

# An ERP Life–Cycle Cost Model

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## INTRODUCTION

Nowadays, the enterprise resource planning (ERP) products and services industry is one of the most promising. Through the usage of ERP systems such as SAP, BAAN, Peoplesoft and Oracle, organizations try to integrate the information flow of the different business areas and, at the same time, improve efficiency and reduce costs. Theoretically, these integrated systems provide large functionality in terms of problem solving associated with data flow when they are integrated with different software systems.

Some critiques of ERP systems focus essentially on the high costs of ERP projects, the high failure rates and their complexity, which makes it difficult for users to perceive the benefits and the opportunities of these systems. ERP systems demand a large investment at the economic, human resource and organizational levels. This investment is made not only in the initial phase but also throughout their life-cycle. Thus, this study is intended to analyze the necessary investment to integrate an ERP system during its life.

## BACKGROUND

One of the issues in the ERP systems area is that of determining if the investment made will be compensated in the future. A survey of Meta Group Inc. (Craig, 1999) shows that in financial terms, ERP projects cost more than the expected benefits. This is close to academic studies on this object. But there are some suggestions that financial terms and other strategic benefits should be considered. This issue is included in broader discussions about investment in information systems (IS) and their performance (Bender, 1986; Brynjolfsson & Hitt, 1994; Harris & Katz, 1988). Some authors found no or little relationship between them (Strassmann, 1990, 1999; Turner, 1985), while others concluded that the investment in IS has been detrimental to organizations (Roach, 1988).

A study conducted by Meta Group (2000) showed that only 20% of companies that have implemented ERP solutions actually know the total cost of ownership (TCO) of their deployments. The other 80% do not fully understand

the magnitude of on-going support and infrastructure-related costs. Our study analyzes the necessary investments for the integration of an ERP system during its existence, along with an analysis of the costs associated with each phase.

## ERP SYSTEMS LIFE-CYCLE

To define the ERP life-cycle model we use a simplified version of the model proposed by Esteves and Pastor (1999). Other authors have proposed models for ERP systems but focusing on the ERP implementation phase. However, there is a misunderstanding in relation to the concept of implementation. Our model is structured in phases and dimensions. Here, we only make reference to the phases as the different stages of the life-cycle of an ERP system in an organization. Next, we describe each phase, that is, adoption, acquisition, implementation, usage and maintenance, evolution and retirement.

- **Adoption decision phase:** During this phase managers examine the need for a new ERP system while selecting the general IS approach that will best address the critical business challenges and improve the organizational strategy. The decision phase includes the definition of system requirements, its goals and benefits, and an analysis of the impact of adoption at a business and organizational level.
- **Acquisition phase:** This phase consists of the product selection that best fits the requirements of the organization, thus minimizing the need for customization. A consulting company is also selected to help in the next phases of the ERP life-cycle, especially in the implementation phase. Factors such as price, training and maintenance services are analyzed and the contractual agreement is defined. In this phase, it is also important to make an analysis of the return on investment of the selected product.
- **Implementation phase:** This phase consists of the customization or parameterization and adaptation of the ERP package acquired according to the needs

of the organization. Usually this task is done with the help of consultants who provide implementation methodologies, know-how and training.

- **Use and maintenance phase:** This phase consists of the use of the product in a way that returns expected benefits and minimizes disruption. During this phase, one must be aware of the aspects related to functionality, usability and adequacy to the organizational and business processes. Once a system is implemented, it must be maintained, because malfunctions have to be corrected, special optimization requests have to be met, and general systems improvements have to be made.
- **Evolution phase:** This phase corresponds to the integration of more capabilities into the ERP system, providing new benefits, such as advanced planning and scheduling, supply-chain management, customer relationship management, workflow, and expanding the frontiers to external collaboration with other partners.
- **Retirement phase:** This phase corresponds to the stage when with the appearance of new technologies or the inadequacy of the ERP system or approach to the business needs, managers decide if they will replace the ERP software with other information system approaches more adequate to the organizational needs of the moment.

## COSTS ALONG THE ERP LIFE-CYCLE

The literature on ERP research shows a lack of studies on ERP system costs and investments (Esteves & Pastor,

2001). Based on published case studies and literature review related to the cost analysis of IS, we developed a structure of costs along the ERP life-cycle. Next, we conduct an exploratory case study to validate this structure of costs (for more details see Esteves et al., 2001).

Table 1 summarizes the cost items, where costs are classified as tangible or intangible. Thus, tangible costs are the costs that can be measured in a direct way, taking always into account that, sometimes, tangible costs cannot be measured in monetary terms. Intangible costs are those costs that are difficult to be measured in a direct way, since they refer to vague concepts, as illustrated in Table 1. Next, we describe in detail each phase and related costs.

## ADOPTION PHASE

### Tangible Costs

- **Decision-making costs:** This phase is perhaps the phase that has the least associated costs, because it represents only the decision to adopt or not an ERP system. The associated cost is essentially the time spent by managers in the decision-making task. In the context of the decision-making process, the concept of avoidable costs is used to define the costs that can be eliminated when we opt for a specific choice or solution. The unavoidable costs refer to the costs that we cannot eliminate.
- **Consultancy costs:** Consultants help with knowledge and experience in the evaluation of the existent IS architecture and the definition of the new IS strategy.

Table 1. Cost items along the ERP life-cycle

Phase	Tangible Costs	Intangible Costs
Adoption	Consultancy	Decision-making costs
Acquisition	Consultancy Hardware Software licenses	Decision-making costs Opportunity costs
Implementation	Consultancy Training Human resources System specification	Customization, conversion and data analysis Time dedicated by staff Business process reengineering
Usage and Maintenance	System reconfiguration System adaptation Cost of system failure	Indirect costs of system failure Lost of competitiveness
Evolution	Cost of new applications Consultancy	
Retirement		Opportunity costs Decision-making costs

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