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INFLUENCE OF THE KNOWLEDGE MANAGEMENT PROCESS, INFORMATION CULTURE, AND INFORMATION TECHNOLOGY MATURITY ON BUSINESS INTELLIGENCE SYSTEM QUALITY

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ABSTRACT

This study examines the extent of the influence of the knowledge management process, information culture, and information technology maturity on business intelligence system quality. It uses the descriptive analytic research method and the SEM-PLS statistical method. Data are collected from a questionnaire distributed to and returned by the employees of the Finance and Accounting Department and the Information Technology Department of a private higher education institution in Bandung City, West Java, Indonesia. The results indicate a positive partial influence of the knowledge management process, information culture, and information technology maturity on business intelligence system quality.

Keywords: Knowledge Management Process, Information Culture, Information Technology Maturity, Business Intelligence System Quality

1. INTRODUCTION

To achieve business goals, information systems are vital in the United States and most other developed countries (Laudon & Laudon, 2016, p. 44). Information systems are built to support business activities at all levels of organizations, so they can be accepted and used by all their employees (Laudon & Laudon, 2012, p. 6). One of their objectives is to process economic data into information (Turban & Volonino, 2011, p. 8).

For educational institutions that have applied information and communication technology within their organization, in addition to utilizing information systems for the tasks in the business function of the general education system, the methods and technology of business intelligence are therefore indispensable, especially for the teaching activities undertaken and the identification of prospective student targets, the recruitment process for teaching staff, the targeted learning process, and the market needs focused on the right priority scale.

In the world of higher education, information and communication technology can introduce changes into educational patterns, improve teachers' and students' ability, and prepare them to take part in the global economy and enter the information age. Thus, the Indonesian Government's budget provision might also be enhanced by the increase in

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the Human Development Index (HDI) and the EDI (Education Development Index) and the improvement of the quality of the education system and school management/higher education. Sri Mulyani Indrawati, as Minister of Finance of the Republic of Indonesia, stated that it increased by 27.4% in the period 2015–2017 compared with 2011–2014. In 2017, the allocation reached Rp 416.1 trillion or 20% of the Government's budget (Afrianto, 2017). However, some of the facts below show that the increase in the Government's budget is not directly proportional to the improvement of education quality (Kompasiana.com, 2015).

According to a United Nations Educational, Scientific and Cultural Organization (UNESCO) report released on November 29, 2007, Indonesia's ranking in education dropped from fifty-eighth to sixty-second out of 130 countries across the world. The Education Development Index (EDI) of Indonesia is 0.935, below those of Malaysia (0.945) and Brunei Darussalam (0.965), and in 2011 Indonesia still lagged behind Brunei, which is ranked thirty-fourth in the group of high-achieving countries; Japan has reached position number one in the world. Meanwhile, Malaysia is ranked sixty-fifth. Indonesia's position is much better than that of the Philippines (rank 85), Cambodia (rank 102), India (rank 107), and Laos (rank 109). While, in the 2014 UNESCO Education for All Global Monitoring Report (EFA-GMR), Indonesia's Education for All Development Index 2014 was ranked fifty-seventh out of 115, in 2012 Indonesia was ranked sixty-fourth out of 120 (kompasiana.com, 2014). The total EDI score was derived from a summary of the scores obtained for four assessment categories, namely the primary education enrollment rate, the literacy rate at age 15 years and over, the participation rate by gender equality, and the student survival rate up to grade V of elementary school (Kompas.com, 2011).

The Indonesian education system is also experiencing problems, as Indonesia ranks the lowest in the world, according to the global league table published by Pearson Education Firm. His ranking integrates international test results and data such as graduation rates between 2006 and 2010. Indonesia is at the bottom with Mexico and Brazil. The two main educational forces, Finland and South Korea, are followed by three countries in Asia: Hong Kong, Japan, and Singapore (BBC, 2012).

Judging by the quality of information, the role of knowledge remains dominant in the process of transforming data into information, which ultimately can be used by companies to strengthen their competitive advantage (Turban & Volonino, 2011, p. 34) and achieve a successful organization (Turban, Aronson, & Liang, 2005, p. 490). The ability of an organization to learn, develop, and disseminate knowledge depends on its culture (Turban et al., 2005, p. 496) and is also measured by the effectiveness of information technology (O'Brien & Marakas, 2010, p. 17). Information systems cannot stand alone and have goals in the social context (organization), which consists of the values and beliefs that determine what is acceptable in companies that involve people and cultures. Information system quality is determined by the user, the business processes, and the culture within the organization (Turban & Volonino, 2011, p. 10).

Previous studies have researched the effect of knowledge management, the information culture, and information technology for information systems; the results have shown that

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there are positive influences between those variables (Alter, 1996; Ismail & King, 2007; Kuntjoro, 2013; Mukred, Singh, & Safie, 2013; Mulyani, Darma, & Sukmadilaga, 2016; Nurhayati, 2014; Osubor & Chiemeke, 2015; Popovic, Hackney, Coelho, & Jaklič, 2008; Svard, 2014; Travica, 2008).

The specific purpose of this study is to answer the following research question: Do the knowledge management process, information culture, and information technology maturity have a partial influence on business intelligence system quality? The study is undertaken at a private higher education institution located in Bandung, West Java, Indonesia.

2. LITERATURE REVIEW

2.1 Knowledge Management

Knowledge management consists of a set of business processes developed by an organization to create, store, transfer, and apply knowledge (Laudon & Laudon, 2016, p. 463). The management of the relationship between knowing and acting (Bolisani & Handzic, 2015, p. 3) is the process that an organization uses to gain the greatest value from its knowledge assets (Valacich & Schneider, 2016, p. 259). Laudon and Laudon (2016, pp. 462-463) stated that "Knowledge residing in the minds of employees that has not been documented is called tacit knowledge**,** knowledge of the characteristics: a) Stored in the human mind, b) Difficult formulated (e.g. an individual's expertise), c) It is important for creativity and innovation, d) Converted into explicit knowledge by means of externalization. Knowledge that has been documented is called explicit knowledge, is knowledge that has the characteristics: a) can be codified / formulations, b) Can be converted to a tacit understanding and absorption."

2.2 Information Culture

The information culture is no longer distinguishable from the organizational culture, and organizations have evolved into a form in which the availability and use of information are inherent in everyday activities (Curry & Moore, 2003, p. 95). According to Choo, Bergeron, Detlor, and Heaton (2008, p. 793), the information culture consists of those elements of an organization's culture that influence its management and use of information. Thus, the information culture is manifested in the organization's values, norms, and practices, which have an impact on the way in which information is perceived, created, and used. Curry and Moore (2003, p. 94) described the information culture as a culture in which the value and utility of information in achieving operational and strategic success is recognized, information forms the basis of organizational decision making, and information technology maturity is exploited as an enabler of effective information systems. Baltzan, and Philips (2009, p. 9) stated that the information function cultural dimension consists of indicators showing employees' use of information as a tool and as power to influence other employees. The information-sharing cultural dimension consists of an indicator of inter-departmental employees' trust in each other to use the information between departments. The information-inquiring cultural dimension includes indicators of inter-departmental

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employees seeking information for a better understanding of the future and enriching themselves with current trends and new goals. The information discovery cultural dimension consists of an indicator of the openness of interdepartmental employees to new thinking about crises and radical changes and the creation of a competitive advantage.

2.3 Information Technology Maturity

The concept of information technology maturity is used to determine the extent to which managers use computer-based information systems. The maturity models primarily focus on how well a process is managed. For the concept of information technology maturity to be operationalized, the CobiT framework identifies information technology processes in four main domains: planning and organization (PO), acquisition and implementation (AI), delivery and support (DS), and monitoring and evaluation (ME). The PO domain consists of strategy, tactics, and attention indicators and concerns the identification of the ways in which information technology makes its best contribution to the achievement of the business objectives. The AI domain involves the realization, implementation, and integration of the information technology strategy into the business process. The DS domain consists of delivery and support indicators for information technology services. The ME domain includes monitoring indicators for all of the controls applied to each information technology process (O'Brien & Marakas, 2010, pp. 595-596; Tugas, 2010, pp. 50-51).

2.4 Business Intelligence System Quality

Business intelligence refers to a collection of an information system and technologies that support managerial decision making or operational control by providing information on internal and external operations (Turban & Volonino, 2011, p. 325) Besides, O'Brien and Marakas (2010, p. 11) stated that business intelligence refers to all the applications and technologies in the organization that are focused on the gathering and analysis of data and information that can be used to drive strategic business decisions. In general, the quality of information systems is defined as a form of statement about the conditions in which the information system can produce information in accordance with the needs of the user. For the operationalization of the concept of business intelligence system quality, the following dimensions and indicators are used (Fitriati & Mulyani, 2015, p.168; Stair & Reynolds, 2012, p. 32) integration with other systems, consisting of an indicator of integration between components; 2) reliability, consisting of indicators of security, confidentiality, personal freedom, integrated processing, and availability; 3) ease of use, consisting of indicators of the user-level ability to learn and remember the information system, the level of users' ease of mastering the information system, and the level of users' convenience of using the information system; and 4) usefulness, consisting of indicators of how fast the users' work can be completed, how well their work can be performed, how easy it is for them to achieve their work targets, and how easily the users can carry out their tasks.

2.5 Theoretical Framework and Hypothesis Development

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2.5.1 Knowledge Management Process and Business Intelligence System Quality

Stair and Reynolds (2012, p. 15) stated that people are the most important element of computer-based information systems and that people make the difference between successful and failed organizations. Turban and Volonino (2011, p. 10) asserted that the information system quality depends on the relationship between information systems, humans, and culture. Nurhayati (2014) provided empirical evidence that knowledge management has a significant impact on the success of information system implementation, while the research conducted by Kuntjoro (2013) led to the conclusion that information systems are supported by the quality of knowledge management. The research by Mulyani et al. (2016, p. 2958) concluded that the clarity of the business vision and top management support has a significant impact on business intelligence system quality, while it mentioned that the clarity of the business vision is closely related to knowledge management.

2.5.2 Information Culture and Business Intelligence System Quality

Laudon and Laudon (2016, p. 523) stated that systems do not necessarily result in better decisions that improve the company performance due to issues with information quality, management filters, and the organizational culture. Galliers and Leidner (2003, p. 499) also argued that the application of information systems should take account of the corporate culture when designing change plans. Stair and Reynolds (2012, p. 31) suggested that the organizational culture has a positive effect on the development of information systems. Research on other factors that have an influence on business intelligence system quality has been conducted by Mukred et al. (2013, p. 128), Osubor and Chiemeke (2015, p. 17), Popovic et al. (2014, p. 270), Svard (2014, p. 5), and Travica (2008, 1), who found an influence of the information culture on business intelligence system quality.

2.5.3 Information Technology Maturity and Business Intelligence System Quality

Galliers and Leidner (2003, p. 498) reported that the success of the information systems within an organization depends on the compatibility of the information technology with the organization. Information technology is important in the use of information systems, because it must be compatible with and support other components of the information system (Bagranoff, Simkin, & Norman, 2010, p. 37). In line with that opinion, Fitriati and Mulyani (2015, p. 169) stated that the information system is closely related to the use of information technology. The research on factors that have an influence on business intelligence system quality conducted by Alter (1996) and Ismail and King (2007, p. 1) found that information technology maturity influences information system quality.

The research model of this study, based on the prior discussion, is illustrated in Figure 1 below:

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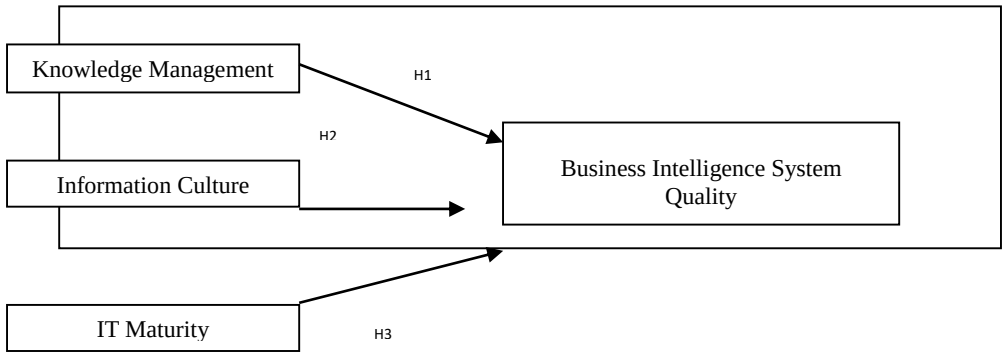
Figure 1

Research Model



Furthermore, the hypotheses proposed in this study are as follows: H_1: The knowledge management process affects business intelligence system quality; H_2: The information culture affects business intelligence system quality; and H_3: Information technology maturity affects business intelligence system quality.

3. METHODOLOGY

This study uses the explanatory method. The population of this study is a private higher education institution in Bandung City, West Java, Indonesia. The private higher education institution chosen for this study has been implementing a business intelligence system application. The participants in this study are finance and accounting managers, finance and accounting staff, information technology managers, and information technology staff. A total of 160 questionnaires were distributed among the sample, and 146 questionnaires were returned and used in the statistical analysis, performed using structural equation modeling (SEM) and partial least squares (PLS). The questionnaires included four dimensions – the knowledge management process, information culture, information technology maturity, and business intelligence system quality – and the questions were answered using a Likert five-point scale. The questionnaires had previously been tested for validity and reliability. This study uses the probability sampling and random sampling techniques (Sekaran & Boogie, 2016, p. 242). The determination of the number of samples is based on the theory according to Roscoe (1975) quoted by Sekaran and Boogie (2016, p. 264), which gives rules of thumb about the sample size. The structural model is shown in the following figure 2:

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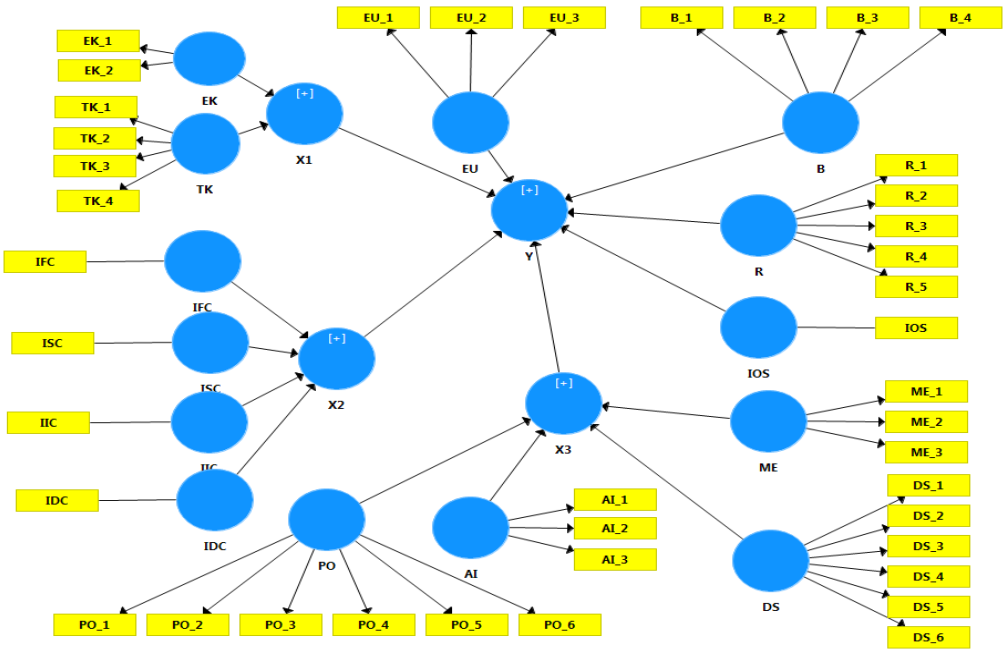
Figure 2 Structural Model



4. RESULTS AND DISCUSSION

4.1 Result

4.11 Tests of Validity and Reliability

Tests of validity and reliability are conducted using partial least square path modeling (PLS-PM).

The loading factors of all the indicators are >0.50, which indicates that the overall indicators used are valid. The value of the AVE (average variance extracted) of all the dimensions is >0.50, which means that on average the information contained in the indicator can be represented through each dimension. Thus, the model presents no convergent validity problems. The discriminant validity was tested by looking at the value of the cross-loading factor for each knowledge management process indicator, information culture indicator, information technology maturity indicator, and business intelligence system quality indicator. The calculation shows that the value of the cross-loading of each variable is greater than the value of the cross-loading indicator on other latent variables. Consequently, the model tested has no problem in terms of discriminant validity. The unidimensionality test is performed using CR (composite reliability) and Cronbach's alpha. In this model, each dimension of the knowledge management process variable, information culture variable, information technology maturity variable, and

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business intelligence system quality variable has a CR value >0.70 and a Cronbach's alpha value >0.60. It is concluded that all the indicators have consistency in measuring their respective dimensions and that no problems of reliability/unidimensionality exist in the established model.

4.1.2 Method of Analysis and Hypothesis Testing

The technique used to complete this research is the quantitative analysis technique, an approach that is focused on the purpose of generalization by performing statistical and sterile tests of the subjective influence of the researcher (Sekaran, 2007). In this research, quantitative analysis is undertaken by quantifying the research data to produce the information needed for the analysis. The analysis tool used in this research is partial least square path modeling (PLS-PM) using Smart PLS 2.0.M3.

Table 1: Calculation Results of the Effect of X_1 on Y

	R-Square (R2)	tcount	ttable	Significance	Result
X_1 > Y	0.872	46.065	1.96	0.00 Significance	Positive Influence

Source: Statistical data processing

The table above shows the results of the trimming method calculation using Smart PLS 2.0.M3. It can be seen that the value of the coefficient of determination (R2) of the X_1 variable is equal to 0.872, and the numbers are in the range 0.81–1.00 in the Guilford table, which means that the influence is very high. The knowledge management process affects the quality of business intelligence systems with 87.2%. This means that changes that occur in the quality of business intelligence system quality can be explained by the changes that take place in the knowledge management process. Furthermore, based on the t test, it can be seen that tcount>ttable (46.065>1.96), so it can be said that the knowledge management process has a positive influence on business intelligence system quality.

Table 2: Calculation Results of the Effect of X_2 on Y

	R-Square (R2)	tcount	ttable	Significance	Result
X_2 > Y	0.720	14.755	1.96	0.00 Significance	Positive Influence

Source: Statistical data processing

Based on table 2 above, the value of the coefficient of determination (R2) of variable X_2 is equal to 0.720, and the numbers are in the range 0.49–0.81 in the Guilford table, indicating that the influence is high. It is apparent that the existence of an information culture affects the quality of the business intelligence system with 72.0%. This means that changes that occur in the quality of the business intelligence system can be explained by the changes that take place in the information culture. Furthermore, based on the t test,

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tcount>ttable (14.755>1.96), so it appears that the information culture has a positive influence on business intelligence system quality.

Table 3: Calculation Results of the Effect of X_3 on Y

	R-Square (R2)	tcount	ttable	Significance	Result
X_3 > Y	0.917	51.493	1.96	0.00 Significance	Positive Influence

Source: Statistical data processing

Based on table 3 above, the value of the coefficient of determination (R2) of X_3 is equal to 0.917, and the numbers are in the range 0.49–0.81 in the Guilford table, which means that the influence is very high. Thus, it appears that information technology maturity affects business intelligence systems with 91.7%. This means that changes that occur in the quality of business intelligence systems can be explained by the changes that take place in information technology maturity. Furthermore, the t test shows that tcount>ttable (51.493>1.96), so it is concluded that information technology maturity has a positive influence on the quality of business intelligence systems.

4.2 Discussion

4.2.1 Hypothesis Testing of the Influence of the Knowledge Management Process on Business Intelligence System Quality.

The influence of the knowledge management process on business intelligence system quality is tested using Smart PLS 2.0.M3, and a positive and significant result is obtained. The better the knowledge management process, the better the business intelligence system quality. Based on the result of the individual partial least square path modeling/PLS-SM tests, it can be concluded that hypothesis H_1, stating that the knowledge management process affects business intelligence system quality, is accepted. Research on the influence of the knowledge management process on the quality of business intelligence systems has been undertaken by many previous researchers, and the same results have been obtained both inside and outside the country. This result is consistent with the research of Kuntjoro (2013), Mulyani et al. (2016, p. 2958), and Nurhayati (2014).

4.2.2 Hypothesis Testing of the Influence of the Information Culture on Business Intelligence System Quality.

The influence of the information culture on business intelligence system quality is tested using partial least square path modeling/PLS-SM, which obtains a significant result. Based on the result of the individual partial least square path modeling/PLS-SM tests, it can be concluded that hypothesis H_2, stating that the information culture influences business intelligence system quality, is accepted. The information culture has a significant influence on business intelligence system quality. The positive coefficient of the information culture highlights a positive relationship between information culture and business intelligence system quality. The better the information culture, the better the

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business intelligence system quality. These results are consistent with Mukred et al. (2013, p. 128), Osubor and Chiemeke (2015, p. 17), Popovic et al. (2014, p. 270), Svard (2014, p. 5), and Travica (2008, p. 1).

4.2.3 Hypothesis Testing of the Influence of Information Technology Maturity on Business Intelligence System Quality.

The influence of information technology maturity on business intelligence system quality is tested using partial least square path modeling/PLS-SM, and a significant result is obtained. Based on the result of the individual partial least square path modeling/PLS-SM tests, it can be concluded that hypothesis H_3, stating that information technology maturity influences business intelligence system quality, is accepted. Information technology maturity has a significant influence on business intelligence system quality. The positive coefficient of information technology maturity shows a positive relationship between information culture and business intelligence system quality. The better the information technology maturity, the better the business intelligence system quality. These results are consistent with Alter (1996) and Ismail and King (2007, p. 1).

5. CONCLUSION

Based on the results of the analysis and testing of the data in the study regarding the Influence of Knowledge Management Processes, Information Culture, Information Technology maturity on the Quality of Business Intelligence Systems at Private Universities in Bandung City, several conclusions can be drawn:

a. There is a positive influence between the process of knowledge management and the quality of business intelligence systems.

b. There is a positive influence between information culture and the quality of business intelligence systems.

c. There is a positive influence between information technology maturity and the quality of business intelligence systems.

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