ERP Deployment in Manufacturing Industry in Sri Lankan Context


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The successfulness of an Enterprise Resource Planning (ERP) system is not only dependent on the vendor. The use of an ERP can harness enormous benefits for organizations, if the implementation process is properly managed. Hence, the successful ERP usage opens the doors towards many advantages and ultimately resulting in customer satisfaction. The manufacturing industry is one of the largest contributors to the Gross Domestic Product (GDP) in the Sri Lankan economy. It is also focused towards the same objective. Therefore, the proper alignment between the ERP and the organizations who have adopted the solution in the manufacturing industry is viral. The overall objective of this research is to identify current conventions of ERP, ERP adopted organizations and its current usage, the issues associated with ERP usage in the Sri Lankan manufacturing industry and to evaluate several ERP systems deployed in organizations with the use of a framework evaluation criteria. This is an attempt to provide a comprehensive knowledge to the newcomers who are entering in to the manufacturing industry. Twelve organizations in the Sri Lankan manufacturing sector with their deployed ERP solutions are selected as the sample for the data collection. The research consists of a thorough data gathering process and it involves both qualitative and quantitative analysis techniques. This research is of great value to the new ERP adopters as well as for the organizations who are currently using the system.

Index Terms—Enterprise Resource Planning, Manufacturing Industry

I. INTRODUCTION

Enterprise Resource Planning (ERP) is a software solution that addresses the enterprise needs by taking the process view of the organization to meet organizational goals through tight integration of all functions within the enterprise. Even though ERP is a large investment, many organizations have undertaken these projects because of the latest technology availability. It is crucial for an organization to make the ERP implementation project a success and start obtaining benefits out of it as fast as possible [1].

Following the international influence, a lot of organizations belong to various industries in Sri Lanka have also adopted ERP systems. Product manufacturing, telecommunication, insurances, intimates, and health care to name a few.

The research focus is on the well established manufacturing sector of Sri Lanka, which is a major contributor to the GDP. By definition, the manufacturing sector includes establishments engaged in the mechanical, physical, or chemical transformation of materials, substances, or components into new products [2]. The advantages such as cost effectiveness, efficiency and customer satisfaction through better customer relationship management make an ERP implementation essential for the manufacturing industry in Sri Lanka.

This research focuses on the current trends involved in the ERP practices within the Sri Lankan manufacturing industry. The case studies were conducted in 12 manufacturing organizations using interviews and questionnaires. Framework evaluation criteria were used to gather information about the ERP deployment containing technology complexity, resource utilization, information dissemination and business logic implementation dimensions. The results are presented from the user’s perspective. The issues in current practices and the recommendations to overcome those usage issues were also identified.

This paper encompasses of six sections and literature review is presented next. The objectives are briefly outlined in section three before the research methodology. The research findings and discussion are given in section five. The paper concludes with the conclusions and suggestions for further research.

II LITERATURE REVIEW

The literature survey presents a basic insight with respect to the area of research. The focus is mainly on Enterprise Resource Planning (ERP), ERP adopted industry sectors and commercially available ERP software packages and their current practices in Sri Lankan context.

Enterprise Resource Planning systems are defined in many ways. To provide a holistic view, different perspectives are taken in to account. From the managerial perspective ERP is defined as a software application that utilizes to improve the performance of organizations' resource planning, management control and operational control. On the other hand, from organizational integration’s perspective it is multi-module application software that integrates activities across functional departments, from product planning, parts purchasing, inventory control, and product distribution, to order tracking. ERP implementations are to improve and restructure internal business processes, which typically require reengineering of current business processes is another perspective of ERP [8].

ERP application is a multi-component based solution. The ERP software automates all the business activities within an organization. ERP has been prompted as a solution for supporting or reorganizing business processes at all levels (strategic, management and operational) from lower level workers to executives [3].

There are number of popular proprietary ERP software applications that can aid ERP implementation such as SAP, Oracle, PeopleSoft, Baan, Microsoft, The Sage Group, Lawson, Sybis and Integral [4].
The Sri Lankan contexts of the ERP practices are very much similar to the developing countries in the Asian region. Compared to the western world, the adoption rate of the ERP systems in this region is relatively low [5]. Organizations in the developing countries pursue ERP systems for similar reasons like the organizations in the developed countries. This is mainly, to support their growth beyond what their legacy systems allowed, and to stay competitive with other organizations globally. Even though ERP systems were mainly initiated by large organizations in the West, today ERP vendors are concentrating more effort on small and middle size enterprises [6].

The ERP vendors’ (SAP, ORACLE and PEOPLESOFT) statistics show that the ERP adoption is less than 7% compared with the global adoption. There are several factors that have contributed to this concern, such as [6]:

- Differences in relative wealth of organizations in Western versus most Asian countries.
- Relative to national per-capita incomes, ERP systems (including hardware, software, and support) are much more expensive for organizations in most Asian countries than in the West. Higher relative costs lead to lower relative demand.
- Limited national infrastructure further restricts adoption e.g., due to lack of skills to implement ERP systems and lack of telecommunications infrastructure.
- The level of integration provided by ERP is too high compared to expectations of individuals and organizations.
- An enterprise system like ERP imposes its own logic on a company’s strategy, culture, and organization. Therefore, the cultural differences of western developed ERP software and the developing countries in Asia.

Due to the ability of the system to reduce the operational costs of an organization the usage of the ERP systems have been increasing each year. According to SAP, 38 of its customers using their solution in Sri Lanka were able to reduce cost, improve efficiency and adapt to changing global business needs. The underlying fact is that there are ERP system users with a profit less than Rs. 1 million [7]. However, ERP implementations in Sri Lanka are mostly done for large and medium scale organizations in the island [4]. In the global market, these organizations are categorized in to small and medium scale [8]. These implementations are done with limited resources, lack of computer literacy and language problems and cultural issues and without properly evaluating their capabilities and competence. Therefore, they are less likely to survive and quick to failures in ERP implementation [8], [9]. John Keels Holdings PLC, MAS Holdings Pvt (Ltd.), Hemas Holdings PLC, Asian Paints Ltd, Chevron Lubricants Lanka Ltd and Loadstar Pvt (Ltd.) are some of the organizations that use ERP solutions successfully.

Sri Lanka’s manufacturing industry covers a wide range of categories. However, main focus is on highly valued products such as tea, rubber, gems, and apparels. In 2001, the manufacturing industry accounted for about 15.8% of the Gross Domestic Product (GDP), which was more than the construction, mining, electrical power and water all together [10].

The ever changing requirements of the exports market have led Sri Lanka’s manufacturing industries where they can no longer rely only on low cost labor. These are mostly in the incidences where the arrival of new competitors, expiration of multi-fibre and new free trade agreements. Hence, Sri Lanka’s competitive edge of manufacturing exports is to be realized by improvements in productivity. Sri Lanka’s manufacturing industries have not harnessed its full potential gain in technical efficiency after trade liberalization and furthermore capital intensive industries have performed better than the labor intensive industries in achieving and maintaining higher technical efficiency levels [11].

II. RESEARCH OBJECTIVES

Even though it is extremely expensive in Sri Lanka, ERP is one of the fast growing business solutions that organizations from various industries mostly preferred in adopting. The successfulness of the ERP adoption is dependent on the effective usage of system. The overall objective of this research is to provide an insight to the ERP deployment in the Sri Lankan context.

The approaches taken by the manufacturing organizations towards the ERP success and the lessons learnt will be discussed; subsequently other potential ERP implementers in the industry would find it helpful for achieving success in ERP deployment and improving business performance to gain competitive advantage.

III. RESEARCH METHODOLOGY

Since, this research examined the selected cases in the real life context, the research was mainly based on several case studies and mainly information gathering was based on interviews and questionnaires. The research findings are based on the 12 case studies conducted in an equal number of ERP deployed manufacturing organizations in Sri Lanka. Those organizations represent the large scale multinational organizations in Sri Lankan manufacturing sector. The selected case studies are represented in appendix.

Fig.1.- The framework evaluation criteria [12]
The framework evaluation criteria of N. Rittammanart, W. Wongyuedy and M.N. Dailey, 2003 represented in Fig. 1 was used to identify the effectiveness of the ERP solution from the users’ perspective. The framework was adjusted according to the research requirements. An outline of the framework is given below.

**Technology complexity:** The understandability of the technology used in developing the system, the sufficiency of the IT competencies within the organization in order to run the system, the organizations ability and skill in fixing the problems occurred in the system within the organization and efficiency of the data transfer and system functionality are considered in this criterion. The complexity level of the system’s deployment, the ease of system maintenance and the level of system security and user access are considered in this criterion.

**Resource utilization:** The system helps organizations to utilize its resources efficiently and effectively, saving time and money.

**Information Dissemination:** The system distributes information in an effective manner throughout the organization to enhance decision making.

**Ease of business logic implementation:** The system is flexible to the changes in business environment such as new business rules, alignment of business processes and the software allow organization to future expansion are tested in this criterion.

Furthermore, a survey was conducted to measure the technology complexity of the ERP systems but it can be expanded to other framework dimensions and framework validation research can also be conducted.

### IV. RESEARCH FINDINGS AND DISCUSSION

All the organizations in this research sample have adopted commercially available ERP systems to run their business processes efficiently. From the organization’s perspective, all of them are highly satisfied with the ERP solutions that they are using and were able to customize the solutions as required.

According to the visualization of analyzed information the same ERP suit have been deployed under different product categories. (e.g: The SAP ERP solution is used by food, beverage, intimate apparel and tyre manufacturing organizations). The results based on the four dimensions from the framework evaluation criteria are presented next.

#### A. Technology Complexity of ERP Systems

IT literacy and ease of use of the system are the two dimensions considered under the technology complexity. From the management's perspective, all the organizations in the sample have a satisfactory level of IT literacy. They ensured that most of the employees are capable enough to understand the system. The psychometric tests are used to measure the competency levels of employees.

Case study evidence presents that the user's perspective is different than it is of management's. The user's sample includes both the middle level and the operational level system users. The understandability of the system and the IT skills of the middle managerial level are more towards medium to high in percentages whereas, in the operational level; most of the users have low to medium range understandability and IT skills. The Appendix represents statistical information for the above statement. The understandability of the system, IT skills and user interface user friendliness are the three factors that are been considered under the user's perspective of the technology complexity.

#### B. Resource utilization of ERP Systems

Human resources, time and money are the factors that were used to evaluate the resource utilization of the case study organizations. From the management's perspective, system utilizes above mentioned factors effectively in order to function their business process faster. All the organizations in the research sample utilized these factors to increase the efficiency and productivity.

Many organizations were able to minimize the cost of recurrent activities in the organization considerably. Before the implementation of an ERP the organizations were involved in manual work. This resulted in many inconveniences, mistakes, errors and financial losses. Employees had to spend their valuable time in correcting those errors and organization had to pay more. This led to less productivity of the employees and the entire organization processes. Since, ERP introduces best practices; organizations could overcome above difficulties after adopting.

#### C. Information Dissemination of ERP Systems

The information dissemination of the ERP systems in the research sample is at a high level. It helps to integrate and disseminate all the information in an efficient and effective manner all over the organization.

Since, ERP provides the information dissemination in an efficient and effective manner, all the departments of this organization are integrated with their ERP system. Therefore, all the employees in the every department are responsible for their duty. If, any employee is unable to perform his duty in a proper way it causes a breakdown of the whole business process. These evidences are in favour of proper information integration and dissemination is helpful to all these organization to run their business process efficiently and effectively.

#### D. Business Logic Implementation of ERP Systems

All the organizations in the sample have customized ERP system to suit their business process more than 90%. If the systems that are developed specifically for an industry vertical the organizations were able to successfully align the business process with the ERP system. However, in some cases organizations had some difficulties in aligning their business process with the system.

Also, the commercially available software solutions are easily customizable and integrate able than the in-house developments. Therefore, those systems will suit the organizations which have large number of business units and branches. That is one of the main reasons to choose commercial ERP systems by the organizations.
E. Usage Issues in ERP

English and IT Literacy Issues: Even though English and IT is considered as a prerequisite for using ERP solutions. Most of the organizations in Sri Lanka face difficulties due to the lack of these to competencies.

Garbage in – Garbage out: If the user input is incorrect to the process, the process will produce an incorrect output. The information verification needs to ensure that input data is correct and output is accordance to the input.

User Short Cuts: Users of the system may try to find alternative ways without following the standard process of the system. This behaviour results many faults of the processes and final result will also be erroneous.

High training cost: Training employees for the ERP requirements incur high cost. Since, an organization consists of people with different skilled levels and educational, the training required different. Hence, the training should appropriately organize.

F. Practices to overcome ERP issues

The recommendations to avoid or mitigate some of the ERP issues in the deployment stage were identified from practices within the case study organizations.

Effective training: Nowadays, Job training has become an important factor in enhancing the individual and career well-being of workers in the organization. By definition, Job training involves teaching someone the skills required to do a job competently.

The psychometrics testing and trainings were found through the case studies. Psychometric tests are used in educational psychology. The tests are used as a part of the recruitment and selection process or as an assessment tool of learning and development in the organizations. The following psychometrics training types were found through the case studies.

- Personal Profiling Analysis (PPA): Each person of the organization is categorized under several dimensions such as dominant, designations, managerial levels. Then the training is organized by analysis of requirements. This is a training method to use to identify IT competencies of the employees.

- IRIS: This is a specific training method to identify the operating behaviour of an employee in an emergency situation. As an example, if there will be a corruption of the ERP system, what is the immediate action taken by the user will be identified.

- ELPHICAT: The English and IT competency levels of employees will be measured by this test. It will help organization to identify training needs of each employee.

Error Verification Techniques are used to eliminate the garbage in - garbage out issue. Information should be verified by an authorized person to ensure that input data is accurate. Then only the entire process will be secured to produce the accurate output. Each organization in this sample is performing data verification to minimize the errors and faults. As example end user should get authentication from the super user of the system to make sure that right information is input.

IT Help Desk through managing knowledge: An integrated system like ERP needs high and frequent level of maintenance in order to function as expectedly. In implementing an ERP; vendors train people within the organization who will be competent with handling all-around system’s functionality. These Super users are expected to handle the errors and maintain the systems performance without contacting the vendors. This is a process of managing ERP system’s knowledge from the client’s perspective. Where, the knowledge of the ERP system’s functionality will be captured by the super users as well as the ERP knowledge distribution from the vendor. The commercially available ERP systems provide a high quality help desk with frequently asked questions from the customers’ worldwide and functional descriptions of the system itself.

Best Practice: In order to obtain quick results with the intention of finishing their faster, users may avoid following the sequence of the system. These shortcuts are serious issues in an integrated system. Hence, the other users may not have the sufficient information in order to complete their work. ERP systems is incorporated with industry proven best practices where, a follower will have the standard, cutting edge processes way ahead of the competition.

V. Conclusion

The commercially available software solutions are preferred in all most every criterion in the framework. None of the organization in the sample have not opted to develop in-house ERP because of system integration difficulties since organizations consists of many business units and branches, high cost, failure risk is high.

IT Literacy of users is at a medium level and the ease of use is at a higher level in research data analysis. Hence, the technology complexity of the system is at a minimum level. ERP solution utilizes human resources and time in the organization maximally and it helps to minimize running cost of the organization though the best practice. Proper information is disseminated is available with all the deployed ERP systems in the case studies. Organizations were able to customize ERP solutions that they have adopted according to their business processes. The analysis has uncovered the current usage issues that prevent the effective use of ERP. The recommendations have been provided to overcome those issues. These will be presented in form of a website in order to share out with rest of the community who are future ERP users, ERP Implementers and ERP researchers.

This research on ‘ERP Deployment in Manufacturing Industry in Sri Lankan Context’ has only focused to analyze of the current ERP usage in Sri Lankan manufacturing sector base on a framework to provide comprehensive knowledge about different ERP software packages due to the time...
limitation. Future research can be conducted on other ERP adopted industries in Sri Lanka.

APPENDIX

TABLE I

<table>
<thead>
<tr>
<th>Case study</th>
<th>Product</th>
<th>ERP system</th>
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<tbody>
<tr>
<td>Case study A</td>
<td>Diary</td>
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</tr>
<tr>
<td>Case study B</td>
<td>Paints</td>
<td>MS Navision</td>
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<td>Case study C</td>
<td>Consumer products</td>
<td>SAP</td>
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<tr>
<td>Case study D</td>
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<td>Movex</td>
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<td>Case study E</td>
<td>Soft drinks</td>
<td>SAP</td>
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<td>Case study F</td>
<td>Gloves</td>
<td>CA-PRMS</td>
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<tr>
<td>Case study G</td>
<td>Intimates</td>
<td>SAP</td>
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<tr>
<td>Case study H</td>
<td>Consumer products</td>
<td>SAP</td>
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<td>SAP</td>
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<td>Case study J</td>
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<td>WISE technology</td>
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<tr>
<td>Case study K</td>
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<td>Lawson</td>
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<td>Case study L</td>
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TABLE II

MIDDLE LEVEL USERS - SAMPLE SIZE 46

<table>
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<th>Understanding</th>
<th>High %</th>
<th>Medium %</th>
<th>Low %</th>
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<tr>
<td>IT skills</td>
<td>41.30435</td>
<td>56.52174</td>
<td>2.173913</td>
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<tr>
<td>User friendliness</td>
<td>36.95652</td>
<td>58.69565</td>
<td>4.347826</td>
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TABLE III

OPERATIONAL LEVEL USERS - SAMPLE SIZE 40

<table>
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<th>Understanding</th>
<th>High %</th>
<th>Medium %</th>
<th>Low %</th>
</tr>
</thead>
<tbody>
<tr>
<td>IT literacy</td>
<td>5</td>
<td>65.00</td>
<td>30</td>
</tr>
<tr>
<td>User friendliness</td>
<td>12.5</td>
<td>50.00</td>
<td>37.5</td>
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</table>

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REFERENCES


