Effects of IT Service Management on E-Learning Readiness through the HOT-Fit Model

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***Abstract*—The majority of private universities are prone to encounter gaps and incompletely realize contributions and effects of IT service management on e-learning readiness. So far, the focus of this readiness has been more on online learning processes and mechanisms. Distributing knowledge through electronic media regardless of time and locations, therefore, becomes existing limitation. This study objective was on confirmation and ascertainment of the extent of IT service management in positively influencing e-learning readiness through the HOT-Fit model. The researchers applied a survey method with an explanatory design and a follow-up explanation model. There were questionnaires successfully completed and submitted by 298 respondents who were in association with special schools of informatics skills and computing in West Kalimantan. Likert scales were used to process the whole data collected and the SEM-PLS method was used for analyses. Meanwhile, bootstrapping was applied for data distribution in terms of normality. Finally, a feedback process lasted. Outcomes represent that IT service management is a crucial factor and technology is no longer a factor determining the success of implementing e-learning readiness with very high predictive relevance (99%).**

Keywords— E-Learning Readiness, IT Service Management, HOT-Fit Model, Higher Education, SEM-PLS

I. INTRODUCTION

The COVID-19 pandemic which has lasted for two years has not obviously indicated the tendency of the spread decrease rate. Even now new variants are emerging and rapid transmitted symptoms are much more complicated to detect. This condition certainly brings a number of impacts in various human activities, including the implementation of education in universities. So far, learning activities have generally involved the application of e-learning through Moodle, Microsoft Teams, and Zoom platforms [1] positively enabling students to conduct discussion and visual presentation, and submit assignments. Hence, learning processes and assessment both become more efficient and more effective. E-learning provides much convenience and becomes an integral part of current and future educational processes [1]. The presence of digital technology in the form of Learning Management System (LMS) forms a new, more innovative paradigm in learning processes through integration of multimedia and video streaming with a more communicative pattern [2]. LMS is an interactive application providing various web-based electronic services to facilitate learning processes, academic administration, documentation, content search, as well as reporting and deliveries of materials [3]. E-learning with LMS platforms can be more flexible, structured, and easy to manage. Their scope of content accessibility is even not limited by space and time.

Referring to findings of previous studies, the success of implementing e-learning technology through LMS platforms always relies on psychology, instructors, patterns of design and content, institutional management, and Information Technology (IT) capabilities [4]. Characteristics of student nature, lecturer levels of competence, instructional design, learning environment and ecosystem, availability and ease of empowering communication media, capability of IT infrastructure resources, scopes of learning material content, knowledge of technology, and capability to collaborate are additionally influential [5]. Moreover, the application of e-learning is influenced by perception of usefulness, perceived ease, gender, duration of use [6], and technical multimedia skills of managing and visualizing digital content [7]. Ease of use, functions, quality of information, system, and services, and integration with social media platforms are other facets [8]. Availability of IT capabilities is a significant element covering software, hardware, connectivity, security, system flexibility, technical skills and supports, cloud computing, and data centers [9]. The shift of learning patterns and innovation brings fundamental, radical changes in understanding each material transparently and effectively based on digital content. The success of each e-learning factor can assist stakeholders to formulate education policies, manage assets, and keep up-to-date with global issues for acquisition and management of knowledge [10].

Nonetheless, it is complexity to deal with the practice since understanding of the meaning of readiness of e-learning processes and mechanisms is generally unachieved. An emphasis is that having IT infrastructure and application resources is the most critical element, apart from understanding and utilization of e-learning media [11]. Unavailability of technical personnel and supports for operational facilities in accessing the internet [12], lack of awareness and unwillingness to learn through digitization patterns, inconsistent material content [13], Low skills of managing e-learning content, and unclear standards of knowledge further hinder the practice [14,15]. Being similar to these, an initial survey of a number of private universities in West Kalimantan shows that students and instructors (lecturers) still encounter difficulties to comprehend and

accept transformation of e-learning readiness. Besides, constraints in forms of lack of knowledge about values and assets of IT services, errors in planning IT service procedures, low IT infrastructure investment, unresponsiveness of providing standardized IT services, less consistent learning mechanisms, and unguaranteed IT service management exist and make most private universities encounter gaps and fail to completely implement e-learning. Therefore, there is no ascertainment that advantages and disadvantages of its system bring implementation success.

A captivating part of this research is that majority of private universities are apt to encounter gaps and are incompletely aware of contributions and effects of IT service management on e-learning readiness. So far, the focus of such readiness has only been on infrastructure capabilities and readiness of IT application performance [16,17]. The statement becomes reflection of gaps and novelty of previous studies. Contributions of this research are essential as implementing e-learning wholly refers to limitation of IT service management. Comprehensibly, capabilities and reliability of this effective management are strategic assets to increase the continuity of e-learning readiness. The implementation includes a set of specific organizational capabilities to deliver values in forms of functions and processes [18] requiring acceptance and comprehension in e-learning. Thus, besides processes and mechanisms through electronic media, LMS platforms integrated with availability of service assets are needed for quality e-learning readiness.

Current circumstances are further confirmed and strengthened by previous research [19,20,21]. It is rarity or absence to have an explicit statement that e-learning readiness is influenced by IT service management due to an assumption that providing IT services in relation to this readiness is simple. In fact, the implementation tends to be ignored. Currently, it is no longer necessary to possess and provide IT infrastructure and applications because they have been prepared from the outsourcing or vendors. This reality often creates confusion on functions of e-learning limited to knowledge distribution regardless of time and locations. There is a need to confirm the extent of effects of IT service management on e-learning readiness so that optimal results can be achieved. Understanding such effects refers to the HOT-Fit model involving the suitability of human, organization, and technology [22]. Implications of this model emphasize that these three important components are needed to synchronize e-learning readiness.

Consequently, formulated research problems are on assumptions that ensuring the achievement of e-learning readiness is inseparable from direct or indirect effects of exogenous constructs through the application of the HOT-Fit model [22] with or without an endogenous construct, i.e. IT service management of private universities in West Kalimantan. The problem content is in line with research objectives to confirm the extent of such management in positively influencing e-learning readiness. This goal is crucial considering that learning through electronic media is common and becomes current and upcoming options.

II. Literature Review

A. E-Learning Readiness

E-learning readiness is the level of readiness of a particular organization to implement e-learning technology. The assessment is on the extent of a community making preparation to use technology in learning processes through electronic media [23]. Student capabilities to use multimedia resources enhance learning quality. Besides, being optimistic in realizing efficiency, flexibility, and implementation control is linked to efforts to improve system quality and standardize learning patterns [16,20]. Interaction between students and instructors through e-learning platforms can be an opportunity to increase knowledge accessibility, develop intelligence and understanding of material content, and provide governance access to wider resources [22]. E-learning readiness also provides key information regarding needs of higher education institutions to develop strategies to meet specific user needs and capabilities of applying IT [24]. A number of studies have determined critical success factors of this readiness such as students, instructors, design and content, system and technology, and institutional management [25].

B. IT Service Management

IT service management has a vital role for accessibility of data and information in managing the learning processes through electronic media. Such management is a combination of IT, human, and processes referring to relationships among providers, interaction, and service benefits for users in ensuring the availability of IT services [26]. It consists of two primary elements, namely service supports and service deliveries. The former includes adjustment to information needs and IT infrastructure configuration, and acceleration of availability of information. On the other hand, the latter includes availability of continuous information and timely information services, and smooth operation of IT services [27].

C. Human, Organization, Technology (HOT-Fit) Model

The HOT-Fit model is a combination of IT organization and Information System (IS) success. It provides a holistic view of determinants of e-learning readiness through validation of positive roles of human, organization, and technology [28]. It can flexibly be applied in various contexts, evaluation methods, stakeholder perspectives, and life cycle of system development. Human covers system use and user satisfaction, organization consists of structure and environment, and technology comprises system quality, information quality, and service quality [22]. Analyses of the HOT-Fit model influence users to implement e-learning readiness. The usages refer to identification of processes and information needs in service applications, as well as provision of comprehensive evaluation factors, complete measurement dimensions of service processes, main components of system, development, use, and usability. This, therefore, enables sustainable evaluation of system and other evaluation models [29].

III. Research Method

This research adopted a sample survey design based on individual units of analysis and selected population size. This design was chosen because it was suitable for obtaining information about facts, behavior, and feelings of individuals in a particular population [30]. A mixed method with a

convergent triangulation model incorporating an explanatory design and follow-up explanation was applied [31]. The research stages included background, literature review, problem formulation, hypothesis design, data collection and analyses, results, and conclusion [32]. The population was private universities with study programs of informatics and computing in West Kalimantan. Survey data were collected from July to December 2021. Questionnaires on the use of Moodle, Microsoft Teams, and Zoom application were only distributed to final-year students through Google Form. They were successfully completed and submitted by 298 respondents initially selected through a purposive sampling technique. Aforesaid students were chosen because they could think systematically and analytically so that results on the effect extent of IT service management on e-learning readiness through the HOT-Fit model became more accurate.

Mechanisms of data processing involved Likert scales with an interval of strongly agree (score 6) to strongly disagree (score 1). Their ordinal values can provide more accurate data due to elimination of the tendency of doubt factors [32]. Questionnaires created referred to a number of previous studies. Adjustment was made based on the condition, time, and location of the study. Moreover, validity and reliability of questionnaires used were tested in advance. In terms of the method and analysis, Structural Equation Modeling (SEM) and Partial Least Square (PLS) were in use. SEM-PLS phases comprise conceptual models, algorithm analysis methods, bootstrapping, path diagram models, model evaluation, conclusion, and suggestions [33]. Bootstrapping was applied as a data distribution technique based on normality. Next, the whole data were re-validated with in-depth interviews with five students particularly selected as key informants based on an exclusive and inclusive approach. Following this, a feedback process lasted based on their inputs on effects of IT service management.

This study aimed to discover construct effects of human, organization, and technology on e-learning readiness mediated by IT service management. Tested hypotheses were H1: human had positive effects on e-learning readiness; H2: human had positive effects on e-learning readiness mediated by IT service management; H3: organization had positive effects on e-learning readiness; H4: organization had positive effects on e-learning readiness mediated by IT service management; H5: technology had positive effects on e-learning readiness; H6: technology had positive effects on e-learning readiness mediated by IT service management; and H7: IT service management had positive effects on e-learning readiness.

IV. Result and Discussion

Result discussion stages began with path analyses of research models. Following this, estimation through PLS algorithms and bootstrapping were conducted to obtain optimal values of data distribution in meeting normality assumptions. Bootstrapping used algorithms creating a large number of resamples through resampling with replacement method. Each of them contained rows which were selected and could be reselected from original data sets at random [33]. Referring to SEM-PLS method, latent exogenous and endogenous variables included such constructs as: (a) human comprising system use (SU) and user satisfaction (US); (b) organization including structure (ST) and environment (EN); (c) technology consisting of system quality (SQ), information quality (IQ), and service quality (VQ); (d) IT service management covering continuous adjustment to information needs (ITSM1), expedited information availability (ITSM2), adjustment to IT infrastructure configuration (ITSM3), provision of continuous information (ITSM4), provision of timely information services (ITSM5), and smooth operation of IT services (ITSM6); and (e) e-learning readiness including student content (ER1), instructors (ER2), design and content (ER3), system and technology (ER4), and institutional management (ER5).

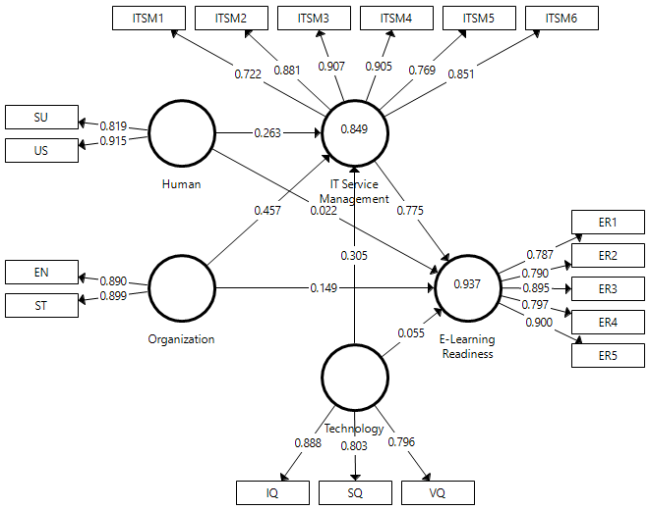

Fig. 1. Research Path Diagram

Moreover, a validity test was carried out to determine convergent and discriminant validity coefficients by referring to outcomes of Average Variance Extracted (AVE) computation based on Fornell-Larcker criteria. The AVE was used to measure the amount of variance which could be captured by each construct in comparison to the one obtained from measurement errors. This value represented an adequate range of convergent validity. In other words, latent variables could generate elaboration of more than half of the average indicator variance. Results of processed data of an outer model indicated effects of each construct represented in the path diagram model (see Figure 1). The representation was on the magnitude of correlation between each indicator and its respective constructs. Additionally, computation showed that load factors were greater than 0.70 so that all indicators were valid and suitable for use in research models [33,34].

Discriminant validity coefficients of constructs were tested by using Fornell-Larcker criteria. The content in Table I revealed all of these test results. Conversely, the one in Table II showed that tested reliability and validity could be based on calculation results of Composite Reliability (CR), Cronbach's Alpha (CA), and AVE. The requirements are that CR, CA, and AVE should be respectively greater than 0.80, 0.70, and 0.50 [33,34] to obtain good reliability and validity.

TABLE I. Discriminant Validity

Fornell-Larcker Criterion	ER	H	ITSM	O	T
E-Learning Readiness (ER)	0.835				
Human (H)	0.810	0.868			

Fornell-Larcker Criterion	ER	H	ITSM	O	T
IT Service Management (ITSM)	0.964	0.822	0.842		
Organization (O)	0.868	0.763	0.859	0.894	
Technology (T)	0.779	0.689	0.788	0.660	0.830

TABLE II. RELIABILITY AND VALIDITY OF CONSTRUCTS

Fornell-Larcker Criterion	CA	rho_A	CR	AVE
E-Learning Readiness	0.890	0.897	0.920	0.698
Human	0.682	0.739	0.859	0.754
IT Service Management	0.916	0.925	0.936	0.709
Organization	0.750	0.751	0.889	0.800
Technology	0.776	0.793	0.869	0.689

Another stage was to analyze an inner model through bootstrapping and SmartPLS v.3.2.8 application program. They were applied to test the significance of indicators by referring to the t-value revealing the presence or absence of relationships among constructs in the research models. An indicator is significant if the t-statistic is greater than 1.96 (the z-value for the 95% Confidence Interval (CI) = 1.96), and the probability value of the computed p-values should be less than 0.05 [33]. Results of significance tests of path coefficients reflected that, all original sample values were positive (see Table III). Nevertheless, there were negative t-statistic and p-value. Meaningfully, they were insignificant. This condition happened in terms of the relationship between the human factor and e-learning readiness. It was noted that the t-statistic was only 0.771 (less than 1.96) and the p-value was 0.441 (greater than the limit, 0.05). Consequently, H1 was not proven.

TABLE III. PATH SIGNIFICANCE TEST

Fornell-Larcker Criterion	Original Sample (O)	T-Statistic (|O/S TDEV|)	P-Values
Human → E-Learning Readiness	0.022	0.771	0.441
Human → IT Service Management	0.263	5.930	0.000
IT Service Management → E-Learning Readiness	0.775	19.100	0.000
Organization → E-Learning Readiness	0.149	4.409	0.000
Organization → IT Service Management	0.457	11.474	0.000
Technology → E-Learning Readiness	0.055	2.064	0.040
Technology → IT Service Management	0.305	7.902	0.000

Outcomes of inner model analyses (see Table III) indicated that human had positive effects and relationships with e-learning readiness. Comprehensibly, students and instructors (lecturers) immensely required its governance. The ease and flexibility of online learning through electronic media could be carried out without being restricted to time and locations as long as they were connected to the internet. More understanding and capabilities to empower all electronic media for online learning instruction would affect the success of e-learning readiness. However, it turned out that hypothesis test results were insignificant. This condition represented that system use and user satisfaction inconsistently enhanced e-learning readiness. Hence, e-learning with LMS platforms inconsistently provided quality learning patterns. Only several students and instructors (lecturers) were expertly able to apply these features so that only satisfaction on learning materials was felt. In contradiction to significant results of some previous studies, through the HOT-Fit model, a new input showed rarity or absence of efforts to improve learning motivation by applying interactive visualization models in learning content by using electronic media. This was indivisible from the lack of understanding, training, skills, and electronic learning equipment. There were even a number of universities not having technicians managing e-learning system. In addition, limited references of e-learning governance were poorly understood by universities. The affirmation was emphasized by [35] that the gap was on the inability of users to use e-learning to gain satisfaction. This was linked to IT service management that supports and deliveries of services were required in order to expedite e-learning readiness.

The adjusted R-squared value of e-learning readiness was 0.936 (93.6%). The representation was that such readiness was strongly influenced by the HOT-Fit model including the whole constructs of this study directly or indirectly. The rest was, however, influenced by others not becoming influential models (6.4%). Moreover, the adjusted R-squared value of IT service management was 0.848 (84.8%). The interpretation was that the existence of this management was strongly influenced by the HOT-Fit model in forms of human, organization, and technology. Nevertheless, the rest was influenced by other constructs not becoming influential models (15.2%). In general, relationships of all constructs of this research model critically contributed to the success of a predictive model of the application of e-learning readiness. After calculation, it was found that the predictive relevance was 0.990 (99%). In other words, a very good result emerged. Thus, the research model was very appropriate to be used to predict effects of IT service management on e-learning readiness influenced by human, organization, and technology.

In addition, the highest path coefficient was in terms of effects of IT service management on e-learning readiness (0.775) reflecting that the former greatly influenced the smooth implementation of this readiness of universities. This success was inseparable from the extent of implementation of IT service management so that those involved could understand online learning content. Immediate strategy implementation to boost IT service management was further requisite. The focus was more on improvement of operation of IT service functions based on (a) service provider relationships cognized through internal and external services given; (b) interaction indicated through IT services used by stakeholders and IT service providers to support operational activities; and (c) service benefits (IT services mainly needed and added values of learning materials). Optimizing IT service management required capabilities to process IT service

innovation through the integration of human, organization, and technology. Next, complete adjustment of e-learning readiness content was made through internalization of the use of IT service applications. The success of these processes was influenced by governance of IT service management involving structures, processes, and relational mechanisms essentially facilitating the synchronization and interoperability, and ensuring the suitability of application portfolios of IT services of e-learning readiness content. It was clearly noted that path coefficients of indirect effects of human, organization and technology on e-learning readiness mediated by IT service management were respectively 0.204, 0.354, and 0.236. They were smaller than the ones of direct effects of this management.

Regarding the path coefficients of direct and indirect effects, it was reflected that IT service management importantly influenced e-learning readiness. Meanwhile, the ones of human, organization, and technology on the latter without being mediated by the former were smaller (respectively 0.022, 0.149, and 0.055). These findings further emphasized the research novelty that importance of IT service management for successful implementation of e-learning readiness was accepted. This affirmation was, however, not given in previous studies [4, 9, 24, 25, 28].

With reference to tested research hypotheses, unlike previous studies showing significant results [15,28], H1 was not proven. Hence, the more students and instructors (lecturers) could use the system well and felt satisfied, the more decreasing the interest and motivation to learn online were. Meanwhile, of the three constructs of the HOT-Fit model, organization, followed by human and technology, was the greatest success determinant of e-learning readiness because of its highest path coefficient. In other words, technology was not the only success factor since the internet infrastructure was no longer a problem for some users of the e-learning system.

Finally, a follow-up step was taken with a number of informants to obtain more accurate outcomes by referring to previous studies. Similar questions were given to five informants previously determined and answers were matched with findings analyzed through the PLS-SEM application. Information conveyed generally highlighted crucial effects of IT service management. Besides, IT services requiring the supports and deliveries in relation to the content of e-learning readiness should last smoothly. Also, all instructors (lecturers) should be skillful in empowering this content. This study was limited to construct relationships to determine and confirm effects of IT service management on e-learning readiness without further analyses and interpretation of each indicator including path coefficients of constructs.

V. Conclusion and Future Research

IT service management has crucial roles and is indivisible from other constructs when implementing e-learning readiness through the HOT-Fit model. Such management should be in line with capabilities and supports of the third parties delivering content from IT service applications. The research can be continued to have more specific exploration in all universities in West Kalimantan and other provinces, and in depth confirmatory analyses of indicators with direct and indirect effects so that the results become more comprehensive. The fact shows that there have been no universities realizing that IT service management determines the implementation success of e-learning readiness.

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