

ERP Project Lifecycle costs: A Review

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ABSTRACT: *Today, many organizations acquire and implement enterprise resource planning (ERP) solutions to improve their operations performance and create value. However, they fail to achieve these objectives due to a lack of knowledge and a better estimating of all the costs related to an ERP system project. The purchasing costs of ERP systems are the most visible expense for many organizations that have adopted ERP systems, but the entire ERP lifecycle phase of implementation contains many hidden costs. As a result, institutions have long struggled with information system implementation cost overruns. This document presents the research on the various costs associated with the different stages of the life cycle of the REP project according to the literature on ERP lifecycle costs.*

Subject Categories and Descriptors: K.4.3 Organizational Impacts K.4.4 Electronic Commerce

General Terms: Enterprise Resource Projects, ERP, Resource Allocation, Product Life cycle

Keywords: ERP, costs, ERP lifecycle, Product Life cycle, Resource Allocation

Received: 24 March 2023, Revised 12 June 2023, Accepted 25 June 2023

Review Metrics: Review Scale: 0/6, Review Score: 4.85, Inter-reviewers Consistency: 84.2%

DOI: 10.6025/jdim/2023/21/4/110-116

1. Introduction

ERP systems are increasingly being incorporated into businesses for a variety of reasons, including to boost efficiency, lower costs overall, reduce inventory, satisfy customer needs, and raise return on investment (ROI) [1][2][3]. However, all the benefits perceived by users or promised by vendors are not actually achieved in reality for different reasons. One of the reasons for ERP system failure from a management point of view is cost overrun [4]. Budget overruns are frequently attributed to improper planning and a lack of understanding of associated costs during the creation of the implementation project [5].

The purpose is not to provide cost comparisons for the multiple products and services offered by the vendor. This research shows different costs that could occur during the implementation of an ERP project in all types of organizations. In particular, it explores the following main question: What are the different costs over the entire life cycle of an ERP system? As an elaborated work, a list of costs for different lifecycles of ERP projects will enable organizations to better predict the total cost of ownership.

2. Research Methodology

The research uses a systematic literature review methodology to collect, analyze, and review scientific papers linked to ERP costs in order to give a comprehensive view of ERP project costs. The study responds to the following questions: Which are the different stages of ERP implementation? Which are the various costs related to each

phase of the ERP project life cycle? Four stages of the literature review are carried out, according to [6]. The steps involved are shown in Table 1.

Stage1: Defining key words based on research question

Stage2: Extracts by search in the abstract and the key-words Stage 3: Articles analyzed in detail

Stage 4: Relevant articles exploited in detail in the in the state of the art

3. Results

In this section, the costs collected from articles are classified according to their phase in the ERP project lifecycle (Table 2).

3. Analysis and Discussion

Consultancy Fees: In the current review, the cost of consultants was found to be the most cited cost in ERP, with a maximum frequency of 19 (ranked #1). The higher recurrence of consultancy costs suggests that this component is crucial to the success of the ERP project. Consultants are generally hired for their expertise in implementing and customizing ERP systems. It is important

to monitor these costs closely to ensure that consultants are used effectively and to look for ways to streamline these expenditures if possible.

Hardware costs: The current literature review also found hardware cost as one of the most cited cost (ranked #2) occurred during ERP project. The subject covered in the literature may be heavily focused on technology, including the implementation of ERP systems or other IT solutions. Material costs are essential because they cover the purchase and deployment of the infrastructure needed to run these systems.

Customization: ERP projects are often complex and require significant levels of customization to meet the specific needs of each company. Customization costs can therefore represent a significant share of the overall budget. The cost of customization is cited 18 times in the literature (ranked #3), suggesting that customization is a major and recurring element in the context addressed.

Training Costs: According to the literature review, training costs are also ranked as the third most common cost facing the organization. This suggests that organizations are struggling to ensure that their employees have the skills and knowledge to use ERP systems effectively.

Databases / Stages	1	2	3	4
Elsevier Science Direct, Web of sciences, Scopus, Google scholar	"Enterprise Resource Planning implementation", "Total Cost of ownership", "costs", "hidden costs", "expenses", "Expenditures", "lifecycle costs"	85 articles	25 articles	TABLE II

Table 1. Number of Articles Studied in Scientific Database

Phase	Category cost and its Cost elements	References	Frequency
ADOPTION: This decision phase comprises an examination of the adoption's effects on the business and organizational levels as well as the description of the system requirements, their applicability, goals, costs, and benefits [7].	Decision-Making Costs: the time managers spend deciding whether or not to adopt ERP	[7][8]	2
ACQUISITION: To reduce the need for customization, this phase entails choosing the product that best meets the needs of the organization. Additionally, a consulting firm is chosen to assist with the subsequent the ERP lifecycle stages, particularly the implementation stage. The contract is built, and the contractual agreement is specified after factors including functionality, cost, training, and maintenance services are examined. Analyzing the chosen product's return on	Consultancy Fees: The consultants assist the business in selecting the best ERP systems for its requirements.	[7][8][10][11][5][12][13][14][15][16][17][18][9][19][20][21][22][23][24]	19
	Business Integrator cost: the company integrator who is in charge of assisting the client in defining their requirements in order to select an appropriate ERP.		
	Internal resources cost: To assist the integrators in understanding the organization's procedures and processes, internal company personnel were assigned to the project.		

investment during this period is equally crucial [9].

<p>Hardware costs: Upgrading the current hardware infrastructure is necessary when purchasing an ERP system. Application servers will be required in greater numbers as the system's daily users increase. greater application servers, greater memory, and faster processor speeds are among the requirements for a speedy response time. In order to prevent system disruptions, redundant database servers must have automated backup in the case that one server fails.</p>	<p>Computers</p>	<p>[7][8][10][11] [19][12][13] [14][15][17][9] [19][20][21] [22][25][26][23]</p>	<p>18</p>
	<p>Database servers</p>		
	<p>Application servers</p>		
	<p>Web servers</p>		
	<p>Disks</p>		
	<p>Load balancing switches</p>		
	<p>Storage</p>		
<p>Infrastructure network costs: Ensure that the new software will run on your network's infrastructure.</p>	<p>Coaxial cabling</p>	<p>[8][14]</p>	<p>2</p>
	<p>Fiber optics</p>		
	<p>Network devices</p>		
	<p>Routers</p>		
	<p>Wireless networks</p>		
	<p>An uninterruptible power supply</p>		
	<p>Power sources</p>		
<p>Backup power sources</p>	<p>[13][14] [17][21][25]</p>	<p>5</p>	
<p>Vendor project management:</p>		<p>[13][17][21]</p>	<p>3</p>
<p>Software costs</p>	<p>ERP vendor software package cost:</p> <ul style="list-style-type: none"> • Server licenses • Supporting software • Database management system (DBMS) • Operating systems (OS) 	<p>[7][8][10][11] [19][12][13][14] [15][17][9][19] [20][21][22][25] [26]</p>	<p>17</p>
	<ul style="list-style-type: none"> • ERP software Licenses • Application software licenses • Backup 		
	<p>Third-party software: For most businesses, extra third-party bolt-on applications may be required to support full business processes. Examples of this software include CRM, integration software, tax software (like Avalara), specialty form printing software (like CreateForm, FormScape, etc.), and more</p> <ul style="list-style-type: none"> • Additional servers • Additional hardware, such as databases, operating systems 		

	<u>Services</u>	Hosting and VPN: A service known as web hosting enables businesses and individuals to share a website or web page on the Internet.	[13][17][21]	3
	<u>Quality assurance:</u> as a process to guarantee the quality of software goods or services that a company offers to its clients. The goal of quality assurance is to increase the efficiency and effectiveness of the software development process in accordance with the quality standards established for software products.		[13][17][21]	3
	<u>Opportunity Costs:</u> Expenses reflect the opportunity lost or forfeited when a choice is abandoned.		[7]	1
	<u>Travel costs:</u> Costs related to visiting companies already working with operational ERP systems and attending meetings or professional conferences of ERP user groups and vendors.		[8][11][19]	3
	<u>Communication plan:</u> This plan includes a variety of media approaches that allows to make stakeholders during the progress of the implementation of ERP as videos live meetings reports....		[8][11][25]	3
	<u>Request for proposal (RFP):</u> Allocation of sufficient staff time to carefully draft the PTR to avoid problems during system implementation.		[8]	1
	<u>Hiring human resources:</u> The project's full-time employee's everyday duties are carried out by the backfill staff.		[8][25]	2
<u>IMPLEMENTATION:</u> The adaptation and parameterization of the purchased ERP package to the needs of the organization are the topics of this phase. Typically, consultants that offer implementation strategies, expertise, and training are used to do this work.	<u>Consultancy Costs:</u> The consultants are used by companies to implement the ERP system, as they have the knowledge, methodologies and training to implement the system.		[7][8][11][5] [12][13][14][9] [19][25][26]	11
	<u>Training Costs:</u> include training for the project team and end users on the use of the new system.	Costs of training and education: IT and business. Technology training: At least two complete copies of the software product, and possibly more, will need to be built and maintained. For the production environment, one copy will be used, and the other will be used for training, testing, development, upgrades, and debugging. (Typically, three copies are needed.)	[8][7][11][19][13] [27][5][12][14] [15][17][9][19] [21][25][26][28]	17
	<u>Customization:</u> The cost of adapting the system to business needs.		[7][8][13][25][11] [26][19] [27][5][29][30] [14][15][17] [9][19][31][21]	18
	<u>Change Management:</u> cost of investing resources to encourage staff to adapt to change.	<ul style="list-style-type: none"> • Planning • Executing 	[10][13][17][9] [19][21][31] [25][26]	9
	<u>Cost of business disruption and lost productivity:</u> The total amount of time wasted on unproductive activities		[14][15][10]	3
	<u>Conversion(migration) and data analysis:</u> As they are typically not adjusted to the new formats, data converted from other systems and new data should be reviewed for errors.		[7][8][5][13][14] [17][9][21][25] [26]	10
	<u>Business-process re-engineering cost:</u> the cost of changing organizational processes	Planning and executing: Plan and acquire the business modeling tools necessary to revamp the company's processes. Internal resources: This cost refers to the number of human resource hours devoted to help external consultants to understand and design the company processes	[7][19][13][14] [17][19][21]	7

	<i>IT security officer:</i> There is a lot of confidential data stored in ERP systems, thus security precautions must be taken and managed to keep it out of the wrong hands.	[8][10][11][19]	4
	<i>Testing:</i> Testing a new version or updates requires a lot of staff time	[10][8][5][9][19][25][26]	7
	<i>Help desk professionals:</i> possess the knowledge and experience necessary to respond to consumers' inquiries regarding the software and the technology underlying the software	[7][8][5][13][14][17][9][21][25][26]	10
	<i>Software Integration:</i> If other software of company must be integrated into the ERP software, the cost of integration must also be considered. This can include barcoding, payroll, labor collection, testing equipment, EDI, report writers, strategic watch, etc.	[14][13][17][9][21][31][26]	7
	<i>Implementation Team Turnover:</i> The hidden cost of an installation will be considerably impacted by changing the project manager, consultants, and users. It's crucial to maintain momentum. The project must be stopped, reevaluated, and restarted when there are staffing changes, losing crucial momentum.	[8][14]	2
<i>USE AND MAINTENANCE:</i> This stage involves using the product in a way that delivers anticipated advantages and reduces disturbance. Functionality, usefulness, and suitability to the organizational and business processes are crucial throughout this phase. Once a system is put into place, it needs to be maintained because errors need to be fixed, unique optimization requirements need to be fulfilled, and overall system enhancements need to be made.	<i>Software De-bugging and Patching:</i> An ERP system's operation exhibits some inefficiencies after being implemented, necessitating a revision to the ERP setup.	[14][7][30][19][5][29][19]	7
	<i>System-failure costs:</i> Are costs resulting from ERP system failures	[7][10][11]	3
	<i>Ongoing software costs:</i> An operating system or network system is upgraded, or new third-party software is installed when a new database is created.	[8][9][10][19][5][25]	6
	<i>Annual Support Fees:</i> The use of the ERP solution, access to support, and upcoming upgrades are all covered by the majority of service agreements. This cost varies between 15% to 20% of the purchase price of the product.	[14][15][19][8][25]	5
	<i>Ongoing hardware costs:</i> if the equipment is updated or replaced	[8][5][19][14][19]	5
	<i>Hardware and software maintenance fees:</i> annual fees	[8][11][5][13][25][17][9][19][20]	9
	<i>Training costs:</i> continue to train new employees if there are updates in the system.	[8][25][26][10][27][5][12][13][19]	9
	<i>Consulting fees:</i> continue as new versions of the software are implemented.	[8][5][12][13][19][25]	6
<i>EVOLUTION</i>	<i>Cost of new applications:</i> Acquiring new software, such as advanced planning and scheduling, customer relationship and management, workflow, e-commerce, etc..	[7]	1

Table 2. The distribution of erp project costs during its lifecycle

4. Conclusion

The aim is to understand the different types of costs associated with the implementation of ERP projects, their distribution over time, and their significance in relation to the entire project. The paper contributes to the research and practice communities by providing a comprehensive review of the literature on ERP cost elements in their lifecycle stages. In practice, the document highlights the different costs associated with ERP projects and helps consultants, suppliers, and clients better understand and

estimate their future projects, considering costs. In research, the organization of literature at the ERP lifecycle phase can help identify topics, conclusions, and gaps that are discussed at each stage of interest.

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