IMPLEMENTATION OF ENTERPRISE RESOURCE PLANNING (ERP) SYSTEM IN THE MANUFACTURING INDUSTRY, A LITERATURE REVIEW

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TABLE OF CONTENT

ABSTRACT

If implemented successfully, an enterprise resource planning system can provide the adoption firm with incredible strategic , operational, and related knowledge advantages. Failed implementation often can result in financial disasters. Today, much of the information on setbacks and achievements is focused on implementation reports of major production and service organizations. Yet suppliers of company resource planning now continue to change their marketing strategy for small and medium-sized producers. The time has come for researchers to gather, evaluate and disseminate knowledge that will help these businesses efficiently execute their projects. This research adopts a case study approach to investigate the implementation process in companies in the manufacturing industry , especially small and medium-sized firms. This research focuses on implementing activities which drive effective deployment and is developed using information obtained from field studies. Pathways are also highly recommended for future research.

Keywords: *Enterprise Resource Planning, implementation, manufacturing industry*

CHAPTER I

INTRODUCTION

1.1 Research Background

Nowadays, companies are constantly looking for the best ways to boost their business efficiency through more productive and reliable processes to maintain competitive advantages on the global market. To achieve the goals, the automotive industry needs to update its production technologies to increase its productivity. Enterprise Resource Planning (ERP) is a platform for business process management through a solid information business system that allows an organization to use a system of integrated applications to manage the business and automate certain back office functions (Beal, 2015 Manufacturing industry needs to look for an ERP system as it is capable of solving many problems and offering valuable benefits such as cost savings, streamlining processes, controlling growth and gaining a competitive edge (WorkWise, 2013 ERP system can help managers of a company track and manage the supply chain, sales and distribution, production, finance , logistics, human resources and other mission-critical components of a corporation through a series of interconnected executive dashboards (Rouse, 2014). ERP system is also a system that is able to integrate all these systems into one single database that is more effective in internal and external communication and data transfer (Shamsudin, 2008).

Additionally, ERP systems enable information to be standardized and centralized and turned into useful data that greatly helps a firm make the right choice. In reality, this program will improve companies' competitiveness by providing simpler ways to access relevant and accurate information, which in turn allows the right decisions quicker (David, Khondkar & Robert, 2009). Currently the manufacturing industry faces many difficulties in introducing an ERP program due to lack of human and financial resources. Implementation of ERP includes new processes, preparation, and data conversion (Khaparde, 2012). However, ERP systems give companies a better understanding of the overall business situation and the ability to produce the required reports.

1.2 Statement of problem

Although many studies indicated that ERP systems significantly improved the efficiency of a company in the business process as a whole, the actual results of many ERP systems failed to gain significant benefits from their program. An implementation of an ERP program must have clearly identified the goals and objectives in each industry. Nonetheless, although they had taken the correct step to clearly define their goals and expectations, the industry will still fail to report partially (Graham, 2009). Most of the failure of ERP implementation was not caused by the system itself but causes a large number of changes resulting from the ERP's high complexity of the organization (Seo, 2013). Additionally, many adjustments have to be made to the design and system analysis in the ERP system software, but system implementation management is a very challenging issue (Holland & Light, 2014).

The main reason for this issue is because implementing ERP requires a huge investment in money, resources , and time (Azhar & Mallikarjuna, 2016). An ERP program takes a long time for an implement to understand. Hershey made a mistake in attempting to fit a complex ERP implementation project into an unreasonably short timeline that would lead to system failure (Gross, 2013). In addition , the cost of implementing an ERP can be unpredictable as organizations take longer to plan their project costs which will normally result in over-budgets. By an average of more than $3 million, 63 percent of the manufacturing industry employs an ERP program to meet the budget that meets the planned costs. The cost of implementing ERP in the manufacturing industry is $11.4 million, which is higher than all industries that cost only $9.8 million, according to Panorama research. This is because further improvements are needed on ERP systems in the manufacturing industry (Panorama Consulting Solution, 2014).

One of the reasons for this studied research is the lack of further clarification of the efficacy of the ERP implementation in the manufacturing industry (Abugabah & Sanzogni, 2010). There are still many manufacturing industries unfamiliar with ERP systems and the system is implemented by only a few organizations. It is therefore important to look for the effectiveness of implementing ERP in the manufacturing industry including its challenges in meeting the requirements and satisfaction of the companies involved. Hence the aims of this study are:

a) Identify the advantages of introducing an ERP program in the automotive sector to more efficiently achieve targets and aspirations.
b) To examine the problems involved when using ERP systems in the manufacturing sector during business processes.
c) Exploring the usefulness of ERP systems in manufacturing business functions.

CHAPTER II

LITERATURE REVIEW

2.1 An overview of ERP systems

ERP is the latest stage in the evolution and expansion of manufacturing planning and control techniques from material requirement planning (MRP) (Orlicky, 1975) to capacity requirement planning (CRP) to manufacturing resource planning (MRP II) (Wight, 1982; 1984). MRP II systems began to evolve into ERP systems in 1988 when Dow Chemical Company acquired its first ERP development module from SAP AG, Germany (Schaaf, 1999). The term "enterprise resource planning" which describes systems designed to organize and schedule all the internal resources of the organization was first used by the Stamford, Connecticut, United States Gartner Group. The terms MRPII and ERP were, however, used interchangeably during the period 1988 to 1994.

In 1994, when SAP AG launched its next-generation software known as R/3, the distinctive essence of ERP systems became more apparent. The introduction of R/3 also marked a shift from mainframe technology platforms to the increasingly popular UNIX-based client-server architecture. In the years that followed, manufacturing and some service companies began investing heavily in ERP systems offered by SAP and its major competitors such as Oracle, Baan, PeopleSoft and J.D. Edwards. Given that ERP preparation and deployment activities are generally more expensive than the software product itself, consultants and system integrators have also pushed actively into the market for implementation. In 1998, ERP-related sales exceeded $ 1 billion for each of the five leaders in the consulting and systems integration industries (Escalle et al . 1999). Advanced Manufacturing Research (AMR), one of the leading ERP industry analysts, predicts that by 2002 the ERP market for software sales and ancillary services would reach $50 billion in annual revenues.

ERP systems consist of a suite of software modules, each module being typically responsible for collecting and processing information for a single business function, or a group of separate business functions. Modules of ERP software may include accounting, master planning , material planning, inventory, forecasting, finite scheduling, distribution planning and others. A typical ERP

system integrates all the functions of the company, allowing the modules to freely share and transfer information (Hicks and Stecke, 1995Therefore, all information is consolidated in a single relational database accessible across all modules, thereby removing the need for multiple entries of the same information. Although large firms usually budget heavily for ERP and can install a considerable number of modules available (Chalmers, 1999), smaller firms frequently follow a piecemeal approach, beginning with a few modules or a few components of each module (Ferman, 1999). With an external communication interface, customers and suppliers with network security clearance are allowed to access those types of information.

2.2 Benefits of ERP System

Many industry reports extol the virtues of ERP and its ability to bestow multiple benefits on those firms that can successfully implement these systems. One of the primary objectives for installing ERP as well as one of its principal benefits is the ability to integrate business processes (Brakely, 1999; Davenport, 1998, 2000). ERP use was also found to be important in increasing customer service. For examples, NEC Technologies credits its ERP deployment to increase its order processing speed, boost invoicing and dramatically reduce customer-service response times (Michel, 1997). ERP was also found to be effective in reducing the cost of inventories, enhancing productivity and increasing profitability (Appleton, 1997; Brakely, 1999). In addition, ERP has also been credited with the manufacturing lead times (Goodpasture, 1995). Other possible benefits of ERP include: dramatic decreases in inventory; significant reductions in working capital; ample knowledge about consumer desires and needs; and the opportunity to view and control the expanded enterprise of vendors, partnerships, and consumers as an interconnected whole.

However, it should be noted that not all enterprises which have implemented ERP are satisfied with the results of their investments. Many enterprises consider their attempts at implementation to be failures. For example, a $5-billion pharmaceutical business, FoxMeyer Drug, recently filed for bankruptcy. FoxMeyer claimed that a faulty ERP system, which produced excess shipments resulting from incorrect orders, had caused major problems (Bicknell, 1998; Boudette, 1999). Furthermore, Dell Computer has scrapped its ERP program, saying it was not robust enough to manage its expanding global operations.

In seeking to explain why some companies excel in their implementation while others fail, it is critical to understand that while the technical capabilities of ERP systems are fairly well known, it is not a simple matter of purchasing and installing the technology to execute such systems. Many believe that managerial issues, as with all advanced technology systems, present major barriers to the effective adoption of ERP systems from planning through to implementation. The literature stressed the need for and importance of empirical studies on technology planning and implementation issues (Chen and Small, 1996; Voss, 1988).

The ERP system must be dynamic, flexible enough to suit the business growth, and the centralized system must form a traditional best business process based on best organizational practice (Saleh, 2016). In addition, ERP system is capable of providing and collecting the correct data required to maximize business process efficiency across the entire organization (Jetley, 2016). There are four dimensions of ERP benefits, Cesarini and Gunnarsson (2014) say :

Operational Benefits; ERP systems can increase the level of efficiency, removing redundant processes that result in cost-cutting. In addition, ERP allows the great management to boost efficiency on the goods produced and efficiently deliver to the consumer. Decreased duplication and error rate, and improved information accuracy and reliability which can lead to improved quality (Burnson, 2016).

Managerial Benefits; ERP will reduce stock and increase productivity resulting from improved inventory management. In addition, the ERP program has strengthened the management of human resources by allocating and using workers based on their expertise and skills. The integration of data into a single system provides the ability to generate operational data that enables the organization to effectively make the better decisions. In addition, ERP offers improved performance monitoring, allowing the organizational experience to increase the overall effectiveness and quality of operational management (Rajesh, 2011).

Strategic Benefits ERP system may support alliances between businesses. Newly acquired businesses can be effectively incorporated into the standard business practices of an organization. ERP is capable of building external connections into the system. In fact, the ERP system allows for global expansion by being able to manage global resource management, global market penetration and cost-effectively (Rajesh, 2011).

Infrastructure Benefits; The ERP system allows the organization to react more quickly, cost-effectively and provide some alternatives for internal and external changes to enhance business flexibility (Cesarini & Gunnarsson 2014).

2.3 Case Study In The Implementation of ERP System

Many researchers have strongly recommended the case study research approach as an ideal resource for enhancing analytical and concise comprehension of complex phenomena (Flynn et al . , 1990; McCutcheon and Meredith, 1993; Yin, 1994). The introduction of ERP is an expensive and comprehensive undertaking involving preparation, rationale, deployment and commissioning activities of the integrated framework. The ERP system expands to include integral stakeholders in the supply chain Implementing ERP systems in the organization, and often even beyond. Additionally, it may take two or more years to fully implement ERP projects (Bradley et al., 1999; Parker, 1999). All of these factors add to the difficulty of ERP implementations and make snap-shot cross-sectional methods insufficient to evaluate the implementation phase of ERP.

The case study approach also provides other benefits, such as the ability to observe causality directly and combine evidence and logic to construct, establish or endorse theory that is not possible using other research methods (Maffei and Meredith, 1995). Unlike survey research formats, it allows more concrete follow-up questions to be asked and answered, which can lead to more relevant, generalizable which detailed findings and observations (Meredith, 1998). This study adopts a longitudinal case study methodology for delineating the process steps and investigating the myriad and complex relationships within and between these steps. Unlike most studies in this area, however, which concentrate on single case studies , this study reports on ERP implementation at four separate manufacturing facilities.

For this study , multiple methods were employed to gather data. Such approaches included direct observation by two of the writers who were academic observers for the projects from the project initiation point. The authors were given free access to historical documents and other records including financial data, and statistics of operations related to non-personnel. Also allowed the authors to sit in on regularly scheduled project-team meetings. There were also ongoing, open-ended interviews with corporate officers, divisional managers , project leaders, super-users, consultants and other project team members during and after the ERP projects were introduced.

These interviews, as suggested in Maffei and Meredith (1995), allowed the project participants to identify and frame the important issues and factors that affect the success of ERP implementation. This approach is consistent with the recommendation that researchers should use an inductive approach to the process of identifying problems for inclusion in the study in an area where theory is relatively undeveloped (Spector, 1992; Flynn et al . , 1994; Hensley, 1999).

2.3.1 Challenges of ERP implementation

Manufacturers face more problems when it comes to ERP implementation than non-manufacturing firms. Their market processes tend to be more complex (Ann, 2014). According to Hall (2014), the challenges during implementation, such as:

Bing Bang Approach; ERP system works as an independent system that doesn't fit into an entity with the existing system. This problem has proved ineffective and unsuccessful, and even worse, leading to the failure to adopt the ERP system (Hall, 2014).

Choosing the Wrong ERP; To achieve the effectiveness, it is very important to choose the right ERP system to fit in with the culture of the organization and its business processes. This is because if an incorrect ERP system is selected the organization will create a lot of problems as it will weigh down the whole organization (Needle, 2014).

High Cost; Very costly to implement ERP system. Panorama found that 57 per cent of manufacturing companies are beyond their ERP budget and expect to encounter greater overruns of $3.8 million on average (Panorama Consulting Solution, 2016). The main reason of the ERP budget overrun is due to the organization underestimate and unanticipated costs. ERP system required additional costs such as training, integration, testing , maintenance, adjustment, data conversion from old systems and consulting fees which cause the organization overrun their budget (Rajesh, 2011).

2.3.2 ERP system in business functions

The ERP system can improve information accuracy, quality , speed, and availability in all internal corporate relationships (Sulaiman, 2013). In market functions the ERP method is:

Operations and Logistics; ERP system improves the order management, enhances cooperation with the business partner and unit, and able to produce specific product depending on the

customers' needs and the market. By introducing the ERP system, the data and information between the business unit will be facilitated, as a result, the communication and interaction between them go effectively and efficiently (Sulaiman, 2013).

Human Resource; ERP system can simplify the management of human resources and the human capital. ERP system allows the organization to maintain a full employee database including all staff attendance, salary details, performance assessment, contact information, promotion and compensation. This ability provides another department with easy access to specific personnel data (Ross, 2015).

Financial; For control financial management, the supplier can incorporate the ERP program that can streamline accounting, consolidation, project scheduling, workflow, and collaboration. Implementing the ERP program improves the accuracy of financial data which can help faster decision-making (Sulaiman, 2013).

Sales and Marketing; The ERP psystem allows the organisation's access to the latest customer information. ERP system can minimize data entry errors and give information in real time. The employees will monitor all sales order transactions involved. It also gives a complete picture of customer activities, generates sales opportunities and handles order fulfilment (Jandu, 2014).

Suppliers; ERP system can improve the performance of suppliers by setting an alert with the system. ERP system documents the name, period, and quantity of each transaction. When the stock is low, the organization can use the alert tool to remind them. It will enhance coordination among both parties and increase order process efficiency (Miller, 2015).

2.3.3 ERP Implementation costs

ERP implementation costs may include but not limited to the costs of hardware, software, professional and consulting services, and internal staff costs. The costs are incurred during the initial installation of the system and may continue for several years afterward. Research have shown that ERP implementation is costly irrespective of the sector within which it is applied. Results of a 2002 study conducted by Meta Group which included 63 small , medium and large enterprises in various industries. The study showed the average cost of ownership of ERP was $15 million (the highest was $300 million and the lowest was $400,000) (Tambovcevs, 2012). There are typically certain pieces of costs which are ignored during the budgeting process. These items

may be considered as hidden ERP costs which may include: (Training, Integration and Testing, Customisation, Data Conversion, Data Analysis, Consultation, Implementation Teams can never stop, Waiting for ROI, Post-ERP Depression).

2.3.4 ERP implementation life cycle

As frequently mentioned in literature, the main four fundamental phases of the ERP life cycle are (1) planning, (2) implementation, (3) stabilization and (4) enhancement. The implementing company strives to reach a normal operation using the latest ERP software in the third stage "stabilization." Although the company aims to continuously develop the program and incorporate more functionalities in the fourth step. The fourth phase may be subdivided into three sub-phases, such as backlog, new module and major update, according to the literature. These sub-phases are special in character because they occur in the post-implementation cycle. The new ERP system is actually in use during this period and is forming a new reality (Shaul, L. & Tauber, D., 2012). Several ERP life cycles have been proposed in the literature among them are (Markus & Tanis) and (Esteves and Pastor) models which describe the process flow from the beginning until the system is fully stabilized. On the other hand, researchers have proposed other models to solve some of the implementation-related problems. Brehm and Markus (Brehm, L. & Markus, M. L., 2000, June) suggested one of them, which gives more focus to post-implantation activities such as software development , maintenance, improvement, and assistance.

CHAPTER III

DISCUSSION AND CONCLUSION

3.1 Discussion

ERP system must become a vital component of the performance of an organisation. This is because an ERP system allows all processes to run efficiently, which saves time, energy , and resources. In addition, the ERP system facilitates the flow of information between all organizational functions within an organization and relations with outside parties. The main objective of implementing the ERP system is to centralize the different functions of the organization into a single system that makes operations more efficient.

This study makes a contribution in identifying the benefits, challenges, and business functions of ERP implementation in the manufacturing industry. In order to improve the data accuracy, the future researchers can conduct a case study of one or two manufacturing companies and make a more detailed investigation of the efficacy of ERP implementation and how well its impact on the outcome. Specific industries or organizational sizes may have different organizational characteristics and business requirements for ERP systems and this may have a different impact on the factors of effectiveness.

3.2 Conclusion

Through introducing the ERP system, an enterprise allows the application capabilities to enhance efficiency and improved performance across the entire business cycle. ERP system helps an company to efficiently manage its global business in a timely manner by standardizing the details. Besides that, the introduction of the ERP program without any awareness and consideration is hard for an organization. The biggest challenge of ERP implementation is the system breakdown which brings the organization a slowdown in production and a shutdown process. By recognizing the functionality and complexities of the ERP system, an organization has the potential to deal with those challenges by providing effective management and preparation during implementation. Each business function is important for the effectiveness of the ERP implementation as it is linked throughout the entire organization during each business process.

In conclusion, not much work on the feasibility of applying ERP has been done. The research was therefore intended to describe the benefits, drawbacks, and business functions of ERP systems in the manufacturing sector. Through the interview , the researcher will recognize more closely related problems , challenges and functionality that the manufacturing industry will face before they decide to start implementing the ERP system.

REFRENCES

Appleton, E.L. (1997), "How to survive ERP", *Datamation*, Vol. 43 No. 3, pp. 50-3.

Beal, V. (2015). Retrieved from ERP - Enterprise Resource Planning: http://www.webopedia.com/TERM/E/ERP.html.

Bicknell, D. (1998), "SAP to fight drug firm's $500M suit over R/3 collapse", *Computer Weekly*, September 3, p. 3.

Boudette, N.E. (1999), "Scrambles to stem big glitches: software giant to tighten its watch after snafus at Whirlpool Hershey", *Wall Street Journal*, November 5, pp. A25-6.

Brakely, H.H. (1999), "What makes ERP effective?", *Manufacturing Systems*, Vol. 17 No. 3, p. 120.

Brehm, L., & Markus, M. L. (2000, June). The divided software life cycle of ERP packages. In *Proceedings of 1st Global Information Technology Management (GITM) World Conference* (pp. 43-46).

Burnson, F. (2016). *7 Little-Known Benefits of ERP Systems*. Retrieved from Software Advice: http://www.softwareadvice.com/resources/7-little-known-erpbenefits/.

Chen, I.J. and Small, M.H. (1996), "Planning for advanced manufacturing technology: a research framework", *International Journal of Operations & Production Management*, Vol. 16 No. 5, pp. 4-24.

Davenport, T.H. (1998), "Putting the enterprise into the enterprise system", *Harvard Business Review*, Vol. 8 No. 25, pp. 121-31.

David J. Emerson, K. E. (2009). SOX And ERP Adoption. *Journal of Business & Economics Research*, 53.

Escalle, C.X., Cotteleer, M.J. and Austin, R.D. (1999), *Enterprise Resource Planning* (ERP): *Technology Note*, February 1999, Harvard Business School Publishing, Boston, MA.

Ferman, J.E. (1999), "Strategies for successful ERP connections", *Manufacturing Engineering*, Vol. 123 No. 4, pp. 48-60.

Flynn, B.B., Schroeder, R.G. and Sakakibara, S. (1994), "A framework for quality management research and an associated measurement instrument", *Journal of Operations Management*, Vol. 11 No. 4, pp. 339-575.

Goodpasture, V. (1995), "Easton steps up to the plate", *Manufacturing Systems*, Vol. 13 No. 9, pp. 58-64.

Graham, J. F. (2009). Enterprise Resource Planning in Higher Education. 4-11.

Gross, J. (2013). A Case Study on Hershey's ERP Implementation Failure. 1-2.

Gunnarsson, P. C. (2014). Barriers to ERP System Use - Overcoming a Troublesome Post-Implementation Phase. 8-11.

Hicks, D.A. and Stecke, K.E. (1995), "The ERP maze: enterprise resource planning and other production and inventory control software", *IIE Solutions*, Vol. 27 No. 8, pp. 12-16.

Jetley, V. (2016). *Why ERP is So Important*. Retrieved from https://www.bayt.com/en/specialties/q/243092/what-is-the-importance-ofenterprise-resource-planning-erp/.

Khaparde, V. M. (2012). Barriers of ERP While Implementing ERP: a Literature Review. *Journal of Mechanical and Civil Engineering* , 49-50.

Light, C. P. (2014). A Critical Success Factors Model For Enterprise Resource Planning Implementation. *Manchester Business School*, 1-2.

Mallikarjuna, S. A. (2016). Implementation of Enterprise Resource Planning (ERP) Systems in the Construction Industry. *International Journal of Construction Education and Research*, 3-4.

McCutcheon, D.M. and Meredith, J.R. (1993), "Conducting case study research in operations management", *Journal of Operations Management*, Vol. 11 No. 3, pp. 239-56.

Michel, R. (1997), "The quicker the better", *Manufacturing Systems*, September, pp. 26A-8A.

Orlicky, J. (1975), *Material Requirements Planning*, McGraw-Hill, New York, NY.

Rajesh. (2011, June 9). *Advantages & Disadvantages of ERP (Enterprise Resource Planning) Systems*. Retrieved from http://www.excitingip.com/2010/advantages-disadvantages-of-erp-enterpriseresource-planning-systems/.

Rouse, M. (2014, August). Retrieved from ERP (enterprise resource planning): http://searchsap.techtarget.com/definition/ERP

Saleh, K. (2016). *What is the Importance of Enterprise Resource Planning* (ERP)? Retrieved from https://www.bayt.com/en/specialties/q/243092/what-is-theimportance-of-enterprise-resource-planning-erp/.

Sanzogni, A. A. (2010). Enterprise Resource Planning (ERP) System in Higher Education: A literature Review and Implications. *International Journal of Human and Social Sciences*, 395-397.

Schaaf, D. (1999), "Where ERP leads, training follows", *Training*, Vol. 36 No. 5, pp. ET14-ET18.

Seo, G. (2013). Challenges in Implementing Enterprise Resource Planning (ERP). 53.

Shamsudin, M. I. (2008). The Effectiveness of ERP Implementation in Manufacturing Industries. 1-6.

Shaul, L., & Tauber, D. (2012). CSFs along ERP life-cycle in SMEs: a field study. *Industrial Management & Data Systems*.

Solution, P. C. (2014). The 2014 Manufacturing ERP Report . 8-10.

Tambovcevs, A. (2012). ERP system implementation in Latvian manufacturing and construction company. *Technological and Economic Development of Economy*, *18*(1), 67-83.

Wight, O.W. (1984), *Manufacturing Resource Planning*: MRP II, Oliver Wight Publications Ltd, Brattleboro, VT.

WorkWise. (2013, October 7). *Why Today's Manufacturers Need A Modern ERP System*. Retrieved from http://www.workwisellc.com/why-todaysmanufacturers- need-a-modern-erp-system/.

Yin, R.K. (1994), *Case Study Research: Design and Methods*, 2nd ed., Sage Publications, Newbury Park, CA.