How to Cite:
Fatah, L. A., Mardiputra, H. M., & Dewanto, J. (2022). The impact of knowledge management, data culture and the development of data innovation on the quality of the business insights framework. *Linguistics and Culture Review*, *6*(S1), 824-838. https://doi.org/10.21744/lingcure.v6nS1.2169

The Impact of Knowledge Management, Data Culture and the Development of Data Innovation on the Quality of the Business Insights Framework

Lalu Abdul Fatah
Universitas Tangerang Raya, Indonesia

Hamzah M. Mardiputra
Universitas Pelita Bangsa, Indonesia

Joko Dewanto
Universitas Tangerang Raya, Indonesia

***Abstract*---**This study examines how much the influence of Knowledge Management Process, Information Culture and Information Technology Maturity on the Business Intelligence System Quality. This study uses descriptive analytic research method and SEM-PLS statistic method. Data is collected from questionnaires distributed and returned from the employees of Finance & Accounting Department and Information Technology Department on private higher education at Bandung City, West Java, Indonesia as respondents. The result indicates a positive influence of Knowledge Management Process, Information Culture and Information Technology Maturity partially To the Business Intelligence System Quality.

***Keywords*---**business intelligence, data innovation, information culture, management process, technology maturity.

Introduction

Information systems are essential to doing business in the United States and most other developed countries, as well as to achieve strategic business goals (Mayasari & Sadeli, 2016). The role of knowledge remains the most dominant in processing data into information, which ultimately can be used by companies to strengthen competitive advantage. Measuring knowledge activity within an organization strengthens business intelligence and competitive advantage.

***Corresponding author**: Fatah, L. A.; Email: laluabdulfatah@gmail.com*
Manuscript submitted: 18 Oct 2021, Manuscript revised: 27 Jan 2022, Accepted for publication: 09 Feb 2022

Knowledge is contextual, relevant and actionable information (Turban et al., 2005). Gelinas et al. (2014) states that users of information systems should be involved in the information system design process to ensure the information system is in accordance with the required. For the success of an organization, knowledge as a form of asset must be able to develop and move between people (Turban et al., 2005).

Information systems can not stand alone, and have goals in the social context (organization). The general purpose is to provide solutions to business problems. The social context of the information system consists of the values and beliefs that determine whether or not it is acceptable in companies that involve people and cultures. The information systems quality is determined by the people who use them, the business processes that support them, and the culture within the organization (Turban et al., 2011). The ability of an organization to learn, develop and disseminate knowledge depends on its culture (Turban et al., 2005). The success of information systems is not only measured by the efficiency of the information system itself, but also measured by the effectiveness of information technology in supporting business strategy (O'Brien & Marakas, 2011). The spesific of this study are to answer the research question: Do the Knowledge Management Process, Information Culture and Information Technology Maturity partially have an influence to the Intelligence Business System Quality?

Literature review

Knowledge management

Knowledge management refers to a set of business processes developed within an organization to create, store, transfer and apply knowledge (Mayasari & Sadeli, 2016). According to Bolisani & Handzic (2014), Knowledge Management means managing the relationship between knowing and acting in organizational context, part of wich is managing the processes of knowing and learning towards an organization ends. Knowledge management refers to the process an organization uses to gain the greatest value form its knowledge assets (Valacich & Schneider, 2017). O'Brien et al. (2008); Chaffey & Wood (2005), said that *"Knowledge residing in the minds of employees that has not been documented is called tacit knowledge. Knowledge that has been documented is called explicit knowledge.*

- Tacit knowledge
  Tacit knowledge is knowledge of the characteristics:
  - Stored in the human mind.
  - Difficult formulated (eg an individual's expertise).
  - It is important for creativity and innovation.
  - Converted into explicit knowledge by means of externalization.
- Explicit knowledge
  is knowledge that has the characteristics:
  - Can codified / formulations.
  - Can be converted to a tacit understanding and absorption".

Information culture

The information culture is no longer distinguishable from the organizational culture and the organization has evolved into one in which the availability and use of information are inherent in everyday activities (Curry & Moore, 2003). According to Choo et al. (2008), information culture as those elements of an organization's culture that influence its management and use of information. Thus, information culture is manifested in the organization's values, norms, and practices that have an impact on how information is perceived, created and used. Curry & Moore (2003), stated information culture as a culture in which the value and utility of information in achieving operational and strategic success is recognised, where information forms the basis of organizational decision making and Information Technology maturity exploited as an enabler for effective Information Systems. In order for the concept of information culture to be operationalized, these are the dimensions and indicators for cultural information variables Haag et al. (2008), information function culture dimensions consists of the employee using information as a tool or power to influence other employees indicator. information-sharing culture dimensions, consist of inter-departmental employees trusting each other to use the information between departments indicator. Information-inquiring culture dimensions, consist of inter-departmental employees seeking information for a better understanding of the future and enriching themselves with current trends and new goals indicators. Information-discovery culture dimension, consists of open interdepartmental employees to new thinking about crisis and radical changes and create competitive advantage indicators (Azma & Mostafapour, 2012; Cheng et al., 2020).

Information technology maturity

The collection of computing systems used by an organization is term Information Technology (Turban et al., 2011). Information Technology (IT) to be the technology used in creating, maintaining, and making information accessible, in the other words, IT combines people with computing resources, software, data and computer network (Richard, 2013). Laudon & Laudon, (2013), states IT consist all of the hardware and software that a firm needs to use in order to achieve its bussiness objectives, while Stairs & Renolds (2012), states IT refers to hardware, software, databases and telecommunications. Telecommunications also include networks and the internet (Oyedele et al., 2020; Saura et al., 2021).

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. In order for the concept of information technology maturity to be operationalized, The CobiT framework identifies Information Technology processes in 4 main domains: Domain: Planning and Organization (PO), Acquisition and Implementation (AI), Delivery and Support (DS), and Monitoring and Evaluate (ME) (Baltzan & Phillips, 2008; Ramakrishnan et al., 2012). PO domains consist of strategy and tactics, and attention indicators, is the identification of ways Information Technology in giving its best contribution to the achievement of business objectives. AI Domain consist of realization, implementation and integration of Information Technology strategy into business process. DS domain consist with delivery and support indicators for

Information Technology services. The ME domain with monitoring indicators on all of the controls applied to each Information Technology process (Tugas, 2010; O'Brien & Marakas, 2011).

Business intelligence system quality

Business Intelligence refers to a collection of information system and technologies that support managerial decision making or operational control by providing information on internal and external operations Turban & Volonivo (2011), Besides that, O'Brien & Marakas (2011), states that business intelligence refers to all 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. In order for the concept of business intelligence system quality to be operationalized, these are the dimension and indicators of business intelligence system quality, Stair & Reynolds (2017); Fitriati & Mulyani (2015):

- Integrated with other systems, consist of integration between components indicator.
- Reliable, consist of security, confidentiality, personal freedom, integrated processing, availability indicators.
- Easy to use consist of user-level learn and remember the information system, the level of user ease of mastering the information system, the level of user convenience using information systems indicators.
- Useful consist of how fast the user work can be completed, how well the performance of the user's work, how easy the user can achieve the target work, how easy the user can do his work indicators.

Theoretical framework and hypotheses development
Knowledge management process and business intelligence system quality

Stairs & Renolds (2017), states that humans are the most important element in computer-based information systems, humans make the distinction between successful and failed organizations, while the meaning of human beings is the knowledge that exists within the human being. Turban et al. (2011), states that the information systems quality depends on the relationship between information systems, people and culture. Nurhayati et al. (2017), provides empirical evidence that knowledge management has a significant impact on the success of information systems implementation, while research conducted by Kuntjoro (2013), leads to the conclusion that information systems are supported by the knowledge management quality. Research by Mulyani et al. (2016), concludes that the clarity of business vision and top management support has a significant impact on the business intelligence systems quality, while it is mentioned that the clarity of business vision is closely related to knowledge management (Van Niekerk & Von Solms, 2010; Da Veiga & Eloff, 2010).

Information culture and business intelligence system quality

Laudon & Laudon (2013), states that systems to support decision-making do not necessarily result in better decisions that improve company performance due to issues with information quality, management filters, and organizational culture. Galliers & Leidner (2003), also argued that the application of information systems should take account of corporate culture when designing change plans; Otherwise, such a system can produce results, some can be anticipated, but others do not, the system will fail in delivering the expected improvements. Stairs & Renolds (2017), states that organizational culture has a positive influence on the success of information systems development. Research on other factors that have an influence on the business intelligence systems quality as information systems conducted by Svärd (2014); Mukred et al. (2013); Travica (2008); Osubor & Chiemeke (2015); Popovic et al. (2014), who found that there is an influence of information culture on the business intelligence systems quality (London & Smither, 2002; Trkman, 2010).

Information technology maturity and business intelligence system quality

Galliers & Leidner (2003) states that the success of information systems within an organization depends on the appropriateness of information technology with the structure and design of the organization. Information technology is important in the use of information systems because information technology must be compatible and support other components of the information system (Bagranoff, 2010). In line with that opinion, Fitriati & Mulyani (2015), stated that the information system is closely related to the use of information technology. The research on factors that have an influence on the business intelligence system quality as an information system conducted by Azizi et al. (2021); Alter (1996), found that there is influence of information technology maturity to information systems quality. The research model on this study based on the prior disscussion was outlined on illustrated in Figure below:

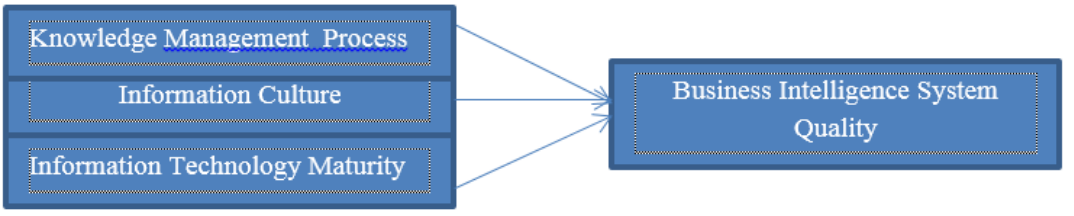

Figure 1. Research model

Futhermore, the hypotheses proposed in this study are as follows : H1: knowledge management process affect the business intelligence system quality. H2: Information culture affects the business intelligence system quality. H3: Information technology maturity affects the business intelligence systems quality (Dovichi Filho et al., 2021; Albert et al., 2015).

Research Method

This study uses explanatory method. The population on this study was private higher education at Bandung City, West Java, Indonesia. The private higher education chosen in this study have been implementing business intelligence systems application. The participants of this study were finance & accounting managers, finance & accounting staff, Information technology managers, information technology staff. 160 questionnaires were distributed to the number of the sample, 146 questionnaires were returned and used in the statistical analysis using Structural Equation Modelling (SEM)- Partial Least Square (PLS). The reason researchers use a method of SEM-PLS is because this method is suitable for testing the theory, requires a small sample, tested the latent variables. The applications processed data easily and does not require the assumption of normal distribution data. The questionnaires include 4 dimension, knowledge management process, information culture, information technology maturity and business intelligence systems quality. This study used a likert five-point scale rangers. The questionnaires to be used previously tested for validity and reliability. This study uses probability sampling technique and random sampling technique (Sekaran & Bougie, 2016). The determination of the number of samples is based on the theory according to Roscoe (1975), quoted from Sekaran & Bougie (2016), gives rule of thumbs about sample size. The Structural model as the following figure 2:

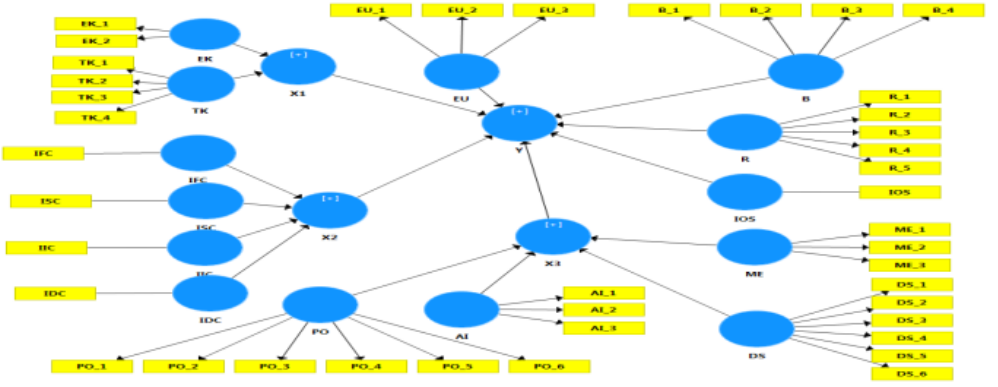

Figure 2. Structure analysis variable

Result

Measurement Model of Knowledge Management Process Variable (X_1), using partial least square-path modeling (PLS-PM) as in Figure 3 below:

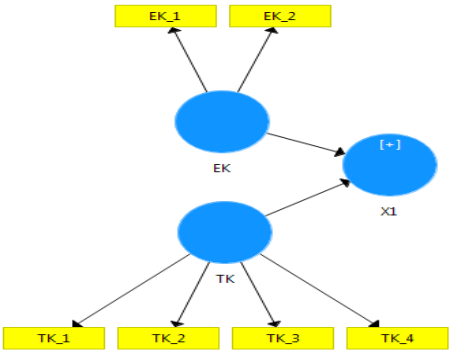

Figure 3. Measurement model of knowledge management process variable (X_1)

Measurement Model of Information Culture (X_2), using partial least square-path modeling (PLS-PM) as in Figure 4 below:

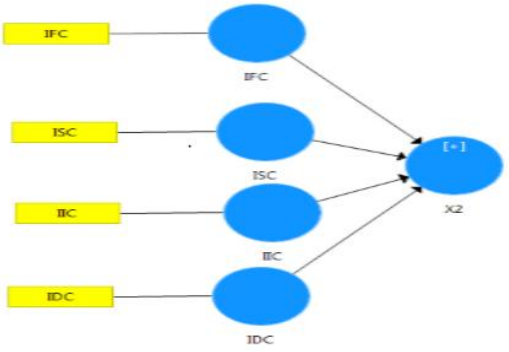

Figure 4. Measurement model of information culture variable (X_2)

Measurement Model of Information Technology Maturity (X_3) using partial least square-path modeling (PLS-PM) as in Figure 5 below:

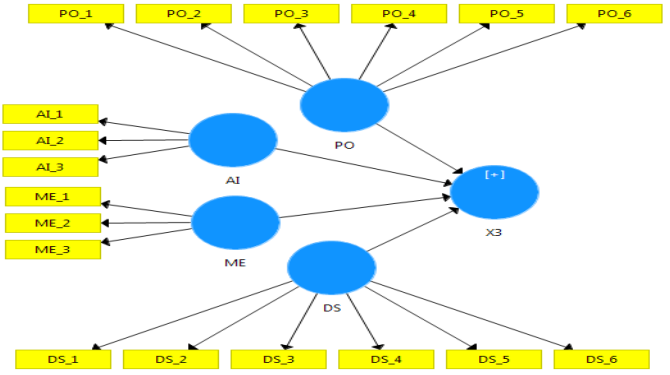

Figure 5. Measurement model of information technology maturity variable (X_3)

Measurement Model of Business Intelligence System Quality (Y) using partial least square-path modeling (PLS-PM) as in Figure 6 as follows:

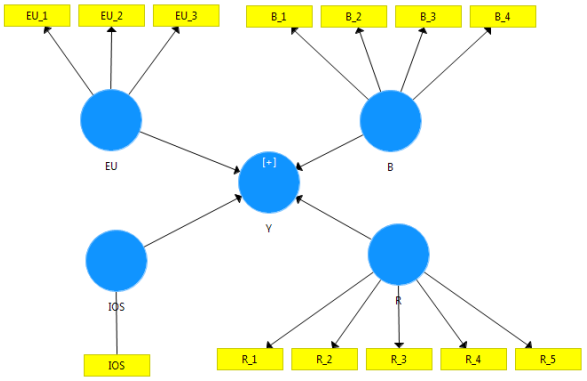

Figure 6. Measurement model of business intelligence system quality variable (Y)

Test of validity and test of reliability

Test of Validity and Test of Reliability using *partial least square-path modeling* (PLS-PM) for each variable with the following results (Table 1, Table 2, Table 3 and Table 4):

Table 1
The result of instrument test of knowledge management process variable (X_1)

Variable	Dimension	Indicator	Loading factor	T-count (>1,96)_	Cronbach Alpha (>0,60)	CR (>0,7)	AVE (>0,5)
Knowledge Management Process	Explicit Knowledge	EK_1	0,917	37,159	0,694	0,784	0,650
		EK_2	0,677	5,417			
	Tacit Knowledge	TK_1	0,728	9,309	0,643	0,790	0,587
		TK_2	0,767	10,063			
		TK_3	0,719	5,335			
		TK_4	0,561	4,224			

Table 2
The result of instrument test of information culture variable (X_2)

Variable	Dimension	Indicator	Loading factor	T count (>1,96)_	Cronbach Alpha (>0,60)	CR (>0,7)	AVE (>0,5)
Information Culture	Information-discovery culture dimension	IDC	1,00	6,059	1,00	1,00	1,00
	information function culture	IFC	1,00	11,751	1,00	1,00	1,00
	Information-inquiring culture dimensions	IIC	1,00	10,454	1,00	1,00	1,00
	information-sharing culture dimensions	ISC	1,00	12,513	1,00	1,00	1,00

Table 3
The result of instrument test of information technology maturity variable (X_3)

Variable	Dimension	Indicator	Loading factor	T count (>1,96)_	Cronbach Alpha (>0,60)	CR (>0,7)	AVE (>0,5)
Information Technology Maturity	Acquisition & Implementation	AI_1	0,573	3,390	0,666	0,767	0,528
		AI_2	0,773	8,663			
		AI_3	0,812	8,312			
	Delivery & Support	DS_1	0,546	5,049	0,711	0,806	0,512
		DS_2	0,687	9,367			
		DS_3	0,599	3,788			
		DS_4	0,694	7,022			
		DS_5	0,562	3,470			
		DS_6	0,739	8,627			
	Monitoring & Evaluation	ME_1	0,751	5,264	0,708	0,755	0,518
		ME_2	0,861	10,684			
		ME_3	0,500	2,781			
	Planning & Organization	PO_1	0,526	3,859	0,673	0,788	0,598
		PO_2	0,654	5,130			
		PO_3	0,763	10,064			
		PO_4	0,765	10,158			
		PO_5	0,652	5,912			
		PO_6	0,505	2,554			

Table 4
The result of instrument test of business intelligence system quality variable (Y)

Variable	Dimension	Indicator	Loading factor	T count (>1,96)_	Cronbach Alpha (>0,60)	CR (>0,7)	AVE (>0,5)
Business Intelligence System Quality	Useful	B_1	0,822	12,843	0,709	0,820	0,540
		B_2	0,803	9,740			
		B_3	0,769	9,295			
		B_4	0,500	3,371			
	Easy of Use	EU_1	0,664	5,236	0,685	0,780	0,543
		EU_2	0,784	9,320			
		EU_3	0,758	7,280			
	Integrated	IOS	1,000	7,857	1,000	1,000	1,000
	Reliable	R_1	0,676	8,352	0,656	0,782	0,523

Loading factor of all indicators have >0,50, this indicates the overall indicator used is Valid. The Value of AVE *(Average Variance Extracted)* of all dimension >0,50 it means that on average the information contained in the indicator can be represented through each dimension. So on the model there are no convergent validity problems. Test the discriminant validity by looking at the value of cross loading factor in each knowledge management process indicators, information culture indicators, information technology maturity indicators and business Intelligence system quality indicators. Where from the calculation shows that the value of cross loading each variable is greater than the value of cross loading

indicator on other latent variables. So the model tested has no problem in terms of discriminant validity. The undimensionality test is performed using CR (Composite Reliability) and Alpha Cronbach. In this model each dimension of knowledge management process variable, information culture variable, information technology maturity variable and business intelligence system quality variable has CR value> 0.70, then has value of cronbach alpha> 0.60. It is concluded that all indicators have consistency in measuring their respective dimensions and no problem of reliability / undimensionality is found in the established model (Chadhiq & Yusroni, 2021; Manullang, 2021).

Method of analysis and hypothesis testing

The technique of completion of this research is by using quantitative analysis technique, that approach is more focus to the purpose for generalization, by doing statistic and sterile test from subjective influence of researcher (Sekaran, 1992). In this research, quantitative analysis is done by quantifying the research data so as to produce the information needed in the analysis. The analysis tool used in this research is the analysis using partial least square-path modeling (PLS-PM) using Smart PLS 2.0.M3.

Table 5
The result of calculation test influence X_1, X_2, X_3 to Y

	R-Square (R^2)	T count	T table	Significance	Result
X1 > Y	0,872	46,065	1,96	0,00	Positive Influence
X2 > Y	0,720	14,755	1,96	0,00	Positive Influence
X3 > Y	0,917	51,493	1,96	0,00	Positive Influence

The table above shows the results of the trimming method calculation using Smart PLS 2.0.M3 can be seen the value of coefficient of determination (R2) of X_1 Varible is equal to 0.872, where the numbers are in the range 0.81 - 1.00 in the Guilford table so it means that the influence is very high. Knowledge Management Process affects the Quality of Business Intelligence System 87.2%. This means that changes that occur in the quality of business intelligence systems quality can be explained by the changes that exist in the Knowledge Management Process. Furthermore, based on t test, it can be seen that tcount> ttable (46,065> 1,96) so that it can be said that the Knowledge Management Process has a positive influence on the business intelligence system quality (Hendriarto, 2021; Haris et al., 2021).

The value of coefficient of determination (R2) of Variable X_2 is equal to 0.720, where the number is in the range 0.49 - 0.81 in the Guilford table so that means that the influence is high. It is seen that the existence of information culture affect the quality of business intelligence system of 72.0%. This means that changes that occur in the quality of business intelligence systems quality can be explained by the changes that exist in the information culture. Furthermore, based on the t test shows that tcount> ttable (14,755> 1,96) so that it appears that information culture has a positive influence on business intelligence system quality (Zong & Zhen, 2021; Suwija et al., 2019).

The value of coefficient of determination (R2) of X_3 is equal to 0.917, where the number is in the range 0.49 - 0.81 in the Guilford table so it means that the influence is very high. So it appears that the information technology maturity affect the business intelligence system of 91.7%. This means that changes that occur in the quality of business intelligence systems can be explained by the changes that exist in the information technology maturity. Furthermore, based on the t test shows that thitung> ttabel (51,493> 1,96) so it is concluded that the information technology maturity has a positive influence on the quality of business intelligence system.

Discussion

Hypothesis Testing influence of Knowledge Management Process To the Business Intelligence System Quality. Testing influence of Knowledge Management Process on the Business Intelligence System Quality by using Smart PLS 2.0.M3 shows positive and significant result. The better the Knowledge Management Process, the better the Business Intelligence System Quality. Based on the result of partial least square-path modeling / PLS-SM test individually it can be concluded that hypothesis H1 stating that knowledge management process affect the business intelligence system quality is accepted. Research on the influence of Knowledge Management Process on Quality of Business Intelligence System has been done by many previous researchers and the same results are also obtained both inside and outside the country. This result is consistent with the research (Nurhayati et al., 2017; Kuntjoro, 2013; Mulyani et al., 2016).

Hypothesis Testing Influence of information culture to the business intelligence system quality. Testing influence of Information Culture To The Business Intelligence System Quality by using partial least square-path modeling / PLS-SM shows significant result. Based on the result of partial least square-path modeling / PLS-SM test individually it can be concluded that hypothesis H2 stating that Information Culture influence the Business Intelligence System Quality accepted. Information Culture has a significant influence to the Business Intelligence System Quality. The Positive Coefficient of information Culture shows a positive relationship between Information Culture and Business Intelligence System Quality. The better the Information Culture the better the Business Intelligence System Quality. These results are consistent with the Proscovia study (Mukred et al., 2013; Travica, 2008; Osubor & Chiemeke, 2015; Popovic et al., 2014).

Hypothesis Testing Influence of information technology maturity on the business intelligence system quality. Testing influence of Information Technology maturity on Business Intelligence System Quality by using partial least square-path modeling / PLS-SM shows significant result. Based on the result of partial least square-path modeling / PLS-SM test individually it can be concluded that hypothesis H3 stating that Information Technology maturity influence the Business Intelligence System Quality accepted. Information Technology maturity has a significant influence to the 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 (Azizi et al., 2021: Alter, 1996).

Conclusion

Based on the results and discussion of this research several conclusions can be drawn: Knowledge Management Process, Information Culture and Information Technology Maturity partially has a positive influence to Business Intelligence System Quality.

Limitation

After doing this research found some limitations that can be considered for further research in order to get better results. This research is conducted only on private higher education in Bandung City, West Java, Indonesia, for further research can do research on higher education and the country in the outher city of Bandung or can be expanded its coverage area, subsequent research can be replaced by doing research on unit analysis outside of higher education.

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