Utilization of Technology and Perceived Complexity

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Abstract

This study examines the level of utilization of information technology in the education industry through perceived complexity. The study was conducted on 75 human resources who have IT backgrounds in higher education. Data from respondents were obtained through quantitative questionnaires and processed through SPSS to assess the perceived value. The research findings conveyed that the level of indicators in the perceived complexity that needs attention is difficult to understand from a business perspective and difficult to apply from a technical perspective. The study results provide an overview of the education industry in Indonesia in early learning the utility level of HR technology so that the implementation of technology will be able to support organizational performance.

Keywords
Technology, Perceived Complexity, Organizational Performance.

1. Introduction
Information technology is believed to be an important support for organizational growth so that investment is made by organizations to support organizational performance (Chouinard, Wandschneider, and Paterson 2016). All parts of the organization use information technology to accelerate performance and provide the best performance in operations (Cai, Chen, and Bose 2013). In the highest position, information technology is used as a tool to support decisions for entrepreneurs (Freihat 2012; Setiadi et al. 2018). The use of information technology is tailored to the needs of the company, from the operational level to the decision-holder level. This adjustment is considered important so that the implementation of information technology is by company goals and supports organizational performance (Hikmawati, Alamsyah, and Setiadi 2020; Zhao et al. 2014). The development of the company provides new opportunities for the use of more complex information technology. This is associated with the many functions of technology to support organizational performance (Alamsyah et al. 2019). However, some obstacles coexist with the implementation of

information technology, namely the adaptation of human data sources. Where not all human resources have a rapid adaptation to the implementation of information technology, especially for human resources who are unfamiliar with technological developments. This explains that perceived complexity occurs in organizations that experience changes or increases in the implementation of information technology (Setiadi et al. 2018). One industry that uses information technology is higher education (Mariana 2015).

In Indonesia, the lowest to highest education, namely elementary school to university, has adopted information technology (Alamsyah et al. 2019). The information technology used has different variants according to the HR needs in it. In higher education information technology is used to manage academic and non-academic (Kummitha and Majumdar 2015). Especially in universities, information technology is also used by outsiders who have influence, such as students, parents, and the government. In this case, parties outside of higher education entrust all information conveyed through information technology (Alamsyah et al. 2018; Hikmawati and Alamsyah 2018; Mailizar et al. 2020). As with companies in general, the adaptation of information technology in the education industry also has challenges. Especially when there is a company and the development of technology implementation to support higher education performance. The problem phenomenon over the utilization of information technology in the education industry is ultimately able to affect company performance (Kurniawan 2018). So, it needs to be evaluated before and after the implementation of information technology in the education industry.

In previous research studies, many stated that information technology can support higher education performance (Alamsyah et al. 2019). Implementation and evaluation are carried out using various research models. In the end, what is done is to find the main problems faced by human resources in the education industry in the utilization of information technology. Based on a study on the phenomenon of information technology adaptation, this research focuses on examining the utility of information technology based on the perceived complexity faced by the human resources of the education industry. This research is the basis for evaluations that need to be carried out by universities in implementing information technology.

2. Literature Review
2.1. Information Technology in Education
The development of information technology provides the possibility for an organization to continue to develop and provide innovations that can support organizational performance (Kuo 2011). Organizations such as universities no longer use conventional methods in their operations because of many obstacles and sacrificed time wastage (Alamsyah et al. 2019). Currently, universities are thinking about how information technology provides value to support long-term benefits (Wang et al. 2015). And how information technology can be maximized through the effectiveness of innovations that have been implemented (de Jager and Gbadamosi 2013). Many theories explain information technology in companies including the education industry (Raffo et al. 2000). Among them are academics and non-academic systems based on information technology. The academic system is known to be used by the education industry in managing data on teachers, students, learning, grades, or what is commonly known as the obligation to manage the obligation of higher education (Naveh, Tubin, and Pliskin 2010). Meanwhile, the non-academic system is related to the management of education management which is usually associated with higher education development, such as marketing information systems (Kurniawan 2018). The two information technologies used to provide opportunities for the implementation of service innovations to stakeholders, including students, parents, and the government.

Information technology continues to develop, and the education industry is no exception. This is due to the increasingly complex and high value of innovation adopted by universities (Kweon et al. 2017). This development certainly needs to be adopted by universities, with the ultimate goal of sustainability or organization (Naveh et al. 2010). Of course, the existence of technology provides an opportunity for the adaptation of existing values in higher education to be more effective. Information technology itself is a tool developed by experts to support individual and organizational operations (Dao, Langella, and Carbo 2011). Because technology is a tool, the choices for information technology vary widely. However, in the end, what determines the choice of information technology is the ease of use and the low perceived complexity of human resources in organizations.

2.2. Perceived Complexity of Technology
Perceived complexity occurs and is faced by HR in activities in organizations such as universities (Alamsyah et al. 2019). In theory, perceived complexity is the level of innovation in information technology that is considered difficult for human resources to understand and use in organizations (Ehrke, Berthold, and Steffens 2014). The level of technological innovation has differences, starting from the lowest to the highest depending on the value of technology in supporting HR activities (Zhao et al. 2014). However, it needs to be realized that technology continues to develop

in line with the development of organizations such as universities (Alamsyah et al. 2020; Setiadi et al. 2018). There are many demands faced by universities to meet the expectations of stakeholders, so that adaptation to information technology is expected to be more easily resolved.

Many theories are presented to solve problems in the adaptation of information technology implementation, one of which is a technology adaptation model such as the Technology Acceptance Model (Hong and Yu 2018). However, before evaluating information technology, a study is needed related to the initial problems in the unitization of information technology, commonly known as perceived complexity (Setiadi et al. 2018). Perceived complexity is easy to study, where based on previous studies assessed from several criteria, including difficulty to understand of technology, difficulty to implement of technology, and difficulty to adopt of technology (Cai et al. 2013). There are two perspectives from perceived complexity, namely from a business perspective and a technical perspective (Santos-Vijande, González-Mieres, and López-Sánchez 2013), where both have a relationship with each other to support the implementation of information technology.

3. Methods

Examining the research objectives, this research focuses on examining a variable, namely perceived complexity so that research studies focus on human resources (HR) who face perceived complexity. The research was conducted on the education industry in Indonesia with a survey on IT HR in universities. The survey was conducted on 75 IT human resources at BSI University consisting of employees, lecturers, and students, where all IT human resources came from internal universities. At least all human resources have experience in using and working through information technology support. Data from respondents were collected through a quantitative questionnaire to determine the research objective, namely perceived complexity. Where there are indicators that serve as guidance, including difficulty to understand technology, difficulty implementing technology, and adopting technology (Cai et al. 2013). Data from respondents are then processed through weighting of loading factor values and descriptive analysis to determine the research findings.

4. Result and Discussions

Data from respondents obtained as many as 75 data, where all data is filled in perfectly and can be used. Based on the respondents' background, it is known that most of the respondents are Faculty Members with 3 to 5 years of experience in information technology. Examining the respondent's profile results, it is known that the education industry that knows about technology and implements it has a lot (feasible), as well as experience with technology that is classified as adequate, namely over three years. These findings explain that respondents have good feasibility in providing input related to problems in information technology's perceived complexity. Furthermore, from the data, further analysis is carried out, namely the validity and reliability test as well as the weighting of the perceived complexity indicator value.

4.1. Correlation Values and Reliability Statistics

The first data processing results are related to the validity and reliability of the research instrument from the variable perceived complexity. Based on the results of data processing through SPSS, it is known that the correlations that appear in Table 1. Correlation values are the results that can be used to assess the validity of research instruments through the study of Pearson correlation values. It is known that the overall value of perceived complexity is 0.813, 0.905, 0.866, 0.864, and 0.783, from these results it is assessed that all research instruments are acceptable considering the Pearson correlation value is above 0.5. The next result is related to the reliability test (Table 2), where it is known that five indicators of perceived complexity have reliability above 0.7 which explains the received reliability of the research instrument.

Table 1. Correlation Values

		X1	X2	X3	X4	X5	X
		Correlations					
X1	Pearson Correlation	1	,716**	,629**	,636**	,451**	,813**
X2	Pearson Correlation	,716**	1	,794**	,676**	,609**	,905**
X3	Pearson Correlation	,629**	,794**	1	,648**	,570**	,866**
X4	Pearson Correlation	,636**	,676**	,648**	1	,723**	,864**
X5	Pearson Correlation	,451**	,609**	,570**	,723**	1	,783**
X	Pearson Correlation	,813**	,905**	,866**	,864**	,783**	1
	N	75	75	75	75	75	75
**. Correlation is significant at the 0.01 level (2-tailed).							

Based on the results of the validity and reliability test of research instruments, it can be concluded that the research instrument of perceived complexity is acceptable and worthy of analysis. The next analysis is weighting through-loading factor values, which aims to determine the indicators that have the greatest weight or influence on the formation of perceived complexity. If it is known that the greatest value of the problem with perceived complexity, it can easily determine the priority scale that needs to be prepared before the implementation of information technology in the education industry. So that information technology can run well and support organizational performance.

Table 2. Reliability Values

Reliability Statistics	
Cronbach's Alpha	N of Items
,901	5

4.2. Analysis of Loading Factors

Following are the results of the weighting through-loading factor values shown in Table 3, where it is easy to know the largest to the lowest weights that affect the formation of perceived complexity. There are five indicators studied, namely difficulty to understand technology with a perspective of business and technical, difficulty implementing technology with a perspective of business and technical, and difficult to adopt of technology. Based on the results of data processing, it is known that the difficulty to understand in business perspective has the highest loading factor value, the second is from the difficulty to implement in a technical perspective. These findings explain that there is a level of difficulty in understanding technology from the business level and implementation from the operational level. These two things need to be a consideration that needs to be evaluated before implementing information technology. Meanwhile, the issue which is not of concern is the level of difficulty to adopt technology, which means that there are fewer problems in adaptation related to information technology to support work. More details on the value of loading factors are shown in Table 3 so that the level of attention of organizational management can be evaluated in facing the perceived complexity of information technology.

Table 3. Loading Factor Values

Indicators of Perceived Complexity	Load. Factors
Difficulty to understand (business perspective)	0.917
Difficulty to understand (technical perspective)	0.772
Difficulty to implement (business perspective)	0.854
Difficulty to implement (technical perspective)	0.903
Difficulty to adopt of technology	0.649

4.2. Analysis of Perceived Complexity

The level of acceptance of information technology for each human resource in the education industry has differences. Based on the previous findings in Table 3, two indicators need to be prioritized. The first is related to the level of difficulty to understand from a business perspective and the second, the level of difficulty to implementation from a technical perspective. Meanwhile, the lowest level that could be abandoned is the difficulty level to adopt the technology. Difficulty to understand is an understanding of technology in the education industry at the highest level. Usually, in management decision-support information systems, this is naturally considered difficult because the data from management decision support systems come from all academic systems from all management lines. So that more effort is needed in making and understanding the system. This finding is in line with previous studies that sometimes top management has difficulty carrying out operational activities related to information technology (Asonitis and Kostagiolas 2010; Bhandari, Hassanein, and Deaves 2008; Pi, Liao, and Chen 2012). Even though the information needed is very important and supports organizational performance. Next at the operational level of concern is the difficulty in implementing indicators, which is more on the implementation of technology that is usually done in the academic system.

The teaching staff believed that sometimes difficulties occur if there is an improvement in the academic system implemented in the middle of the teaching system. Because teaching staff such as lecturers are accustomed to using the old system even though they have a background in information technology. This is due to the refusal to learn new things and, most importantly, the lecturers' age who support their low understanding of new technology. These findings are in line with previous studies on HR behavior in understanding technology, which is more influenced by HR's character (Listiana et al. 2019; Riyanto et al. 2018; Siswanto, Shofiati, and Hartini 2018).

Through understanding the acceptance of human resources in information technology, management, in this case, universities, can prioritize evaluation priorities. So that the implementation of information technology is in line with the vision and mission of higher education and provides innovation value for the organization. This research provides value for management in Indonesia's education industry in the implementation of information technology as part of innovation and support for organizational performance. Through the findings in this study, it is hoped that information related to perceived complexity faced by HR in organizations can be input before implementing technology. In the future, there will be many challenges faced by organizations related to information technology, so that internal and external support from the company is needed.

6. Conclusions

This research aims to examine perceived complexity in the education industry for evaluating the utilization of information technology. The main goals of the organization can be achieved in improving organizational performance because of information technology support. The study results found that there are five indicators studied in perceived complexity, namely difficulty to understand and implement technology with a business and technical perspective, also difficulty to adopt the technology. The research findings conveyed that perceived complexity is dominated by two sides, namely, difficulty understanding from a business perspective and difficulty implementing from a technical perspective. Meanwhile, the thing that is not the main issue in perceived complexity is difficult to adopt. The research findings can be used as input for the education industry's most common organizations in evaluating the implementation of information technology. This research does not discuss the impact of perceived complexity technology on organizational performance so that the next research position becomes a recommendation to be continued.

References

Alamsyah, Doni Purnama, Mulyani, Yogi Udjaja, Norfaridatul Akhmaliah Othman, and Nik Rahila Wan Ibrahim. 2020. "Green Customer Behavior: Mediation Model of Green Purchase." *International Journal of Psychosocial Rehabilitation* 24(05):2568–77.

Alamsyah, Doni Purnama, Rizal Amegia Saputra, Tuti Alawiyah, Herlan Sutisna, Dini Silvi Purni, and Miftah Farid Adiwisastra. 2019. "Pinning-Up Green IT for Competitive Advantage in Education Industries." Pp. 1–5 in *2018 6th International Conference on Cyber and IT Service Management (CITSM)*. IEEE.

Alamsyah, Doni Purnama, Titin Suhartini, Yayu Rahayu, Irma Setyawati, and Oda I. B. Hariyanto. 2018. "Green Advertising, Green Brand Image and Green Awareness for Environmental Products." *IOP Conference Series: Materials Science and Engineering* 434(1):012160.

Asonitis, Stefanos and Petros A. Kostagiolas. 2010. "An Analytic Hierarchy Approach for Intellectual Capital Evidence for the Greek Central Public Libraries." 31(3):145–61.

Bhandari, Gokul, Khaled Hassanein, and Richard Deaves. 2008. "Debiasing Investors with Decision Support Systems: An Experimental Investigation." *Decision Support Systems* 46(1):399–410.

Cai, Shun, Xi Chen, and Indranil Bose. 2013. "Exploring the Role of IT for Environmental Sustainability in China: An Empirical Analysis." *International Journal of Production Economics* 146(2):491–500.

Chouinard, Hayley H., Philip R. Wandschneider, and Tobias Paterson. 2016. "Inferences from Sparse Data: An Integrated, Meta-Utility Approach to Conservation Research." *Ecological Economics* 122:71–78.

Dao, Viet, Ian Langella, and Jerry Carbo. 2011. "From Green to Sustainability: Information Technology and an Integrated Sustainability Framework." *Journal of Strategic Information Systems* 20(1):63–79.

Ehrke, Franziska, Anne Berthold, and Melanie C. Steffens. 2014. "How Diversity Training Can Change Attitudes: Increasing Perceived Complexity of Superordinate Groups to Improve Intergroup Relations." *Journal of Experimental Social Psychology* 53:193–206.

Freihat, Sultan "Mohammadsaid" Sultan. 2012. "The Role of Marketing Information System in Marketing Decision-Making in Jordanian Shareholding Medicines Production Companies." *Ijrras* 11(May):326–36.

Hikmawati, N. K., D. P. Alamsyah, and A. Setiadi. 2020. "IT Implementation of Customer Relationship Management." Pp. 1–4 in *2020 Fifth International Conference on Informatics and Computing (ICIC)*. Gorontalo, Indonesia.

Hikmawati, Nina Kurnia and Doni Pumama Alamsyah. 2018. "The Digital Company Based on Competitive Strategy." *Proceedings of the 3rd International Conference on Informatics and Computing, ICIC 2018* (2001).

Hong, S. H. and J. H. Yu. 2018. "Identification of External Variables for the Technology Acceptance Model(TAM) in the Assessment of BIM Application for Mobile Devices." *IOP Conference Series: Materials Science and Engineering* 401(1):1–6.

de Jager, Johan and Gbolahan Gbadamosi. 2013. "Predicting Students' Satisfaction through Service Quality Inhigher

Education." *International Journal of Management Education* 11(3):107–18.

Kummitha, Rama Krishna Reddy and Satyajit Majumdar. 2015. "Dynamic Curriculum Development on Social Entrepreneurship - A Case Study of TISS." *International Journal of Management Education* 13(3):260–67.

Kuo, Tsung Hsien. 2011. "The Antecedents of Customer Relationship in E-Banking Industry." *Journal of Computer Information Systems* 51(3):57–66.

Kurniawan, B. 2018. "Integrated Information System for Radio Frequency Identification Based AdMinistration and Academic Activities on Higher Education." *IOP Conference Series: Materials Science and Engineering* 407(1).

Kweon, Byoung Suk, Christopher D. Ellis, Junga Lee, and Kim Jacobs. 2017. "The Link between School Environments and Student Academic Performance." *Urban Forestry and Urban Greening* 23(October):35–43.

Listiana, I., I. Efendi, A. Mutolib, and A. Rahmat. 2019. "The Behavior of Extension Agents in Utilizing Information and Technology to Improve the Performance of Extension Agents in Lampung Province." *Journal of Physics: Conference Series* 1155(1).

Mailizar, Abdulsalam Almanthari, Suci Maulina, and Sandra Bruce. 2020. "Secondary School Mathematics Teachers' Views on e-Learning Implementation Barriers during the COVID-19 Pandemic: The Case of Indonesia." *Eurasia Journal of Mathematics, Science and Technology Education* 16(7).

Mariana, Iatagan. 2015. "Consequences of the Investment in Education as Regards Human Capital." *Procedia Economics and Finance* 23(October 2014):362–70.

Naveh, Gali, Dorit Tubin, and Nava Pliskin. 2010. "Student LMS Use and Satisfaction in Academic Institutions: The Organizational Perspective." *Internet and Higher Education* 13(3):127–33.

Pi, Shih-Ming, Hsiu-Li Liao, and Hui-Min Chen. 2012. "Factors That Affect Consumers' Trust and Continuous Adoption of Online Financial Services." *International Journal of Business and Management* 7(9):108–19.

Raffo, Carlo, Andy Lovatt, Mark Banks, and Justin O'Connor. 2000. "Teaching and Learning Entrepreneurship for Micro and Small Businesses in the Cultural Industries Sector." *Education + Training* 42(6):356–65.

Riyanto, A., I. Primiana, Yunizar, and Y. Azis. 2018. "Disruptive Technology: The Phenomenon of FinTech towards Conventional Banking in Indonesia." *IOP Conference Series: Materials Science and Engineering* 407(1).

Santos-Vijande, María Leticia, Celina González-Mieres, and Jose Ángel López-Sánchez. 2013. "An Assessment of Innovativeness in KIBS: Implications on KIBS' Co-Creation Culture, Innovation Capability, and Performance." *Journal of Business and Industrial Marketing* 28(2):86–102.

Setiadi, Ahmad, Alamsyah Doni Purnama, Syarifuddin Didin, Kurniadi Didi, and Oktora Ema. 2018. "Implementation of Green IT In Education Industries." Pp. 1–4 in *In 2018 Third International Conference on Informatics and Computing (ICIC)*.

Siswanto, T., R. Shofiati, and H. Hartini. 2018. "Acceptance and Utilization of Technology (UTAUT) as a Method of Technology Acceptance Model of Mitigation Disaster Website." *IOP Conference Series: Earth and Environmental Science* 106(1).

Wang, Yuandi, Zhao Zhou, Lutao Ning, and Jin Chen. 2015. "Technology and External Conditions at Play: A Study of Learning-by-Licensing Practices in China." *Technovation* 43–44:29–39.

Zhao, Shukuan, Haiqing Yu, Yancheng Xu, and Zhuming Bi. 2014. "Relationship-Specific Investment, Value Creation, and Value Appropriation in Cooperative Innovation." *Information Technology and Management* 15(2):119–30.

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