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# COMPREHENSIVE MARKETPLACE AND FACTORS AFFECTING THE BUDGET OF ENTERPRISE RESOURCE PLANNING (ERP) IN SRI LANKA

**Samantha Mathara Arachchi[1], Siong Choy Chong[2] , Kennedy D. Gunawardana[3]**
*Management and Science University (MSU), University Drive, Off Persiaran Olahraga, Section 13, 40100 Shah Alam, Selangor Darul Ehsan, Malysia, Malaysia*

**ABSTRACT:** *Enterprise Resource Planning (ERP) is an enterprise with an extensive information system that integrates and controls all business functions and processes in the entire organization. It is an essential and popular tool for large-scale organizations and is currently extended to small and medium-size enterprises (SMEs). In the early days, a good demand prevailed for individual packages, such as payroll, stock control, material management, human resource management, and inventory control systems; but now it is a collection of packages as a whole system. Types and scale of business organizations have customized their products to fulfil the requirements. The complexity of the business process is a significant factor that creates a rigorous marketplace, while competitiveness among businesses leads to the expenditure of vast amounts of money to maintain such business automated systems. The objective of this paper is to present a comprehensive review of the marketplace and the endeavour to maintain ERP within the Sri Lankan domain, in comparison with the global scenario. Due to the close saturation of ERP adoptions in large enterprises, ERP vendors now focus more on SMEs. Moreover, due to globalization, partnerships, value networks, and the widespread information flow across and within SMEs currently, more SMEs are adopting ERP systems. The risks of adoption relate to the fact that SMEs have limited resources and specific characteristics that make their case different from large enterprises. This research has been based on 80 leading business organizations in Sri Lanka catering to local and foreign trade, manufacturing, commerce, banking, and hotel services.*

**KEYWORDS:** Marketplace, Enterprise Resource Planning (ERP), Sri Lanka

## INTRODUCTION

Enterprise Resource Planning (ERP) can be defined as a software system with integrated functions for all major business functions and resource management across an organization such as Manufacturing, Finance, Human Resource Management, Distribution, Customer Relations Management, Supply Chain Management, Materials Management, Inventory Control, Sales and Marketing, Inventory Management, Quality Management, Billing and Invoicing, Stock Management, Shipping, Decision Support, Enterprise Asset Management, and Training and Skills Development (Chou, Tripuramallu, & Chou, 2005). It is the business process backbone and reaches out to all areas of the business industry. On its own it replaces many different packages such as payroll and stock control. It provides multi task, on line-real time, high performance, and security based systems including a centralised data base.

ERP focuses on providing data to make decisions on exceptions and automate the routine of business process, work flow, business operations; and processes the streamline to achieve the needs and objectives of the company and business plans to earn more profits, and face


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competitions. It is not feasible to forecast the dynamics of future company acquisition without such a fully business automated system as the ERP.

It is not favourable due to the rapid changes of business operations, processes and complexity in the identification of business scenarios. Companies have spent fortunes on ERP software and implementation only to find that business performance has not improved at all. These large investments and negative Return on Investments (ROIs) have created a bad impression on the software development industry (Boehm, Abts, & Chulani, 2000; Sherwood.com., 2012; SERC, 2012). Many problems are reinforced by contradictory objectives and performance measures that actually create inconsistent value and principle of system identification, to the company's detriment.

ERP systems have gradually developed and been used by IT and non-IT large-scale organizations and extended to small- and medium-sized enterprises in Sri Lanka. There are a few main leading local and multinational software development companies that have developed systems for industries in overseas companies. Simultaneously, there are outsourced foreign companies that developed ERP applications for local companies, which provide a considerable and competitive impact on the IT world.

The purpose of this paper is to explain the comprehensive comparison between expenditure and the marketplace in Sri Lanka for automating the business process and the cost effect for maintaining such a complex system. It could be attributed to an assortment of factors such as subject matter expert knowledge providers in various disciplines like, business management, information technology and system implementation, infrastructure development, training, data migration, and maintenance (Lagerström, 2010; Dehaghani, & Hajrahimi, 2013).

ERP cost is dependent on factors such as the number of users within an organization or the number of subsidiaries locally or internationally that were merged in addition to the implementation budget (Saleem, & Dhavachelvan, 2010). It depends on the level of sophistication, complexity of the solution within a business scenario, and the size and complexity of the implementation project (aptean.com., 2012). It also depends on whether one needs to buy and install hardware and major changes with infrastructure along with the software, and the architecture of ERP implementation or the business process reengineering methodology.

## RELATED WORK

It is necessary and important to effectively measure the remuneration brought by ERP to the business, which is favourable for both users and software vendors (Chen & Liu, 2009). ERP applications are spreading worldwide, even to developing countries like Sri Lanka with the merging of local and overseas businesses (Molla & Bhalla, 2006). ERP systems are integrated packaged software solutions, the key function of which is to synchronize work in a business. The problem domain of organizational ERP cost estimation differs from business to business according to the complexity of the business processes and also depends on the approaches to modelling relationships (Daneva & Wieringa, 2008).

Cost estimation models are widely used in software development projects. They describe the parametric software cost estimation model formulas, size inputs, cost drivers, and how they relate to the Standard Metrics Definitions. The models include Constructive Cost Model (COCOMO), Software Evaluation and Estimation of Resources - Software Estimating Model


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(SEER-SEM), and Software Life-Cycle Management (SLIM) (SERC, 2012; Saleem, & Dhavachelvan, 2010).

The COCOMO family of models (Boehm, Abts, & Chulani, 2000; Boehm *et al*., 2000; SERC, 2012), which provide frameworks for analysis and management, are not suitable for cross-organizational projects when estimating the budget for ERP implementations and maintenance. This is because any organizational ERP project is always a part of a business transformation initiative, which implies that the project not only delivers business functionality, but also brings with it changes in organizational structures, data, and business processes. Therefore, effort, productivity, and cost modelling have to be multidimensional (Stensrud, 2001). The integrated approach to ERP project cost modelling is especially important for the exposure of partners to estimate the budget to reduce the failure risks in an organization (Daneva & Wieringa, 2008).

Organizations have identified the intended benefits of an ERP investment; which must integrate both, the technical expertise and functional area knowledge. In addition, the continuing support after implementation is also a requirement. It is important to understand and utilize functional Subject Matter Experts (SMEs) (Chen & Liu, 2009) from the business units as members of the implementation and a big effort is necessary to tap into the SMEs' knowledge of business processes and inform them of any potential changes in the processes. Due to their knowledge of business processes, functional SMEs are often perceived as highly valued, essential personnel to configure and implement ERP systems and this is one of the key factors that increases the ERP systems budget (Kevin, Gallagher, Worrell, & Mason, 2012).

The ERP selection is budgeted according to the framework of the selection process. This includes all major and minor parts of the budgeting (Stefanou, 2002). The Initial costing step is to develop the ERP application, considering Software License Fees, Maintenance Fees, Hardware and Implementation Services including Requirements Analysis (feasibility study) / Definition of Scope, Installation, Configuration, Integration, Data Migration or Conversion, Customization, Reporting, Testing, Training, Documentation, and Project Management (Sherwood.com, 2012).

Furthermore, competitive advantage helps to earn returns on investment when developing an ERP system. Therefore competitors make sustainable competitive advantages and strategy to formulate it uniquely since this implementation and maintenance cost is high (Molla & Bhalla, 2006).

ERP users often refuse to disburse the balance of payment as they think software vendors would fail to complete the targets (Chen & Liu, 2009).

ERP systems promote the business processes and business functions in the entire value chain to improve business performance (Chen & Liu, 2009).

'ERP on Demand' intends to increase the affordability of ERP solutions to enterprises by eliminating upfront capital expenditure and also eliminating the need for in-house IT resources and additional infrastructure. The payment method is module-wise or package-wise according to the complexity, level of the security, and monthly or annual basis. It is regularly updated with new versions and made available to all clients (180systems.com, 2014).


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**Reasons for varying ERP Implementation cost**

The ERP software cost is only a part of the total ERP system development charge. Cost calculation was categorised into common sections using a common rule intended for software. It represents 30% of the total implementation cost. Hardware might be another 20%, and half of the total envisaged for implementation services, data conversion, consulting, and training. These percentages can considerably vary from 30-20-50 (aptean.com, 2012).

Due to the complexity of the solution, larger and more complex solutions have a reputation for high implementation costs (SERC, 2012). Vendors find this (high cost) particularly challenging and continually attempt to simplify the process and reduce the implementation burden. Some reasons were identified for the variation of ERP implementations (Kumar Pal, 2008).

There are direct and indirect factors affecting ERP implementation costs. The initial cost of licence and maintenance is a key factor occurring under implementation cost. Database licence, number of modules, and operating systems are some of the costs included under initial licence and in general, the expenditure on implementation depends on the software selected by the vendor and the technology. Hardware maintenance cost is a main factor influencing ERP implementation including servers, networking, terminal series, and workstations (Daneva & Wieringa, 2008; Erpsoftwareblog.com, n.d.).

To reduce hidden costs during ERP implementation, appropriate planning is advised before selecting any ERP vendor (Lindley, Topping, & Lindley, 2008). There are cost estimation models that help to calculate the accurate budgets (Daneva, M. & Wieringa, R. (2008, GAO, 2009; DODIG, Inspector General, 2012; SERC, 2012).

**Vender Reputation**

ERP system prices for software are generally competitive within a category of solution providers or venders. It has been enriched with the reputation or rank of the vender they maintain locally or internationally (tgiltd.com, n.d.). SAP and Oracle are expensive products compared to others (aptean.com, 2012), even though companies in final negotiations with several solution providers from different tiers may be surprised to find that the prices are very competitive between business scenarios (Westrup & Knight, 2000; Jama, 2006).

According to a recent study conducted by the US consulting firm Panorama Consulting, SAP is the undisputed leader when it comes to ERP, enjoying a 22% market share. Oracle maintains a 15% market share, while Microsoft at 10%. The remainder is spread over other ERP vendors (blogs.sap.com, 2010). The balance 53% includes all other leading venders that are over 100. It concludes that remaining vendors will not receive even 2% each.

**Experience and Expertise Knowledge**

Expertise knowledge and past experience are really countable and reduce the overhead as well as the budget by selecting the correct tools and methodologies (Kumar Pal, 2008). There are systems to outsource certain parts of the project to third party consultation firms who are more confident about handling sections such as performing feasibility study, documentation and presentation, costing and budgeting (Clarke & Connor, 2012).


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**Development lifecycle of the ERP**

ERP system cost should be viewed in the context of lifecycle cost or total cost of ownership (TCO). Consider the up-front cost for hardware, software and implementation plus operations, support and maintenance cost for a reasonable span of time (at least 5 to 7 years). It is based on the lifecycle of the ERP implementation process including Business Analysis, System Design, System Implementation and System Testing. The development lifecycle is based on the conceptual framework aligned with the business process (Maditinos, Chatzoudes, & Tsairidis, 2011; SERC, 2012). Most ERP system providers charge an annual maintenance fee in addition to these, in the range of 18-20% of the purchase price and it is well worth the cost (aptean.com, n.d.). A maintenance subscription will ensure that there is continuous support, "bug-fix" services, as well as system updates and enhancements as the supplier continues to invest in the product and take advantage of new functions and technologies within a given period or according to the agreement.

**Software Service Cost**

Due to the complexity of the business process most ERP system suppliers now offer a Software-as-a-Service (SaaS) deployment option for their systems rather than running on their own to reduce the overhead of the application maintenance, responsibilities, and the risk. SaaS is a monthly "subscription" pricing paradigm (aptean.com, 2012). There is no up-front software licence cost and no hardware or operating system cost because the system is hosted in the cloud. However, monthly or annual costs will be higher than the maintenance fee with normal licensing.

**Companies still have unrealistic expectations**

SaaS, implementation accelerators, pre-configured solutions, and out-of-the-box implementations may be touted by software vendors as the silver bullet to an easy implementation, but companies are still more likely to go over the budget and take longer than expected (Zimin, Qiang, Jing, & Jianwei, 2013).

**Number of modules/amount of functionality**

Similarly, software is often priced by the scope of the business process and the functionality included. Software with more functionality is generally more expensive than software with less functionality and that means it needs to add many modules to represent the different business processes such as Human Resource Planning, Finance and Accounting, Manufacturing and Material Management. Likewise, implementing software that supports a broader set of business processes and functions will cost more (Scavo F., (2010), Rosa & Max Hodal, 2010). Analysing and documenting specific business requirements and conducting feasibility studies have significantly contributed to the pricing of the ERP (Erpsoftwareblog.com, n.d.).

A function point is a unit of measurement to articulate the amount of business functionality of an ERP system . Function points measure the software size and the cost of a single unit. There are recognized standards and public specifications for sizing software based on Function Points as ISO Standards i.e. COSMIC: ISO/IEC 19761:2011 Software engineering. A functional size measurement method, FiSMA: ISO/IEC 29881:2008 Information technology - Software and systems engineering - FiSMA 1.1 functional size measurement


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method, IFPUG: ISO/IEC 20926:2009 Software and systems engineering - Software measurement - IFPUG functional size measurement method, Mark-II: ISO/IEC 20968:2002 Software engineering - Ml II Function Point Analysis - Counting Practices Manual, NESMA: ISO/IEC 24570:2005 Software engineering - NESMA function size measurement method version 2.1 - Definitions and counting guidelines for the application of Function Point Analysis (Omg.org., 2014; Lagerström, 2010).

**Amount of data conversion or interfaces required**

An organization that can implement the new system plainly, without a lot of data conversion from the old system and without building interfaces to legacy or third-party systems, will get by with a lot less implementation budget than an organization that requires much data conversion or integration. The complexity or the simplicity of the interface depends on the business functionalities, but interfaces and navigation structure are very clear to the end user to understand easily including the navigation structure (Scavo, n.d.). This is based on the number of interfaces that define the metric to determine complexity and the size of the ERP project (Rosa & Max Hodal, 2010; Clarke & Connor, 2012).

**Skills and availability of the internal project team**

Even after outsourcing the ERP development there is a team to represent the internal process of the business. The organization that has to provide a well-formed internal project team with skilled resources will generally pay less for implementation than an organization that depends mostly on outside contractors to undertake implementation activities (Scavo, n.d.). It reduces the business analysis process and configuration including the period, and since they are on the job they give live experience (Robert, McLeod, & Davis, 2011).

**Travel Cost**

ERP applications are developed for local and overseas businesses that are linked together. The company has a right to select a vendor after following the vendor selection process. A critical factor for overseas vendors is the cost of travelling, since they must reside on the site according to their requirement. If the vendor stays in the client's backyard, has a branch office nearby, or implementers that are geographically diverse and use a home office, then travel costs including room, board, airfare, car rentals, parking, and mileage may be less (Scavo F., 2010).

**Parallel systems**

This issue arises when data is migrated into a new system without following proper procedures. Parallel systems hamper the appropriate integration of organizational data and lead to data mismatch in other modules. As a result, support system provided by the vendor becomes obsolete and difficult to implement (Dixit & Prakash, 2011). Hence, the use of parallel systems should be completely avoided to prevent the increase of implementation and maintaining costs.

**Training and testing**

Training and testing of the system should be properly conducted by the ERP Consultants. As part of the implementation process, the vendor provides training to a group of people comprising 30% from the clients' side, known as the 'Core Team'. It is the responsibility of


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the core team to act as the trainee team who coach the rest of the End Users (Dixit & Prakash, 2011). It was observed that 50% of training provided to end users was not performed mainly due to the lack of computer literacy. Therefore, they need extra training and time. Due to this natural reason, an extra budget was allocated for this purpose. In this regard, a mixed training method is suitable for in-house employees (Noudoostbenil & Hashem, 2009). Coverage-based testing approach could significantly reduce the risk of failures (Gerrard, n.d.; Lagerstr¨om, von W¨urtemberg, Holm, & Luczak, 2010).

**Employee Retention**

ERP implementation requires two to five years on average. Thus, ERP vendors have observed, the system going live after completion of the training to the staff, but, within a short period, many trainees from the organization quit the company. This causes a great loss to the organization in the form of shortage of key resources, i.e. trained staff. Therefore, with the request of the organization, the vendor has to continue training people. This is considered as a hidden cost and increases the implementation costs (Dehaghani & Hajrahimi, 2013; Clarke & Connor, 2012; Jama, 2006).

**Constructive Technology**

This is a highly demanding and key competitive factor when considering the budgeting. According to client requirement or vender's preference, it is possible to select the technology used to develop ERP application. Complexity of the technology, future survival with competition, and the expertise in those areas, are the factors that raise ERP budget (Lagerstr¨om, von W¨urtemberg, Holm & Luczak, 2010; Lagerström, 2010).

**Documentation**

Documenting a large-scale ERP project is a complex task. It initiates from the beginning and should align with the entire development process including creating the user manual (Sherwood.com, 2012). This is a legal document as well as a reference material that the developer can reuse when necessary. Under the documentation process there are hidden costs such as printing, filing and maintaining, drafting, and typing, including user manuals (Dehaghani & Hajrahimi, 2013).

**Integrating to an external system**

According to the available budget, the complexity of the business process or how new the existing module is, have been considered to drop some module from the new system to reduce the total budget by the client. However it increases the budget unnecessarily because the vender needs to put extra effort to integrate existing modules with the latest application (Sherwood.com, 2012; Herbert, 2006).

**Budget management and audit costs**

The Budget management and auditing costs are also a significant factor throughout the project. According to the stability of the vender they are outsourced or keep the in-house records to maintain the budgeting (Herbert, 2006). Software development companies like to outsource this to the auditing firm to reduce their stress but this cost will be added to the client (Lagerstr¨om, von W¨urtemberg, Holm, & Luczak, 2010).


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**Celebration funds**

Budget allocation for the celebration of the project is also a considerable amount due to factors such as inauguration, project delivery, meeting in different stages, and with different levels of employees or consultants for the milestones and duration of the project (Herbert, 2006). Sufficient amount of funds have been allocated at the beginning of drafting the budget to celebrate turning points in the project.

**Back-up, monitoring, and data protection**

This is a duty of the vender during the development of the ERP system, even though a separate budget has been allocated for this purpose from the client. This is especially considered for large-scale projects because while developing such a system, the vendor needs to create an artificial environment to obtain back up and protect the data (Lagerstr¨om, von W¨urtemberg, Holm & Luczak, 2010).

**Third party software licence cost**

According to the client requirement, the vender needs to purchase third party software or plug-ins to develop the ERP application. Thus, a budget is allocated for this purpose (Herbert, 2006).

**Cloud computing technology**

Advancements of the Technology and new innovations are being used to maintain the competitiveness among businesses. Budgeting has been increased due to these technological achievements (Lagerström, 2010).

**Data Migration or Conversion**

Data migration or conversion has an impact on budgeting (Erpsoftwareblog.com, n.d.; Rosa & Max Hodal, 2010). This includes the data migration process and the expected application techniques.

**Database Management Cost**

Once the company or vender determines the sensitivity of the data, the next issue is how to manage the database to ensure high security and easy maintenance (Rosa & Max Hodal, 2010). Therefore, data encryption process and recovery, and backup processes are included during budget allocation.

**Multiple Environments on one Server**

When starting, testing process and production process on real environments are installed and running multiple setups on a server. Traders use the web site that resides on the production environment (Oracle Software Corporation, 2014).

**Design for Reuse Specified separately**

When a client requests for a separate design for the purpose of reuse in the future, an extra cost needs to be included in the budget (SERC, 2012; Lagerström, 2010). This is important when extending the application or adding separate modules in future.


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**Additional consultants increase project costs**

Additional consultations other than the number of times fixed initially, is charged to the total cost of the ERP development (Lagerstr¨om, von W¨urtemberg, Holm & Luczak, 2010). These consultations are conducted to verify and ensure the business process and testing stages (Herbert, 2006; Clarke & Connor, 2012).

**Risk Classification**

According to the business process, the level of the sensitiveness of data, online and real time data transaction, and also security are the factors considered to analyse the risk of the project (Lagerström, 2010; Clarke & Connor, 2012).

**Hidden Costs**

Allocating separate budgets for every category as mentioned above is difficult. Therefore, companies maintain a hidden cost section to allocate a budget for items they cannot exactly figure out or break down, and name it as miscellaneous costs (Saleem & Dhavachelvan, 2010; Jama, 2006).

**Legal Compliance**

It is necessary to consider Legal compliances in order to review and check the bond or the signed contract. This ensures that the vendor and the client employ a proper legal channel and adhere to all legal points for the survival of both parties (BearingPoint, 2004).

## METHODOLOGY

The research was conducted quantitatively using a questionnaire, for 80 leading companies. The main focus was on the ERP system implementation cost and the maintenance cost. Companies were selected according to different business processes to encompass leading companies in Sri Lanka. Some of the companies were fully functional locally and others affiliated with foreign companies or conducted international business. A mixture of stakeholders who were involved in ERP system implementations in-house or out-sourced were the participant companies in the research.

Implementation and maintenance cost has been considered together in order to calculate the amount that has been spent on softwares to run the business in an organization.

The budget preparation priority level for the above factors has been identified using a questionnaire. Senior and middle level consultants who work in the Sri Lankan software development companies were interviewed.

Approaches for conducting the research include Descriptive, Hypothesis Testing [Anova, Analysis and variance (One Way), Pearson Correlation], and Frequency Analysis. For this study, a Hypothesis Testing approach referred to as the ‘deductive approach’ is utilized. Using the above model, hypothesis developed in the earlier part of the research will be tested.


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**The Population**

All companies, representing samples, were selected according to their business processes and business functions. Sixty Companies selected from Manufacturing, Finance and Banking, Hotel, Hospitals, Air Lines, Sales and Marketing, Services Providing Centres, and Garment sectors are presented in Table 1.

**Table 1: Selected companies**

| Type of the Company | No. of Companies |
|---|---|
| Banking Sector | 08 |
| Garment Sector | 05 |
| Manufacturing Sector | 10 |
| Sales and Marketing | 06 |
| Hotel Sector | 11 |
| Services Providing Centres | 10 |
| Airline | 02 |
| Hospital | 04 |
| Insurance | 04 |
| **Total Companies** | **60** |

In addition to the above companies, 50 senior- and middle-level software developers who engage in budgeting were consulted to develop an idea on the priority level of the above factors when preparing a budget. The Likert scale was used to analyse the data.

**Primary Data: Questionnaires**

The main source of primary data was obtained through the distribution of questionnaires issued to companies which used ERP applications. Three questionnaires facilitated collecting these primary data.

The first questionnaire gives a general idea about the ERP system implementation cost and the second questionnaire identifies the maintenance cost for the entire business process per annum. This helps to measure the knowledge gained in that particular subject as well as the ERP implementation and maintenance costs. The third questionnaire was based on the budget calculation of ERP projects. Here, we mainly highlighted the question whether they had surplus cost for the selected key areas as above to recover the ERP implementation costs and earned the profit, without being profitless or earn only a marginal profit.

**Secondary data: Annual Reports**

Primary data is verified by the secondary data which was crosschecked with the company annual reports of 2013, 2012 and 2011. The secondary data list helped to learn about the cost breakdown for different factors. In addition to the local companies, applications from all over the world were compared for comparison (180systems.com, 2014).


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### Presentation of Data and Data Analysis

Since this is a paper focusing on the topic of the marketplace of the ERP application, implementation and expenditures, and co factors which increase the cost of maintenance it was presented in tabular format. Individual variables were compared to check the relationship between these variables. This helps to understand the marketplace of ERP implementation and the maintenance to improve the quality of in-house ERP and outsourced-developed ERP applications within the Sri Lankan domain.

### Limitations

While performing this research, limitations were identified to avoid inconsistency and anomalies. These limitations are as follows:

Vendor organization and product brands were negligible Originality of the organization, whether it is a local software development company, foreign or a multinational company Level of the business complexity even in the same business domain Country infrastructure for local scenarios and for foreign companies.

Implementation and maintenance cost average was obtained for the years 2012, 2013, and 2014, to maintain dataset consistency.

### Analyse Priority level when preparing budget

We have assigned values in ascending order from 1-5, to the options in the Likert scale starting from “Not a priority” to “Essential”. So “Not a priority” option gets a value of 1 and “Essential” gets a value of 5 and each of these values is multiplied by the corresponding number of companies within each fact. Finally, a total score for each fact is calculated by adding them up during budget preparation.

## STATISTICAL ANALYSIS

### Analyze Local Software Implementation Cost

The following Descriptive analysis table shows the local software implementation cost among a valid sample of 60 companies.


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**Table 2: Descriptive Analyze local software implementation cost**

| | | |
|---|---|---|
| N | Valid | 60 |
| | Missing | 0 |
| Mean | | 570,833.47 |
| Median | | 194,298.50 |
| Mode | | 153,516 |
| Std. Deviation | | 1,008,314.191 |
| Variance | | 1,016,697,508,319.643 |
| Skewness | | 3.592 |
| Std. Error of Skewness | | .309 |
| Range | | 6,267,823 |
| Minimum | | 384 |
| Maximum | | 6,268,207 |
| Percentiles | 25 | 44,281.50 |
| | 50 | 194,298.50 |
| | 75 | 614,062.00 |

The average software implementation cost (per system) for the local companies is about $570,833 whereas the median cost is about $194,298. These costs range from a minimum of $384 to a maximum of $6,268,207 and they were recorded for the services type companies and banks, respectively.

Histogram for the system implementation cost (per system) for local companies is given in Figure 1. It is observed that the histogram is rightly skewed mainly due to the higher software implementation cost involved in the banking sector.

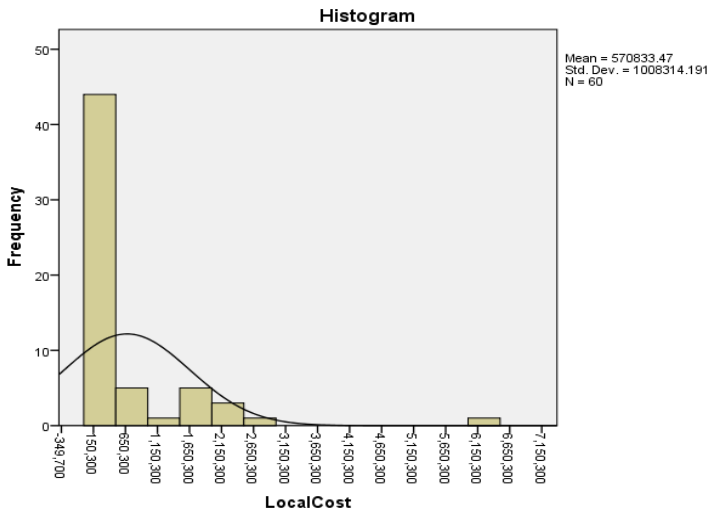


**Figure 1. Bar Chart representing the histogram for the system implementation cost (per system)**


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**Analyze and calculate the cost per module locally**

**Table 3: Descriptive Analyze and calculate the cost per module locally**

| | | |
|---|---|---|
| N | Valid | 60 |
| | Missing | 0 |
| Mean | | 119,081.95 |
| Median | | 35,273.00 |
| Mode | | 30,703[a] |
| Std. Deviation | | 243,008.244 |
| Variance | | 59,053,006,482.862 |
| Skewness | | 4.207 |
| Std. Error of Skewness | | .309 |
| Range | | 1,566,975 |
| Minimum | | 77 |
| Maximum | | 1,567,052 |
| Percentiles | 25 | 10,169.50 |
| | 50 | 35,273.00 |
| | 75 | 79,922.75 |

a. Multiple modes exist. The smallest value is shown

The average software implementation cost per module for the local companies is approximately $119,082. The median cost is about $35,273. The price range varies from $77 to $1,567,052 per module depending on the type of the company and the complexity of the business process.

The following histogram (Figure 2) illustrates the distribution of cost per module for local companies.

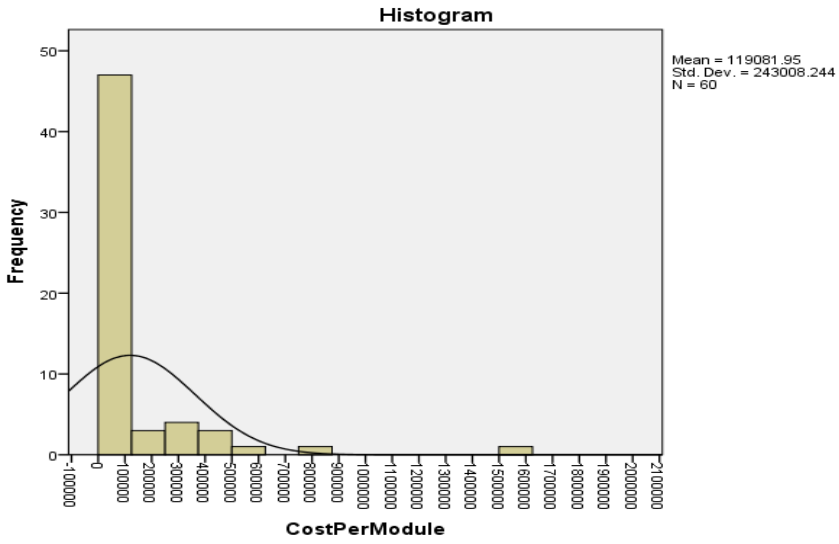


**Figure 2. Bar Chart indicates cost per module**


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Similar to the cost per system, the cost for modules also right skewed, indicates that most of the cost values are less than $600,000.

As illustrated in Table 4, the minimum software implementation cost per module by local companies is recorded for the hospitals and the maximum is recorded for the banking sector. The overall average cost per module, irrespective of the type of company is about $ 119,081.

**Table 4: Minimum software implementation cost per module by local companies**

| Company Type | No. of Companies | Cost Per Module($) (Local Companies) |
|---|---|---|
| Hotels | 11 | 67,997.00 |
| Banks | 8 | 403,857.74 |
| Hospitals | 4 | 39,175.05 |
| Manufacturing | 10 | 115,023.65 |
| Sales | 6 | 46,709.49 |
| Services | 10 | 100,206.60 |
| Insurance | 4 | 60,259.44 |
| Garments | 5 | 50,774.30 |
| Airlines | 2 | 40,961.81 |
| **Total Local Companies** | **60** | **119,081.93** |

**Comparison/Analyze local and international software development and maintenance cost**

**Table 5: Local and global software development and maintenance cost**

| Statistic | | | Global | Local |
|---|---|---|---|---|
| N | Valid | | 36 | 60 |
| Mean | | | 126,048.7 | 570,833.5 |
| Median | | | 66,926 | 194,298.5 |
| Mode | | | 13,703 | 153,516 |
| Std. Deviation | | | 126015.5 | 1008314 |
| Variance | | | 1.59E+10 | 1.02E+12 |
| Skewness | | | 1.592 | 3.592 |
| Std. Error of Skewness | | | 0.393 | 0.309 |
| Range | | | 548045 | 6267823 |
| Minimum | | | 1268 | 384 |
| Maximum | | | 549313 | 6268207 |
| Percentiles | | 25 | 36606.75 | 44281.5 |
| | | 50 | 66926 | 194298.5 |
| | | 75 | 179366.5 | 614062 |

Table 5 shows that the average and the median software implementation and maintenance costs for global companies are considerably higher than for local companies. This fact is


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further assured (as the one tail p value is 0.00064) by the two sample mean hypothesis tests as given in Table 6.

**Table 6: Local and global software development and maintenance cost using t-Test**

| t-Test: Two-Sample Assuming Unequal Variances | Local | Global |
|---|---|---|
| Mean | 570833.4345 | 126048.7 |
| Variance | 1.0167E+12 | 1.59E+10 |
| Observations | 60 | 36 |
| Hypothesized Mean Difference | 0 | |
| df | 62 | |
| t Stat | 3.373255419 | |
| P(T<=t) one-tail | 0.000642357 | |
| t Critical one-tail | 1.669804163 | |
| P(T<=t) two-tail | 0.001284714 | |
| t Critical two-tail | 1.998971517 | |

**Analyze Organization level (co-relation) software development and maintenance cost in 2014**

The correlation analysis is presented in Table 7 for local software development for module and cost for the entire system; and the cost for global software development for selected companies.

**Table 7: level (co-relation) software development and maintenance cost in 2014**

| Company Type | Local Cost Per Module ($) | Local Cost Per System ($) | Global Cost Per System ($) |
|---|---|---|---|
| Hotels | 67,997 | 359,173 | 114,889 |
| Banks | 403,858 | 1,978,205 | 72,778 |
| Hospitals | 39,175 | 231,475 | 99,301 |
| Manufacturing | 115,024 | 409,026 | 209,045 |
| Sales | 46,709 | 273,693 | 68,033 |
| Services | 100,207 | 503,770 | - |
| Insurance | 60,259 | 238,198 | - |
| Garments | 50,774 | 270,735 | - |
| Airlines | 40,962 | 235,488 | - |


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**Analyze Priority level when preparing budget**

When preparing the budget, the facts with the higher number of "essential" options will get a higher score (i.e. higher the number of companies that selected a particular fact as "Essential", higher the score for that fact). We have arranged these scores in descending order and identified the most important facts that need to be considered. According to Table 8, key factors have been identified according to the level of priority. Hence, budgeting varies accordingly.

**Table 8: Priority level during budget preparation**

| Rank | Fact | Total Score |
|---|---|---|
| 1 | Software Service Cost | 245 |
| 1 | Data Migration or Conversion | 245 |
| 2 | Development lifecycle of the ERP | 240 |
| 3 | Risk Classification | 234 |
| 4 | Number of modules/amount of functionality | 233 |
| 4 | Skills and availability of the internal project team | 233 |
| 5 | Documentation | 231 |
| 6 | Back-up, monitoring, and data protection | 228 |
| 7 | Hidden Cost | 227 |
| 8 | Experience and Expertise Knowledge | 225 |
| 9 | Training and testing | 225 |
| 9 | Parallel systems | 220 |
| 10 | Constructive Technology | 213 |
| 10 | Specified separately for Designed for Reuse | 213 |
| 11 | Budget management and audit costs | 207 |
| 12 | Multiple Environments on one Server | 195 |
| 13 | Employee Retention | 191 |
| 14 | Vender Reputation | 185 |
| 15 | Integrating to a external system | 180 |
| 16 | Third party software licence cost | 165 |
| 17 | Cloud computing technology | 163 |
| 18 | Database Management Cost | 150 |
| 19 | Amount of data conversion or interfaces required | 136 |
| 20 | Additional consultant increased project costs | 122 |
| 21 | Travel Cost | 104 |
| 22 | Companies still have unrealistic expectations | 75 |
| 23 | Celebration funds | 73 |


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## CONCLUSION AND DISCUSSION

The Banking sectors show high investment for Software implementation cost per system than other business organizations. When analysing business scenarios, the process of the business is more complex, responsible, and risky. These institutes maintain transactions globally and thus, the automated systems should be more reliable and more secure in order to trust them.

The results show that the average and the median software implementation and maintenance costs for global companies are comparatively higher than in local companies. These multinational companies deal with all businesses online and on real-time basis. Therefore, the monitoring process and the implementation process vary due to identified factors.

Software Service Cost and Data Migration or Conversion indicate that the highest values are given more priority when considering software development.

Development of ERP lifecycle, Risk Classification, Number of modules/amount of functionality, Skills and availability of the internal project team, Documentation, Back-up monitoring, and data protection, Hidden Costs, Experience and Expertise Knowledge, Training and testing, and Running parallel systems are considered as key factors of prime importance.

In addition, Multiple Environments in one Server, Employee Retention, Vendor Reputation, Integrating to an external system, Third party software licence cost, Cloud computing technology, and Database Management Cost have significantly contributed to the budget calculation.

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