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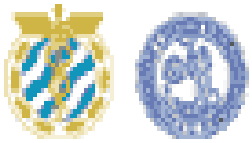

School of Economics and Commercial Law
GOTEBORG UNIVERSITY

Management control system and ERPs in Italian healthcare organizations

Luca Del Bene – Attilio Mucelli – Francesca Spigarelli[1]
Faculty of Economics Giorgio Fua' – Department of Management and Industrial Organization
Piazzale Martelli, 8 60121 ANCONA, ITALY - Phone: 0039.071.2207197 - Fax : 0039.071.2207199
www.econ.univpm.it/mucelli - Email: mucelli@econ.univpm.it

Abstract

The paper analyses the impact that Enterprise Resource Planning (ERP) systems have on the development of management control systems, in Italian healthcare organizations. Some recent studies demonstrate that ERP systems are having a relatively limited influence on management control systems, in industrial enterprises (Fahy and Lynch, 1999; Maccarone, 2000; Granlund and Malmi, 2002), despite the initial euphoria for them (Davenport, 1998; Mucelli, 2000). The evidences are not so clear, at the moment.
The starting point of the analysis is the result of a previous research project, carried out in 2002 (Mucelli and Spigarelli, 2003). Through an empirical study (on the universe of Italian healthcare organizations), 82 organizations were examined (answered to our questionnaire). We were able to verify the diffusion of ERP systems as well as the level of satisfaction of their managers on the quality and timeliness of the information produced by their management accounting systems. We found that 16 organizations had implemented an ERP system.
After two years from the first analysis, we want to test the real role that ERP systems have had for the development of management control systems in those 16 organizations. In particular, we focus on the consequences that the implementation of ERP systems have had on information features, as well as on the management decision making process (Poston and Grabski, 2001) and on accountants activities (Grandlund and Malmi, 2002).

[1] This project is the result of a research carried out jointly by the authors. Neverthless, the contents of paragraphs 2, 3 and 4 can be attributed to F. Spigarelli, paragraphs 5 to L. Del Bene and paragraph 6 to A. Mucelli.

As for methodology, the research is mainly based on a questionnaire, directly delivered to the 16 healthcare organizations that had already implemented an ERP two years ago. The questionnaire focuses on the following topics:

- the implementation of an ERP can have some influence on the development of management control systems. ERPs can create opportunities, but even bonds in some cases, for the changes in management control structure and instruments (Granlund and Mouritsen, 2003; Scapens and Jazayeri, 2003);
- the implementation of an ERP can improve the performance of the "measurement system", i.e. its ability to monitor not only financial aspects but also technical (medical) performance of healthcare organizations;
- the impact of an ERP on the organizational structure could be wide, especially in healthcare. ERPs might bring to a higher integration between the administrative and the medical areas, thus increasing the level of participation of all the employees. Moreover, they are supposed to support the management decision process and to improve the planning and control activities (Buccoliero, 1998);
- the design of the ERP system is only a part of the implementation process (Preston et al., 1992). To achieve a successfully implementation, managing change is a crucial issue. Some technical and organizational obstacles may arise and cause the failure of the ERP implementation;
- the adoption of an ERP challenges the definition of the expertise and roles of accountants within organizations, leading to new hybrid positions (Caglio, 2003).

1 - Introduction

The work analyses the impact of Enterprise Resource Planning (ERP) on the development of managerial control systems in Italian public healthcare organizations.

The analysis springs from a previous research project (Mucelli and Spigarelli, 2003) carried out in 2001 and based on an empirical study which allowed us to verify how widespread the ERP system was in the Italian public healthcare context, as well as how satisfied the managers were concerning the quality and the speed of the information produced by the new information system and the consequences on its internal organization. The research showed that 16 healthcare organizations of the 82 which responded at that time had already adopted the ERP.

Two years after the first analysis, we felt it would be interesting to closely examine the role that the ERP system had had in the development process of the control system in these 16 healthcare organizations. In particular, we focused on the consequences that this implementation has led to on the characteristics of the information produced (Chenhall and Morris, 1986) on the decisional processes at managerial level (Poston and Grabski, 2001), on the accounting activities (Grandlund and Malmi, 2002), as well as on the organizational setup of the healthcare organization. Also in this case the analysis was based on the collection of data through a questionnaire.

In the following paragraphs a system of hypotheses is outlined which we have tried to test through analysis, taking into consideration the theoretical framework of reference relative to the most recent studies on ERP, control systems, and organization of the healthcare organization. We also illustrate the methodology of the analysis adopted, the composition of the sample investigated and the procedure for conducting the research. We will then discuss the main results obtained. In paragraph 5 we focus on the relation between the ERP and the managerial control systems. In paragraph 6 we concentrate on expected organizational consequences and those which were in fact obtained by the healthcare organizations following the introduction of the ERP. Finally, some conclusions arrived at after our investigation are proposed.

2. The theoretical framework

The research is part of the on-going theoretical debate, concerning the effects of ERP systems on managerial control systems[2]. Some recent studies referred to industrial enterprises show that the introduction of the ERPs has had limited effects on them (Fahy and Lynch, 1999; Maccarone, 2000; Granlund and Malmi, 2002)[3]. However, the empirical evidence and theoretical contributions do not agree with this thesis (Davenport, 1998; Davenport, 2000; Amigoni – Beretta, 1998; Agliati, 1999; Mucelli, 2000). The impact according to some authors is positive and "proactive" while according to others extremely negative.

For the former, the implementation of the ERPs stimulates the controllers to think and generate new structures and control logics, given their potential to collect and elaborate information (for a summary of the features of ERPs, see Box 1). The ERP in fact becomes an enabler of the change (Davenport, 1990; Marchi, 1993; Amigoni and Beretta, 1998). The supporters of this thesis point out that integrated information systems are potentially able to improve the quality and completeness of the performance assessment system. This is absolutely relevant in the case of healthcare organizations, making it possible for the ERP to jointly and systematically monitor the economic and financial aspects both of management and the technical-medical performance (Buccoliero, 1998).

The opposite position is taken by those who point out how the ERP could perhaps contain

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[2] The subject of the research carried out is part of the wider field of studies connected to the impact of ERP systems on the performance and value of the enterprise. For an extensive bibliographic review on this field of studies please refer to McAfee A. (2002), *The impact of enterprise information technology adoption on operational performance: an empirical investigation*, Production and operations management, 1, Spring.

[3] With reference to the manufacturing field, particularly small and medium-sized enterprises, the impact of integrated information systems on the development of control systems is analyzed in Marasca S., Mucelli A., Spigarelli F. (2003), *Development path of cost accounting methodologies and information systems: a cognitive survey among Italian SMEs*, paper discussed at the "6th Manufacturing Accounting Research Conference", held in Twente (Holland).

and limit the development of the control system if the healthcare organization adopts the "standard" setups of the information present in it[4].

In this case the ERP would become a limitation to a real change and to the development of the control system itself (Granlund and Mouritsen, 2003; Scapens and Jazayeri, 2003). In spite of this difference of opinion there is substantial agreement when the theory considers the consequences of the ERPs on the organizational setup of the healthcare organizations.

In general it must be noted that the introduction of an integrated information system is a particularly critical moment in the life of the enterprise and at the same time brings about important organizational innovations, which go from the exploitation of some activities to changes in roles[5] and operating procedures, and to the possibility of strengthening the inter-relationships between third parties (most importantly, clients and suppliers)

This is thanks to the fact that the health care organization is forced to redesign completely its own internal processes (Kraemmergaard and Rose, 2002).

Some researchers even underline that it is the very lack or late adoption of a process driven management logic which explains any unsatisfactory performance by the ERPs (Beretta and Polo, 2002).

With specific reference to healthcare organizations, the ERPs, by favouring re-engineering, could lead to a greater integration both in the medical area and between the medical and the administrative environments (Buccoliero, 1998; Klaus, Rosemann and Gable, 2000). Moreover, exploiting the intrinsic connotations of the ERPs should allow for the setting up of connections between institutions and third parties (e.g. Regional authority, other healthcare organizations, etc.) promoting the creation of inter-enterprise networks. (Mucelli and Spigarelli, 2003).

The theoretical framework emphasises how the strong organizational impact of the ERPs means that the planning phase of the integrated information system is only one part of the whole process which leads to its implementation (Preston et al., 1992).

The management of change therefore becomes an essential element in order to arrive at an

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[4] Davenport points out the limits of many current setups of ERP systems proposed by the most important software houses, drawing the managers' attention to the risks of strictly respecting them. "[…] some ES (enterprise systems) vendors (SAP most aggressively) are developing their own visions of what a management cockpit might look like, with screen-covered walls featuring complex graphical displays. However, this approach to management behaviour has risks, and I do not mean just the misconfiguration of the system. If managers never step out of their cockpits and never take their eyes off their screens, they may miss important aspects of what is going on in their organizations". Refer to Davenport T.H. (2000), *The Future of Enterprise System-Enabled Organizations*, Information Systems Frontiers, 2 [2].

[5] The overall redesigning of the flow of information and its content should bring about a revision of the responsibilities and the role of all those who work within the organizational unit in charge of information and finance systems and of the controller in particular (Caglio, 2003)

efficient introduction of the ERP: any organizational obstacles which should arise could even be the cause of its failure (Ravagnani, 2000)[6].

On this subject it is interesting to consider the risks, mainly of an organizational-cultural origin, which could arise in the healthcare organization and hinder the concrete use of the ERP as an aid to management (McAfee, 2003).

As can be seen in Table 1 there are problems connected with inertia or with resistance by human resources, as well as cases of an incorrect use of the ERP or even its non-use, due to a lack of knowledge about the instrument or to it being boycotted by human resources: these are all situations which could cancel the expected benefits of ERP implementation.

Table 1 – The 5 risks in the implementation of ERP systems.

Inertia	Delays or a lack of progress in the implementation process arise even if all those involved agree on the utility and necessity of the initiative.
Resistance	The people involved do not agree about the way of intervening or the necessity of carrying out the implementation.
Wrong set-up	The software is not set up correctly for the needs of the business
Incorrect use	The system is used incorrectly because a limited knowledge of the technology and/or the internal processes.
Non-use	The potential users of the system, because they can choose whether to use it or not, prefer to ignore it so as to avoid their own method of work.

Source: Our adaptation of McAfee A., "When too much IT knowledge is a dangerous thing", in *Sloan Management Review*, Winter, 2003.

Compared with the theoretical positions summarised above, this study aims at verifying the behaviour of the Italian healthcare organizations, by testing two research hypotheses in particular.

The first hypothesis concerns the impact of the ERP on the control system. The expected impact is positive, since the ERP works as an enabler, stimulating change, so as to induce not only improvements in quality/variety/timing of the information available but also new methods and logic for measuring performance. On this subject it is necessary to bear in mind that the reforms made to the health service in the 90s established that a planning and control system should be set up, a condition to which the healthcare organizations have replied generally by setting up traditional control systems, in particular those widely used in industrial enterprises. It is to be expected therefore that the introduction of the ERP has permitted and stimulated an improvement in the type of control system. To test this hypothesis the following aspects have been assessed: the quantitative and qualitative development of the flow of information directed

[5] Among those authors who have dealt with the cause of failure in the implementation of the ERPs the following works are of interest: Scott J.E., Vessey I. (2000), *Implementing Enterprise Resource Planning Systems: The Role of*

towards management; the presence of new dimensions of the economic-financial and physical-technical analyses monitored; the integration of information and economic aspects with medical ones; the increase in reporting activities.

The second hypothesis is connected with the possibility of finding a less than optimum use in the light of ERP implementation. If the adoption of the ERP is not followed up with radical re-thinking of the organizational setup and the logic behind the management of the organization, there is the risk of running into a non-use or an incorrect use of the system.

On the management control level this could lead to an incomplete and not internally coherent monitoring of the performance of the healthcare organization, to the inability to introduce new dimensions of analysis, in the tendency to produce useless information. Similar consequences could be found in the light of a partial adoption of the ERP, limited to some modules, or of an implicit acceptance, without personalisation, of the management control structure (standard) present in the ERP.

To test this hypothesis the following aspects have been assessed: the organizational change undertaken by the healthcare organization in the framework of reorganization by processes; the presence of ERP packages which have been implemented in incomplete versions; the variation/personalization of the module for management control[7].

Box 1. Integrated information systems.

"Integrated information systems (Enterprise Resource Planning – ERP) came about to satisfy the need to manage interdependence which is present in every type of enterprise, to overcome fragmentation and dispersion of information within organisations and to integrate the various applications already used in enterprises. These applications spread so quickly on the market as to become one of the great "events" in the world of information technology at the end of the 20th century.
The main features of these packages are in-built integration and modular structure. In fact the ERP starts out as an integrated system both in its information technology structure and in its planning logic (in-built integration). Moreover the system is articulated in different modules, each covering a specific segment of the application portfolio (modular structure). In this way the enterprise can insert the different modules separately, or can combine them and later substitute them with updated versions so as to guarantee that the information system has a high level of evolution.
The introduction of these information systems is complex and expensive, implementation time is long and the organizational profile of the enterprise may need to be rearranged. For a project of integration of information systems in enterprises using an ERP to be successful it is necessary to understand how it is structured: it does not substitute the entire information system, but is a tool which permits a greater degree of flexibility, a revision of enterprise processes, the setting up of enterprise innovation and organizational learning, and must therefore be accompanied by a radical change in enterprise culture". (Mucelli, 2000, p.XV).

Learning from Failure, Information Systems Frontiers, 2 [2] e Ross J.W. and Vitale M.R. (2000), *The ERP Revolution: Surviving vs. Thriving*, Information Systems Frontiers, 2 [2].

[7] The second hypothesis of our research is therefore a possible explanation of the negation of the former hypothesis put forward.

3. The approach of the empirical analysis

Empirical investigation was carried out between January and February 2004, through a questionnaire which was sent to the 16 healthcare organizations (ASL, AO and IRCCS) which had declared, in a previous study that they had implemented an ERP system. Characteristics of the sample are examined in Box 2. The questionnaire was delivered via e-mail. When required the completion of the questionnaire was backed up with a telephone conversation with the person in charge of the management control organisation department or with the managing director.

The questionnaire was divided into 3 sections. The questions in the first section were drawn up with a view to assessing what targets the enterprise had fixed on introducing the new information system and whether, some years after implementation, these targets had been reached.

The second section gathered information about the modifications which the ERP had generated in the tools and logic used for management control, with a focus on the budget and the calculation of costs.

The third section concerned organizational changes brought about by the introduction of the ERP, with particular reference to those concerning management of processes.

The questionnaire, in this form, was filled out by 11 healthcare organizations – 6 ASL, 4 AO and one IRCCS.

Box 2 – The sample examined

The healthcare organizations, which the investigation was addressed at, are analysed according to 3 different characteristics: geographical location, type of authority, size.
To assess geographical location the country was divided into three areas: North (Valle d'Aosta, Piedmont, Liguria, Lombardy, Trentino Alto Adige, Veneto, Friuli Venezia Giulia); Centre (Emilia Romagna, Tuscany, Umbria, Marche, Lazio, Abruzzo); South (Campania, Molise, Apulia, Basilicata, Calabria, Sicily, Sardinia). On the basis of this division 7 healthcare organizations out of the total sample (16) are situated in the north; 5 (31.3%) are in the centre and 4 (25.0%) are in the south.
When analysed by type of healthcare organization 7 are ASL, equal to 43.8% of the total sample; 6 are AO, equal to 37.5% of the total and 3 are IRCCS, equal to 18.8 % of the total.
As far as size is concerned, analysis of the composition of the sample is based on two fundamental criteria: the personnel employed and the number of beds available, using the most recent dated provided by the Health Ministry. Personnel includes medical staff, professional staff, technical staff, administrative staff, personnel with atypical qualifications and the remaining staff. Healthcare organizations with more than 2,500 employees have been considered as large, those with between 1.000 and 2,500 as medium and those with fewer than 1,000 as small. With reference to number of beds available, those calculated/estimated at the start of the year for normal hospitalisation have been considered, while those in Day Hospital structures have not. Healthcare organizations with more than 300 beds available have been considered as large, those with between 300 and 900 as medium and those with fewer than 300 as small. If the personnel employed is considered we find that more than half the ASL are of medium size (57.1%), followed by large (28.6%) and small. AO are distributed in 1/3 for each size. With reference to number of beds available, we find that the ASL are equally divided between large and medium (with a percentage of 42,9% each) while the small ones have a lower incidence. In the AO on the other hand, half the sample makes up the large category, 33.3% the medium and the remaining 16.7% the small. Finally it is interesting to notice that, whatever criterion is used, the IRCCS are all part of the small sample.

The data concerning the size, in terms of personnel employed and beds available, show that the healthcare organizations analysed are prevalently medium – large in size, except for the IRCCS, classified as small enterprises[8]. More than half the healthcare organizations which replied (55%) are situated in the north, 36% in the south and only 9% in the centre. Fifty percent of the ASL and AO which took part in the study are situated in the north, as is the only IRCCS examined. In the south we find 33.3% of the ASL and 50% of the AO, while 16.7% of the ASL are to be found in the centre.

4. Use of the ERPs by the healthcare organizations: some preliminary results

A first set of interesting information emerging from the empirical investigation concerns some general aspects associated with the implementation of the ERP and some preliminary results obtained through renewing the information system.

First of all, with reference to the year of introduction of the integrated information system into the enterprise, we find that 64% of the healthcare organizations analysed carried out the investment between 1998 and 2000, 27% after 2001 and only 9% before 1997[9]. The data per type of healthcare organization show a greater delay in the AO, with 50% introducing an ERP after 2001.

On the whole of course the healthcare organizations interviewed can be defined as pioneers regarding the use of these tools, which even in industry only started to spread in the second half of the 90s. The degree of homogeneity in terms of number and variety of the ERP modules introduced is also high, considering that only one healthcare organization of those interviewed stated it had only purchased the administrative application[10]. The others had adopted the whole package.

The study also closely examined the targets which the managers had fixed during the introduction of the ERP, and asked them to state whether these targets had been reached after implementation of the system.

Results show that the main aim behind the introduction of the ERP in the healthcare

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[8] When forming the size categories the same criteria as illustrated in Box 2 were used. In particular, using the number of personnel employed as a discriminating variable, 66.7% of the ASL are of medium size while 33.3% are large. 50% of AO are large. On the contrary, using the number of beds available as the discriminating variable we find that 50% of the ASL are large and 50% medium, with 75% of the AO being large.

[9] It refers, in particular, to a health authority where the process of implementation of the ERP system started in 1991, but went on in a gradual way until 2000.

[10] In order not to jeopardize the importance of the results of the investigation, the processes referred to the impact of the ERP system on measurements were realized excluding the responses provided by the healthcare organizations with its partial implementation.

organization was to improve the planning and management control system, which, as mentioned above, was subject to significant legislative changes in the 90s.

All the healthcare organizations that took part in the study stated this aim, and all feel that it was reached following the introduction of the integrated information system. This confirms that there is a close connection between the two organizational operating mechanisms (the information and the control system) and recognises that the integrated information system is able to improve the speed with which information is produced and its intrinsic quality, in this case understood as ease in tracking down information.

Other important targets which were aimed at with the introduction of an ERP system spring from the desire to better integrate the data coming from the medical and the administrative/finance sectors (82%) and to reduce the costs of the CED, by avoiding the production of ad hoc solutions for the interaction of software packages which use different languages (82%). From the results obtained it appears that the healthcare organizations recognise the strategic significance of the ERPs.

The importance of these systems in fact is not only limited to the greater quantity of information that they make available, but also, and above all, involves the possibility of integrating the medical and the economic aspects of organizational management, as well as the possibility of avoiding the use of ad hoc information technology solutions which result in higher costs and greater complexity.

Unavoidable circumstances (the adoption of the Euro and the year 2000) contributed towards the decision to switch to the integrated information system in 64% of the cases examined.

Forty five percent of the healthcare organizations stated that they had chosen to implement an ERP in order to carry out re-engineering of management procedures, following the logic present in the integrated information system. This rather significant figure shows that these healthcare organizations have probably considered the organizational solutions present in the ERP as successful solutions to be imitated when they decided to improve their own procedures. We will come back to this aspect later in this paper.

Lower percentages were found when considering the targets of bringing the information system of the healthcare organization into line with that of the Ente Regione (Regional Authority) (36%), increasing the information system as a result of an increase in size of the healthcare organization itself (36%),and bringing the internal information system into line with that of other healthcare organizations or of suppliers (9%)[11].

[11] In two cases there some objectives were added which were not present in the proposed list: “more transparency and circulation of information, possibility of starting management based on the evidence” and “reducing time and

As for the extent to which the different targets mentioned were met, it should be noted that the healthcare organizations state that they are generally very satisfied. In fact there is full satisfaction in nearly all cases.

This aspect is confirmed by the fact that all those who replied to the questionnaire (100%) felt that the introduction of the ERP had led to a significant improvement in the information available[12]. The empirical results therefore confirm what was underlined in theory, that the implementation of the ERP induces a quality jump in the information system in terms of greater speed, coherence, reliability and variety of the information made available at various organizational levels[13].

Table 2 – Qualitative-quantitative effects on information after the introduction of the ERP

Economic information

Degree of improvement	High		Medium		Low		No answer	
Quality of the information	n.	%	n.	%	n.	%	n.	%
Speed	6	55%	4	36%	0	0%	1	9%
Essential coherence	6	55%	1	9%	3	27%	1	9%
Reliability	6	55%	3	27%	1	9%	1	9%
Variety	6	55%	3	27%	1	9%	1	9%
Other	1	9%	0	0%	0	0%	10	91%

Medical information

Degree of improvement	High		Medium		Low		No answer	
Quality of the information	n.	%	n.	%	n.	%	n.	%
Speed	3	27%	2	18%	5	45%	1	9%
Essential coherence	3	27%	3	27%	4	36%	1	9%
Reliability	3	27%	3	27%	4	36%	1	9%
Variety	4	36%	1	9%	4	36%	2	18%
Other	1	9%	0	0%	0	0%	10	91%

In order to better understand the real significance of the "quality jump" in the flow of information which the healthcare organizations indicated, we assessed those aspects and

costs for the training of the personnel" at highlighting how the objectives connected to the introduction of the integrated information system can be most varied.

[12] In this way, it is affirmed, as already highlighted by the theory and operational experience regarding the capacity of the ERP systems of having a strong impact on the quality and quantity of the available information. "I believe that higher quality of information is a matter of fact; an integrated system by definition guarantees univocity of the information, which is the main element of the quality of information generated. Also in quantitative terms information has increased considerably (…) On the contrary, it is important to highlight that, in spite of a large quantity of information, not always does there exist a real possibility or capacity of its use".
Refer to.Agliati M., Meregalli S., Meloni G. and Songini L. (2000), *L'impatto degli ERP sull'attività Amministrativa. Una promessa mantenuta?*, *Economia & Management*, 1 [19].

characteristic features of the information which the healthcare organizations considered had improved. The results are summarised in Table 2[14].

If we consider economic information, the introduction of the ERP had positive effects on the various features involved, having a minor impact concerning the essential coherence. In fact it must be considered that in 55% of the cases, all the features examined (speed, essential coherence, reliability and variety) have experienced a high level of improvement.

The increase in essential coherence was not significant for 27% of the healthcare organizations.

As far as medical information is concerned we find the opposite results, considering that all the aspects investigated showed a particularly limited improvement.

The healthcare organizations feel that the quality jump is low in 45% of the cases in terms of speed, and in 36% of the cases for essential coherence, reliability and variety.

The result that we find can probably be interpreted in the light of the fact that in many situations the healthcare organizations which implemented an ERP have still not associated this activity with a revision of management philosophy tending towards a logical sequence of processes. (On this subject see the observations in paragraph 6).

The administrative area in many cases appears to be still disconnected from the medical one, and, what is worse, the latter is not perfectly integrated from the information point of view.

The final result therefore is that the potential benefits connected with the use of an ERP are not always evident.

Moreover it must be pointed out that in most cases the questionnaire was filled out by the person in charge of management control or by administration, that is to say by those structures which know less about the real situation concerning the flow of information of a strictly medical kind or which might not fully understand any improvements made compared with the past.

The optimism inspired by the interpretation of the answers to the first questions on the questionnaire must be put back into perspective.

At the least further investigation is needed to understand the real importance of the changes brought about by the implementation of the ERP. Bearing this in mind, below we analyse the

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[13] Refer to De Pietro C. (2002), *L'evoluzione delle funzioni innovative nelle aziende del SSN: i sistemi informativi*, Mecosan, 43 [109].

[14] In the questionnaire one was asked to give a number from 0 to 6, where 0 meant the least improvement and 6 the maximum improvement. In order to make the process clearer, the responses were grouped according to the following criterion: between 0 and 2 improvement is low, between 3 and 4 improvement is medium, between 5 and 6 improvement is high. The percentages were calculated on the total number of responses

results of the study with specific reference to the information-finance and organizational areas of management control, trying to understand the influence of the new information systems on management activities and the real use made of them by management and human resources. The examination of the results is supported by some theoretical considerations, which try to put the variables analysed into the specific context of healthcare organizations.

5. ERP and management control

5.1 Management control in the healthcare organizations

Introduction of management control systems in public healthcare organizations, that had an important boost with the "season of reforms", has very often been characterized by implementation of systems based on a traditional concept of control. We refer to systems which are on a short term basis, which focus on economic-financial variables, which focus primarily on the internal activities of the healthcare organizations, and which are related to the concept of controllability and based on a hierarchical approach (Bergamin Barbato, 1991; Brusa, 2000; Del Bene, 2000). These kinds of systems do not adapt well to the reality of the public healthcare organizations, leading to resistance regarding the standards proposed when comparison with those present in the organization, but above all they are not able to provide real support for the decision-making processes of the personnel.

In fact, the evolution of both theory and routine operational procedures revel the need for significantly different control systems, compared with the past when the main aim was to monitor efficiency. Modern control systems (Brimson, 1994; Norton and Kaplan, 1996; Lorino 1992) in line with the prevailing strategic orientation increasingly improve those aspects related to effectiveness, to quality, to satisfaction of the client, to a transversal vision of the healthcare organizations, to outward orientation, to a multidimensional analysis of management, to emphasis on the strategic sphere. Therefore, they are much more suitable for the reality of the healthcare organizations which, it must be remembered, pay great attention to efficiency[15].

In this context one of the aims of the research was to assess the impact that the introduction of the ERP had had on the management control system. As mentioned earlier, the theory on which the following considerations are based are studies on integrated information systems (Saita 1988, Mark 1993, Amigoni-Beretta 1990) and, in particular, those contributions that take into consideration the relationship that links them to the managerial systems, highlighting the greater

[15] Refer to Ansoff H.I. (1987), I*nnovative organization*, Ipsoa, Milano; Saita M.(1996), *Programming and control*, Giuffrè, Milano; Bergamin Barbato M. (1991), *Programming and control in un'ottica strategica*, Utet, Torino; Donna G. (1997), *Sistemi di controllo direzionale: un riesame critico*, *L'impresa*, 5; Dixon R.J., Nanni A.J. and

or lesser influence as well as the degree of mutual adaptation (Davenport 1990, Amigoni and Beretta 1998, Agliati, 1999, Mucelli 2000, Maccarone 2000, Granlund and Malmi, 2002).

What is interesting to consider is that, as mentioned in the theoretical description, a biunique relationship may be created between the information system and control system. We refer to the fact that ERP could influence the control system modifying its logical setting or, vice versa, we may find that an adaptation of ERP generates from the basic structure of the existing control system. From a logical point of view it is natural to think that the general plan of the control system in terms of orientation, depth, specific importance and integration[16] constitutes a first step (prius) in comparison with the formulation of the structural and dynamic components of the information system. As far as the information demands set by internal and external management are concerned, an information system should be identified which works according to one determined logic and which can be adapted, from the point of view of its configuration, to the needs identified. In reality, it is surprisingly frequent to find cases where an information system is made operative without considering its coherence with the (possible) overall plan of the organizational and financial system of the healthcare organization.

It is therefore opportune to estimate the impact that the ERP has had on the control system, in a positive or negative way, especially when the investment required and the consequent changes are important, as in this case. In this assessment it should also be considered that the adoption of an ERP can be a factor for the development and growth of the control system when its potential for collecting and elaborating information are exploited and methods for developing the function of interpretation of the information directed to the service can be created[17]. Conversely, if an ERP is introduced uncritically in its standard setup, without therefore adapting it to the managerial and organizational peculiarities of the healthcare organizations, there is the risk that it might limit the development of managerial systems.

5.2 *Results of the research*

When commenting on the results of the research it is essential to underline that the introduction of management control in public healthcare organizations is rather recent. The first cases date back to the mid 80s and the legislative references that established that these systems should be set up date back to the 90s. As previously stated, this introduction almost always took place following traditional methods and just as frequently without the support of adequate information

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Vollmann T.E. (1990), *The new performance challenge*. Business One Irwin, New York; Lorino P. (1992), *Il controllo di gestione strategico*, Franco Angeli, Milano.

[16] Refer to Brunetti G. (1979), *Il controllo di gestione in condizioni ambientali perturbate*, Angeli, Milano.

[17] Refer to Mucelli A. (2000)**,** *I sistemi informativi integrati per il controllo dei processi aziendali*, Giappichelli, Torino.

systems, not to mention integrated ones. These information systems, and ERPs in particular, were therefore introduced in the presence of an existing control system which had been planned without considering the possibility of integrating the various information systems, and which was in accordance with a "traditional" logic enforced by the legislator. In this sense, it can be supposed that ERPs have had an impact on the control system itself, at least by increasing its information potential, in terms of variables and visible management dimensions, speed and, finally, of making personnel responsible.

The results of the empirical analysis, with specific reference to the changes brought about by the ERP on the information-finance structure of the control system (those on the organizational structure will be the subject of analysis in paragraph 6), confirm that in the healthcare organizations examined a quantitative development of information available was generated. The ERP, on one hand, has made the process of producing information which is useful for the planning and control system much faster.

On the other hand, it has modified the type of operations to be carried out, changing the operational and organizational activity of the “management control” unit by freeing it from mere operational tasks and allowing it to devote more time to the development of the system.

The ERP has simplified the production of information which is useful for planning processes, for programming and control, obtaining a greater flexibility of the information system and making the cost accounting system relatively easy to use.

On this subject, it is useful to emphasize how most of the healthcare organizations adopted the ERP package in its original setup, while a smaller percentage required personalization of the software. This is indicative of the clear target which the healthcare organization fixed when it implemented the ERP.

Moreover, it is important to remember that when interviewed all the healthcare organizations specified that the introduction of the ERP system was aimed at obtaining a greater amount of information useful for management control and budget procedures and 82% aimed at reducing CED (Data Processing Center) costs.

The same importance was given to the target of integrating data of an economic nature with those of technical- medical type. Later e will come back to this aspect as well as to the degree of availability of the information system to third parties.

From the point of view of the quality of the flow of information it is possible first of all to state that the ERP system potentially offers the possibility to increase the dimensions of analysis through different levels of aggregation and multiplicity of subjects: healthcare profiles, processes, classes of patients, tendency of particular costs.

The introduction of ERP should lead to the improvement of the system for measuring performance[18], allowing for the integration of economic-financial information and physical-technical measurements with numerous perspectives (such as the case of the balanced scorecard) having target parameter which allow for the cross balancing of effectiveness and efficiency in the short and medium-long term[19].

Such a hypothesis is only partially confirmed by the research that shows how the increase in information was prevalently concerned with the measurement of performance of a traditional kind such as the cost of services, the course of elementary costs, the indicators of factorial efficiency. The setting up of measurements of technical-medical performance was less frequent and in any case it was not possible to show a meaningful positive correlation between the introduction of the ERP and the setting up of measurements of this kind of performance. Please refer to Table 3 on this subject.

Table 3 - ERP and measurement of performance[20]

Situation	**Before ERP**		**Current**		**No Answer**	
Economic Measurement	n.	%	n.	%	n.	%
Costs of services offered	1	25%	3	75%	6	60%
Costs for cost center	4	44%	5	56%	1	10%
Course of elementary costs	3	33%	6	67%	1	10%
Indicators of factorial efficiency	2	22%	7	78%	1	10%
Other	0	0%	0	0%	10	100%
Medical measurement	n.	%	n.	%	n.	%
Performance for healthcare profile	4	50%	4	50%	2	20%
Technical indices on patient satisfaction	2	100%	0	0%	8	80%
Training Investments	2	50%	2	50%	6	60%
Others	0	0%	0	0%	10	100%

We believe that it is important to underline that the introduction of the ERP has allowed for an improvement in the calculation of the cost for services offered and the analysis of the costs for organizational units, making the assessments faster and reliable (Table 4).

In a previous study (Mucelli and Spigarelli, 2003) these qualities were found to be lacking. From the same point of view, it seems worth pointing out that, even if limited to only two healthcare organizations, the introduction of the ERP has created the conditions for setting up a system calculating costs based on activities.

[18] Refer to Lodh S.C. and Gaffikin M.J.R. (2003), *Implementation of an integrated accounting and cost management system using the SAP system: a field study*, European accounting review, Vol. 12, No. 1 [94].

[19] Refer to Bergamin Barbato M., *Programmazione e controllo*, cit., [26]

[20] The percentages of the data "before ERP" and "current" have been calculated on the total number of answers, while the percentages of "no answers" has been calculated on the total number of questionnaires received. When two options have been ticked, only the "before ERP" option has been considered. The same method has been applied to the data shown in table 5.

Table 4 – Information targets for the calculation of costs of services

Situation / Information Targets	Before ERP		Current		No Answer	
	n.	%	n.	%	n.	%
Cost Analysis of organizational units	4	40%	6	60%	0	0%
Improvement in efficiency of providing services	1	17%	5	83%	4	40%
Improvement in efficiency of supply process	2	25%	6	75%	2	20%
Management of supplies	5	50%	5	50%	0	0%
Supplier selection/supply relations management	4	67%	2	33%	4	40%
Transfer price calculation	3	75%	1	25%	6	60%
Make or buy determination	2	67%	1	33%	7	70%
Other	0	0%	0	0%	10	100%

With reference to the budget, a significant qualitative-quantitative increase in information available to management was also recorded. We particularly refer to the completeness of economic data, to the presence of new indicators, to information about waiting lists, to the work loads of personnel and finally to more rational criteria for the sharing of costs which are in common. This has led to the improvement of the planning process itself which can be seen in the budget because there is a better transfer of basic information necessary for the elaboration of action programs. Negotiations can also be carried out with a different degree of intensity and significance (Table 4)[21].

Consequently the reliability and speed of the reporting system have also increased significantly, emphasizing greater completeness of information, as well as the availability of methods for synthesizing numerous dimensions, such as the cost of factors by DRG point or number of DRG points by doctor.

Finally it is worthwhile pointing out how the healthcare organizations are able to obtain more detailed information both for coherently responding to information demands of positions that need more thorough analysis, and for supporting any in-depth investigations required by whoever is in charge of understanding the phenomena behind managerial trends[22].

Table 5 – Budget processing stages improved following the introduction of the ERP

Stages	n.	%
Communication of basic information for budget proposal formulation	5	56%
Control stage	4	44%
Negotiation stage	2	22%

[21] Refer to Bubbio A. (1995), *Il budget nel governo dell'impresa*, Il Sole 24 Ore, Milano.

[22] Refer to Anselmi L. (2000), *Il reporting per finalità esterne nelle aziende sanitarie*. Work presented at the Conference *Il sistema di reporting nelle imprese di pubblica utilità*, Roma, Luiss, May 2000. On reporting for key variables please refer to Brusa L. and Zamprogna L. (1991), *I sistemi di pianificazione e controllo*. Etas, Milano.

From the point of view organizational structure of the control system there is no doubt that the availability of a greater amount of information as a consequence of introduction of the ERP and a greater number of attainable decisional levels lead to an increased depth of the control system according to the principle of "the identification of the critical decisional areas [obtainable] by crossing strategic directions with the setup of the organizational structure."[23] In healthcare organizations the level of depth is of particular importance, given the high degree of peripheral autonomy present and the consequent necessity to provide effective decisional decentralization. In this sense, even though only 40% of the healthcare organizations in the sample started redesigning the organizational structure of the control system, it is significant that new cost centers have been created, and that new aggregates of responsibility have been established and existing aggregations revised.

In fact, the increase in the depth of control must be coordinated appropriately with the level of delegating and with the style of management, avoiding the risk of setting up formally a decentralized system, but which substantially cannot deal with this kind of setting. Healthcare organizations, given the type of services they provide in order to satisfy needs, are very frequently involved in carrying out different types of coordinated activities set up by different operational (and/or organizational) units. It is therefore essential to plan the organizational structure of control so as to favor joint responsibility for the processes. The possibility to obtain suitable information allows allocation of responsibilities to be re-examined for carrying out activities and for their linking them in processes, aimed at obtaining the final result. The following section deals with a closer examination of these aspects.

6. ERP and organizational consequences

The introduction of an integrated information system represents a critical moment in the life of a healthcare organization because of the numerous organizational implications that it involves, both at the introductory stage and subsequently, when the system is operative and generates information (Mucelli and Spigarelli, 2003).

For correct implementation it is necessary, in fact, to survey the sequence of processes for the different activities carried out by the organization, so as to reconstruct, at a data processing level, the existing relationships between the activities on which already established processes are based. The planning of processes can, therefore, lead to a modification in the characteristics of some activities or can even make it convenient to partly or totally redesign the general structure of the processes.

[23] Refer to Bergamin Barbato M., *Programmazione e controllo*, cit., [261].

After the implementation stage, it must be pointed out that the presence of an integrated information system in an organization induces a change in the existing relationship between management and information for two reasons[24].

The first reason is connected to the fact that a computerized survey of the cause-effect relationships produced by each activity leads the healthcare organization to set up an information system able to produce on-line information about the processes, stimulating management to reduce the area of indecision during decision-making moments. In order to transform such an opportunity into a competitive advantage management is required to independently generate information from the system and to use it in its decision-making process. In other words, the benefit is apparent only if management grows in terms of its computer expertise.

The second reason involves standardization of procedures and the possible reconfiguration of processes, connected with the introduction of the ERP. In fact they are the conditions necessary for opening barriers to systems and external parties, increasing the flow of information which is available to management.

The critical stage of the organizational aspect, not only due to the revision of the processes, but also to the above mentioned changes regarding the use of information, has been so greatly emphasized in the theoretical background, that it can be considered among the principal possible causes of failure in the implementation of the ERP (Beretta and Polo, 2002).

This research tried to better investigate these aspects, concentrating, at first, on assessing the targets that management had set when deciding to implement the ERP system and to what extent these targets had been reached.

As seen in the first part of this paper, 45% of the healthcare organizations aimed at re-engineering processes. 80% stated that the target had been reached. This result shows how the firms have a clear perception that the moment of implementation of an ERP needs to coincide with organizational "re-thinking", with the processes of the healthcare organization becoming the most important element. Without this effort there is the risk of losing part of the potential for improvement that ERPs are able to generate (Beretta and Polo, 2002).

However the research highlighted that only 9% of the healthcare organizations have already carried out an organizational change connected with management through processes (Table 6). This figure, therefore, clearly points out that the healthcare organizations surveyed have not effectively implemented the ERP system. When introducing the system, the organizational re-thinking in general, which is a moment of possible and real managerial improvement, was absent.

[24] On these aspects refer to Mucelli A., *I sistemi informativi integrati per il controllo dei processi aziendali*, cit., [224].

Going back to the considerations in the first part of this paper, it is possible to state that the research highlights a process of adoption of the ERP by the healthcare organizations rather than a process of its implementation capable of bringing about organizational re-thinking.

Table 6: Management by processes set up after introduction of the ERP

MANAGEMENT BY PROCESSES	n.	%
Being planned	7	64%
No intention of setting up	2	18%
Previously set up	1	9%
Set up after ERP introduction	1	9%

On this subject, it should be noted that ERP systems are considered as one of the most powerful enablers for bringing about changes in activities in the last decade. The possibility of having highly standardized and integrated computer tools tends to guarantee the possibility that the change, stimulated by technology, is real and lasting. Especially with reference to healthcare organizations, it should be pointed out that ERP technology tend to strongly stimulate an approach through processes which is capable of permanently overcoming the continuance of a vision and modus operandi by functions, typical of this sector[25].

In 7 organizations, equivalent to 64% of the total organizations surveyed, management by processes is being planned. In only one case it had been previously set up. This result shows that a considerable number of the healthcare organizations surveyed feel a need to carry out redesigning of their internal processes only after the introduction of the ERP. It seems, therefore, that there is an awareness of the strategic importance connected with the decision to implement the ERP[26]. However the full potential of the decision is not understood initially, but only at a later stage, thereby probably provoking diseconomies in organizational and economic terms.

If management by processes was set up after the introduction of the ERP, the healthcare organization was asked to specify what processes had been redesigned. There was only one affirmative answer, which specified the redesigning only of those processes which concerned specific care profiles, particularly out-patient assistance.

It is useful to emphasize that these data are in contrast with what has more than once been pointed out in theory about the necessity of starting a project of implementation of an integrated

[25] Refer to Caccia C. (2000), *Management e Information Technology: un possibile percorso di qualificazione delle aziende sanitarie e del mercato tecnologico*, *Mecosan*, 36, October-December [167].

[26] In other words, the research shows how the health authorities, instead of carrying out an organized analysis aimed at identifying and improving processes before the introduction of the ERP, decide to do it later, that is only after having adopted the integrated information system.

information system through the analysis of processes[27]. If this is not carried out, there is the risk of being subject to the organizational structure of the software, without being able to judge its validity.

The healthcare organizations surveyed are however very behind with re-engineering, even in those cases where the decision was made after the ERP had been implemented.

The delay in applying the typical paradigms of BPR (Business Process Re-engineering) in the healthcare organizations could be largely due to reasons of a cultural kind. For correct redesigning of processes it is essential, in fact, to overcome traditional fragmentation of knowledge and to reread the activities of the healthcare organization in a way which is transversal to subdivisions by responsibilities.

The difficulty in implementing ERP projects could therefore be referable mainly to the fact that the healthcare organizations are organizations in which human resources are specifically "trained" and highly professional. The redefinition of roles and duties, inherent in redesigning the processes could prove to be complex, more or less consciously opposed, and require integration and maximum coordination of the different professions at various levels, "invading and changing" responsibilities and deep-rooted routines[28].

Another part of the research, limited to the impact of the integrated information system on the organizational structure of the healthcare organization, concerned the analysis of the targets to be reached through the process of re-engineering, where implemented. The results are shown in table 6.

The data show that the most frequent target is that which concerns attaining greater effectiveness of the service provided to the patient through improving the technical-medical quality. Healthcare organization management therefore believes that improvement in the quality of the available information can directly help the people who work in contact with the patients, enabling personnel to make more suitable choices.

In order to have higher efficacy there are other targets according to the healthcare organizations surveyed. In particular, in about half the cases reference is made to greater coordination between economic and medical sectors that an integrated information system succeeds in guaranteeing. 27% of the cases mention greater coordination of human resources belonging to the medical sector.

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[27] Refer to Caccia C. and Vella C. (2000), *Opzioni strategiche per lo sviluppo del sistema informativo nelle aziende sanitarie*, Mecosan, 33 [134-135].
[28] Refer to Coppa G. and Sanguigni V. (2002), *Riprogettare i processi nelle aziende sanitarie*, in Amministrazione & Finanza, 17 [39].

Table 7: Targets to be reached through re-engineering

	n.	%
Improvement of technical-medical quality of the service	8	73%
Reduction in costs	7	64%
Greater coordination between the economic and medical sectors	6	55%
Coordination of human resources in the medical field	3	27%
Other	1	9%

The data gathered have been summarized in table 7. The table shows that in most healthcare organizations (73%) no form of openness is present toward third parties, in 27% of the cases, there is integration with the regional information system, in 18% of the cases with the information system of other healthcare organizations and in 9% of the cases with that of the suppliers. In the category "others" one healthcare organization specified: "integrated with systems connected with electro-medical instruments and with other systems present in the healthcare organization."

The potential for external integration of ERPs does not seem to be fully exploited by the healthcare organizations that show little propensity to simplify information exchange relationships with external third parties.

7. Conclusions

At the end of this paper some considerations can be made about the research hypotheses which were verified through empirical analysis, concerning the type of impact of ERP on the control system and the possible consequences connected with its ineffective or non- adoption, above all as a result of phenomena of an organizational nature.

As far as the first aspect is concerned we first tested first the ability of the ERP system to improve and enlarge the field of analysis, by integrating variables of an economic type with physical-technical or medical-health measurements (patient satisfaction, information related to learning processes, etc.)[29]. The survey showed a relatively low percentage of healthcare organizations that took this direction after the introduction of the ERP. The first hypothesis of the research is therefore only partially confirmed: the qualitative and quantitative increase in the flow of information happened within traditional dimensions of analysis, for example efficiency, and primarily with reference to measurements of an "economic" kind.

[29] As seen before, this is necessary to support setting up of advanced managerial systems that are capable of considering the internal analysis with others directed towards third parties and which allow to connect the strategic dimension with the operative one more efficiently.

Despite the unsatisfactory development of management control, some considerations can be made that, in part, seem to justify this situation and in part highlight the risks of some possible pathological situations.

The delay in the development of management control could be justified considering that the exploitation of the potential offered by ERP systems involves a not so short period of time, which is necessary in order to pass from mere implementation to concrete use. There are two reasons for this.

The first reason refers to the evidence offered by literature[30], concerning the importance of defining a period of time which is sufficient for completing the setting up process of the integrated information systems both from the technical and the training point of view. The latter element is fundamental not only for learning how to work the system, but also for evaluating the coherence of the ERPs with the information demands of the healthcare organization.

Secondly, it is evident that the ERP must be considered as an essential operating tool among those managerial tools that could be defined as evolved. The introduction of such systems, in healthcare organizations implies that there must be an advanced cultural level from a managerial point of view. In the cases examined however, although they are undoubtedly advanced situations in the area of public health, these conditions are now in the process of being created and, therefore, it is only in the near future that it will be possible to fully appreciate what the ERPs can offer to the planning and development of managerial systems.

The inadequate development of control systems, apart from having a possible physiological explanation as a result of the length of time needed for assimilating ERP implementation, could in reality be motivated by pathological situations which the results of the empirical analysis suggest need to be examined. This is coherent with the second hypothesis of the research.

Firstly, a question arises about the correctness of the logical setting of the ERPs adopted by the healthcare organizations surveyed, since, in a few cases, a personalization of various modules was made, depending on the requirements and on the managerial and operational features of the healthcare organization. The unsatisfactory development of control could therefore be referable to the wrong logical setting at the basis of the ERP and in particular to an administrative module which is not consistent with the demands/characteristics of the healthcare organization.

Moreover it must be observed that, apart from problems such as time lag or wrong setup of the system, there were long delays by the healthcare organizations concerning the organizational

[30] Refer to Lodh S.C. and Gaffikin M.J.R., *Implementation of an integrated accounting*, cit.; Burns J. and Vaivio J. (2001), *Management accounting change*, Management accounting Research, 12; Ganlund M. and Mouritsen J. (2003), *Introduction: problematizing the relationship between management control and information technology*, European Accounting Review, Vol. 12, No. 1 [77-83]; Miler J.A. (1992), *Designing and implementing a new cost management system*, Cost Management, Winter.

plan, with reference to implementation of management by processes. Normally, the main aim in introducing an ERP is to stimulate organizational integration through the redesigning of processes and their coordinated management at an information and information technology level. In the field of public health, this need for integration is great, given the coexistence of the administrative area and the medical area and the type of production of the healthcare organizations.

To summarize, therefore, the research demonstrates that in the public health sector ERPs are systems with not fully exploited potential. In relation to management control, even some years after the implementation of the ERP, dimensions and traditional tools for cost analysis continue to be privileged. On the organizational level, re-engineering of processes has not been pursued with determination. As such, it is essential to have an in-depth study onsite, to be able to test more directly problems and difficulties faced by the public healthcare organizations. The next step in research will therefore be to carry out case studies, so as to analyze in detail the organizational and managerial implications of the ERPs, to verify the nature of the causes of incomplete exploitation of their potential in order to draw up specific indications to assist management as well as national and local government.

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