records?

The EPR system helps me to record more information about my patients and go back and access easily and quickly the information that I need. Before the implementation of the EPR system, we used to complete a form with the patient's personal details, diagnosis and receipt number and keep it in folders. This form is still available and might be used by some dermatologists to provide the diagnosis to their patients, but they do not use it to record patient information.

✓ Please describe to me your role regarding the documentation of health information and records. Has it changed?

I view on the system the list with our patients, I open the record of the patient I am interested in and I record the number of the laser session, the power that I used, pathological or hormonological findings from diagnostic tests, the therapy that it was provided and some comments. I record this information into the system in order to work better the next time that the patient visits the department. The only thing that has changed is that I record more and richer information as well as I do not have to search for a patient's record in case that the patient does not remember what was the therapy provided in the previous laser session.

b) The impact of the enactment of technology-in-practice on other organizational routines

✓ How does storing patient information link with other activities / work practices that take place within the hospital?

The cashier records a patient's demographics, which then appear on our system. This is the only linkage that I can think of. Storing patient information electronically does not link with any other activities, since the information that we record is only accessible by us. No one else can have access to this information.

✓ What changes did the enactment of the documentation of health records routine induce in other organizational routines? Please describe thoroughly.

In the past, patients used to pay at the Cashier and then show the receipt to the receptionist of the department. She then used to record the patient's personal details in the department's book, which was then stored. After the documentation of patients' demographics by the staff in the Cashier, the receptionist of the department can view on the system our patients' personal details. She still records them in the book, but this is later thrown.

✓ Have you noticed any changes in the way that other organizational routines are performed since the early implementation stage? What are they? Why do you think that this happened and who were the individuals involved in the decision to change the way in which these routines were performed?

I have not noticed any changes.

3. Variability in the use of the EPR system

a) Description of the standard operating procedure that exists in each department

✓ Please describe the main aspects of the written guidelines for use of the EPR system in your department.

The guidelines for the use of the EPR system refer to the receptionist of the department. She has to check on the system a patient's demographics and if the patient has paid for the service provided, as well as to choose a diagnosis from the list and view a patient's previous visits.

✓ Please describe to me how other people use the EPR system in your department.

The receptionist of the department uses the system to check the demographics of the patients and if they have paid for the consultation or laser session, inform the doctors about a patient's previous visits and choose a diagnosis from the list with

the possible diagnoses. The doctor who provides the laser sessions during the morning shift uses the system in order to record the number of laser session, the power that she used during the session, the therapy provided, some clinical notes and the results from histological and microbiological tests that are relevant to the laser therapy. In addition, a dermatologist records in the system his patients' diagnoses and some information that is of his interest. The rest of the doctors (7) do not use the system.

b) Inter-departmental variations

✓ Have you noticed any variations in the use of the system? What are they? Who are the individuals who use the system in a different way?

Some doctors do not even know that the system exists. Others do not want to use it and one dermatologist, the doctor for the laser sessions and I use it.

✓ Why do you think that different individuals make use of the system in different ways?

I believe that it depends on the needs that a user has regarding the documentation of patient information. That is, with regards to the laser sessions it is necessary to use the system in order to record the power that we used or any skin irritations that appeared during the laser session. A dermatologist might not find it useful because the patient will consult him/her and he/she will depart and follow his/her guidelines. He/she might not visit him/her again. Furthermore, the use of the system varies according to the meticulousness of the user. Some users want to record any single detail about their patients, whilst others do not find it necessary to do so.

c) Variability across different departments

✓ How is the EPR system used across different departments in the hospital? Have you noticed any differences with regards to the use of the EPR system?

I do not know how the EPR system is used across different departments in the hospital. Therefore, I have not noticed any changes.

✓ Why do you think that in some outpatient departments health information, such as a patient's diagnosis and history, is stored electronically while in the inpatient departments the same information is recorded manually using the paper-based system?

In the inpatient departments, doctors are obliged to record the diagnoses and the clinical guidelines manually because there is more than one specialty involved in

the care of a patient. For example, if a pregnant presents an exanthema, all three, the gynaecologist, the pathologist and the paediatrician, are involved in the patient's care. Sometimes there are more health care professionals involved, such as urologists. Therefore, I cannot visit a patient in an inpatient department and not provide a diagnosis manually because my colleagues have to be informed. We could certainly record this information electronically and each doctor would have to log on his system and find the diagnosis or the clinical guidelines/notes of his/her colleague, but it would take a lot of time and would result in an increase in our workload. It is easier to ask for a patient's paper-based file, open it and find the diagnosis provided by another doctor than to go to your office or tell the receptionist to log on the system, browse the patient's name, open his/her record and find the required information. It would also be difficult to interfere with the receptionist's work. In addition, every time I visit a patient in an inpatient department, I have to provide the diagnosis and the clinical guidelines to the senior nurse of the department before I return to my office because I might forget something. There is also the possibility of a system breakdown, which would prevent health professionals from having access to a patient's health information. Last but not least, each time I provide a diagnosis, I stamp it. How would I use the EPR system to stamp it?

✓ Why do you think that the use of the EPR system varies across different outpatient departments and diagnostic labs?

It depends on the needs that each specialty has in terms of health information documentation. A cardiologist, for example, cannot work without records, because he has to monitor his patient's progress and he needs to go back and see his patient's medication dosage or the tests that he/she has undergone. On the other hand, dermatological cases do not usually require monitoring. The dermatologist will prescribe some medication and, if it is not effective, the patient will visit him after – let's say – 10 days and he will prescribe other drugs or he will tell him to undergo a histological test.

Appendix 10: Observation transcript (main study)

DEPARTMENT: GENERAL ULTRASOUND DEPARTMENT

DATE: 03/08/2009

TIME IN: 12:00 pm

TIME OUT: 13:30 pm

12:00-12:15 There are two receptionists in the department; the first one sits at the front desk and the second one covers both the examination room and the waiting room. The second receptionist tells the front desk one to find on the system the results of a superior-inferior vena cava ultrasound that was carried out on 12/07/09. The receptionist browses the patient's name on the system, opens her record and accesses all her previous tests. She then answers that the patient was not charged for a superior-inferior vena cava ultrasound, but for a superior vena cava one. Her colleague replies that the patient claims that she underwent a superior-inferior vena cava ultrasound. The front desk receptionist advises her to tell the patient to photocopy the receipt of the test in order to double-check in the notebook of the department if the test was recorded. A patient arrives at the department and tells the receptionist that he has an appointment for an ultrasound screening. The receptionist asks for his personal details and then checks on the system if he has paid. She then finds the patient's name in the notebook and marks that the patient arrived. She asks for the receipt and writes the receipt number in the department's notebook.

12:15-12:30 The second receptionist tells the front desk one that an inpatient has been charged on an ultrasound by both the inpatient department on the 4th floor and the Intensive Care Unit. The receptionist views on the system that the patient has been double-charged and double-checks in the notebook of the department. She gives a call to the receptionist of each department and finds out that they have both requested an ultrasound screening for their patient. She then tells the receptionist from the inpatient department to cancel the request. The second receptionist hands to the front-desk receptionist the photocopy of the receipt that she previously requested. The receptionist searches in the notebook and finds out that the patient had booked an appointment for a superior vena cava ultrasound. She then opens the electronic form with the diagnosis and the results of the ultrasound and sees that it is a superior-inferior vena cava ultrasound. She informs the patient that they had made a mistake in

the Cashier and charged her for a superior vena cava ultrasound. She explains that she was not working on the day that the test was performed. She then prints the form, gives it to the doctor to sign it and then hands it to the patient.

12:30-12:45 The ultrasound screening is over and the patient steps out from the examination room. The receptionist asks him to take a seat. Her colleague informs her that the results of the ultrasound are available. The receptionist opens the patient's record, clicks on the test and accesses the diagnosis provided by the doctor and the results of the ultrasound test. She then presses "print" and passes it to the doctor to sign it. The doctor asks the receptionist about his remaining appointments, because he has to go to the Intensive Care Unit. The receptionist checks in the notebook and tells him that he has two left. She hands the results of the ultrasound to the patient.

12:45-13:00 The receptionist answers the phone. She asks the patient for the type of ultrasound she is going to undergo. She checks in the notebook and tells her that there is an appointment available in two days. She then asks for the patient's personal details and telephone number, and tells her to come over on 05/08/09 at 12:30 pm, pass by the Cashier, pay for the test and then walk in the department. She writes the appointment in the notebook. A patient steps in the department and tells the receptionist that she has an appointment for a uterus ultrasound scanning. The receptionist asks for her personal details and the receipt. She then finds the patient's name in the notebook and marks that the patient arrived. She writes the receipt number in the department's notebook. She asks the patient to take a seat and after a while her colleague asks the patient to go through.

13:00-13:15 The receptionist answers the phone. It is the receptionist from the Pediatrics Clinic asking if they could send a patient for a superior-inferior vena cava ultrasound scanning. The receptionist asks one of the doctors if he is available and he answers that he will try to find time for that case. She informs the receptionist from the Pediatrics Clinic that she will get back to her shortly.

13:15-13:30 The patient steps out from the examination room and the receptionists asks her to take a seat in the waiting room. At the same time, the doctor who was asked to carry out the superior-inferior vena cava ultrasound scanning informs the receptionist that he will see the patient, but it is his last appointment. In addition, he asks the receptionist to contact the paediatrician who requested the test. The second

receptionist walks out from the examination room and tells the receptionist that the diagnosis form is ready. The receptionist opens the patient's record, clicks on the test and accesses the diagnosis provided by the doctor and the results of the ultrasound scanning. She then presses "print" and passes it to the doctor to sign it. She informs the patient that she can collect her test results.

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