A model for risk identification in ERP system processes

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Abstract

There are many cases where companies have spent considerable amounts of money on ERP system implementation, only to find out afterwards that business performance has not improved at all. After the 'go-live' phase, the implemented system needs to be streamlined to ensure that all the components of the system are stabilised and integrated. However, this phase is characterised by a number of unanticipated risks that might put the whole project in jeopardy. Thus, a supporting tool is needed in order to prevent ERP system operators and consultants from risks that might occur during the hand-over phase. Risk management is a highly evolving theory, related to almost any managerial or technical procedure, which can be used in order to help companies in knowing where to focus their management attention. The aim of this paper is to offer a risk identification tool in the form of a Risk Breakdown Structure. Risks that might occur during the operation of an ERP system have been classified in categories such as technical, managerial, human, strategy, etc. These risks have been identified through published risk catalogues and return from experience related to ERP installations, concerning the parapharmaceutical, publishing, oil and wood processing industries. The classification follows a typical decomposition structure, starting from the overall ERP operating risks and ending down to specific risks, like loss of data.
Keywords: project management, risk identification, ERP systems.

1 Introduction

1.1 The project of ERP implementation (hand-over phase)

In the early 90's, increased complexity of business and the need to integrate all the functions within an enterprise to sustain in the dynamic environment led to the development of the ERP systems, which are packaged (though customisable) software applications, which manage data from various organisational functions and provide a fully integrated solution to major organisational data management problems. These systems offer the advantage of providing organisations with a single, integrated software system linking the core business activities such as operations, manufacturing, sales, accounting, supply chain transactions and inventory control.

The projects of ERP implementations are always large and complex. Although the Product Breakdown Structure (PBS) is given, according to the modules of the software to install, the Work Breakdown Structure (WBS) is complicated as lags and leads complicate the precedence of the activities. Important milestones have to be met, mainly when the integration of the different modules takes place. In addition this type of projects are executed by complicated matrix structures as the project team will include, at least for a part of the duration of the project, employees of all the departments of the company. The project office has to coordinate the project team under considerable time pressure and facing many unforeseen events [1]. However, simply setting up an ERP solution is not enough. It is common for companies to face ERPs as projects with the assumption that the day the system will go-live the project will end. The truth is that an enterprise system installation will not end as a typical project but the system needs to be constantly supported and optimised. As ERP systems go through several stages of development and maturity, they require a lot of effort in order to achieve significant results and improve companies' performance.

There are three, core, distinct phases in ERP implementation projects, which are the feasibility study phase (go/ no go), the installation phase (Kick off – design – go live) and the hand-over phase. This last phase, which is the project phase between the "go-live" point and "cut-off", the point where the consulting company stops offering its services as a part of the project's contract and begins a maintenance contract, is often underestimated as far as the duration and the resources is concerned. During this phase implementers face particular problems as the company aligns the previous business processes with the processes imposed by the ERPs. This is the project phase where this paper is focusing on.

After the 'go-live' phase the implemented system needs to be streamlined to ensure that all the components of the system are stabilised and integrated. At this stage company's attention should focus on the redefinition of user roles and responsibilities, establishment of new policies to support the ERP infrastructure, integration and utilisation of the information generated from the new system. However, the hand-over phase is most of the time ill-defined. Project plans describe it as a single phase, where all other phases are analysed in many correlated activities. This is not only a "signal" indicating that the phase is

mistakenly taken for an easy task but also that the activities which have to take place during this phase are difficult to model using the traditional activity networks, included in the project management tools. Thus, project managers should pay particular attention to this phase. This paper argues that critical risks of the ERP installation projects can arise exactly in this phase and put the whole endeavour in jeopardy. The RBS - checklist is proposed here both to identify the relative risks and as a project management tool.

1.2 Risk Management (RM)

Risk management is not a new field of science [2]. The first approach of the formal introduction of RM techniques in the scientific community was the effort put by Hammer [3] to apply it on technical solutions. There exists also extended bibliography of RM in the theory of investments and financial risk field [4]. Recent trends have involved RM in the project management sector [5]. However, there is no literature considering the risk management as a tool embedded in the hand-over phase of ERP implementations. This is what the authors are ambitious to achieve through this paper.

The steps of Risk Management can be summarised as in Fig. 1 [6].

The first step of the process is the Development of a Risk Management Plan. This Plan sets the base for the other Risk Management steps. The second step of the process is the identification of risks that might affect the project. Identification is an important step of the process since one cannot cope with problems that have not been identified. There are many techniques indicating the way to identify risks, such as checklists, experts' interviews, etc [7]. The third and fourth steps of the process address the analysis issue. Depending on the amount of information available or desirable, analysis could be either qualitative or quantitative. Next step for RM is the Mitigation Action Plan, i.e. the definition of specific and effective response, in order to smooth or completely eliminate the risk. Preventive or corrective actions can be taken in order to obtain the minimisation of risk [6]. The last step, which is the Follow Up and Control of risks, aims to assure that the outcome from the previous steps is still valid as the time goes by, the mitigation actions defined are really efficient and that every new risk is registered.
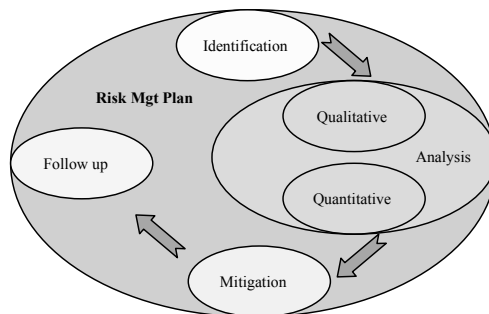

Figure 1:   Risk management steps.

The method presented in this paper is focusing on the Risk Breakdown Structure (RBS), which is a tool for risk identification. The RBS is a simple way of describing the structure of project risk. Risk categories can be structured in a similar way to the Work Breakdown Structure (WBS) and shape the Risk Breakdown Structure. Following the pattern of the WBS definition by PMI, the RBS is defined as "A source oriented grouping of project risks that organises and defines the total risk exposure of the project. Each descending level represents an increasingly detailed definition of sources of risk to the project" [8]. The RBS can function as a base for the identification (organised identification by focusing in specific risk categories) and the creation of a list of risks using the lower levels of the RBS and searching for risks in each risk category (i.e. technical, financial, etc). Table 1 presents basic considerations for the method.

Table 1:   Advantages and disadvantages of the RBS.

Advantages	Disadvantages
Structured presentation of risks	Time consuming process
New risks may be identified focusing on the RBS risk categories	Risk that apply in more than one classes may cause data redundancies
The decomposing and detailed nature of the RBS minimize the possibility of losing risk categories or classes	
Direct links between risks visible	
Imagination not limited by fixed risk list	

1.3 Scope and objectives

Aim of this paper is to produce a structured referential of risks, including all those risks that appear during the hand-over phase of an ERP project and affect business processes, jeopardizing their alignment with the processes imposed by the ERPs. The referential aims to assist project managers in knowing where to focus risk management attention. The findings of this paper were derived through the study of four different hand-over cases, from the publishing, the oil, the wood processing and the parapharmaceutical industrial sectors. Although every ERP system is unique, the hand-over risks apply to each company studied and fall into the majority of the categories presented in this research.

The rest of this paper is organised as follows: section 2 describes the research method. Section 3 is divided into two subsections. The first one presents the parapharmaceutical case study and the second encompasses the most often met hand-over risks and maps them in an RBS. Finally, section 5 draws some conclusions and reveals opportunities for further research.

2   Research method

Regarding the identification of risks, an extensive research on public risk catalogues has been conducted. Additional risks resulted from studying the hand-over phase of ERP projects in four Greek industries, from the publishing, the oil, the wood processing and the parapharmaceutical industrial sectors. Risks, identified in each case, were documented in the form of risk sheets. The literature review followed a top down approach concerning the categorisation of risk, while the risks identified during the case studies followed a bottom up approach. These two approaches (literature review and practical experience) were merged in order to provide a complete risk referential. Although, the companies have implemented ERP systems from different vendors, the comparison led to the conclusion that the risks of the hand-over phase can be met in various companies with different systems and different corporate cultures.

The outcome of the research is an RBS tool, which is considered to be crucial for future ERP implementations.

The next section is divided into two subsections. The case study of the parapharmaceutical industry is presented in the first one, while the second encompasses the findings of the literature review and the four case studies.

3   Case study and findings

3.1 The parapharmaceutical industry

The (para)pharmaceutical industry's supply chain consists of four major players [4]:

1. Suppliers of raw materials
2. (Para)pharmaceutical production companies
3. Wholesalers, who act as links between a production company and a point of sales (either a pharmacy or a brand pharmacy).
4. Stores that are allowed by legislation to sell drugs (pharmacies and brand pharmacies). Individual pharmacies are small and very small enterprises owned by pharmacists, while brand pharmacies are unions formed by several independent pharmacies under the same brand. Pharmacies and brand pharmacies have the possibility to buy either from a wholesaler or the main vendor who is the production company. Although independent pharmacies can buy from any vendor, they often develop exclusive supplier – customer relationships. Conventionally transactions between buyers and sellers are executed through means such as fax, telephone or face to face contact with merchandisers, resulting in long lead times and high costs.

In order to achieve economies of scale, quick respond to market demands and improved information sharing, the parapharmaceutical production company under consideration recently made the decision to replace its existing non-integrated systems with a leading ERP software package. After the completion of the implementation project the company entered the hand-over phase, which

lasted almost six months and revealed several problems concerning the misalignment of business processes with software's functions.

The next subsection presents the risks identified during the hand-over phase, in an RBS, which is considered to be a supporting tool in order to prevent ERP system operators and auditors from risks that might occur after the implementation and help them fit their process in the ERP.

3.2 RBS of ERP hand-over phase

The final categories (second hierarchical level) and classes (third hierarchical level) can be seen in Fig. 2.
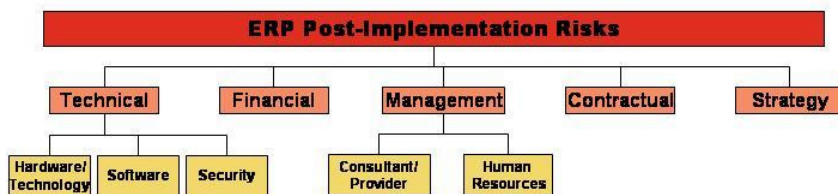

Figure 2:   RBS-Final categories and classes.

As it can be observed in Fig. 2, five major categories of risks have been identified. Technical, financial, management, contractual and strategy risks can interfere and affect the project's success. Technical and management risks are further divided into three and two classes respectively. In the following paragraphs the most often met risks from each category are mentioned.

The first category concerns the technical part of the ERP hand-over phase (Fig.3). Technical risks are related to the technology which concerns operation of the ERP systems (both hardware and software) and are associated with the critical question of system performance. The main hardware risks concern the congestion of the system and some system/architecture constraints, such as memory speed, capacity limitations, usability and reliability of the system. The underestimation of technological needs and the growing volume of data at the (para)pharmaceutical company resulted in additional costs, as the system requirements in capacity and process speed led in purchase of extra hardware units. They even experienced occasional system collapse when many users logged in and server's limitations failed to support network congestion. From the software point of view, risks are related to inadequate interfaces (such as those that do not follow the rules of ergonomics), failure to integrate business-specific processes and insufficient agility/flexibility to adapt changes in processes. The case studies revealed the difficulty to build "bridges" between the ERP system and other legacy applications. The need was generated due to ERP's inability to perform core business-specific processes. In addition, the Greek companies experienced shortcomings as the packaged software lacks conformity to regional accounting regulations.
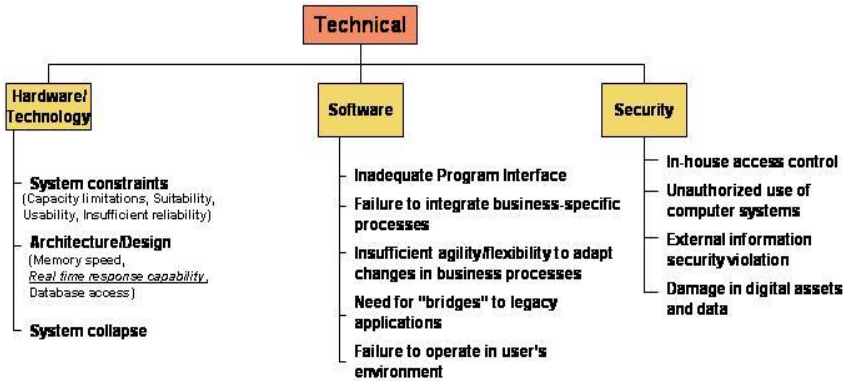
Figure 3:   Technical risks.

As far as security is concerned, the high level of vulnerability and exposure to threats created by information systems necessitate a brand-new level of digital sensitivity. Damage may include direct losses to digital assets, lawsuits arising out of unmet expectations, out-of-pocket expenses due to lost data and lost income from compromised business activities [9]. Although, the companies studied during this research, have not so far experienced external security violation, inaccuracies in users' roles and unauthorised use of certain modules resulted in damage of digital assets and data.

Financial risks (fig.4) concern mostly the senior management.

Figure 4:   Financial risks.

ERP systems are major investments and companies often experience cost overruns during the hand-over phase since the need for additional training, support and maintenance is common. Moreover, ineffective definition of technological and operational needs could lead to hidden expenses. The aforementioned financial risks were met in the case studies presented here and some of them more than once.

Management risks can be divided in two classes. Consultant/ Provider related risks and Human Resources risks (Fig. 5). The first class of risks is related to the role of the consultant which is considered to be crucial. Poor comprehension of company's business processes, insufficient training of the end-users, lack of technical expertise and development errors can lead to many problems in the hand-over phase. The ERP providers in the publishing company were forced to omit some of the functionality in order to meet the deadlines, which caused difficulties during the hand-over phase.
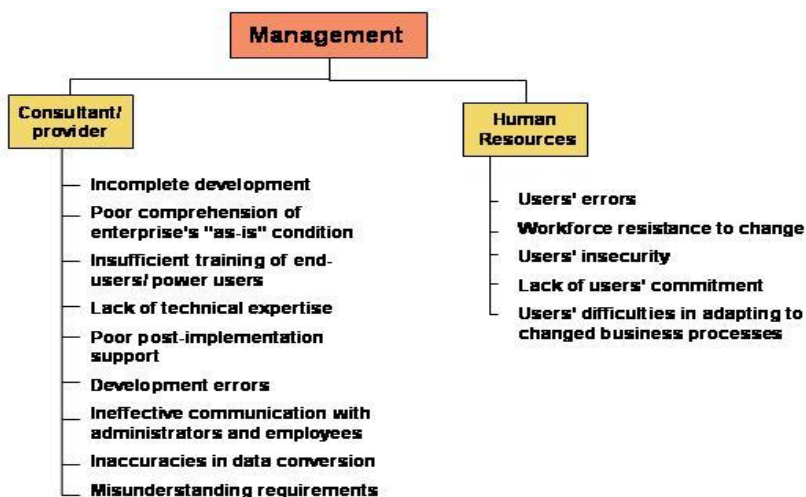
Figure 5:   Management risks.

Additional problems occurred due to poor post-implementation support and development errors that appeared only after the ERP went live. Lack of consultants' technical expertise led the company to replace equipment in the accounting department (printers specified by the legislation), just before they went live, since consultants' technical knowledge fail to predict the need in an earlier stage. In addition, a number of development errors have been uncovered only when users had to utilise specific processes. The second class concerns human related risks, which appear as a result of the important impact that ERP systems have on corporate culture. Corporate culture, which encompasses people who are employed by the company and the way the organisation works, need to change in order to successfully take on an ERP system. Employees need to change their focus from their own department to the whole organisation, since through the ERP system they directly affect data and information concerning other departments. The human risks are in many cases inevitable and no matter how much training and preparation takes place, it can not prepare all the users for the new tool. A common reason for hand-over problems is that although processes look the same as previously, they are executed differently and when employers are unable to do their job in the familiar way, they panic, they feel insecurity and fall to many errors. In the case studies, the most important problems were created by the workforce since quality of life at work declined while personnel are climbing the learning curve. Most of them found difficulties in adapting to the new business processes and developed a strong resistance to change, complicating the already risky post-go-line phase.

Figure 6 maps the contractual risks, which are related to the type of the contract between the company and the ERP consultants.

Contractual
- Inadequate definition of participants' effort
- Dependencies on external entities
- Associate contractors/ Subcontractors
- Conflicting political agendas

Figure 6:   Contractual risks.

The amount and condition of each participant's involvement, penalties, incentives, restrictions and restraints, dependencies on outside products, services and subcontractors are some of the factors that might put the project in danger [10]. The case studies revealed the importance of contractual risks, as the inadequate definition of associated contractors' and subcontractors' responsibilities created conflicts and delays in support and maintenance needs, appeared during the hand-over phase.

The last category concerns strategy related risks and is depicted in Figure 8.

Strategy
- Inadequate 'as-is' analysis
- System's misalignment with business process
- Misalignment with organizational culture
- Inadequate investment
- Insufficient business process reengineering
- Need for additional modules
- Low support from top management

Figure 7:   Strategy risks.

The main strategy risks refer to inadequate 'as-is' analysis, system's misalignment with business processes and organisational culture and inadequate investment. An additional strategy risk come from the case study and concerns the low support from the top management, resulting in a time extension of the hand-over phase. From a strategy point of view business process reengineering (BPR) and change management are considered to be the most effective techniques to set expectations and reduce the problems of change. Without an effective BPR strategy employees would lack process ownership and orientation. Other than technical issues like organisation structure, culture, lack of involvement of people can lead to major hand-over difficulties and full benefits of standard ERP package may not be achieved.

4   Conclusion-further research

There are several cases where, companies have spent considerable amounts of money on ERP systems implementation, only to find out afterwards that business performance has not improved at all. Selecting and implementing a new ERP

system, along with the business process reengineering that goes with it, is a complex undertaking. Simply setting up an ERP solution is not enough and companies have to realise that the ERP is a living system that passes through different stages of development and maturity and needs to be constantly optimised. In this article, authors propose the utilisation of a structured model of risk factors in ERP hand-over phase and create a Risk Breakdown Structure (RBS) of five categories and five classes, which can be an interesting tool that could help implementers in this risky environment.

The paper was focused on the first step of risk management process which is the risks' identification. Further research includes the standardisation of the risk categories defined here and extension to the other risk management steps such as risk analysis and control. Moreover, the efforts required to overcome the critical hand-over phase can also create important opportunities. Some of them are the increased efficiencies through integrated processes, a strong coherence between strategic objectives and goals and a strong alignment of people processes and technology with organisational culture. As a result, an interesting field of research would be the extension of the ERP hand-over risk management process to include opportunities, as well.

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