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Healthcare Firms and the ERP Systems

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Abstract

With the continuous and drastic changes due to the economic crisis, along with the increasing market demands, major reforms are initiated in the healthcare sector in order to improve the quality of healthcare and operational efficiency, while reducing costs and optimizing back-end operations. ERP systems have been the basic technological infrastructure to many sectors as well as healthcare. The main objective of this study is to discuss how the adoption of ERP systems in healthcare organizations improves their functionality, simplifies their business processes, assure the quality of care services and helps their management accounting and controlling. This study presents also the stages required for the implementation of ERP system in healthcare organizations. This study utilizes a literature review in order to reach the research conclusions. Specifically, through related case studies and research, it examines how ERP systems are used to evaluate the better functionality of the healthcare organizations, addressing in parallel important problems, and possible malfunctions. The implementation of ERP systems in healthcare organizations promises to evolve and align strictly to the organizations' corporate objectives and high-levels of healthcare quality. In order to accomplish this goal, the right decisions should be made by the managers of the healthcare organization regarding the choice of the appropriate ERP system following its installation and its application. Limited research exists on the significance ERP systems implementation in healthcare organizations, while possible dysfunctions and challenges during its installation and implementation are recorded. Therefore, new evidence in the significance of ERP systems in healthcare organization is provided.

Keywords: Changing Environment, ERP Systems, Healthcare, Medical Informatics

1. Introduction

Nowadays, business requirements have been increased, handling methods of economic problems are not sufficient and the volume of information is growing rapidly. Therefore, a ready-made software suite that would actually provide encoding and processing all the useful business information will provide a possible solution.

In recent years, because of continuous changes in the global market, the need for adoption of a system of organizing, improving and integrating all the business processes is imperative, thus the main purpose of the development of Enterprise Resource Planning (ERP) systems. ERP system integrates and automates all the business operations aspects. The basic functions of an ERP system is planning and programming of the enterprise resources, manufacturing and sales. The most recent ERP systems incorporate processes such as marketing, inventory control, tracking orders, customer service, asset management, human resources management etc. [1]

Especially in the field of health services, the implementation of ERP systems by health care organizations is vital, because the information transferring, by the information systems, are critical medical data which are necessary for the correct diagnosis and for a better patient care. So the necessity of in-time and reliable information is extremely high in health environment in contrast to other businesses where the loss can only be measured with monetary terms, the loss in this field is measured in terms of human lives.

This study discusses, among other things, the importance of the right decision, by the management of a healthcare unit, regarding the choice of the appropriate ERP system, followed by its installation and implementation. The implementation process of an ERP system in healthcare is also presented in order to support what was said previously.

2. Enterprise Resource Planning (ERP) Systems

The Enterprise Resource Planning systems are information systems that integrate the functions of a business or an organization. This integration is implemented by the connectivity of all procedures of the various departments of the company, while those are to satisfy the business goals. Basically, the organization and integration of business processes is reformed in a "system" context, which results to the fact that the required information (revenues, expenses, materials, etc.) are transferred within the company accurately and at the right time.

We could think about ERP systems as a ready-made software suite that is created from the beginning for each company. In the name of globalization, what would be better than an organized and identical operation of all businesses? Easily someone realizes that most business processes are

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almost identical and therefore can easily be codified and reflected in an ERP system.

Modern ERP systems are integrated IT systems [2], associated with operational application– subsystems (modules), which replace the separate autonomous software units which had been developed previously in order to monitor the core business processes (accounting, sales, sales management, inventory and warehouse management, manufacturing, etc.). Thus, users can fully utilize all the available business resources, as well as the organized and efficient handling of procedures, performed in every modern enterprise with the best and the most effective way. The basic ERP subsystems are presented in the diagram below.

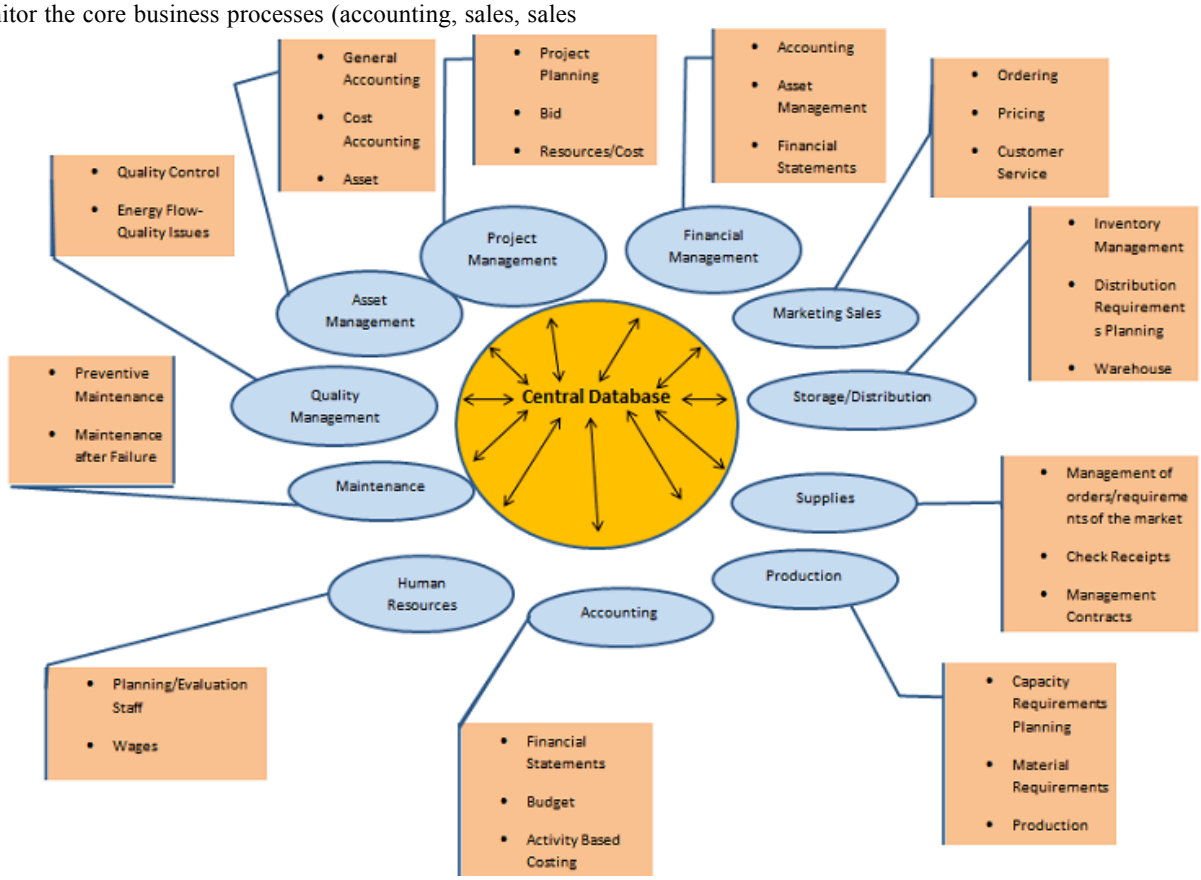

Fig 1: ERP subsystems [3]

3. ERP systems in healthcare

Although ERP systems are set up to help firms to achieve their business goals, it is equally necessary in the health sector too, even though the natural diverse of their business expectations. The rapid changes occurring in healthcare, are leading the relevant organizations to be unable to respond to current market needs, since they face serious management problems, which were created mainly from: the huge amount of information generated daily, the increased costs of supplies, the failure of patient census, the medical payments, the lack of specialized staff etc [4]. These issues are the main motivations that lead healthcare organizations to search and adopt advanced information systems, such ERP systems, to solve their problems and reach an effective daily operation. It is observed that even in cases where the organizations do not face significant problems, they adopt ERP solutions in order to achieve better management and administration.

Since 80s, it was already started the implementation of IT systems in hospitals and medical care businesses. However, the advent of ERP systems in the health sector made the difference to these institutions by offering a new, more utilitarian and functional environment, allowing to them to automate their individual operating procedures [5]. The motivations that lead health organizations to adopt an ERP solution are various. In that context, [6] in the following table classified the results into six motivation categories: technology, administration, strategic management, clinical service, clinical strategy and financial strategy. With the term "motivation" the researchers actually define the primary causes which led health organizations to the adoption and operation of an ERP system.

Table 1. Motivation categories (with the number of cases)

Rank	Technological performance	Managerial - operational	Clinical - operational	Managerial - strategic	Clinical - strategic	Financial performance
1	Search for IT integration (51)	Improve effectiveness of administrative processes (88)	Improve effectiveness and efficiency of patient care (44)	Improve administrative performance management capabilities (30)	Strengthen clinical strategic positioning (8)	Monitor cost trends (40)
2	Improve IT infrastructure capabilities (44)	Improve administrative data availability and accessibility (29)	Improve effectiveness of clinical processes (29)	Enhance compliance with laws and regulations (30)	Transform care delivery and respond to changing needs (5)	Increase profitability or return on investment (17)
3	Modernize IT systems (43)	Improve HR management performance (39)	Facilitate access to clinical information (21)	Support organizational growth and expansion (26)	Improve clinical performance management capabilities (4)	Improve financial transparency (5)
4	Improve IT productivity (20)	Improve administrative data accuracy and relevance (15)	Improve patient safety (21)	Facilitate connectivity with majors stakeholders (19)	Implement a patient safety culture (3)	Monitor asset value (1)
5	Build a knowledge management infrastructure (2)	Search for business process integration (14)	Enhance the preservation of patients' privacy (16)	Improve decision-making processes (14)		

Improving the efficiency of administrative operations is the major reason for ERP system adoption by a health organization. ERP systems seem to be an effective management tool for health organizations, while

organizations seem to be very interested about integration and improvement of their Information-Technology (IT) systems. Another significant outcome of the research is that improving patient care is a significant reason for obtaining an ERP system, indicating that organizations understand the human side beyond the economic.

Disadvantages – Possible dysfunctions

The process of establishing an ERP system, as we will see below, is a rather time consuming process.

Also, it should be understood that the automation of business processes cannot become more than 30-50% [7] and these systems are recording accounting and not medical data [8]. Quite apart from this, there are still three major disadvantages relating to the adoption of ERP solutions.

- Big cost: Undoubtedly the total cost of an ERP system is high because in addition to the costs of buying software and licenses, installation costs, management costs, cost of possible expansion and other costs, there are extra costs which are often not foreseen by prospective buyers. These extra costs are the training cost of users, the cost for further configuration and the costs of acquiring consultants. However, it is noteworthy that many managers do not face the adoption of an ERP solution as a very high cost, but as a competitive advantage and as an important opportunity for reorganization and effective management of their organization.
- Also, some firms, which are unable to afford the purchase cost, operation and support of a commercial ERP system should consider the adoption of an open source ERP system, which is about to have significantly lower costs [9]. There are many suppliers of these systems such as OpenBravo, Opentaps, Compiere, OpenERP, TinyERP etc. Apart from the low cost, there are other advantages of an open source ERP system such as functionality, high adaptability and flexibility, usability, reengineering of business process, best adaptation to current business processes, support by the systems' provider and the global community of users [10].
- On the other hand, the adoption of open-source ERP solutions is accompanied by some significant drawbacks such as continuous upgrading of systems, because the newer versions are free and correct system bugs all the time. This process is negative because users are usually familiar with the previous version and in general you should be not obliged to upgrade if you are satisfied with the existing version. This process is time consuming and requires skilled personnel for its integration. In case of commercial ERP systems, the update process is usually made by expert consultants from the company-supplier in predefined periods and is usually accompanied by the related user training [11].
- The failure of familiarizing users with ERP systems: It is reasonable the situation that users who use specific accounting packages for a long period to have developed a significant familiarity with them. So, when it is decided to replace them by modern software packages, there is always the problem of non-acceptance of the new operating environment by users. To avoid this type of problems, the most important solution is the proper education of users accompanied by the good mood from their side. At the same time, managers, during their planning, should realize and understand that adopting a new ERP system takes time for its users to become familiar with it.
- Problems of integration with other systems: Despite the global establishment of ERP systems, large and smaller organizations have not abandoned using their previous IT systems [7]. Therefore, it is necessary to connect the ERP systems with the preinstalled software products and packages. This process is not easy at all because these packages have information concerning relevant clinics, warehouses, workshops, etc. Examples of this type of subsystems are the management of patients, management of outpatient appointments, medical management, nursing management, archiving and communication of medical images and the management of microbiological and laboratory tests.

The most important of these software packages is the patients' management subsystem. Its purpose is to monitor and manage the patient from the time of admittance until the time of discharge. The main functions is to record demographic and insurance information of patients, the statistical analysis of patients data, monitoring random and routine admittance of patients, the management of emergencies admitted to hospitals, monitoring the tickets, issuing the discharges and any kind of certificates (for pension funds, certificates of admittance etc.), observing the hospital occupancy (per bed/ floor/ clinic, etc.). The main data which are managed by these subsystems are the patient historic records (Computer Based Patient Record System) and the electronic medical record (Electronic Health Record).

However, the attempt for systems integration leads more often to a reorganization of business processes and organizational changes [12]. The reorganization results to further cost increases and in some cases even to the failure to implement an ERP system. This reorganization observed in many cases, but especially in hospitals [13].

- Failure to comply with medical confidentiality: The information managed by ERP systems in health sector are often sensitive personal medical data, which are protected by domestic and European legislation. The protection of medical confidentiality begins in the depths of antiquity with the Hippocratic oath and through our history various declarations and ethical rules have followed such as the Declaration of Geneva (1948), the Code of Ethics of the American Medical Association (American Medical Association) and the Principles of European Medical Ethics (1987) [14].

In Greece, the protection of medical confidentiality is protected by [14, 15]

- The law 2071/1992 "Modernization and organization of the health system", Article 47, paragraph 6 stating that "The patient has the right, at the possible measure and actual conditions, to protect his privacy. Confidentiality of information and the content of the documents related to him, the medical notes file and findings, must be guaranteed".
- The law 2472/1997 "Peoples' protection during processing of their personal data".
- The revised Syntagma (2001) where Article 9A, states that "everyone is entitled to protection from the collection, processing and use, especially by electronic

means, of personal data as required by law. The protection of personal data is ensured by an independent authority, established and functioning, as required by law. "

- The law 3418/2005 Article 13, paragraph 1 "Code of Medical Ethics".

Despite the relevant laws, in our country there have been observed serious deficiencies to keep personal patient data confidential. These problems are mainly due to the failure to properly organize the procedures and the incomplete training of users.

Internal audit, Costing and Pricing

ERP systems help to reduce operating costs, which is achieved through the costing process. Costing process is the key point for pricing. But an important condition for the successful completion of both processes is the existence of internal control. The bad situation of recent years in Greece, especially in the public health facilities, with operational and administrative problems and lack of effective control, is demonstrating the need to reorganize the national health care system. To achieve this goal, it is not enough a well-designed planning and replacement of the existing complex management model, but it requires a modern system of internal control which will contribute decisively to the consolidation of healthcare system [16].

The advantages that would bring the implementation of internal control units in the national health system are varied. The most important of them are the splitting of responsibilities and duties among the units, the establishment of operational rules and behaviors to the staff, a proper management of financial resources, which will therefore contribute to the achievement of operational goals. Efficient pricing leads to logical planning, which in turn helps the management to make the right decisions giving the possibility, through proper pricing, of cost reduction. Because no one wants to negotiate the precious "gift" called health, the reduction of cost should not have a negative impact on quality of provided services by health organizations. Health organizations should follow specific strategies that give the minimum total cost while providing the better quality of health services.

The costing process supported by an ERP system includes the costing of an incident, costing of an emergency incident, costing by department (cardiology, pediatric etc.), measurement of the profitability by incident/department/doctor, measurement lateral revenue, cost accounting analysis to laboratories - the most profitable option etc.

Connecting and harmonization of ERP systems

As was expected, most ERP systems tend to integrate-harmonize the information systems of their healthcare units. This integration is not only internal where an information system such as an ERP system transfer the information from one section to another easier and faster, but also between different health units at national and international level.

Connection and integration problems are primarily due to the extremely large volume of data generated daily in hospitals [18]. A complete integration is not easy to be done because of the complex business environment where the firms operate today [12]. Since most health organizations operate like businesses, the same applies to them.

The health care environment consists of several suppliers such as providers, pharmaceutical firms etc., who interact on a daily basis. This situation is leading to a need for online communication between their information systems - EPR systems among health organizations and these partners [12]. Through this connection of ERP systems, the interaction between them and with everyone who have transactions with those agencies will be simpler and faster. The internet allows to ERP systems to operate with portable devices such mobile phones or tablets, providing information to users in real and at any time.

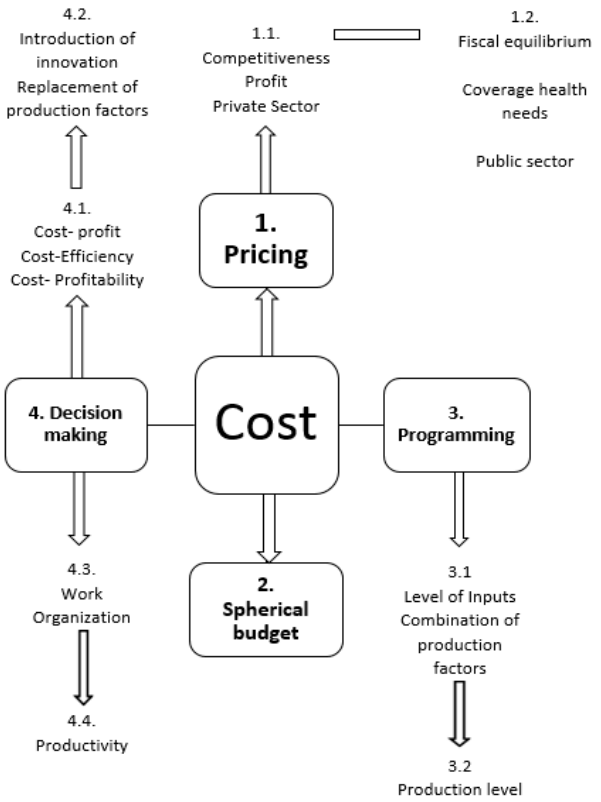

Fig. 2. Costing process [17]

4. The adoption process of ERP systems in health care

Factors which affect the implementation

The adoption process of ERP systems is not standard, due to the fact that the implementation is affected by many factors. These factors can be separated into two categories, which are: (a) national-environmental factors and (b) organizational-internal factors [19].

The first category of factors (**national-environmental**) includes, the following five factors:

i) Economy and economic growth
ii) Infrastructure (both basic and IT infrastructure)
iii) Manufacturing strengths
iv) Government regulations and
v) Regional environment.

Instead, the second one (**organizational-internal**) includes the following five factors:

i) Business size
ii) IT maturity (of the organization)
iii) Computer culture (of the organization)
iv) Business Process Reengineering (BPR) experience
v) Management commitment.

Consequently, there could not be a standard ERP

implementation process and each case should be considered as unique. However, we are going to present the main steps that should be included in any case of an implementation of an ERP system in healthcare organizations, in order to be effective.

Pre- implementation

Prior to the healthcare organization's adoption of an ERP system, it would be useful to make a research to its customers and its staff about the quality of health services provided in order to determine a) the degree of satisfaction of its customers and b) any problems or malfunctions that the staff could also consider [20]. Since the managers determine what areas need improvement, a team, which should be composed of people from different sectors of the organization, should recognize the major problems which the implementation of the ERP is going to eliminate or even reduce. This procedure requires special attention as it should be studied in detail whether it is possible to apply solutions to these problems. For instance, if they don't pay special attention it may cause glitches, such as the lack of necessary financial resources, skilled personnel, or even technical equipment.

The top management has the pivotal role in ERP success [21] and surely no management would like to be accused of a system implementation that does not benefit the organization. Therefore, based on preliminary work, managers must decide how to implement the system in any part of the organization, step by step so that the implementation would be about to have the best possible results.

So when managers decide whether to implement an ERP system and which ERP solution suits to their problems and malfunctions, before the approval of the budget by the Board, they should be presented with a project plan which should convince any interested person for such a large investment. In this plan, the goals of the project should be recorded clearly. These goals, of course, should be feasible and a clear scope should exist in which these goals are analyzed in terms of when and how the business is going to achieve the desired goals. In order to accomplish this, it is important to translate correct the business needs into appropriate system parameter settings [22].

Another significant point is that the steering committee of the project should be staffed by suitable persons who will be able to cooperate properly with both the Board and the project team. Furthermore, the decision on which ERP solution to choose must be obtained in relation to costs, the potential adaptability, usability, accuracy, efficiency and safety and the potential support provided by the supplier after the implementation.

In addition, it is essential to choose right the consultants, cause their offer during and after the configuration of the ERP system directly influences the effectiveness of the implemented ERP [23]. Therefore, the decision on the selection of consultants should be depended on the environment of the company. Finally, it is extremely important to begin the training staff in the early stages of implementation, in order to realize the spirit of ERP systems [24].

Preparing for implementation

After selection, by the responsible group, of the appropriate ERP system a proper planning should be produced for the project. It is very important the implementation process to comply with the time schedule in order to achieve the goals which are set. Failure to plan is the most common reason for failure of the project [25], thus it is absolutely clear how important is it's fully compliance.

The responsible group should select an "implementation team" made up by skilled, experienced and competent persons from all sectors which the implementation of the ERP system affects [26]. This group will take over the project, ensuring the appropriate hardware, and the maintaining the interest of employees in order to keep them advocates in this attempt because their behavior is crucial for a successful implementation [27].

During the implementation

Once the project is launched, it is vital to monitor the program implementation, the compliance with the time plan and the quality control at every stage. The time factor is the most crucial, because any deviations will affect the budget and will lead to the failure of the implementation.

Also, the collecting data process is a very difficult part of the project. For this reason, the collection should be done by experienced users using the appropriate data collection patterns. It is necessary, during the project, the constant monitoring of the accuracy and reliability of data. They should also, inform the management of the organization at a regular basis, protecting the project from hate-filled people [28].

In addition, there must be a support team to guide the final users and help them to deal with any problems. This procedure would be useful to be made in three levels. Firstly, there should be a contact of the final user with a more experienced user and if this does not help the final user should contact a skilled user. If the trouble still exists, the final user should contact a specialist which may be a consultant either form the ERP supplier or the organization itself.

Post- implementation

After the completion of the installation of the ERP system, at the functional phase the employees and the final users should adapt to the new realities. The support provided by the providers of the ERP system is necessary after the implementation. This support is usually a big expense for any organization and something that most managers either are unaware of or fail to realize earlier.

5. Conclusion

The significance of ERP systems adoption by the enterprises is high, but in the case of health organizations is more important because the information managed to them, is related to human lives. Therefore, the need of adopting an ERP system is imperative and the implementation process should be done carefully since any deviations from the planning can have disastrous effects for the organization.

The critical points in adoption of ERP systems by a health organization is the selection of the appropriate ERP system, the right preparation, the maintenance of project schedule and the proper staff training. The result of any deviations or dysfunctions, range from a slight increase at cost until the total failure of the implementation.

On the other hand, the right adoption increases the productivity significantly. Since most operating costs of health care are considerably reduced, these funds can be reallocated to other significant needs such as hiring new nursing and medical staff. The medical information will be transmitted faster and reliably and the doctors are able to

watch on a computer screen all the medical examinations and the patient information. In addition, the supplies' department will be able to know at any time the warehouse stocks in medical supplies or equipment in order to forward their orders without delays, thus the shortages will be minimized.

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