

Industrial Management

An analysis of the ERP Implementation on the Effectiveness of Maintenance of Production Facilities in oibl ltd

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Abstract – *Business environment today is more global and competitive for medium and big companies; therefore, Enterprise Resource Planning is commonly used. Enterprise Resource Planning, which is an integrated package application software and used widely in organizations that support automation throughout the process of business and industry, also affects the operation of management. Ophir Indonesia Bangkanai Limited (OIBL) is an oil and gas company which is focused on exploration and production. In running their business, OIBL uses the Workmate as data base for its Enterprise Resource Planning. One of the functions of the workmate is the maintenance module which is used for running the Computerized Maintenance Management System (CMMS). ERP implementations remain problematic despite the fact that many of the issues are by now quite well known. The type of this research was correlation investigations. The population was about 85 employees of Ophir Energy Indonesia, and 50 of them were used as the samples. The research location was in the field and Jakarta Office. The data were gathered by distributing questionnaires and analyzed by using multiple regression analysis which consisted of F-test simultaneous F-test and partial T-test. The result of the research showed that the key users and management of change had significant influence on the effectiveness of the implementation of ERP program in the company. It is suggested that Ophir Energy Indonesia Bangkanai Ltd increase the competency of the employees (key users) by providing appropriate training so that the ERP implementations can run successfully. Copyright ©2017 Department of industrial engineering. All rights reserved.*

Key Words: Key Users , CMMS, Workmate Data Base System.

1 Introduction

Today companies run its business process by utilizing information technology which supports its operational activities. Nevertheless, the utilization of the information technology requires competence of human resources and IT infrastructure regarding the application soft wares to support of the mentioned technology. Enterprise resource planning (ERP) is a package of integrated application software that widely used in organizations that support the automation throughout the business and industrial process and also affect significantly the managerial operation . It is a system that is reliable, integrated and suitable for an organization that has routine, high technology and operations with strict regulations. Although setting ERP is fitting and right in execution but it also have

difficulty in using science inflicted by itself due to the inherent rigidity, inertia and rejection of change of the workmen [1]. In the implementation of ERP, the transfer of science is really crucial and vital for the sake of success of ERP project. The previous study and literature show that to transfer knowledge in organization is more difficult rather than to imitate from what the process can be seen. [2]. Theory proposed by Gargeye and Brady (2005), claimed that there were factors of success and failure, among others are: first, the ability to shorten the business process or operation so customization reduces to company. Secondly, the success of project is supported by management, consultant and vendor. Thirdly, trainings are sustainable when ERP is implemented in the company. Next, adjustment to the organization

culture is required to avoid its own way to work in certain thing and every function or department operating with different procedures and different business needs to be done in one pattern of sharing knowledge in company. Fifth, the budget has to be planned during the implementation and development of ERP to avoid the extra cost higher than the ability of company. Sixth, the testing is proven to bring the success for other companies and to cause failed implementation directly in the company. At Ophir Energy Bangkanai limited (OIBL) corporation where the researcher also uses the information technology integrating one system in a department with the other departments.

The relevant departments which use Enterprise Resource Planning system are:

1. Warehouse/ logistic.
2. Procurement
3. Maintenance
4. Drilling
5. IT

The Program that is used in this data enterprise is called Workmate system. In the implementation, the programs could not run properly as it should be. Among the problems are:

1. For maintenance module, the work order system still could not be integrated with spare parts or stock items in warehouse since the program was installed. As a result, the equipment history versus the work order could not be easily controlled and the allocation for mesocode of the spares did not function.
2. Material return of stock items still could not be run when there was cancellation of withdrawn material occurring at material management, and this could cause the status of on hand quantity not updated.
3. Requisition for Procurement module not be clearly defined between the direct item material and stock item materials; it would lead to the wrong takeout or withdrawn materials and regeneration of new requisition.
4. The reorder point of stock item could not run automatically, it still searched manually for the minimum level or zero stock, so that the availability of materials was not updated and it also endangered the plant reliability in term of critical stock.
5. The program could not run correctly for the inspection of fixed calendar basis in the maintenance equipment and so on, causing the Maintenance reliability low (not complying with the operation of the vendor recommendation).

2 Literature Review

Literature review is needed when doing a certain research about ERP theory including but not limited to the understanding of ERP, ERP components, advantageous and disadvantageous of ERP and application of ERP within information system project which covering sense understanding information system, general method of the information project and strategy information system project also factors that influential to successful ERP which includes internal and external factors.

2.1 ERP Technology

Enterprise Resource Planning is a method for industry as effort of business process that is more efficient by dividing information in and between business process and run in electronic. Enterprise Resource Planning system which is purposed to use from middle size up to the big company such as manufacture, pharmaceuticals, oil and gas, service company and other companies which have the role to integrate and automate business process among organization functions or other relevant production operation aspect, location even distribution from a company [3].

2.2 HR, ERP and Knowledge of Competitive Advantage

Enterprise Resource Planning (ERP) can be described as a concept plan and organization resource management that can be used optimally to produce additional value for all interested parties or stake holder [4].

The word enterprise has specific meaning that it cannot be read only in organization or firm but the word is used to generally describe a business situation in an entity corporate either small, medium or giant companies. The use of ERP system nowadays is very significant to affect the operation of management from every business and production. ERP is a system that fits the application software that is integrated to obtain information and business process. The main package of this system combines the supporting information towards the operational activities, accounting, material distribution management, marketing and often including human resource management. Although there have been specialists in information technology such as Oracle, SAP, JD Edward, People Soft, etc. vendors have promised that ERP technology is beyond flawless, but when it is implemented it is difficult. If only ERP is implemented, it will be far from sufficient to warrant strong competitive position in the science of economic, [5-6]. To promote competitive superior that can survive (sustainable) along an enterprise, the organization should be able to use ERP preferentially and differently (distinctive) to achieve an output such as a privilege [7]. The dilemma in an opposite perspective to ERP is that in learning organization we possibly find them alone as community social designed to transfer knowledge [8-9]. Capability of to obtain and distribute information is a

basic intellectual of the company and social capital that are basis of competitive advantage [10]. Daft proposed dual's core to overcome dilemma in an organization that is the core/nucleus of technology and administrative technology with different internal of characteristic. There are three crucial factors to the ineffectiveness of ERP in the operational and organizational learning [11-12].

- a) Management knowledge
- b) Human capital
- c) Social capital

Human resources give an important contribution to acknowledge a source of knowledge, civil servants who are wise men. Employee eliciting knowledge provides a mechanism at the right corporate culture. Professional human resources can make a significant contribution if he's capable of reversing effectively the relation between knowledge and organization.

Table 1 Critical success factors in ERP implementation.

Top management support	Al-Mashari et al.2003 ;Al-Sehali, 2000; Akkermans& Van Helden, 2002; Esteves-Souza and Pastor-Collado, 2000; Gargeya& Brady, 2005; Gattiker, 2002; Gupta, 2000; Horrison, 2004; Holland and Light, 1999; Jarr et al. 2000.
Clear goals and objectives	Al-Mashari et al.2003 ;Al-Sehali, 2000; Akkermans& Van Helden, 2002; Gargeya& Brady, 2005; Horrison, 2004; Holland and Light, 1999; Mabert et al. 2003; Magnusson et al, 2004; Parr & Shanks, 2000;
Business process	Al-Mashari et al.2003 ;Al-Sehali, 2000; Akkermans& Van Helden, 2002; Esteve – Sauza and Pastor – Collado,2000,Gargeya & Brady, 2005; Gattiker,2002: Horrison, 2004; Jarrar et al, 2000, ; Magnusson et al, 2004; Parr & Shanks, 2000;Skok and legge,2002: Sommer and Nelson, 2001 Zhang et al, 2001: Umble et al, 2003,: Sternad et al, 2007
Change Management	Al-Mashari et al.2003 ;Al-Sehali, 2000; Akkermans& Van Helden, 2002; Esteve – Sauza and Pastor – Collado,2000,Gargeya & Brady, 2005; Gattiker,2002: Horrison, 2004; Jarrar et al, 2000, ; Magnusson et al, 2004; Parr & Shanks, 2000;Skok and legge,2002: Yet et al,2002: Sommer and Nelson, 2001: Zhang et al, 2001: Umble et al, 2003,: Sternad et al, 2007
Communication	Al-Mashari et al.2003 ;Al-Sehali, 2000; Akkermans& Van Helden, 2002; Esteve – Sauza and Pastor – Collado,2000,Gargeya & Brady, 2005; Gattiker,2002: Horrison, 2004; Jarrar et al, 2000, ; Magnusson et al, 2004; Parr & Shanks, 2000;Skok and legge,2002: Yet et al,2002: Sommer and Nelson, 2001: Zhang et al, 2001: Umble et al, 2003,: Sternad et al, 2007

Table 1 Critical success (Continue)

User involvement and participation	Aladwani,2001: Al- Sehali, 2000, Esteve – Sauza and Pastor – Collado,2000,Gattiker,2002: Magnusson et al, 2004;Skok and legge,2002: Yet et al,2002: Sommer and Nelson, 2001: Zhang et al, 2001: Umble et al, 2003,: Sternad et al, 2007
Legacy system Management	Al- Sehali, 2000:Akkermans& Van Helden, 2002;Reif,2001:Gattiker, 2002; Somers and Nelson, 2004:Sternad et al, 2007: Umble et al, 2003: Zhang et al, 2003..
Consulting Service	Al-Mashari et al.2003 ;Al-Sehali, 2000; Akkermans& Van Helden, 2002; Horrison, 2004; Skok and Legge, 2002: Magnusson et al, 2004; Somers and Nelson, 2001: Sternad et al, 2007
Project management	Al-Mashari et al.2003 ;Al-Sehali, 2000; Akkermans& Van Helden, 2002; Estevas-Souza and Pastor-Collado, 2000; Magnusson et al, 2004; Reif, 2001; Somers and Nelson, 2001: Sternad et al, 2007; Umble et al, 2003; Yen et al, 2002; Zhang et al, 2003.
Sponsorship	Akkermans& Van Helden, 2002; Estevas-Souza and Pastor-Collado, 2000: Parr and Shanks, 2000; Skok and Legge, 2002; Somers and Nelson, 2001:
System technological	Al-Sehali, 2000; Akkermans& Van Helden, 2002; Gargeya& Brady, 2005; Gattiker,2002: Jarrar et al, 2000, ; Parr and Shanks, 2000; Somers and Nelson, 2004: Sternad et al, 2007; 2002; Zhang et al, 2003.
Minimal customization	Estevas-Souza and Pastor-Collado, 2000; Gargeya& Brady, 2005; Mabert et al, 2003; Somers and Nelson, 2001; Sommer and Nelson, 2004.

Source: Adjusted and updated upon Sternad et al [13].

2.4 ERP Implementation

Implementation of information system based on ERP is an architecture software that has objective to facilitate the flow of information between function business inside the boundary organization or company with the stake holder outside companies. ERP built on the basis of data base system and usually bears centralized computing common platform. In practice the implementation of ERP designed by virtue of business process best practices that is the process of public business being worthy of being imitated.

Key User participant

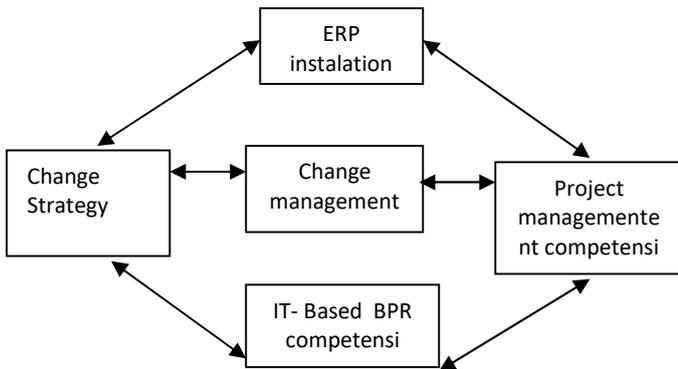


Figure 1 Core competencies in effective implementation of ERP [14].

in they research, that 70% of entire ERP project failed to implement the ERP program and even after 3 years after. There was none found to be blame because of the failure. In general there are two failure rates, once is total failure and second is partly failure [14-15]. In term of total failure the program might be stop from the beginning of implementation, while the partly failure the implementation of ERP can influence and disturb the daily operation. The research of Huang and Palvia also shown that the information technology use, computer culture, business size, business process, re-engineering experience and management commitment are the factors influence the success and failure of ERP. The research was conduct to compare between development country with establish ones [16].

3 Conceptual Model

The conceptual framework is a conceptual model of how one theoritizes or makes logical sense of relationships among several factors that have been identified as important to the problems [17]. start from associated human resources, a program that is worn to come up with equipment used. Utilization of integrated information technology system is expected to produce easier, cheaper and trusted in solving inventory system associated with other process business units. Among the factors that need to be paid to be analyzed in order to success of the implementation of ERP packages in this workmate system at company, they are:

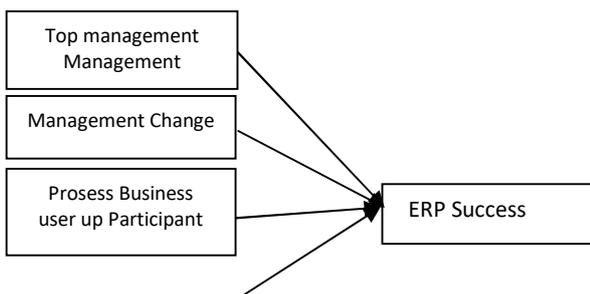


Figure 2 ERP Success [18]

4 Research Methodology

4.1 Type of Research

This research is a correlational investigation. It was done with the aim to detect the role of management and human resources against the factors that impede the maintenance program from working as expected based on the data which was covered [19].

4.2 Location and Research Time

This research was done in Ophir Indonesia Bangkanai Ltd (OIBL) in Karendan village, Bangkanai field and in its office in Jakarta as well. Research time for twelve weeks beginning of September until November 2016.

4.3 Population

Population is all subjects or research objects [20]. In this research, the population is 50 employees of OIBLeither in particular its plant site or at Jakarta office, BEJ tower, SCBD.

4.4 Method of Data Analysis

In order to measure the validity and reliability, the validity and reliability test were carried out carried out.

a. Validity Test

Data validity testing is used to measure weather a questioner is valid or not. It refers to how well a test measures what it is supposed to measure. Validity testing is done by means of Pearson correlation product moment method

$$r_{xy} = \frac{\sum x_i y_i}{(\sum x_i^2)(\sum y_i^2)}$$

in which :

r_{xy} = coefficient correlation between x and y

X_i = variable score independent X

Y_i = variable score dependent Y

b. Reliability Test

Realibility test uses Cronbach's Alpha, with the criteria of the coefficient Cronbach's Alpha >0.6.

$$\alpha = \frac{N}{n - 1} \left(\frac{\sum s_i^2}{s^2} \right)$$

in which : n = sum of sample

s^2 = variance scor

$\sum s_i^2$ = sum from each responden

4.5 Simultaneous Test (F-Test)

Test-F is used to determine the simultaneous effect of independent variable on dependent variable with the following formula:

$$F = \frac{MSR}{MSE} = \frac{SSR / k}{SSE / (n - k)}$$

With condition if $F_{\text{calculated}} > F_{\text{table}}$ where percentage confidential 5% therefore H_0 rejected or H_a accepted.

4.6 Partial Effect Test (t-Test)

This test is used to determine of partial effect from each dependent variable on independent variables with following formula :

$$T = \frac{r_{xy} \sqrt{N - 2}}{\sqrt{1 - r_{xy}^2}}$$

With use degree of freedom (df =N-2) on the significance table 5% then if t calculated > t-table, it means the calculate contribution is significant [21]. All data analysis for multiple linear regression done by computer process Statistical Package for Social Science version 16.

4.7 Regression Equation

Model data analysis use Multiple Linear Regression equation which use to determine the effect of some dependent variable on independent variable [21].

The equation model is as follow

$$Y = a + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + e$$

Y = Success ERP (has positive impact or effective)

a = Constant

b = Regression coefficient

e = Standard error

X_1, X_2, X_3 & X_4 = Independent variables

5 Respondents' Characteristics

Characteristics in this research consisted of age, gender, education and the length of service.

5.1 Respondents' Characteristics, Based on Age.

Table 2 Respondent Distribution Frequency

No	Age	responde	persent
1	≤29 years	4	8
2	30 -34years	7	14
3	35 -39 years	15	30
4	40- 44 years	7	14
5	45- 49years	8	16
6	≥50 years	9	18

Total	50	100
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Source : research result 2016

Table 2 above shows that of the 50 respondents, the highest percentage is the age between 35 – 39 years and the lowest is age below 29 years.

5.2 Respondents' Characteristics, Based on Gender

Table 2 Respondent Distribution Frequency, Based on Gender

No	Gender	Sum of respondents	percentage
1	Female	9	18
2	Male	41	82
	Total	50	100

Table 2 above shows that the majority of the respondents in this research are male workers (82%).

5.3 Repondents' Characteristics, Based on Education

Table 3 Respondent Distribution Frequency, Based on Education

No	Education	respondents	percentage
1	High School	6	12
2	Diploma (D3)	4	8
3	Bachelor (S1)	34	68
4	Postgraduate (S2)	6	12
	Total	50	100

From Table 3 above, it is showed that employees' education level is quite good in which 34 employees graduated from various universities.

5.4 Respondents' Characteristics, Based on the Length of Service

Table 4 Distribution Frequency respondent based on the Length of Service

No	Long working	responden	persen
1	1 - 4 years	5	10
2	5 - 7 years	30	60
3	>7 years	15	30
4	Total	50	100

Table 4 above shows that most of the workers in this survey have been working for the company for 5 to 7 years

6 Interpretation

The effect of (Top) Management X_1 on using of ERP (Y) was as follows:

The descriptive analysis of the Table showed that the value of t-calculated X1 (management) = 25,176 with confidence level (p-value) of 0,000.

If it was compared with the value in t-table (N=50 or degree of freedom = 46 amount 2,009 and sig- α = 0,05; it could be known that t- calculate X1 (25,176) >t-table (2,009) and P- value (0,000) < 0,05. This result of analysis met the requirement of hypothesis test where t-calculated > t-table and p-value < 0,05 indicated that H_a was accepted and H_o was rejected. Therefore, it could be concluded that variable X1 (management) had the significant influence on independent variable Y (ERP).

1. Management of Change (X2) on ERP (Y)

The analysis on the Table analysis shows that value of t-calculu X2 (management of change) = 20,901 > t with t-table (2,009) and P- value (0,000) < 0,05. This analysis result met the requirement of hypothesis test which if t-calculated > t-table and p-value < 0,05, which indicated that H_a was accepted and H_o was rejected. Thus, it could be concluded that variable X2 (management of change) has significant influence on independent variable Y (ERP).

2. Process Business Management towards ERP.

From the Table above, it could be seen the value of t-calculu X3 (process business management) = 16,987 > t with t-table (2,009) and P- value (0,000) < 0,05. If it WAS compared with the value in t-table (N=50 or degree of freedom =46 amount 2,009 and sig- α = 0,05 , it could be known that t-calculu X3 (16,987) > t-table (2,009) and P- value (0,000) < 0,05. This result of analysis met the requirement of hypothesis test where t-calculu > t-table and p-value < 0,05, which indicated H_a was accepted and H_o was rejected. Therefore, it could be concluded that variable X3 (process business management) had significant influence on independent variable Y (ERP).

3. Key users

From the Table above, it could be seen the value of t-calculu X4 (key user) = 34,971 > t with t-table (2,009) and P- value (0,000) < 0,05. If it was compared with the value in t-table (N=50 or degree of freedom =46 amount 2,009 and sig- α = 0,05 , it could be known that t-calculu X4 (34,971) > t-table (2,009) and P- value (0,000) < 0,05. This result of analysis met the requirement of hypothesis test where t-calculu > t-table and p-value < 0,05, which indicated that H_a was accepted and H_o was rejected. Therefore, it could be concluded that variable X4 (process business management) had significant influence on independent variable Y (ERP).

7 Conclusion

Based on data analysis results of ERP implementation at Ophir Energy Indonesia, it can be concluded that:

1. There is no single person appointed by the Personnel Management as the person in charge to lead the program of ERP of installation, testing, running and socializing to the workers hence the implementation progress of ERP cannot be monitored or controlled.
2. The program has a specific inherent rigidity, if any addition or modification of the program that requested by the users exclude the package software, it will take more cost to the company; therefore, Senior Management relies on only each relevant department to run the program as it is.
3. Key users/players are still too much dependent on vendors to resolve the problems when they are arisen from the users or required by the system.
4. Causing vendors to attend at the sites (KGPF) for participating in the training from overseas is the other consideration from the management as the IT network is still not properly established yet
5. To get this ERP "workmate" program to be successful in running the company requires full (top) management support and their commitment needs to be stated more specific; otherwise, the implementation will not be successful.
6. The use of software in this program is still limited to the personal and work area/department in which this program can better be utilized and integrated to other work disciplines.
7. The ERP system "workmate" program actually is very comprehensive and up to date, but the implementation still has problems which need full support from other parties such as more vendors involve in order to run it smoothly.

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