Empirical research of enterprise resource planning system implementation in indonesia: a preliminary study

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Empirical research of enterprise resource planning system implementation in indonesia: a preliminary study

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Abstract. Enterprise resource planning (ERP) system highly affect industrial performance improvement. A number of factors of the ERP itself raise the difficulty in implementing the system. An empirical study discusses the implementation of ERP system based on end-user's perspective was conducted. This study aims to investigate the critical success factors in influencing the adoption level of ERP system in an organization. Firstly, mapping of ERP system implementation was conducted in various industrial sectors for all industrial scales in Indonesia. Beside, this paper also describes the proposed research model complete with indicators of each variable. Eventually, a survey result on 444 end user respondents indicates that most industries in Indonesia have implemented ERP system, especially those had undergone digitalization transformation in a recent decade.

1. Introduction

In the digital economy era, the power of information is a vital aspect in transforming all resources to create added value for customers. By implementing an ERP system, it is expected that manufacturing or service companies can improve all aspects of the company with an integrated data system. In Indonesia, the implementation of an ERP system used by each company is not the same because of consideration of various aspects of the company. In fact, it is possible for companies to not or have not implemented an ERP system because if a failure occurs, the company will experience a significant impact on finance and provide an influence that disrupts daily operational activities.

Many factors influence the success and failure of ERP implementation in a company. A number of theories and developments in practice have been used to explain the implementation of ERP systems in organizations. The problem according to Chang, et.al. states that technological, organizational and user factors can influence ERP implementation [1]. ERP systems are different from innovations from other IT systems because of socio-technical challenges that are in line with the complexity of the system implementation and different types of user systems [2]. The success of ERP system implementation is influenced by the level of skills and knowledge of users of the ERP system [3]. Of course, this provides an understanding that some theories and metamorphosis of previous studies [4], [5], [6], [7], [8] who have found contextual factors that influence ERP system implementation are inconsistent (not convincing), inconsistent, and situational. Likewise, the practice of implementing ERP system in industries in Indonesia certainly has different characteristics.

2. Literature Review and Method

2.1. Previous Study of Successful and Failure in ERP Implementation

Various studies have conducted a critical study of the factors that influence the level of success and failure in ERP implementation, such as research using literature studies conducted by Nah et al. (2001) found that there were determinants of the success of ERP implementation including: teamwork, adaptability, top management support, plans and vision, business process management and development, project management, monitoring, effective communication, software development and testing, the role of project and the right business, and legacy IT systems [9]. In addition, 'effective training' is an important factor that must be considered in the implementation of an ERP system [10]. ERP system implementation involves more important efforts in understanding more complex organizational problems [11], [12]. The issues and challenges of ERP implementation can be summarized into three aspects, namely; 1) human resources, 2) technology, and 3) business (organization) [13]. There are several reasons why ERP system implementation fails, namely; 1) operating strategy does not encourage business process planning and development; 2) implementation time is longer than expected; 3) preparation or pre-implementation activities do not work well; 4) employees are not well prepared to receive and operate a new system; 5) implementation costs are greater than anticipated; 6) lack of management commitment for successful implementation so that not only technical aspects relating to software are considered; 7) mapping process is not done first so that it has a long-term effect on the selection of business processes used; 8) not ready for changes in organizational structure that occur due to changes in business processes and implementation of new systems [14]. In addition, there are several studies that reveal the failure of ERP system implementation, namely the lack of training from end users; ineffective communication; lack of full time commitment from project implementation; lack of sensitivity to user resistance; and failure to emphasize reporting [14], [15], [16], [17], [18], [19]. External succession factors, such as vendor support and consultant competence, are needed for the successful implementation of an ERP system [20]. The role of the consultant in ERP implementation was also identified by a number of researchers as an important factor for the successful implementation of ERP [21]. Top management support is considered a positive commitment, enthusiasm, and support from seniors for the ERP project [22]. The success of the application of this system is also influenced by the quality of the system, the quality of information, and benefits to individuals, organizations and society, this means that the perception of benefits affects user satisfaction [23]. Research from Everdingen & Waarts (2003) refers to the Hofstede Model (1983) examining the differences in the learning culture of innovation adoption, in the ERP system in particular, it was found that national culture had no impact on the implementation of ERP system [24], [25].

2.2. A Preliminary Study Method

This study aims to describe the facts that actually occur in the ERP system implementation as well as their development and changes. The whole study is an exploratory-descriptive study that uses a combination of primary and secondary data even direct observation to the location stated as a sample in the study. However, the mapping of ERP implementation in various industrial sectors in Indonesia was first carried out. The sample selection method is more of a purposive categorization method, such as categorization based on industrial sector, region, and the size of a particular industry.

The first stage of this research is conducted by using a research instrument (questionnaire) which distributed to companies both manufacturing and service industries, especially spread in the Greater Jakarta area (Jakarta, Bogor, Depok, Tangerang, and Bekasi), and partly in industrial estates in the Cilegon, Serang, Cikarang and Karawang regions, even outside Java, especially for the service industry. Next will be mapping the ERP implementation in various industrial sectors in Indonesia. Survey respondents focused on end users who work in companies that have implemented ERP system.

3. Results and Discussion

3.1. The Result of Preliminary Study

Table 1 shows the demographics of respondents, including gender, length of work, and field of work. The proportion of respondents considered eligible because it has a variance of data that are supposed to represent the end users of ERP system for manufacturing and service industries. Table 2 shows that the survey result is considered to represent various sectors of manufacturing and services industries. However, the majority are large scale industries. Meanwhile, Table 3 illustrates a comparison result of the adoption level of an ERP system between manufacturing and service industries, including the duration of its implementation.

Table 1. The demography characteristics of respondents

No	Attribute	Freq.	Perc.	No	Attribute	Freq.	Perc.
1	*Gender:*						
	Male	263	59,23 %		Supply Chain	9	4,50%
	Female	181	40,77 %		PPIC	8	4,00%
	Total	**444**	**100%**		Quality Control	8	4,00%
2	*Length of work:*				Inventory Planning	7	3,50%
	Less than 5 years	267	60,13 %		General Affair	7	3,50%
	5-10 years	110	24,77 %		Maintenance	7	3,50%
	Greater than 10 years	67	15,10 %		Others	15	7,50%
	Total	**444**	**100%**		**Total**	**200**	**100%**
3	*Field of work:*				**Service Industry:**		
	Manufacturing Industry:				Marketing	47	19,26 %
	Production	36	18,00 %		Accounting	45	18,44 %
	Marketing	22	11,00 %		Finance	45	18,44 %
	Administration	19	9,50%		IT	22	9,02%
	IT	15	7,50%		Logistic	20	8,20%
	Human Resource	14	7,00%		Human Resource	17	6,97%
	Finance	12	6,00%		Administration	7	2,87%
	Logistic	11	5,50%		Others	41	16.80 %
	Accounting	10	5,00%		**Total**	**244**	**100%**

Table 2. The survey result of industrial characteristics

No	Attribute	Freq.	Perc.	No	Attribute	Freq.	Perc.
Manufacturing Industry (N= 200):				**Service Industry (N = 244):**			
1	Type of sector:			1	Type of sector:		
	Chemistry	45	22.50%		Restaurant, hotel and tourism	31	12.70%
	Wood and its processing	33	16.50%		Finance	24	9.84%
	Food and beverage	23	11.50%		Banking institution	85	34.84%
	Plastic and packaging	11	5.50%		Hospital	17	6.97%
	Cigarettes	10	5.00%		Insurance	9	3.69%

	Metals	10	5.00%		Construction and building	12	4.92%
	Automotive and its components	9	4.50%		Computer and its devices	13	5.33%
	Pulp and paper	9	4.50%		Transportation and logistics service	13	5.33%
	Cables	7	3.50%		Investment institution	12	4.92%
	Cosmetics and household items	6	3.00%		Advertisement, Printing, and Media	8	3.28%
	Textiles and garment	6	3.00%		Property	7	2.87%
	Pharmacy	5	2.50%		Consultant	6	2.46%
	Machinery and heavy equipment	5	2.50%		Retail	3	1.23%
	Electronics	4	2.00%		Education	2	0.82%
	Tires	4	2.00%		Others	2	0.82%
	Footwear	4	2.00%	2	Size of company:		
2	Size of company:				Small	32	13.11%
	Small	7	3.50%		Medium	67	27.46%
	Medium	74	37.00%		Large	145	59.43%
	Large	119	59.50%				
3	Number of employees:			3	Number of employees:		
	Less than 150 workers	25	12.50%		Less than 150 workers	66	27.05%
	151 - 1000 workers	124	62.00%		151 - 1000 workers	86	35.25%
	Greater than 1000 workers	51	25.50%		Greater than 1000 workers	92	37.70%

Table 3. A comparison result of ERP implementation between manufacturing and service industries in Indonesia

Attribute	**Manufacturing Industry**		**Service Industry**	
	Frequency	**Percentage**	**Frequency**	**Percentage**
a. Not implemented yet	15	7.50%	39	15.98%
b. Implemented with the adoption level:				
• Very low	1	0.50%	3	1.23%
• Low	2	1.00%	14	5.74%
• Moderate	53	26.50%	56	22.95%
• High	116	58.00%	80	32.79%
• Very high	13	6.50%	52	21.31%
Total	**200**	**100%**	**244**	**100%**
c. Duration of ERP implementation: (if already implemented)				
• Less than 1 year	21	11.35%	22	10.73%
• 1-5 years	98	52.97%	78	38.05%
• Greater than 5 years	66	35.68%	105	51.22%
Total	**185**	**100%**	**205**	**100%**

3.2. The research model

The next study aims to investigate contextual factors comprehensively from various end user perspectives and the relationships between factors, which affect the level of implementation of the ERP system, including various obstacles/failures that arise when the ERP system is still relatively new adopted in both manufacturing and industrial industries service sector. At this stage, the development of structural equation modeling is formulated, which first develops and tests the confirmatory factor analysis model for all latent variables, namely; characteristics of human resources, top management support, organizational culture, industrial management, business process reengineering, industrial competition, information technology & system, organizational performance. The model developed was tested by using goodness of fit test, validity test, and reliability test.

In this study, each variable uses a Likert scale. Each indicator in latent variables such as: characteristics of human resources, top management support, organizational culture, business process reengineering and information technology & system use a 1-5 Likert scale, where 1 = 'not good' to 5 = 'very good' . While each indicator of industry competition and industry performance variables uses a 1-5 Likert scale, where 1 = 'very low', up to 5 = 'very high'. Then, for industrial management and ERP system implementation using a 0-5 Likert scale, where 0 = ‘has not been implemented', 1 = ‘applied but still not good', up to 5 = ‘very well implemented'. Simply, this research model can be illustrated on Figure 1. The model is developed from various previous studies.

Table 4. The research variables and its indicators

Variable(s)		Indicator(s)	References
Human resource characteristics	S1	Multi-skill workforce	[1], [17], [26], [27]
	S2	Level of understanding of the system	
	S3	Management training	
	S4	coaching/mentoring	
Top management support	TM1	Top management support	[14], [28], [29], [30], [31], [32]
	TM2	Top management commitment	
	TM3	Responsibility of top management	
	TM4	Top management leadership	
	TM5	Top management policy	
Organizational culture	B1	Job standardization	[2], [24], [25], [26], [33]
	B2	Tolerance between employees	
	B3	Award for work performance	
	B4	Teamwork	
	B5	Communication between employees	
	B6	Continuous improvement	
	B7	Decision-making	
	B8	Cross function team	
	B9	Innovation	
	B10	Empowerment of employees	

Table 4. The research variables and its indicators (Cont.)

Variable(s)		Indicator(s)	References
Industrial management	I1	Strategic management	[17], [30], [31], [34]
	I2	Project management	
	I3	Process management	
	I4	Vendor management	
	I5	Supply chain management	
	I6	Lean management	
	I7	Total quality management	
	I8	Activity-based management	

Business process reengineering	BP1	Setting new company goals and objectives	[14], [30], [31], [35]
	BP2	The company's ability to control implementation	
	BP3	Company preparation for business processes	
Industrial competition	PI1	Price competition	[29]
	PI2	Competition in product development/customer goods/services	
	PI3	Market growth	
	PI4	Customer demands	
Information Technology and System	T1	System sensitivity/response	[26], [27], [34]
	T2	The comfort level of using the system	
	T3	The level of ease of use of the system	
	T4	System flexibility	
	T5	System reliability	
	T6	System stability	
	T7	Data integration	
	T8	Integrated System	
Industrial Performance	P1	Productivity level	[20], [36], [37], [38]
	P2	Delivery on time	
	P3	Response to customers	
	P4	Sales growth	
	P5	Work effectiveness	
	P6	Market share	
	P7	Operating profit	
	P8	Cost effectiveness	
	P9	Focus on customers	

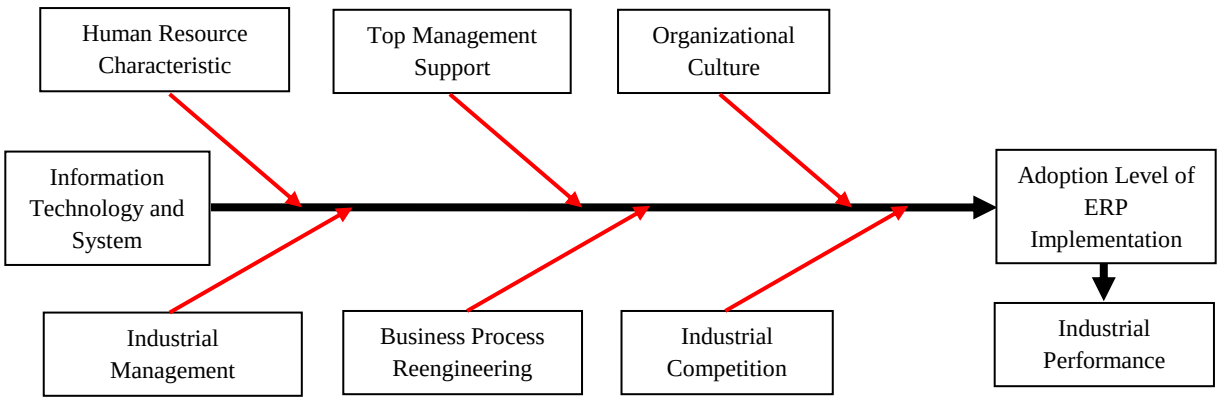

Figure 1. A research framework

4. Conclusion

In this study, the results of a survey of 444 respondents indicated that most industries in Indonesia had implemented ERP or digitalization transformation in the past decade. Only about 7.5% of respondent from the manufacturing industry has not implemented it as well as about 16% in the service industry. The survey results have not been able to infer that there is an influence of industry size towards ERP implementation, because its data distribution is disproportionate. The manufacturing industry sector, the majority of which have implemented ERP systems, include; chemical, wood and processing, food and beverage, plastic and packaging, cigarettes, metals, automotive and components, pulp and paper, cables, cosmetics and household goods, textiles and garments, pharmaceuticals, machinery and heavy equipment, electronics, tires, footwear. While around 32% of the service industries in Indonesia have implemented ERP. And, the service sector that the majority has implemented ERP, among others;

restaurants, hotels, & tourism, finance, banking, hospitals, insurance, construction & building, transportation & logistics, and investment companies. This research is still far from perfect in terms of the number of respondents and the variance of the data regarding the types of manufacturing and service industries. Furthermore, this research needs to be developed comprehensively using a perspective with a qualitative approach besides those that have been carried out using a quantitative approach.

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6. References

[1] Chang, M. K., W. Cheung, C.H. Cheng, and J.H. Yeung, 2008, *International Journal of Production Economics.* Vol. 113 (2), pp. 928-942.
[2] Rajan, C.A. & R. Baral, 2015, *IIMB Management Review*, Vol. 27(2), pp. 105-117.
[3] Saide & Mahendrawati E.R. 2015, *Procedia Computer Science*, Vol. 72, pp. 613-621.
[4] Rahnavard, Farajollah & Nahid Bozorgkhou, 2014, *Management science Letters*, Vol. 4, pp. 747-752.
[5] Matende, Samuel & Patrick Ogao, 2013, *Procedia Technology*, Vol. 9, pp. 518-526.
[6] Afaneh, S., Issam AlHadid and Heba AlMalahmeh, 2015, *International Journal of Managing Information Technology* (IJMIT) Vol.7(1).
[7] Jamil, Muhammad & Rafia Qayyum. 2015, *Journal of Management and Research*, Vol. 2(2).
[8] Aldayel, Abeer I., Mashael S. Aldayel, Abdullah S. Al-Mudimigh, 2011, *Journal of Information Technology and Economic Development* **2**(2), pp. 1-16.
[9] Nah, F., J. Lau, & J. Kuang. 2001. *Business Process Management Journal*, Vol. 7(3), pp. 285-296.
[10] Nelson, R.R., & P.H. Cheney. 2005. *MIS Quarterly*, Vol. 11(4), PP. 547-559.
[11] Huang, A., D. Yen, D. Chou, & Y. Xu. 2003, *Journal of Business and Management*, Vol. 9(2), pp. 137-145.
[12] Huang, M., J. Wang, J. Yu, & C. Chiu. 2004, *Industrial Management and Data Systems*, Vol. 104(8), pp. 689-697.
[13] Yusuf, Y., A. Gunasekaran, & M. Abthurpe. 2004, *International Journal of Production Economics*, Vol. 87(3), pp. 251-266.
[14] Parr, A. & G. Shanks. 2000, *Journal of Information Technology*, Vol. 15(4), pp. 289-304.
[15] Holland, C. & B. Light. 1999, *IEEE Software*, Vol. 16(3), pp. 30-36.
[16] Summer, M., 1999, *Paper presented at the American Conference on Information System.*
[17] _____. 2000, *Journal of Information Technology*. Vol. 15(4), pp. 317-327.
[18] Allen, D., T. Kern, & M. Havenhand. 2002, *Proceedings of the 35th Hawaii International Conference on System Sciences.*
[19] Esteves, J., J. Pastor, & J. Casanovas. 2003, *Information Resource Management Association Conference*, Philadelphia, USA, pp. 325-327.
[20] Somers, T.M. & K. Nelson. 2001, *Proceedings of the 34th Hawaii International Conference on System Sciences*, Maui, Hawaii.
[21] Arens, A.A. & J.K. Loebbecke. 1997, Prentice-Hall, Upper Saddle River, NJ.
[22] Shanks, G., A. Parr, B. Hu, B. Corbitt, T. Thanasarkit, & P. Seddon. 2000. *the 8th European Conference on Information System*, Vienna, Austria.
[23] Igbaria, M.. 1993. *User Acceptance of Microcomputer Technology: An Empirical Test*. Omega, pp. 73-90.

[24] Everdingen, Y.M.V. & E. Waarts. 2003, *Marketing Letters*, Vol. 14(3), pp. 217-232.
[25] Hofstede, G.. 1983, *Journal of International Business Studies*, Fall, pp. 75-89.
[26] Orlikowski, W.. 1993, *MIS Quarterly*, Vol. 17(3), pp. 309-340.
[27] Amoako-Gyampah, K. & A.F. Salam. 2004, *Information and Management*, Vol. 41(6), pp. 731-745.
[28] Jarvenpaa, S.L. & B. Ives. 1991, *Journal MIS Quarterly*, Vol. 15(2), pp. 205-227.
[29] Bradford, M. & J. Florin. 2003, *International Journal of Accounting Information System*, Vol. 4, pp. 205-225.
[30] Nah, F.F., et.al.. 2003, *International Journal of Human-Computer Interaction*, Vol. 16(1), pp. 5-22.
[31] Umble, E., J. Hatt, R. Umble, & M. Michael. 2003, *European Journal of Operation Research*, Vol. 146, pp. 241-257.
[32] Balsmeier, P., & S. Nagar. 2002, J*ournal of Transnational Management Development*, Vol. 7(3), pp. 3-12.
[33] Lee, D., S.M. Lee, D.L. Olson, & S.H. Chung. 2010, *Industrial Management and Data System*, Vol. 110(2), pp. 269-283.
[34] Al-Mashari, M. & M. Zairi. 2000, *International Journal of Physical Distribution and Logistic Management*, Vol. 30(3/4), pp. 296-313.
[35] Jalil, F., A. Zaouia, & R.EL. Bouanani. 2016, *International Journal of Advanced Computer Science and Application*, Vol. 7(1), pp. 387-396.
[36] Ein-Dor, P. & E. Segev. 1978, *Management Science*, Vol 24(10), pp. 1067-1077.
[37] Law. C.C.H. & E.W.T. Ngai. 2007, *International Journal*, Vol. 14(3), pp. 387-406.
[38] Murphy, K.R. & A. DeNisi. 2008. *A Model of the Appraisal Process. Performance Management Systems: A Global Perspective,* Routledge, New York, pp. 131-146.