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DEVELOPMENT OF STRATEGY MODEL FOR ORGANIZATIONAL INNOVATION THROUGH INFORMATION SYSTEMS IN HIGHER EDUCATION IN INDONESIA

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ABSTRACT

The promotion of innovation by means of information systems based on business process reengineering (BPR) and enterprise resource planning (ERP) has become a major trend in recent decades in organizations aiming to achieve performance improvements. To facilitate the formulation of a strategy for higher education innovation driven by strategic management, research needs to be done on organizational innovation models, information systems, and strategic innovation measures. However, no studies have focused on these areas up to now.

This research used expert judgment and structural equation modeling (SEM) to obtain the variables of the designated model. The factor that most affects organizational innovation performance is organizational change, which showed values of 0.619, 0.679, and 0.679 for Jakarta, Bandung, and Bogor, respectively. Specifically, coordination improvement was the most affected aspect of organizational innovation performance. The current research shows that in higher education, the most significant factor in improving organizational innovation performance is organizational change, and in Bandung, this change relied more on ERP implementation than was the case in Jakarta and Bogor.

Keywords: Higher education; Information systems; Innovation; Strategic management

1. INTRODUCTION

In the current technological era of information and knowledge, intense competition due to globalization and the Internet requires organizations to build capabilities that are hard to duplicate in order to achieve differentiation and stay ahead of their competitors in the market (Tang, Pee, & Iijima, 2012). Innovation is considered a core competence of organizations when it comes to offering superior customer value and state-of-the-art products (Kandampully, 2002). In general, innovation occurs mainly in organizations in which a university can provide the necessary research resources to develop new technology (Fagerberg et al., 2005). The current research focuses on higher education and how innovation can be delivered in this field. According to several research findings, universities play an important role in increasing economic competitiveness on a local, provincial, and national scale (Lane, 2012).

Intense global competition and diverse customer needs, coupled with the development of IT and information systems, have resulted in fast, flexible, and customer-centered organizational practices. Innovation and information systems such as business process reengineering (BPR) and enterprise resource planning (ERP) have been a growing trend in recent decades in

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organizations focused on achieving competitive advantage and long-term survival (Fagerberg et al., 2005; Zaheer et al., 2010). The innovation performance of an organization can be improved by implementing BPR (Kassahun, 2012) and ERP (Gattiker & Goodhue, 2005).

Changes in business processes can be supported by the implementation of ERP systems. For many organizations, an ERP system is critical to ongoing operations and is likely to be the largest IT investment the organization will make. For these organizations, the manipulation of knowledge (generation, combination-recombination, and exploitation of knowledge) can lead to competitive advantage (Conner & Prahalad, 1996; Grant, 1996; Kogut & Zander, 1996). Essentially, ERP systems offer organizations the potential to improve their knowledge of business process innovation (Srivardhana & Pawlowski, 2007).

In recent years, ERP systems have been implemented in many organizations, including institutions of higher education. Innovation in higher education can improve the quality of a university in term of business development and can also change the educational paradigm (Salmon, 2005). Leading universities in Indonesia have been using ERP systems, especially in the area of administration, specifically, academic information systems. Any organizations that have used BPR and ERP systems successfully to generate a competitive advantage have not simply remodeled existing processes and installed new systems, but have also simultaneously introduced unique concepts and established objectives to be met based on strategic innovation (Dachyar et al., 2013).

In view of the above, it is necessary to study any factors that can result in organizational innovation, particularly innovation resulting from BPR and ERP implementation, in addition to strategic innovation within the organization. Research on the relationship between ERP implementation based on BPR or organizational performance has been ongoing since the early 2000s, with the most recent study conducted in 2013. Research in this and other fields has been carried out in the last fifteen years and includes the following topics: the relationship between organizational culture, ERP implementation, and BPR performance (Kappos, 2000); the advantages of ERP implementation for organizations (Gattiker & Goodhue, 2005); the success of ERP implementation through organizational support, culture, and project management (Rasmy, Tharwat, & Ashraf, 2005); the relationship between innovation stimulus, innovation capacity, and innovation performance (Prajogo & Ahmed, 2006); the development and testing of business processes to achieve performance (Zaheer et al., 2010); the success of ERP implementation from a project perspective (Dezdar & Ainin, 2011); strategic and tactical factors for successful ERP implementation projects (Dezdar, 2012); the effects of BPR on organizational performance in organizations (Kassahun, 2012); and the effects of business process orientation on organizational innovation performance (Tang et al., 2013). Notwithstanding the many research themes listed above, no study has to date described the relationship between organizational innovation performance through ERP and BPR implementation on the one hand, and strategic innovation on the other. The current study was conducted with the aim of filling this void. The study was conducted using structural equation modeling (SEM), which evaluates the relationship between latent variables and observed variables, the relationship between latent variables, and the consistency of model specifications (Dachyar & Noviannei, 2012).

2. METHODOLOGY

This study aimed to identify the factors that affect organizational innovation. Models were prepared by the author based on literature regarding the following: how strategic innovation affects organizational innovation performance (Prajogo & Ahmed, 2006); how BPR (Hammer & Champy, 1993) affects ERP implementation (Dezdar, 2012; Rasmy et al., 2005); how BPR

and ERP implementation affect organizational change; and how organizational change affects organizational innovation performance (Gattiker & Goodhue, 2005; Tang et al., 2013). The latent variables include strategic innovation, BPR, ERP implementation, organizational change, and organizational innovation performance.

Expert judgment was required before the research was conducted with the aim of filtering the variables obtained from the above literature. The experts were four higher education specialists, each with working experience of more than ten years as a head of department, which deems them experts in their fields (Dachyar etal., 2013). To facilitate the expert judgment, a Likert scale of 1 to 5 was used to measure the level of importance for each variable. GEOMEAN was then used to calculate the weighted average, and the results are displayed in Table 1. Variables with a GEOMEAN of less than 3.5 were considered unimportant and were therefore excluded from the next step of the research. Eighteen variables were observed, as displayed in Figure 1.

Table 1 Results of expert judgment

No		Variable	Expert				GEOMEAN	ok?
			1	2	3	4		
1		*Strategic Innovation*						
	a	Knowledge Management	5	4	4	4	4.23	ok
	b	Creativity Management	4	2	4	3	3.13	no
	c	People Management	4	4	5	4	4.23	ok
	d	Leadership	5	5	4	4	4.47	ok
2		*Business Process Reengineering*						
	a	Fundamental Rethinking	3	2	2	2	2.21	no
	b	Radical Redesign	4	2	2	3	2.63	no
	c	Business Process Orientation	5	5	5	5	5.00	ok
	d	Dramatic Improvement	5	2	4	3	3.31	no
	e	IT Enablement	5	4	4	4	4.23	ok
	f	Top-down Strategy	5	4	5	5	4.73	ok
3		*ERP Implementation*						
	a	Top Management Support	5	5	5	5	5.00	ok
	b	Project Management	4	4	4	4	4.00	ok
	c	External Support	4	4	2	3	3.13	no
	d	Enterprise-wide Communication	4	5	5	5	4.73	ok
	e	User Training and Education	5	4	5	5	4.73	ok
	f	Company-wide Support	3	4	5	4	3.94	ok
	g	Organizational Culture	4	5	5	5	4.73	ok
4		*Organizational Change*						
	a	Task Efficiency	5	4	5	5	4.73	ok
	b	Coordination Improvements	5	5	5	5	5.00	ok
	c	Cross-functional Integration	5	4	4	4	4.23	ok
	d	Customer Integration	4	3	5	4	3.94	ok
	e	Employee Innovativeness	4	3	4	4	3.72	ok

This research was conducted in the top three state higher education organizations in Indonesia, located in Jakarta, Bandung, and Bogor. Primary data was obtained from up to 1050 questionnaires, with approximately 350 for each location. The variables used in the model were then designed for any organization using SEM. The results models for the three higher education institutions in Jakarta, Bandung, and Bogor were compared and recommendations were made for each organization.

In total, 1050 questionnaires were collected and validated, of which 961 were considered valid and were subsequently analyzed.

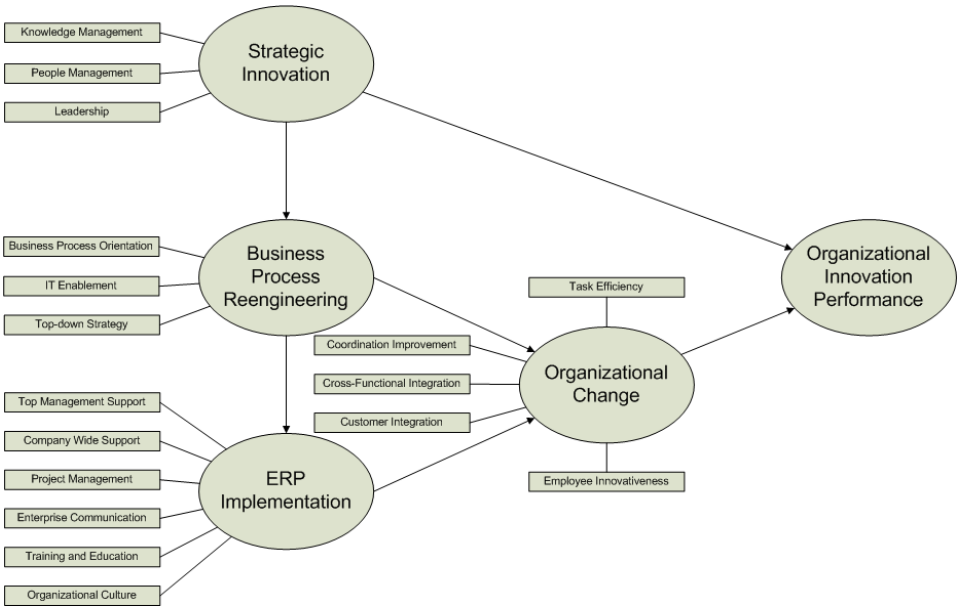

Figure 1 Hypothesis model in higher education

3. RESULTS AND DISCUSSION

SEM models can be produced using the IBM SPSS AMOS 21 software, which can estimate the loading factor, model fit, total effect, direct effect, and indirect effect, and their respective significance.

The loading factor of the hypothesized model was estimated. The model was evaluated using standard loading factor, total effect, and significance. The total value of the effect obtained from direct effects and indirect effects was added. A 95% confidence interval reflected the significance values of the p-value; thus, if the p-value > 0.10, the path was not significant, so the hypothesis was rejected. Table 2 shows the loading factor and the significance of higher education, and Figure 2 shows the resulting structural model in Jakarta. Table 3 shows the total effect and significance of higher education

Table 2 Path analysis, p-value, and hypothesis evaluation for higher education

Path			Jakarta			Bandung			Bogor		
			Estimate	P	Accept?	Estimate	P	Accept?	Estimate	P	Accept?
BPR	<-	SI	.829	***	Yes	3.416	***	Yes	.696	***	Yes
ERP	<-	BPR	.793	***	Yes	.469	***	Yes	.788	***	Yes
OC	<-	BPR	.473	.002	Yes	.217	.002	Yes	.433	.137	No
OC	<-	ERP	.082	.607	No	.182	.056	Yes	.133	.655	No
OIP	<-	SI	.122	.036	Yes	.022	.944	No	.408	.108	No
OIP	<-	OC	.529	***	Yes	.983	***	Yes	1.596	***	Yes

SI : strategic innovation
BPR : business process reengineering
ERP : enterprise resource planning
OC : organizational change
OIP : organizational innovation performance

Table 2 shows the three higher education institutions, how strategic innovation affected BPR, how BPR affected ERP implementation, and the organizational change resulting from organizational innovation performance. There were also other cases where the hypotheses were rejected, for example, in the path of ERP implementation and organizational change in Jakarta and Bogor.

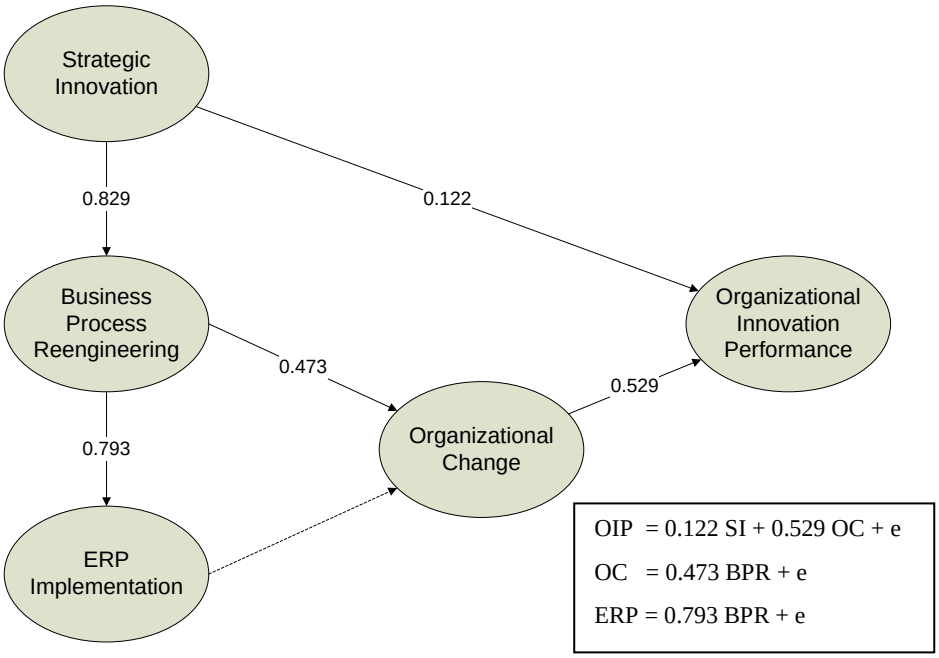

Figure 2 Structural model of higher education in Jakarta

Table 3 Total effect on and significance for higher education

Path			Total Effect		
			Jakarta	Bandung	Bogor
BPR	<---	Strategic Innovation	0.832	0.685	0.731
ERP Implementation	<---	Strategic Innovation	0.674	0.417	0.643
ERP Implementation	<---	BPR	0.810	0.609	0.880
Organizational Change	<---	Strategic Innovation	0.418	0.310	0.561
Organizational Change	<---	BPR	0.503	0.453	0.768
Organizational Change	<---	ERP Implementation	0.119*	0.209	0.171*
Organizational Innovation Performance	<---	Strategic Innovation	0.312	0.188	0.075*
Organizational Innovation Performance	<---	BPR	0.311	0.280	0.522
Organizational Innovation Performance	<---	ERP Implementation	0.073*	0.129	0.116*
Organizational Innovation Performance	<---	Organizational Change	0.619	0.679	0.679

*not significant

It can be seen from Table 3 that three factors in strategic innovation can influence organizational innovation performance, namely, BPR, ERP implementation, and organizational change. The results indicate that organizational change is the factor with the greatest effect on organizational innovation performance, with total effect values of 0.619, 0.679, and 0.679 for Jakarta, Bandung, and Bogor, respectively. According to these results, innovation performance will be optimal in universities if there are coordinating improvements between university

personnel with regard to conducting BPR and ERP implementation. Such improvements are likely to enhance overall university innovation perfomance.

In the case of Jakarta, the least significant factor influencing organizational innovation performance was ERP implementation, with a total effect of 0.073. The total effect of strategic innovation and ERP implementation for Bandung was 0.075 and 0.116, respectively, while all factors are considered significant in the case of Bogor. The negligible effect of ERP implementation on innovation in higher education was due to lack of adequate human resources. Strategic innovation was also found to be insignificant in Bogor, which may be due to lack of strategic enforcement of decisions made at university level in Bogor. In the case of the universities in Jakarta and Bogor, weaknesses were revealed in the relationship between ERP implementation and organizational change. To address this, more attention is needed from top management until all levels of academic staff have achieved successful implementation of ERP systems. This is now a requirement, and once achieved, it will lead to general enhancement of organizational performance.

4. CONCLUSION

Based on research carried out at universities in Jakarta, Bandung, and Bogor in terms of innovation in higher education, the most significant factor in improving organizational innovation performance was found to be organizational change. Organizational innovation performance depends more on ERP implementation in Bandung than in Jakarta and Bogor. Strategic innovation is not a significant factor in the case of Bogor.

Suggestions for future research include the addition of variables such as implementation time, technology, and R&D, all of which may also affect innovation performance (Gattiker & Goodhue, 2005; Kassahun, 2012; Prajogo & Ahmed, 2006). The model described above can also be applied to other types of industry such as telecommunications, goods expedition, or manufacturing, where it can be used to compare the most significant factors between each industry.

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