

# ERP Implementation Assessment in The Manufacturing Industries

Kasturi Kanchymalay  
Universiti Teknikal Malaysia Melaka,  
76100 Durian Tunggal, Melaka, Malaysia ,  
[kasturi@utem.edu.my](mailto:kasturi@utem.edu.my)

Fahmi Arif  
Universiti Teknikal Malaysia Melaka,  
76100 Durian Tunggal, Melaka, Malaysia ,  
[fahmi\\_ra@utem.edu.my](mailto:fahmi_ra@utem.edu.my)

Umami Raba'ah Hashim  
Universiti Teknikal Malaysia Melaka,

76100 Durian Tunggal, Melaka, Malaysia ,  
[ummi@utem.edu.my](mailto:ummi@utem.edu.my)

Syuria Amirrudin  
Universiti Teknikal Malaysia Melaka,  
76100 Durian Tunggal, Melaka, Malaysia ,  
[syuria@utem.edu.my](mailto:syuria@utem.edu.my)

Ramesh Krishnan  
Universiti Teknologi MARA,  
78000 Alor Gajah, Melaka, Malaysia ,  
[rameshkris@melaka.uitm.edu.my](mailto:rameshkris@melaka.uitm.edu.my)

**Abstract**—This study was aimed to explore and assess the implementation processes of Enterprise Resource Planning (ERP) system in the manufacturing industries in Melaka, Malaysia which included the implementation methodology and the problems encountered in the post implementation stage. The study shows that companies chosen for this study have used a proper and detailed project planning with appropriate implementation methodology for a successful ERP implementation. This study also marks an initial effort to assess the ERP implementation in the manufacturing industries in Melaka, Malaysia. (Abstract)

**Keywords**-Enterprise Resource System; ERP; Implementation Methodology; Melaka (key words)

## I. INTRODUCTION

Enterprise Resource Planning (ERP) is designed to integrate inter-department operation procedures for better management of company resources. Prior to the ERP era, each department had its own computer system to serve its operation. Data was being treated in isolation in its own system, causing duplication of data entry when shared among other systems [1]. This kind of operation was time consuming and caused data error during duplicating entry. ERP was developed to ensure efficient flow of information across multiple departments such as finance, accounting, human resources, supply chain and customer management [2]. Evidences show that it can improve operational efficiency by integrating business processes, thus supporting a more efficient and effective decision making in the organization. [3].

ERP is also believed to be one of the most effective solution on traceability and enterprise integration [4]. It has been implemented and used profoundly in many countries around

the world for almost 20 years including manufacturing industries in Malaysia. These industries have implemented ERP to support day to day business transactions. The worldwide market of ERP packages has been growing at an estimated annual growth rate of 4.8% and has exceeded \$21 billion in 2010 [5]. ARC Advisory group stated that total ERP market in 2006 was \$18.4 billion and predicted an annual growth up to 6.7 %. They also estimated that by 2011 the value of the market will reach \$24 billion [6]. SAP, PeopleSoft, Oracle, J.D. Edward and Baan are among the few giant companies which dominated the ERP market. SAP leads the market with more than 50 percent user [7]. The ERP market survey of SAP in 2006 shows that SAP and Oracle's ERP solutions have continue to dominate the Malaysian market.

The ERP implementation project is quite different from a traditional system implementation. Scholars [8,9] noted that ERP implementation is closely linked to change in business process in organization. According to G. Janssens et al. [10], the implementation of ERP will lead to the changes in the way the organization performs its task. Therefore, ERP project is a risky project for an organization. Economically, it is a highly cost project and it is difficult to estimate its success. In general, scholars [8,9,10] found that the implementation of ERP consists of many complicated task to accomplish.

These complicated task, in some cases, leads to failure of ERP implementation. Scholars [7] reported that based on The Gartner Group report, 70 percent of all ERP projects failed to be fully implemented even after three years. The reasons of the failure in ERP implementation have been investigated by many

researchers. After reviewing 134 articles of ERP implementation Finney et al [11] indicated that there are 26 categories of critical success factors in the ERP implementation. It implies that there is no single reason for the success or failure of the ERP. Because the success of ERP implementation is related to many factors, a generic method of ERP implementation is still questionable. Organizations sometimes needs to modify the method to fulfill their specific needs. There is a need for an investigation of various issues, such as method used and the kind of tools used to identify the most suitable implementation method. This study was intended to explore the existing ERP system implementation in the manufacturing companies in Melaka, Malaysia. It was also aimed at identifying and analyzing the ERP implementation methodologies based on the specific needs of the companies involved in this study.

## II. LITERATURE REVIEW

During ERP implementation, the scope and characteristics of the company need to be considered. Since companies structures and business processes vary, the ERP implementation characteristics will also differ [12] from one company to another.. There is no guarantee that ERP can be implemented successfully using one similar method. Scholars have attempted to design a systematic approach to ensure proper integration of all ERP components (software, process flow, customer mindset, and change management) [13] hence proposing varying implementation models.

For an example, P. Rajagopal [14] has proposed the implementation of ERP in six stages based on an adapted IT implementation model. This model consists of initiation, adoption, adaptation, acceptance, routinization and infusion stages. On the other hand, C. Marnewick et al [13] has suggested five stages in the ERP implementation after considering the ERP components. He stated that conceptually, ERP consists of four components which are software component, process flow, change management and customer mindset. Considering these four components, he developed the ERP implementation methodology as described below:

### A. Stage 1: Pre-implementation

Identification of operational needs, business drivers, strategic plans and other factors related to the scope and objective of ERP.

### B. Stage 2: Analysis

Project team evaluates and reviews existing business processes in the organization to understand the current condition. Technical and functional requirements are gathered and analyzed to determine the system needs. The evaluations of organizational culture and workforce skill are carried to identify workforce transition requirements that may lead to management change in the organization.

### C. Stage 3: Design

In this phase, a new process model is designed over an existing process based on the gap identified between the requirements and the new system. The design phase incorporates requirements from the analysis phase and the organization goals determined from pre- implementation stage.

### D. Stage 4: Construction

The construction phase configures the system requirements as modeled to create tangible operational processes and information system support. This process crystallizes the base product according to the integrated process model.

### E. Stage 5: Implementation

The implementation phase includes testing, end user training, system management, and cutover activities. All open issues need to be resolved in this phase. At this stage, all the prerequisites for the system to go live must be fulfilled prior the final ERP solution deployment. Policies, procedures and system authorization policies are finalized to prepare for a go live. Finally, a post-implementation audit is performed to measure the effectiveness of the ERP solution in meeting its goals.

Similarly, I. Ehie and M. Madsen [15] also proposed a five-stage model was proposed by The details of the implementation process are described as follows:

#### A. Stage 1: Project preparation;

Consists of project organization (building steering committee and project team), defining scope and vision-based performance and creation of detailed project plan (describing how to implement and assigning responsibilities)

#### B. Stage 2: Business blueprint;

Consists of analysis of current business processes and selecting a ERP system (creating flowchart, educating people on the ERP system), mastering the ERP system (in terms of functionality and configuration) and new process design mapping

#### C. Stage 3: Realization;

Consists of technical system development and conference room pilot (prototyping and adjustment towards final system)

#### D. Stage 4: Final preparation;

Consists of system tuning and testing (in option, profiles, menus and robustness test), educating and training (on process, data discipline and modules)

#### E. Stage 5: Go live and support;

At this stage, ERP modules would go live and further improvement will be carried out continuously for better performance.

A. Yokota and K. Yasuda [16] developed a 3-stage implementation model by summarizing the critical success factor of the ERP implementation from previous works. They have named their method as “user-oriented comprehensive ERP implementation methodology”. Detail of the methodology is presented below:

- A. *Pre-implementation stage*; consists of:
  - Pre-implementation preparation
  - Business process design
  - Project scheduling
- B. *Implementation stage*; consists of:
  - Implementation preparation
  - System design
  - System building
  - User support
  - System conversion
- C. *Post implementation stage*; consists of:
  - Go live
  - Maintenance, improvement and enhancement

Despite the various investigations and research on ERP implementation, the definition of the ERP success or failures is still vague. Many studies have discussed the critical success factors of the ERP implementation without defining the characteristics of the ERP success. The definition of the ERP success depends on how it is interpreted. Some researchers have categorized the level of success in the ERP implementation. For example, Gargeya and Brady [7] explained the ERP implementation status by considering the level of failure. It is believed that in implementing ERP, there will be two levels of failures; complete failures and partial failures. A complete failure of ERP is considered when the project is pulled off before implementation or when it failed so miserably that the company suffered significant long-term financial damage. On the other hand, a partial failure of ERP is considered, when there is tenuous adjustment process that creates disruption in daily operation and when there are few alignment problems resulting in minor inconvenience or minor downtime.

Al-Mashari et al defined the success of ERP the implementation by associating it to the benefits of the ERP system. He stated that when ERP is implemented successfully, it will give some benefits to the company in terms of operational, managerial, strategic, IT infrastructure and organizational benefits. Zhang et al [17] proposed a measurement model of successful ERP implementation which consists of four dimensions: user satisfaction, individual impact, organizational impact and intended business performance improvement. Arif et al [12] suggested that the measurement of ERP success is related to the level of customization using above the dimensions. The success of ERP implementation can be measured based on the level of

satisfaction perceived by the ERP users, the impact of ERP to individuals and organizational performance, and improvement of the intended business performance

### III. METHODOLOGY

The purpose of this study is to assess methodologies used in the ERP implementation of manufacturing companies in Melaka. Two manufacturing companies were chosen for this study. These companies were selected based on the consideration of the existence of ERP system implemented, the existence of ERP experts and their willingness to share their knowledge on ERP implementation. The ERP expert in this study is referred to a person who has been involved in the ERP implementation for more than 5 years.

To investigate their method in implementing ERP, information was gathered through in-depth interviews. In each company, two types of interview were conducted. First, an interview with ERP expert from each company was performed to explore the ERP characteristics and the ERP implementation activities. Structured and unstructured questions were used to gather information for this study. The questions were developed from previous implementation models [13-15]. Some open-ended questions were asked to explore the possibilities of implementation activities that were not covered in those references.

Another set of interview was conducted with the ERP users to investigate their perception and satisfaction on the implemented ERP system. The interview questions were developed from the dimensions of ERP the success [17] and the benefits of implementing the ERP [4]. The information gathered from interviews was then analyzed qualitatively and compared. As the number of samples is small, the result of this study shall not be generalized to other similar cases [18]. This study is categorized as a snapshot case study since the research entities are assessed and compared for a specific time period only [19].

### IV. ERP IMPLEMENTATION

#### A. ERP Characteristics

In this study, two manufacturing companies were selected and for confidential reasons, the names of sample companies are replaced with C1 (first company) and C2 (second company). In each company, one ERP expert was interviewed on the ERP implementation in their company. The respondent's profile as well as their company description is shown in Table I.

TABLE I  
RESPONDENTS AND COMPANY PROFILES

		Company	
		C1	C2
Company Description	Core business	manufacture	manufacture
	Company scale	medium	medium
	ERP implementation motivation	enhancement of core system	efficient operations
	# external consultant	3	2
	# key user	3	4
	# internal IT personnel	4	2
# managerial level	0	3	
Respondent Profile	Working Duration (recent company)	more than 5	2-5 years
	Involvement in ERP (recent company)	less than 1 years	2-5 years
	Role in ERP * (recent company)	1, 2, 3	3
	Involvement in ERP (previous company)	2-5 years	more than 5
	Role in ERP * (previous company)	1, 2, 3	2, 3

\*Role in ERP:

1. pre-implementation phase
2. implementation phase
3. post-implementation phase

Information on the characteristics of the ERP system implemented in those two companies was gathered from the interview. It is found that in general, there is no significant difference between them. Their only difference is C2 has larger physical scope than C1. Table II explains the ERP characteristics of the companies.

TABLE II  
ERP CHARACTERISTICS

Scope		C1	C2
Physical Scope	# sites	Single	>5
	# ERP users	less than 100	100 - 200
BPR scope	how ERP is implemented	BPR aligned to ERP	BPR aligned to ERP
Technical scope	modification when implemented	No	No
Module implementation strategy	type of module	Full	Full
	module used*	1, 2, 3, 4, 5, 6, 9	1, 3, 4, 5, 6, 9
Resource Scope	how module implemented	all modules implemented then integrated to legacy system	all modules implemented then integrated to legacy system
	budget	unknown	3 M
	time	9 - 12 months	6 - 9 months

\*ERP Modules

1. Finance
2. Human Resources
3. Material Management
4. Production Planning
5. Purchasing
6. Sales & Distribution
7. Supply Chain Management
8. Customer Relationship Management
9. Others

## B. ERP Implementation Model

Based on the characteristics of ERP in both companies, it can be observed that both companies have executed similar implementation Model. Evidently, it was found that all the

steps in reference [15] are implemented in both companies. The implementation model is shown in Figure 1. However, in executing this implementation model, each company has carried out some additional activities. These additional activities were required after considering their specific needs, especially in making user more familiar with the ERP system. The execution of the ERP implementation model is explained in Figure 1.

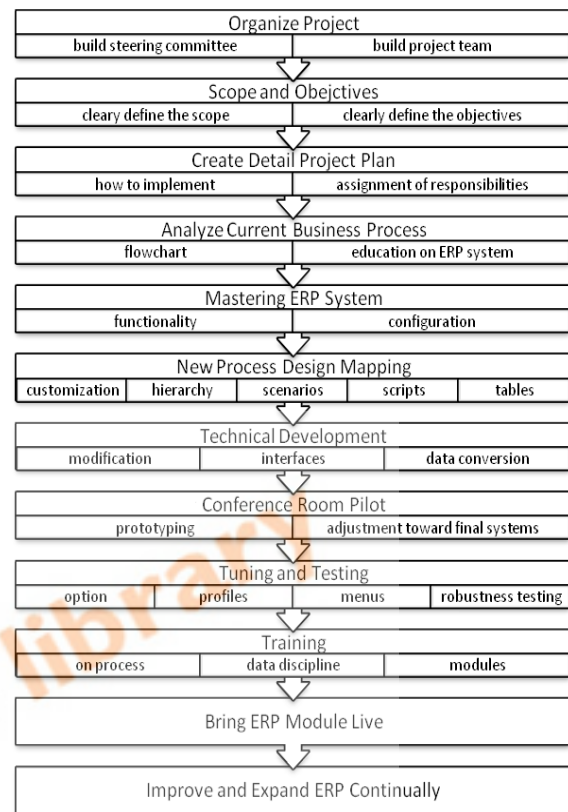


Figure 1 ERP implementation steps in studied companies

### 1. Project Preparation

Before executing this step, C1 carried out some activities such as quality audit and user acceptance test to make sure that ERP is really needed in their company. In C2, the preliminary activity to find out the need for ERP was performed by having discussion on the existing processes, in order to find out the possibilities of improving the existing processes. The actual project preparation steps began when they were performing activities to define the scope and vision of the projects.

The project preparation started with the activity of defining the scope and vision of the ERP. A steering committee and project team were established. The details of the project was defined based on the description of how the ERP will be implemented. Then, to ensure the project is executable, detailed project tasks were then distributed among team members to ensure that every member of the team clearly understood their responsibilities.



## 2. Business Blueprint

Basically in this step, both C1 and C2 analyzed the current business processes, checked and described the business content using flow chart. Then, discussion among team members were held to get in-depth understanding of the ERP system in terms of its functionality and configuration. Subsequently the desired business process was then proposed and mapped accordingly. In designing a new business process, hierarchy, scenarios, scripts and tables were taken into account.

## 3. Realization

This step contains two activities; technical development and conference room pilot. Technical development process in ERP implementation refers to the process of modification, development of interface and data conversion. To perform this activity, C1 carried out the predecessor activity to design the configuration of operating condition. The development of end-user operating manual was also accomplished in this step.

Once the technical development process was finished, the conference room pilot activity was performed. Conference room pilot (CRP) refers to the process of validating the ERP by users. In this activity, users were directly using the configured ERP system based on their requirements and gave their feedbacks on the system.

## 4. Final Preparation

In this step, both companies C1 and C2 did the preparation activities to ensure that the system operates smoothly without any problem. Tuning and testing of options, profiles and menus were completed in this stage. Robustness and parallel testing between system and data conversion were also performed. Testing processes were also needed to reconfirm that all requirements have been fulfilled. This step was finalized by conducting end user training on process, data discipline and modules.

## 5. Go-live and Support

This step is the final step of the ERP implementation processes for both C1 and C2. In this stage all the ERP modules are brought to live. Subsequent activities include trouble shooting and maintenance of the system. The ERP system is continuously improved and upgraded at this stage.

## V. CONCLUSION

This study explored and assessed the implementation of ERP in two manufacturing companies in Melaka, Malaysia. This study was one of the first research attempt carried out in the manufacturing companies in Melaka, Malaysia. It was found that a proper and detailed project planning with appropriate methodology has led to a successful ERP implementation in these companies.

This study found that the key users and project members need to have adequate knowledge to reengineer the existing business processes in order to adapt to the new

integrated processes in the enterprise system. The knowledge to set up crucial master data such as master data of materials, routing and bill of materials is equally important.

Qualified IT consultants with competent knowledge on the system with strong soft skills was also crucial as they play an important role in configuring the ERP system to suit the organizational needs. There are cases where reimplementation was needed in certain modules after the project went live. We have also observed that some project suffered lost of money and time due to incompetent IT consultants.

It is also found that both companies in this study, suffered from a lack of qualified IT staff after the post implementation stage. Staff turnover has contributed to the problem as trained IT staff left the company for greener pastures, leaving the inexperienced newcomers to maintain the system.

This study has some limitations. First this study only managed to assess two manufacturing companies in Melaka, Malaysia due to poor responses from other companies. Industries were reluctant to participate in this research due to reasons such as data confidentiality, tight schedule and lack of return benefits. Therefore, the finding of this research may not be sufficient to represent the general methodology adopted by manufacturing companies in Malaysia. Hence, future research in this field needs to include more participation from manufacturing companies to contribute to significant results.

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## REFERENCES

- [1] C. Koch, D. Slater, and E. Baatz, "The ABCs of ERP," *CIO Magazine*, 1999, pp. 1-7.
- [2] J. Yang, C. Wu, and C. Tsai, "Selection of an ERP system for a construction firm in Taiwan: A case study," *Automation in Construction*, vol. 16, Sep. 2007, pp. 787-796.
- [3] M. Jones, M. Cline, and S. Ryan, "Exploring knowledge sharing in ERP implementation: an organizational culture framework," *Decision Support Systems*, vol. 41, Jan. 2006, pp. 411-434.
- [4] M. Al-Mashari, A. Al-Mudimigh, and M. Zairi, "Enterprise resource planning: A taxonomy of critical factors," *European Journal of Operational Research*, vol. 146, Apr. 2003, pp. 352-364.
- [5] Q. Xu and Q. Ma, "Determinants of ERP implementation knowledge transfer," *Information & Management*, vol. 45, 2008, pp. 528-539.
- [6] S. Klos and I. Krebs, "Methodology of ERP System Implementation – A Case Study of Project-Driven-Enterprise," *International Conference 20th EURO Mini Conference "Continuous Optimization and Knowledge-Based Technologies (EurOpt)*, L. Sakalauskas, G.W. Weber, and E.K. Zavadskas, eds., 2008, pp. 405-409.
- [7] V.B. Gargeya and C. Brady, "Success and failure factors of adopting SAP in ERP system implementation," *Business Process Management Journal*, vol. 11, 2005, pp. 501-516.
- [8] Y.B. Moon, "Enterprise Resource Planning (ERP): a review of the literature," *International Journal of Management and Enterprise Development*, vol. 4, 2007, pp. 235.
- [9] S. Grabski and S. Leech, "Complementary controls and ERP implementation success," *International Journal of Accounting Information Systems*, vol. 8, 2007, pp. 17-39.

- [10] G. Janssens, R. Kusters, and F. Heemstra, "Sizing ERP implementation projects: an activity-based approach," *International Journal of Enterprise Information Systems*, vol. 4, 2008, pp. 25–47.
- [11] S. Finney and M. Corbett, "ERP implementation: a compilation and analysis of critical success factors," *Business Process Management Journal*, vol. 13, 2007, pp. 329-347.
- [12] F. Arif, K. Kanchymalay, N. Suryana, R. Krishnan, U.R. Hashim, and N.H. Ismail, "Measuring the Effect of Customization in Influencing the Success of ERP Implementation," *The International Conference on Industrial Engineering and Business Management*, Yogyakarta, Indonesia: 2010, pp. 371-376.
- [13] C. Marnewick and L. Labuschagne, "A conceptual model for enterprise resource planning (ERP)," *Information Management & Computer Security*, vol. 13, 2005, pp. 144-155.
- [14] P. Rajagopal, "An innovation—diffusion view of implementation of enterprise resource planning (ERP) systems and development of a research model," *Information & Management*, vol. 40, Dec. 2002, pp. 87-114.
- [15] I. Ehie and M. Madsen, "Identifying critical issues in enterprise resource planning (ERP) implementation," *Computers in Industry*, vol. 56, 2005, pp. 545-557.
- [16] A. Yokota and K. Yasuda, "An Analysis of Critical Success Factors of ERP Implementation Projects in Japanese Manufacturing Industry," *7th Asia Pasific Industrial Engineering and Management System Conference*, Bangkok, Thailand: 2006.
- [17] Z. Zhang, M.K.O. Lee, P. Huang, L. Zhang, and X. Huang, "A framework of ERP systems implementation success in China: An empirical study," *International Journal of Production Economics*, vol. 98, 2005, pp. 56–80.
- [18] G.D. Garson, "Case Study," *Statnotes*, 2008.
- [19] J.L. Jensen and R. Rodgers, "Cumulating The Intellectual Gold Case Study Research," *Public Administration Review*, vol. 61, 2001, pp. 234-246.
- [20] K.K. Hong and Y.G. Kim, "The critical success factors for ERP implementation: an organizational fit perspective," *Information & Management*, vol. 40, 2002, pp. 25–40.

