An official publication of The North American
Institute of Science and Information Technology

ISSN:1923-0265

INTERNATIONAL JOURNAL OF

Management Science and Information Technology

NAISIT
PUBLISHERS

www.naisit.org

The International Journal of Management Science and Information Technology (IJMSIT)

NAISIT Publishers

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The International Journal of Management Science and Information Technology (IJMSIT)

NAISIT Publishers

Special Issue: 2015 Spanish-Portuguese Scientific Management Conference

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This is one paper of
The International Journal of Management Science and Information Technology (IJMSIT)
Special Issue: 2015 Spanish-Portuguese Scientific Management Conference

NAIST North American Institute of Science and Information Technology

The International Journal of Management Science and Information Technology (IJMSIT)
Special Issue: 2015 Spanish-Portuguese Scientific Management Conference (21 - 38)

MANAGEMENT INFORMATION SYSTEMS AND TECHNOLOGIES IN PUBLIC HOSPITALS

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ABSTRACT:

The purpose of the present work was to analyse the importance of the use of information systems and technologies in management procedures in the hospital sector. We therefore intended to evidence the effects of the use of the information produced by means of those instruments in the improvement of management performance and as support to decision-making.
In this study, which took place under the Gesiti/Hospital international research project "Evaluation of Management Information Systems and Technologies in Hospitals", we present the results of 5 Portuguese public hospitals on the outskirts of the Greater Oporto region, which we consider a representative sample of the area studied. The case study methodology was used in this research.
With the results obtained, we may conclude that the information systems and technologies have acted as a booster mechanism for improvements in productivity and in the performance of hospital organisations. Within these public sector organisations we also found evidence of the adoption of private sector management practices.

KEYWORDS: Management, Management Control, Information Systems, Information Technologies, Hospitals, Hospital Management.

ISSN 1923-0265 (Print) - ISSN 1923-0273 (Online) - ISSN 1923-0281 (CD-ROM),

1. INTRODUCTION

This paper entitled "Management Information Systems and Technologies in Public Hospitals" forms part of the Master's Degree in Accounting and Finance of the School of Accounting and Administration of Porto (ISCAP).
Since we live in an ever-changing world and given that, in our view, this kind of organisation should and has to take a leading role in changing society, it is essential that the management thereof is capable of facing present challenges and, more than that, understands that the decisions made today will certainly have repercussions in the future.
An attitude of simply managing expenditure is not sufficient. Active management in a quest for new sources of revenue that contribute to better results is imperative.
In this context of constant change, increasingly comprehensive management of organisations is necessary, combined with an overview of all constituent areas.
The objectives of the research include presenting reliable evidence of the importance of Information Systems and Technologies for management and support for decision-making in order to improve the efficiency and effectiveness of hospital management, which is reflected in people more satisfied with the hospital care and management.
The choice of this theme is justified for several reasons.
The first of these reasons relates to the area of accounting, which deals with the theme presented. The area of Management Accounting has always been of great interest to me, in particular the areas of Strategic Management and Management Control, both during my academic career and the pursuit of my professional activities. In recent times, there has been a growing appreciation of the importance and relevance of management accounting in assisting managers in decision-making, which also contributed to the choice of this theme.
Technological development, which we witness on a daily basis, results in more and more entities treating the accounting information produced in a more analytical manner, and for purposes previously unseen. As a result, in light of the climate of fierce competition that exists today, all entities need to have more and better, high quality information to assist managers in decision-making.
Another reason is related to the participation of ISCAP in the Gesiti/Hospital international research project "Evaluation of Management Information Systems and Technologies in Hospitals".
This is a project coordinated by the Renato Archer Information Technology Centre (CTI), a unit of the Brazilian Ministry of Science, Technology and Innovation (MCTI), which aims to map the management of Information Systems and Technology in hospitals, identifying their needs, seeking developments, making publications and, above all, generating an Integrated Research Report (IRP), with the focus of a Research Roadmap Report (RRR). This IRP/RRR should be used as support for decision-making by public or private managers interested in the topic (Balloni, 2012).
In the case of our School, the research was carried out in public hospitals in the Greater Porto region, within a radius of 50 km of the ISCAP.
As described in the Cooperation Agreement concluded between the ISCAP and the CTI/MCT, this research covers topics and proposals for integrated or one-off solutions in the following areas (project focuses): human resources; strategic hospital management; R&D; technological innovation (investment in technological innovation and cooperation for innovation); hospital competitiveness & cooperation for strategic advantage; information technology equipment in hospitals; purchase of machinery and equipment; databases; networks, security and telecommunications; IT management; e-commerce and e-business; telemedicine; customer relations and health service waste management, among other associated themes that we may follow up as a result of the analysis and correlation of the data collected.
With the results obtained from this work, we hope to contribute towards facilitating the work of the managers of the hospitals in the region under study, and hence provide high-quality, timely and integrated information that may allow more assertive decision-making in hospital management.
We hope that the end result of this research is a contribution towards improving the management process and support for decision-making, reflected in an increase in user satisfaction with hospital care and management.

2. REVIEW OF THE LITERATURE

Three areas of analysis were identified during the review of the literature for this paper. Firstly, we analysed the health sector in Portugal and its history up to the present day. In the second part we analyse the area of Information Systems and Technology, with special emphasis on the literature already published under the Gesiti/Hospital project. Then, in the third part, the literature on Management Accounting was analysed, with special focus on recent

ISSN 1923-0265 (Print) - ISSN 1923-0273 (Online) - ISSN 1923-0281 (CD-ROM), Copyright NAISIT Publishers 2016

developments in, among others, Strategic Management Accounting and Management Control, and also the concept of New Public Management, which originated in the United Kingdom in the eighties.

2.1. Health in Portugal

As public hospitals are the subject of this paper, we consider it essential to provide a brief description of health systems in Portugal. To do this, we thought it important to divide the development of the Portuguese health system into four distinct stages (OPSS, 2001), as detailed below:

Before 25 April 1974
During the first phase, and according to the Portuguese Observatory on Health Systems (OPSS, 2001), various institutions with different roots in the country's history coexisted, which may be summarised as follows:

- The *Misericórdias*, centuries-old welfare institutions, occupied an important place in health – managing most hospitals and other health services nationwide.
- The Medical-Social Services (SMS, commonly known as "*postos das caixas"*), providing medical care to beneficiaries of the Federation of Welfare Funds. These were the Portuguese version of the "welfare system" in health – a compulsory levy applicable to employees and employers to finance access to healthcare. Contrary to what happened in other European countries, the Welfare Funds developed their own (outpatient) medical services.
- The Public Health Services were geared primarily towards the protection of health (vaccinations, maternal and child protection, environmental sanitation, among other aspects).
- State Hospitals, both general and specialised, were located mainly in the (few) large urban centres.
- Private Services were directed towards those of higher socioeconomic status.

It was in connection with other transformations in Portuguese society that during the 1970s major reforms were implemented in the Portuguese health system (Baganha, Ribeiro & Pires, 2002).

Creation and development of the National Health Service (SNS) (1974-1985)
The second phase, which coincided with the consolidation of democracy in Portugal, saw the National Health Service (SNS) fully implemented in 1979, the objectives of which – to be universal, general and free – were very democratic.
The SNS was set up by means of Decree-Law no. 56/79, of 26 August, having become dependent on the Ministry of Health of the then Ministry of Social Affairs. Article 64 of the 1976 Constitution of the Republic guaranteed legal recognition of the right to the protection of health.
Implementation of the SNS was marked by two fundamental aspects, funding from the state budget (in 1976) and the incorporation of various structures for the provision of health care services under a single system: the *Misericórdia* hospitals were nationalised in 1975, while health centres were only integrated with the Medical-Social Service centres in 1984 (OPSS, 2001).
In fact, the fundamental design of the SNS took about ten years implement, clearly reflecting the contradictions and infighting that took place between the State and the medical associations/profession (Mozzicafreddo & Monteiro, 2000).
Major structural weakness in the construction of the SNS was the main consequence of this set of circumstances (OPSS, 2001).

The Basic Law of 1990 (1985-1995)
For many, 1990 is regarded as a turning point in the Portuguese Health System (Baganha et al., 2002).
With effect from 1990, the Portuguese health system was regulated by two key instruments: the Basic Health Law (Law No. 48/90, of 24 August) and the National Health Service Act (Decree-Law No, 11/93, of 15 January).
It was at this stage, and with the publication of the National Health Service Charter, that the five Regional Health Administrations were created, which exist to the present day: North, Centre, Lisbon and Tagus Valley, Alentejo and Algarve. Eighteen Health Sub-regions, corresponding to each of the districts of mainland Portugal, were also established.

Most recent experiences (post-1995)
In a reflection of the European social climate and the knowledge base that has been accumulating with regard to healthcare reform, in this most recent phase, a range of initiatives have been implemented, which may be summarised into two categories (OPSS, 2001):

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- The creation of new strategic guidelines and accountability mechanisms: health strategy, contracting (agencies), performance-related pay, management of chronic diseases (e.g. diabetes), quality system, regional public health centres, among others;
- Innovation, decentralisation and enhanced flexibility of healthcare providers – hospital/company, Integrated Responsibility Centres (IRCs) within hospitals, 3rd generation health centres, local health systems and long-term care.

According to the OPSS 2012 Spring Report (OPSS, 2012), the first document to develop strategic thinking with regard to health in Portugal was presented in 1998, "Health, a commitment: health strategy for the turn of the century 1998-2002" (Ministry of Health, 1999).
Subsequently, the National Health Plan (NHP) 2004-2010 was widely disseminated and the subject of much public discussion. A broad participatory movement began in Portugal at different levels and within different structures to forge a collective approach to national health strategy. Support was garnered from the World Health Organization for an evaluation of the NHP, while the same organization was simultaneously asked to conduct an analysis of the Portuguese health system. This analysis may be found in the report *"Evaluation of the National Health Plan of Portugal 2004-2010"* (World Health Organization, 2010).
During this period, the Health sub-regions created under the National Health System Charter were abolished, with the Grouping of Health Centres (ACES) of the National Health Service being created in their place (Decree-Law No. 28/2008, of 22 February).
The preparation and discussion of the PNS 2012-2016 was an extensive and complex process, which included a number of initiatives, such as national and regional forums, decentralised meetings, multiple interviews and analyses carried out by scientific societies and organised sectors of society. This phase lasted for about a year and a half after the expiry of the National Health Plan 2004-2010, and only at the end of June 2012 was the beginning of the implementation phase published on the website of the Directorate-General for Health (OPSS, 2013).

2.2. Information Systems and Technologies

The needs for information resulting from changing market conditions, increased competition and changes in organisational structure and business strategy led to the development of new Management Control practices (Scapens, Burns, Baldvinsdottir, & Ezzamel, 2003).
In a study conducted by Vicente, Major, & Pinto (2011), it can be seen that the introduction of new computerised systems was one of the ways that companies found to provide timely information and respond quickly and efficiently to the pressures of their environment. The perception was evident that companies are attentive to technological progress as a means of introducing more advanced Management Control techniques that enable them to obtain information, whether of a financial or non-financial nature, to sustain/support their management decisions.
Balloni (2006) states that, in the globalised world, Information Systems (IS) and Information Technology (IT) gain increasing importance in light of the needs imposed by competition. Both knowledge of the company's business and a rapid flow of information are fundamental to decision-making, implying that knowledge of IS is essential for creating competitive companies, managing global corporations and providing customers with products and services of value.
Laudon & Laudon (2006) also state that "IS and IT Management" may be considered an important functional area for company operations, an essential field of study for the administration and management of enterprises, making IS and IT components vital to the success of organisations and businesses.
These issues also arise in the health sector, given the growing demand for both public and private services, which requires hospitals to be organised to respond to people's needs and provide effective and humane care, providing all the information that patients require.
As Sun (2010) points out, a hospital is considered one of the most complex organisational models in existence, as it requires a multitude of information for its internal operations, as well as that related to the health society in which it operates. There are several reasons for this complexity, including the technical resources necessary for the diagnosis, cure and prevention of diseases involving the participation of multiple actors, including patients, health professionals, providers, health insurance companies, government agencies, non-government agencies and international organisations, among many others that interact in this context. However, a hospital also has aspects in common with any organisation, such as managing people, finances, security, maintenance and building management, billing, supplier relations and engagement with the community in which it operates. Given this complex situation, Information and Communication Technology (ICT) is an important tool to assist in the collection, storage, processing and management of information, in fact, to support processes involving the health sector. And

ISSN 1923-0265 (Print) - ISSN 1923-0273 (Online) - ISSN 1923-0281 (CD-ROM), Copyright NAISIT Publishers 2016

for this, in addition to technological resources, people with the skills to develop and manage appropriate strategies that address this area of knowledge are required.

The use of ICT is also advocated in the OECD Report (2010), *"Improving Health Sector Efficiency: The Role of Information and Communication Technologies*", according to which the widespread use of ICT in health may contribute to a reduction in the operational costs of clinical services by improving tasks and how they are performed, saving time with data processing and reducing the need to deal with paper and other documents. Which may also increase productivity. However, in the health sector, this outcome depends on the context and the technology employed. (*OECD Health Policy Studies Improving Health Sector Efficiency The Role of Information and Communication Technologies: The Role of Information and Communication Technologies*, 2010).

In the current context, the use of indicators and information to compare health organisations is becoming more widespread, with a view to securing a competitive advantage through the benchmarking of processes, practices and performance measures (Escrivão Junior, 2007).

MacGregor, Hyland, & Harvie (2009) refer to the existence of various studies that examine the benefits of the use of IT in the health sector. The development of the Internet led the health sector to explore IT/IS with a view to improving services provided to users of hospitals, improving the effectiveness of the institutions themselves in business terms, and also improving communication among the various industry players (MacGregor et al., 2009).

Examples of the studies referred to above include Åkesson, Saveman, & Nilsson (2007), who report improved quality of service and availability of information.

According to Mechling & Sweeney (1997), IT/IS add value to organisations. Firstly, because information may be researched and shared due to the opportunities for interactivity. If used properly, these search, interactivity and sharing capabilities can help redesign and improve work processes. With IT/IS, organisations can restructure their work, achieve greater economies and improve their control and feedback procedures.

However, according to these authors, in the public sector, unlike in the private sector, when the question is posed as to why the Government fails to gain greater value from the use of IT/IS, the two most common answers are "lack of long-term leadership" and "lack of funds". The current trend hampers the financing of higher value projects, which are inevitably risky. Where expenditure on these IT projects depends on a significant organisational study, and their value cannot be proven by experience, the risks become uncertain. As a rule, the Government is risk-averse and opts to spend little on high-risk projects, preferring to maintain existing systems despite the fact that they no longer meet requirements or are not in line with current goals, except for projects involving tax collection.

Haux (2010) argues that healthcare is constantly changing due also to the continuous changes in health practices motivated by technological advances. IT in healthcare has a responsibility to contribute to improvements in the care provided to the population, through its contributions to high-quality and efficient healthcare and innovative research in biomedical and related health sciences. This author also points out some possible changes in this area, among others, the growing interaction between the automatic collection and storage of information via computerised diagnostics and therapeutics.

Despite all the developments in the use of IT/IS in the health sector, Ammenwerth, Gräber, Herrmann, Bürkle, & König (2003) suggest that it is of utmost importance for decision makers and users to undertake a rigorous assessment of the technology implemented.

During this evaluation, not only the IT, but also the interaction between the IT and users during the processing of information should be taken into account. The assessment must take into account the environment in which the IT is used. (Ammenwerth et al., 2003).

2.3. Management Accounting and New Public Management

We have witnessed in recent years major developments in Management Accounting practices. These developments, which have been seen in companies, have also been accompanied in other sectors of activity, particularly in the health sector.

In recent empirical studies, evidence has been found that there have been significant changes in the way Management Accounting is used, moving from a subsystem of information focused on registration, analysis and control to a subsystem focused mainly on the business (Vicente et al ., 2011).

Thus, Management Accounting has come to be used as an important aid to managers in the conduct of their business and in ensuring competitiveness. Simmonds (1981) defines Strategic Management Accounting as the processing and analysis of data provided by Management Accounting on the business and its competitors in order to develop and monitor the strategy of a company.

ISSN 1923-0265 (Print) - ISSN 1923-0273 (Online) - ISSN 1923-0281 (CD-ROM), Copyright NAISIT Publishers 2016

To encourage behaviour consistent with the strategy of an organisation, attention has been paid to the development of an integrated performance monitoring framework that can be used to clarify, communicate and manage the strategy (Drury, 2000). The author refers to the Balanced Scorecard.

The Balanced Scorecard was formulated and presented in an article in the Harvard Business Review (R S Kaplan & Norton, 1992). In this article, the Balanced Scorecard is defined as a set of measures that provides top managers with a quick but comprehensive snapshot of the business. Initially, they considered financial indicators to be the most important to the organisation, only afterwards feeling the need to include non-financial indicators. All indicators should be linked to the vision and strategy of the organisation, components that were added in 1996 by Kaplan & Norton as a result of changes the Balanced Scorecard has undergone since it first appeared.

According to a study by Burns, Ezzamel, & Scapens (2003), pressures related to globalisation and the increased competition associated with the 'new' business environment are the factors that best explain the need for companies to strive for better information management.

Also in Scapens et al. (2003), we find that there are several factors related to the business environment that are inducers of change in Management Control practices in businesses: globalisation and customer focus, and technological change.

The scope of Management Control is to carry out the strategy of entities by developing practical Management tools, designed with managers, for managers (Jordan, Neves & Rodrigues, 2008). It should be noted that the word control is not to be understood from a supervisory perspective, but rather in the sense of maintaining and not losing control of situations within organisations.

The concept of new public management (NPM) emerged in the late eighties of the last century in the United Kingdom and other Anglo-American countries (P. Silva and Ferreira, 2010). Its origins lie in the changes experienced by the United Kingdom public sector (Cairney, 2002), having been followed by many other countries. Hood (1995) states that the changes in accounting in the public sector in many OECD countries during the eighties were key to the growth of NPM.

This concept is based on the premise that many private sector practices can be transferred to the public sector (Hood 1991, 1995), including key performance management practices (Hood, 2006; Jacobs, 1995).

Hood (1991, 1995) highlights four aspects that have contributed to bringing the public and private sectors closer together and that appeal to a perception of responsibility in public sector management: breaking down of public sector organisations into smaller units, which allows a more competitive environment to be created within the public sector, with preference given to styles of management found in the private sector, and promoting the efficient use of resources. He further adds that the operationalisation of the NPM is achieved by promoting professionalism in top management in public sector organisations and opting for clear and measurable performance standards.

Along these lines, Humphrey, Miller, & Scapens (1993) describe the changes in the public sector in the United Kingdom since the introduction of neo-liberalism in the late seventies and early eighties. The authors show increased interest in management accountability in public sector organisations, from the introduction of fundamental changes in sector management leading to more efficient controls to the introduction of performance indicators, improved resource management procedures, and the establishment of cash limits.

Public health organisations are often subject to extensive public scrutiny because of their significant and perceptible economic impact. They are also often criticised in the media for allegedly poor performance management practices, weak accountability and poor use of resources (Abernethy, 1996).

The concept of NPM was proposed as a mechanism to achieve a high level of efficiency and effectiveness in the public sector, a goal common to all parties across the political spectrum (P. Silva and Ferreira, 2010). Studies conducted by Jackson & Lapsley (2003) and Lapsley & Wright (2004) show that improvements in efficiency and effectiveness can be achieved through innovation in performance management techniques, processes and procedures.

For some time, IT innovation has been an important mechanism for reform in the public sector, driven by governments' modernising policies. These reforms have been important for public sector accountants at various levels, including project management and allocation of responsibilities for IT functions within organisations, which include procurement policies, implementation strategies and screening potential IT systems (Lapsley, Brown, Jackson, Oldfield, & Pong, 2003).

In a study carried out in Nordic countries, Pettersen (2004) shows how hospitals have become more accountable since the introduction and use of intensive management controls. The author states that the introduction of new accounting and management control systems has the potential to penetrate to the level of the operational processes of hospitals. The accounting techniques are not limited to control functions, but are also important elements in professional decision-making processes and clinical performance.

ISSN 1923-0265 (Print) - ISSN 1923-0273 (Online) - ISSN 1923-0281 (CD-ROM), Copyright NAISIT Publishers 2016

It should be noted that, according to a study conducted by Jacobs, Marcon, & Witt (2004), while there is interest in information regarding hospital costs and activities, usually medical staff do not have access to this information because, initially, it was only accessible to those at higher hierarchical levels.
Cairney (2002) reports that, in the United Kingdom, doctors have experienced some difficulties with the changes driven by NPM; although doctors were more committed in management and decision-making functions, the increased centralisation of the purchasing process in health authorities decreased their role in the process.
Changes in the public sector have led to major concerns regarding efficiency, effectiveness and performance. However, even where organisations follow the best management practices and culture, public managers face significant challenges. In improving performance in the health sector, more complex issues must be addressed, such as benchmarking (Holloway, Francis, & Hinton, 1999). Other researchers suggest, however, that benchmarking does not always result in the desired improvement in performance, and at times result in convergence with the existing average (Llewellyn & Northcott, 2005).

3. RESEARCH METHODOLOGY

When starting work on a new project, taking into account the proposed objectives, a researcher seeks to identify alternative ways of achieving them. The idealised path of research is reflected in the application of research tools, which can either be defined by the nature of the phenomenon or due to the influence of the research community in which the researcher is working. In an early stage in the process, a researcher usually equates different approaches to address the problem identified and, depending on the approach selected, there may be various methodologies and techniques that seem most appropriate to the research process. In other words, in conducting a research project on organisational information systems, as in other areas, a researcher needs to define several key aspects that characterise the entire process. These aspects include the epistemology underlying the research work, the approach followed, the methodology adopted and the set of techniques used (Grilo, Varajão, Basto-Fernandes, & Pereira, 2010).
For this work, and as has been the case in the research carried out under the Gesiti/Hospital international research project "Evaluation of Management Information Systems and Technologies in Hospitals", a qualitative approach was followed, with the underlying method of interpreting the results (epistemology) being interpretive. The research methodology adopted was the case study and the research technique used was the interview (Balloni, 2012).
Below, a brief description will be given of each of the aspects of the research process.

3.1. Qualitative Approach

In terms of the approach to addressing the problem identified, we are faced with two choices: a quantitative approach or a qualitative approach.
Research performed using a quantitative approach produces data that may be statistically analysed, with the results being expressed numerically. Typically, methodologies and techniques classified as quantitative seek to quantify the results and sort them by values or levels representing theoretical concepts. The interpretation of this ranking can be seen as scientific evidence of how the phenomenon occurs. Under a qualitative approach, in order to achieve the proposed objective or to study a phenomenon, the research does not use statistical procedures or other quantitative means, but methods for collecting qualitative data. Qualitative research can be found in various disciplines and areas, and is supported by a variety of methods and techniques (Grilo, 2008).
What motivates the selection of qualitative over quantitative research is above all the ability to communicate. Qualitative research methods are designed to help researchers understand people and how they live in a particular social and cultural context. The goal of understanding a phenomenon from the point of view of the participants and their social and institutional context would be largely lost were the textual data to be quantified (B Kaplan & Maxwell, 1994).
The main feature of this research approach is the fact that the data collected are not readily prepared or are not suitable for quantification, the specification of values, classification or are not objective. Because of this fact, common statistical procedures cannot be applied for presentation or analysis of the results (Mauch & Park, 2003).
In recent decades we have increasingly witnessed the qualitative approach being employed in research into accounting and management control. This type of research has increasingly featured in better quality scientific journals, which is a strong indicator of its legitimacy and credibility. The growing importance of qualitative research is due, on the one hand, to quantitative research having undergone a certain decline in light of the positivist paradigm and, on the other, the need to develop new methodological approaches to enable a deeper understanding of

ISSN 1923-0265 (Print) - ISSN 1923-0273 (Online) - ISSN 1923-0281 (CD-ROM), Copyright NAISIT Publishers 2016

the research problems under study. These approaches require intense involvement of the researcher in data collection and analysis, and the quality of these depends largely on his knowledge, sensitivity and integrity (Vieira, Major, & Robalo, 2009).

3.2. Interpretive Epistemology

Qualitative research has followed different philosophical approaches. All research, whether quantitative or qualitative, is based on assumptions regarding what constitutes valid research and which research methods are appropriate. These assumptions relate to epistemology, i.e. knowledge and how it is obtained (Vieira et al., 2009).
Regarding the criterion of epistemological classification, Chua (1986) suggests three categories of research: Positivist, Interpretive and Critical.
By joining the possible epistemological foundations for research, whether qualitative or quantitative, possible relationships result, as indicated in Figure 1:

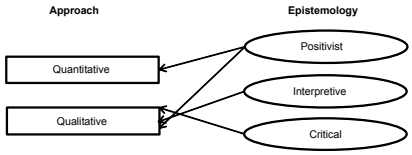

Figure 1 – Epistemological assumptions of research (Grilo, 2008)

Positivist epistemology is based on an assumption of universal laws that govern social events. Understanding these laws allows the researcher to describe, predict and control the phenomenon (Kim, 2003). Vieira et al. (2009) also report that, in general, positivists assume that reality is objectively observable and can be described by means of measurable properties, which are independent of the observer (researcher) and his measuring instruments. Studies conducted from this standpoint seek to test theories in order to improve prediction and control of the phenomena.
By contrast, research conducted from the interpretive standpoint seeks to understand the values, beliefs and meanings of the phenomenon, by means of in-depth analysis of cultural activities and experiences (Kim, 2003). Researchers assume that reality consists of social constructions such as language, consciousness and shared meanings. Interpretive studies have sought to understand the context underlying accounting information systems, and how these systems influence and are influenced by the context (Vieira et al., 2009). Unlike the positivist approach, interpretive research takes into account the relationship between day-to-day actions and the dimensions of the social structure. This means finding the structures in their social context and understanding how they evolve over time (Ryan, Scapens, & Theobald, 2002). Interpretive research employs qualitative methods, using an iterative process involving a field study, which interprets it in its context from the perspective of the various actors involved. Instead of being concerned with finding ultimate truths, it obtains reports reflecting various interpretations, as it is considered that reality is a construct of its various actors. Although it may be deemed inadmissible under positivist theories, in interpretive research, the researcher himself is involved in the subject of the research and the interpretation thereof results, to a great extent, from his experience as a researcher. The results of this kind of research usually present an account of specific situations, allowing multiple interpretations, which are tested. In short, interpretive research advocates that there are various and interesting ways of seeing the world, all of which are valid (R. Silva & Silva, 2013).
The main assumption of the critical philosophy is the belief that everything, whether organisational or social, is historically constituted, and therefore human, organisational and social phenomena are not confined to a particular state (Chua, 1986). Although people may act consciously to change economic and social circumstances, critical researchers acknowledge that their capacities to enact change are limited by various forms of political, cultural and social dominance. Critical researchers concentrate on the oppositions, conflicts and contradictions of contemporary society, and seek to eliminate the causes of dominance (Vieira et al., 2009).

In this research, interpretive epistemology was used to interpret the data. According to R. Silva & Silva (2013), this kind of research uses an iterative process, which includes a field study, which interprets it in its context from the perspective of the various actors involved. The objective is not to find ultimate truths, but reports' reflecting various interpretations, as it is considered that reality is a construct of its various actors.

ISSN 1923-0265 (Print) - ISSN 1923-0273 (Online) - ISSN 1923-0281 (CD-ROM), Copyright NAISIT Publishers 2016

3.3. Research Methodology Case Study

Yin is the author most quoted by researchers who, in accounting, use the methodological approach of the case study (Vieira et al., 2009). This author defines the case study as an empirical inquiry that investigates a phenomenon in its real environment, where the boundaries between the phenomenon and its context are not evident, and in which multiple sources of evidence are used (Yin, 2008).
According to Yin (2008), there are three factors determining the type of research methodology to be used:

- Type of research question;
- Degree of control that the researcher has over behavioural events;
- Degree of focus on contemporary or historical events.

Vieira et al. (2009) reported that case studies most frequently adopted in the area of accounting can be classified into 5 different types:

- Descriptive – this type of case study is intended primarily to describe the systems, techniques and procedures followed in practice. A certain number of companies are selected in order to describe various systems and accounting practices, or in order to describe a particular technique that has been adopted by various companies.
- Illustrative – Robert Kaplan, associated with Harvard Business School, is one of the authors who most notably have resorted to this type of study. According to him, it is necessary to study in practical terms what tools, systems and accounting procedures have been adopted by companies, especially by those considered as successful (R S Kaplan, 1986, 1998). Knowledge of those practices is essential for understanding to what extent the theories and techniques advocated in the literature are actually followed by companies.
- Experimental – these are characterised by being the result of techniques, procedures and practices developed conceptually by researchers with the objective of being applied in companies and their impact analysed.
- Exploratory – these are adopted in order to allow the researcher to explore the reasons for certain accounting practices. As a result of its use, hypotheses are generated regarding the adoption of certain techniques in order that they will be tested in further studies, either through the development of other case studies or questionnaires.
- Explanatory – this type of study is not intended to lay the foundations for obtaining generalisations (as in exploratory studies), but rather to study and explain the existence of certain practices. The emphasis is on the particular, not the general.

In the case of this study, the research was based on five case studies, which fall under the descriptive category.

3.4. Interview Research Technique

Qualitative research has followed different philosophical approaches and has resorted to different research methods. Research methods are research techniques that allow specific analyses according to the methodology followed by the study in which they are used (Vieira et al., 2009).
The same authors report that the following are among the most common research methods: (1) interviews, (2) observation, (3) texts and documents, and (4) audio and video recordings. These methods may be, and often are, combined in the same study. For example, many case studies in accounting combine the use of interviews and documentary information (Vieira et al., 2009).
This research focused on five hospitals, with direct interviews being conducted with representatives of each hospital, during which they answered around 200 questions according to each item or theme described by the questionnaire: human resources; strategic management of the hospital; research and development; technological innovation; information technology equipment in the hospitals; e-commerce; telemedicine and treatment and disposal of hospital waste, etc.
Table 1 shows a summary of the questionnaire applied in this research:

Summary of the GESITI/Hospital Project, "Prospective Questionnaire"

Description of the Hospital
Human Resources
Strategic Hospital Management
Research and Development
Technological Innovation
Investments in Technological Innovation

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Cooperation for Innovation
Hospital Competitiveness & Cooperation for Strategic Advantage
Equipment and Information Technology in Hospitals
Purchase of machinery and equipment
Database
Networking, Security and Telecommunications
IT Management
E-Commerce
Module A: General Information on Information and Communication Technology
Module B: Internet use
Module C: E-Commerce via the Internet (E-Business)
Module D: Costs/Expenses and Features of the Implemented System
Module E: Barriers to use of the Internet and ICT in General
Telemedicine
Customer relations
Rapid Prototyping in Health
Health Service Waste Management

Table 1: Summary of the GESITI/Hospital Project, "Prospective Questionnaire" Balloni (2012)

The interviews may be classified into three types: unstructured, structured and semi-structured (Marginson, 2008). Unstructured interviews have the advantage of allowing the researcher to introduce new themes, questions and topics of conversation according to how the interview unfolds. On the other hand, in structured interviews, the researcher has to put the same questions to all respondents. He has no flexibility to introduce new issues that were not previously planned. In this sense, this type of interview resembles a questionnaire. In turn, in semi-structured interviews a script is prepared, but this may be changed where this proves advantageous during the interview (Vieira et al., 2009).
In this research the questions contained in the questionnaire were mostly closed questions, combined with some open questions.

4. DATA COLLECTION AND ANALYSIS

In this chapter we begin by describing the five studied hospital entities studied, as well as the North Health Region, of which they form part, since all the studied entities are exclusively publicly owned.

4.1. North Regional Health Authority

The North Regional Health Authority (ARS-Norte) was established in 1993 upon publication of the National Health Service Charter (Decree-Law No. 11/93, of 15 January).
The mission of the ARS-Norte, as enshrined under paragraph 1 of Article 3 of Decree-Law No. 22/2012 of 30 January, is to ensure access to health care for the population of the respective geographical area of competence, matching available resources to requirements and complying with and enforcing health policies and programmes within its area of competence.
The geographical area of competence of the ARS-Norte consists of 7 districts: Viana do Castelo, Braga, Vila Real, Bragança, Porto, Aveiro and Viseu. In the case of the districts of Aveiro and Viseu, the geographical area of competence does not cover the entire district, as some municipalities within these districts are already included in the geographical area of competence of the Central Regional Health Authority (ARS do Centro).
Within the abovementioned districts, there are 17 hospitals under the responsibility of the ARS-Norte. These hospitals are shown in the following table, ranked by their distance from the ISCAP, given that, as already mentioned, this was the criterion for selecting them for this study:

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Hospitals	District	Location	Distance from ISCAP (K
Centro Hospitalar S. João, E.P.E.	Porto	Porto	1.3
Instituto Português de Oncologia Francisco Gentil, E.P.E.	Porto	Porto	1.4
Hospital Magalhães Lemos, E.P.E.	Porto	Porto	7.7
Unidade Local de Saúde de Matosinhos, EPE	Porto	Matosinhos	7.7
Centro Hospitalar Porto, E.P.E.	Porto	Porto	11.3
Centro Hospitalar de Vila Nova de Gaia/Espinho, E.P.E.	Porto	Vila Nova de Gaia	12.5
Centro Hospitalar Médio Ave, E.P.E.	Porto	Santo Tirso	27.1
Centro Hospitalar Tâmega e Sousa, E.P.E.	Porto	Penafiel	34.0
Centro Hospitalar Póvoa de Varzim / Vila do Conde, E.P.E.	Porto	Póvoa de Varzim	36.8
Centro Hospitalar Entre Douro e Vouga, E.P.E	Aveiro	Santa Maria da Feira	36.9
Centro Hospitalar Alto Ave, E.P.E	Braga	Guimarães	49.8
Hospital de Braga	Braga	Braga	55.6
Hospital Santa Maria Maior, E.P.E.- Barcelos	Braga	Barcelos	63.5
Unidade Local de Saúde do Alto Minho, EPE	Viana do Castelo	Viana do Castelo	69.6
Centro Hospitalar Trás-os-Montes e Alto Douro, E.P.E.	Vila Real	Vila Real	93.2
Centro Hospitalar Nordeste, E.P.E.	Bragança	Mirandela	149.0
Unidade Local de Saúde do Nordeste, EPE	Bragança	Bragança	209.0

Table 2: Member hospitals of the ARS-Norte

Of the nine hospitals in the district of Porto, seven of them are general hospitals and the other two, specialised hospitals, one in oncological diseases and the other in psychiatric disorders and mental health.

4.2. Hospitals

For this study, five hospitals were selected in the district of Porto, three of which are located in the municipality of Porto and the other two in neighbouring municipalities. Of these five selected hospitals, four are general hospitals and one is a specialised hospital.
All the hospitals studied in this research project belong to the second most densely populated region in Portugal, Greater Porto. Therefore, we may consider that this research is representative of the reality of Portuguese public hospitals.
The hospitals studied will be identified with the letters A to E. Below, in Table 4, we present an overview of these hospitals:

Description of the Hospitals	A	B	C	D	E
Founded	1999	1974	1824	2000	1959
Sector	Public	Public	Public	Public	Public
Composition of Capital	100% National	100% National	100% National	100% National	100% National
Number of employees	2 198	1 981	4 082	652	5 729
Number of beds	400	319	867	143	1 124

Table 3: Description of the Hospitals under study

Human Resources
The human resources of these organisations were also analysed. The following table shows how the human resources are distributed at each hospital according to the function performed:

Total Staff	A	B *	C **	D	E ***
Director	25		22	5	19
Doctor	591	320	972	137	812
Senior Health Technician	8	64	48	5	625
Senior Technician	61	50	67	25	
Information Technology	9		16	4	
Lecturer	1				
Nurse	732	655	1 266	215	2 104
Therapeutic Diagnostics Technician	124	158	267	31	320
Religious Representative	1			1	
Technical Assistant	271	200	424	78	445
Operational Assistant	375	506	997	151	1 190
Other Personnel *		28	3		214
Totais	2 198	1 981	4 082	652	5 729

* Hospital B - includes Managers, Managing Board, Teaching Staff, Researchers, IT Personnel
** Hospital C – includes Teaching Staff and Religious Representatives
*** Hospital E – not specified

Table 4: Distribution of Human Resources by function

It can be seen that, at all hospitals, the most common professional group is nurses, with approximately 34% of the total staff in the sample, followed by assistants (technical and operational) with around 32% of staff, and then doctors with around 19% of total staff.

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Regarding the profile of the Managing Boards of these entities, the similarity between them is evident, both as regards the number of members, and the distribution of each member's functions. All of them have 5 members, including a Chairman, a Clinical Director, a Nursing Director and 2 Board Members. In the case of the Board Members, although not specified in all cases, these Officers normally perform functions in the Finance Division and the Human Resources Division.
The background of the human resources was then analysed. With regard to academic qualifications of the staff, the situation is shown in the following table:

Academic background of staff	A	B	C	D	E
Primary education	ND	420	ND	158	1 174
Secondary education	ND	259	ND	67	446
Higher education	ND	1 296	ND	427	4 109
Totais	-	1 975	-	652	5 729

Table 5: Academic background of Human Resources

As can be seen, in the case of hospitals A and C, it was not possible to obtain information about the educational background of the staff. In the other cases, we can gauge that around 70% of staff have completed higher education, while around 21% have only completed primary education. The remaining 9% have completed secondary education.
Data was also collected on vocational training organised by the hospitals. The following table provides an indication of the total number of training courses, as well as participants and participations, and the number of hours spent in training courses:

Vocational training	A	B	C	D	E
Total no. of training courses	128	ND	ND	101	34
Total no. of participants	1 108	ND	ND	ND	2 834
Total no. of participants	2 338	ND	ND	1 320	ND
Total no. of training hours	18 303	ND	ND	429	172 788

Table 6: Data on Vocational Training

Once again, information was not forthcoming from all hospitals, in this case, from hospitals B and C.

4.3. Data collection

Strategic Management
According to Drucker (1999), "A company is not defined by its name, status or the product it makes; it is defined by its mission. Only a clear definition of the mission is the *raison d'être* of the organisation, and makes the company's goals possible, clear and realistic".
The mission of an organisation consists of the definition of its general strategic purposes. It is a statement of the general and permanent (continuous) purposes that express the fundamental intentions of the overall – top – management of the company, providing guidelines for its future development. It is reflected in the practice of a basic philosophy of operation of the company and is the starting point for defining other goals that are, therefore, subordinate to that mission (Teixeira, 2005).
In the hospitals studied, reference was made to the mission by respondents when asked about dealing with customer enquiries and concerns. These enquiries and concerns are closely linked to the mission of each hospital. These missions are:
Hospital A: "To satisfy all health-related needs of the population of the Municipality, taking responsibility for the integration of different levels, from health education to self-care, continuous and palliative care and referral to other levels of the hospital network".
Hospital B: "The hospital's mission consists of the delivery of patient-centred healthcare, in due time, without neglecting prevention, research, training and teaching in the field of oncology in order to ensure high levels of quality, humanism and efficiency."
Hospital C: "The Hospital is a Centre and Teaching Hospital that seeks excellence in all its activities within a comprehensive and integrated perspective of health. It focuses on providing care that improves the health of patients and the population in highly distinctive activities and in support and coordination with other health institutions. It emphasises and places a high value onundergraduate and postgraduate education and encourages research with a view to contributing to the development of health science and technology."

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Hospital D: "The Hospital's mission is to provide quality health care to the population within its area ofinfluence, ensuring, at the same time, the professional development of its employees, within a framework of efficiency and effectiveness."
Hospital E: "The Hospital's mission is to provide the best healthcare, with high levels of competence, excellence and rigour, encouraging undergraduate and postgraduate training and research, while at all times respecting the principle of humanisation and promoting pride and a sense of belonging among all professionals."
In relation to the assessment of the strategic planning component conducted at the five hospitals studied, no information relating to Hospital B was forthcoming. With the exception of Hospital B, evidence of the existence of a Strategic Plan was collected at the remaining four hospitals.
Thus, Management is aware of a Strategic Plan at the four hospitals that have one. With respect to middle management, this awareness could not be validated at Hospital A, whereas at Hospitals C, D and E, the plan is fully known. Regarding the communication of the Strategic Plan at an operational level, we obtained positive responses at Hospitals D and E.
In terms of the frequency with which the Strategic Plan is reviewed, this stands at between 6 and 12 months for Hospitals C, D and E. In the case of Hospital A, information on the reviewing thereof was not forthcoming.
The degree of involvement of Human Resources in the development and review of the Strategic Plan was then analysed. It was found that at Hospitals A, D and E, the involvement of Human Resources is limited to the executive leadership and leaders of processes. In the case of Hospital C, participation extends to all levels of the hierarchy. It should also be noted that at Hospital E other employees may discuss and participate in the process.
We observed that the strategies are created using different elements. Thus, we found that Hospital A uses analysis of the competition, the degree of customer satisfaction, current and potential demand and also the mission and recognised competence. In addition to the elements mentioned for Hospital A, Hospital C also uses scenario analysis. Hospital D also uses scenario analysis, and benchmarking. Thus, we found that Hospital A uses analysis of the competition, the degree of customer satisfaction, current and potential demand and also the mission and recognised competence.
Questions were asked about the degree of importance of customers (requirements, satisfaction, etc.) and human resources (training, motivation, availability, etc.) in determining the strategies of these hospitals. Through the responses obtained we found that at Hospitals A and E that degree of importance is high, while at Hospital C it is considered moderate, and at Hospital D, low.
In relation to the existence of monitoring of the strategies formulated, only Hospital A responded negatively, stating that no monitoring is carried out. At Hospitals C, D and E, this monitoring exists, although it is done with different frequencies: quarterly at Hospital C, annually at Hospital D and monthly at Hospital E.
The four hospitals where we obtained evidence regarding the issue of strategic management confirmed that they use tools such as the Balanced Scorecard. However, we were unable to obtain specific information on which indicators are used, except for the degree of customer satisfaction.
Moving on to an analysis of the answers regarding knowledge of new technologies, we obtained different responses. At Hospital A, information regarding new technologies is obtained at trade shows and conferences. At Hospital C, this information is collected from magazines, trade shows and conferences, through consultancy services and also via the Internet. At Hospital D, consultancy services and the Internet are used to gain knowledge of new technologies. Finally, Hospital E specifies that its suppliers are the favoured source of information regarding new technologies.

Research and Development (R&D)
In this part of the questionnaire, no information was forthcoming relating to Hospitals B and C. In the other three hospitals, the information collected on research and development activities carried out in the period under review (2007-2011) was as follows: Hospital E undertakes R&D activities on an ongoing basis, while Hospitals A and D undertake such activities on an occasional basis.
In the next question, we note that the degree of importance given to research and development is moderate at Hospital A, and that Hospitals D and E give it low importance.
However, with respect to the degree of importance assigned to knowledge obtained externally, in the period under review, a high degree of importance was given by Hospitals A and E, and in turn, Hospital D gave it moderate importance.

Technological innovation
With regard to technological innovation, all the hospitals in this study have very similar views. Thus, we obtained evidence that technological innovation is seen as a way to improve the performance of hospitals. An increase in

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productivity is widely regarded as the factor most influenced by technological innovation. However, at Hospitals A, C and E, improving the quality and image of the hospitals were also mentioned as other results influenced by technological innovation.

It should be noted that the priorities of all the hospitals in technological innovation are connected with the automation of hospital management, specifically the use of databases to store customer information. However, they faced financial difficulties with regard to investments in information technology, the reasons for this relating to budgetary and executive constraints.

With regard to the level of qualification of staff, although Hospitals B and C consider that their staff is sufficiently qualified to implement information technologies, Hospitals A, D and E are of a different opinion, with respondents stating that the level of qualifications is not always sufficient for this to be achieved.

Another important aspect concerns monitoring of the external environment, which is undertaken by all the hospitals in order to keep abreast of new technologies and that which is acquired by rival hospitals.

This monitoring is done in different ways by different hospitals. Hospital A does so by participating in Trade Shows/Conferences/Events/etc., participating in innovation networks and in meetings with representatives of the sector. Hospital B undertakes this monitoring on an individual basis via the Information Systems Division. Hospital C does so by participating in Trade Shows/Conferences/Events/etc., participating in innovation networks, in meetings with representatives of the sector and in Industry Committees. Hospital D does so by participating in Trade Shows/Conferences/Events/etc., by monitoring IT staff and in meetings with representatives of the sector. Lastly, Hospital E undertakes this monitoring by monitoring IT staff, in meetings with representatives of the sector and participating in Industry Committees.

It should be noted that there are some differences between hospitals in terms of the elements of the external environment monitored.

However, for all of them it is important to monitor customer satisfaction. For Hospitals B, D and E, it also is important to monitor technologies of interest in the external environment. Hospital D was the only one that mentioned that it also monitors the performance of the competition.

With regard to investment, we collected evidence that, over the last three years, all hospitals have invested less than 1% of their turnover in technological innovation (with the exception of Hospital D, which did not respond to this question) and, with respect to prospects for the coming year, investment intentions remain below 1% of turnover.

With regard to the areas in which the next investments are expected to be made, the results obtained vary from institution to institution. Hospital A foresees investments in the field of Telemedicine and information systems aimed at social assistance. Hospital B expects to invest in the field of Management, Enterprise Resource Planning (ERP), Customer Relationship Management (CRM) and Telemedicine, particularly in improving technological infrastructure (networks). Hospital C plans to invest in the area of Operations. Hospital D, on the other hand, foresees investments in the area of Administration. Finally, Hospital E foresees investments in the areas of Administration, Operations (particularly in electronic health records, with the clear intention to computerise data entry), CRM and Telemedicine.

There were two main obstacles to the introduction of technological innovation mentioned by the hospitals. Hospitals A, C and D mentioned a lack of funds, while Hospitals B and E put forward other reasons, without specifically detailing any of them.

When asked about knowledge of lines of credit or government incentives for investment in technological innovation, only Hospital A responded that it was unaware of the existence of sources of funding. The remaining hospitals are unaware of the existence of such financing mechanisms, and indicated some examples of programmes they have used in the past, such as: QREN, SAMA (FEDER) and SAÚDE 21.

As for quality certification systems, only Hospital D has no quality system. All the others are fully certified. Hospital A has been certified since 2005, Hospital B since 2006, Hospital C since 2004 and Hospital E since 2006. All stated that they use a quality management methodology, with Hospital C mentioning the Kanban methodology. The rest did not specify any particular methodology.

With regard to cooperation for innovation in the period under review, the importance of introducing technological innovations to the hospitals was unanimously regarded as high. In terms of the involvement of the hospitals in cooperative arrangements, only Hospitals A, C and E responded they were involved.

Hospital Competitiveness & Cooperation for Strategic Advantage

Cooperation is the action resulting from the interaction of two or more people with common goals, to carry out a task, process or project. With technological development, more and better tools have come into existence that enable the creation of environments that foster cooperation, and therefore employee productivity.

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At this point of the questionnaire, four questions were asked, the answers to which were multiple choice. The first point of note is that no information was forthcoming from Hospital C. Question one asked respondents about which factors drove hospital cooperation. Hospital A did not choose any option, preferring to indicate as the important item "convincing users" for cooperation in hospitals. As with the previous Hospital, Hospital B also indicated a different item from those proposed, this item being "sharing information" and "interoperability". Hospital D considers the most important item to be the need to reduce costs. Hospital E considered the most important items to be ICTs, the need to reduce costs, increases in competitiveness and the existence of a trend towards cooperation.

The second question addressed the main challenge that hospitals will face in the twenty-first century. Hospital A indicated Corporate Governance as the main challenge. On the other hand, the remaining three Hospitals, B, D and E, indicated the efficiency of hospital processes and procedures. Hospital E also indicated competition.

Thereafter, the alignment of the projects developed by the hospitals with their strategy was questioned. Different responses were received. At Hospital A, the answer received was that projects are not always aligned with strategic planning. At Hospitals B and E, the answer received was that projects are always aligned with the strategy. Finally, Hospital D answered "don't know".

In the last question of this section of the questionnaire, respondents were asked what would need to be done to increase the competitiveness of the hospital. The answers were quite diverse. At Hospital A, it would be necessary to reduce the periods required to launch new products and services, streamline and make more flexible processes to manage change, use benchmarking and increase the availability of financial resources for the core business. Hospital B indicated the need to reduce costs with servers. Hospital D stated that the cost of applications and IT contracts should be reduced, benchmarking should be used and IT resources should be centrally managed. Finally, Hospital E indicated that the following measures would be necessary: reduce the cost of servers, reduce the cost of applications, reduce the cost of IT contracts, reduce the cost of data storage, reduce losses due to idleness, streamline and make more flexible processes to manage change, use benchmarking, increase the availability of financial resources for the core business, manage IT resources centrally, reduce the risk of investment in new businesses and increase the speed of return on investment.

E-Commerce

With regard to e-commerce have received a response from four of the five hospitals surveyed. Of these four, only Hospitals D and E make purchases via the Internet. No hospital has a product or services sales catalogue, as this is not the means they use to reach their customers. Given that they are public services, they do not need to use this channel to reach their customers.

Total purchases made over the Internet was very small, less than 10%, i.e. not representative of total purchases made.

Regarding the expected benefits of making purchases via the Internet, questions were asked regarding the following: cost savings, increasing access to and knowledge of suppliers, increasing speed of business processes. Although it does not use, for now, e-commerce in its purchasing process, Hospital A answered these questions: it considered increasing the speed of business processes to be very important, while considering of little importance gaining greater access to and knowledge of suppliers, and of no importance cost savings. Hospital D considered cost savings and greater access to and knowledge of suppliers to be the key benefits expected, and also considered very important the increased speed of business processes. Finally, Hospital E considered cost savings and greater access to and knowledge of suppliers to be the most important, and the increased speed of business processes to be of no importance.

Then, due to the fact that they make purchases via the Internet, we asked Hospitals D and E about the results obtained from this practice. Thus, Hospital D indicated that it achieved good results on the three fronts mentioned above. Hospital E considered that it fully achieved its objectives in relation to cost savings, it achieved good results in relation to greater access to and knowledge of suppliers, and achieved modest results in relation to increasing the speed of business processes.

Telemedicine

Only two of the five hospitals implement telemedicine. These are Hospitals A and E. However, it is not fully implemented, and much less fully comprehensive. The hospitals use this form of medicine only in specific and particular situations. Hospital A uses it for the specialties of Dermatology and Imaging, in diagnosis and in emergency situations. For this, they have specific software, a videoconferencing room and a document camera. Hospital E uses telemedicine for diagnosis and acquired a system for that purpose. No information was forthcoming regarding the specialties that use telemedicine.

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Customer relations

Under this section of the questionnaire we received answers from only three Hospitals, A, B and E. The form of relationship used is different in the three hospitals. Hospital A prioritises remote support via phone. Hospital B has a call centre, and lastly, Hospital E uses a CRM system, technical support, remote telephone support and regular customer visits. As for customer satisfaction, the three hospitals assess and treat customer satisfaction systematically. With regard to security incidents, these are also dealt with systematically by all hospitals. Regarding the last question asked about relations with the customer, all the hospitals believe the quality of customer service is adequate.

5. CONCLUSIONS

This study presents the results obtained from interviews conducted, as well as all additional information collected for each of the five public hospitals in Greater Porto studied and aimed to present evidence that the information systems and technologies are instruments that enhance the performance of hospital authorities.

This study took place under the auspices of the Gesiti/Hospital international research project "Evaluation of Management Information Systems and Technologies in Hospitals", coordinated by the Renato Archer Information Technology Centre (ITC), located in Campinas/SP, a unit of the Brazilian Ministry of Science, Technology and Innovation. For this purpose seven areas for the prospective questionnaire of the project were selected, including Strategic Management, Research and Development, Technological Innovation, Hospital Competitiveness & Cooperation for Strategic Advantage, E-commerce, Telemedicine and Customer Relations.

In the section on strategic management, we were able to gauge the alignment of all hospitals with their mission, which is closely related to service and the concerns of their customers. The evidence collected showed, too, that all hospitals have a strategic plan, which is revised periodically, and demonstrated that the degree of involvement of human resources at each hospital in the design and review of the strategic plan is not the same at all hospitals. Another important aspect in terms of differences between the hospitals is communication of the strategic plan to the entire structure of the organisation, whereby only two entities stated that the entire structure was aware of the strategic plan.

With regard to research and development, we obtained evidence from three of the five hospitals studied, and only one hospital continuously undertakes such activities. It is perhaps no coincidence that it is a university hospital, while in the other two cases these activities are undertaken on an occasional basis. None of the respondents considered R&D activities undertaken internally to be of great importance, although in two cases knowledge obtained externally was considered of high importance.

With regard to technological innovation, we concluded that all those interviewed agreed that technological innovation contributes towards improving the performance of hospitals. Increased productivity, improved quality of services and care and enhancement of the hospital's image were considered topics directly influenced by technological innovation. In this regard, automation of the management of hospitals, specifically the use of databases to store customer information, was mentioned as a priority. However, budgetary constraints on investment in technological innovation were found. During the period under review, hospitals invested less than 1% of their turnover in this area, although some investment in the areas identified is expected in the short term.

In the next part of the questionnaire, hospital competitiveness & cooperation for strategic advantage, based on the results obtained, it was concluded that there are several factors driving hospital cooperation. Not only the development of ICTs was mentioned as a determining factor, but also the need to reduce costs and the need to convince users to cooperate, to share information. Also, increasing competitiveness was mentioned as a factor driving cooperation. Regarding the main challenge facing hospitals in the twenty-first century, and given the results obtained, we conclude that the efficiency of hospital processes and procedures is the main challenge. Although it was mentioned by one of the hospitals, competition was not considered as a very significant challenge, perhaps because, as the entities studied belong to the public sector, this problem is not so pressing.

It was also concluded that, at present, e-commerce is not a significant business process for the entities studied. Only two of the five hospitals studied make purchases via the Internet, and total purchases made by means of this channel is in each case less than 10% of the total. There is also no sales catalogue for products and/or services available online, since the fact that they belong to the public sector does require them to use this channel to reach their customers.

Telemedicine is used very occasionally and limited to specific situations and, in the specific case of this study, at only two of the five hospitals studied.

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On the other hand, in terms of customer relations, at the three hospitals where evidence could be collected, there was concern regarding the complaints and suggestions made by their customers, which are duly processed.
Thus, given the results obtained in this study, it was concluded that information systems and technology have been a mechanism for driving improvements in the productivity and performance of the hospital authorities. Combined with technological innovation, results were found that may be translated into strategic advantages, including cost savings and the efficiency of hospital processes and procedures.
The premises of new public management were also highlighted in the results obtained in this study, since these public sector organisations have adopted private sector management practices, among which we may highlight the existence of strategic plans and their periodic review and, consequently, control of the targets met. Although competition is not one of the key challenges facing these hospitals, benchmarking was another private sector practice used occasionally. However, it was not possible to ascertain whether this was adopted in order to improve performance itself, or just to converge with the existing average. These results show that managers have a sense of responsibility and the existence of clear and measurable performance measures also promotes the professionalism thereof.

Future lines of research

As a suggestion for future research, we propose a deeper analysis of some of the topics developed in this study, particularly issues related to strategy, by conducting interviews with a wider range of professionals at each hospital. By doing so, we would be able to ascertain to what extent the professionals are aligned with the organisation's strategy.
Another possibility for future research relates to replication of the questionnaire in more hospitals, particularly in private sector organisations. In these cases, in which the goal of the organisations is to make a profit, we believe it would be possible to find other evidence that could enrich the issues studied here. The possibility also exists of replicating the questionnaire at hospitals in other regions of our country, or in other countries, which seems a good prospect for future research.

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