



INTEGRATIVE FACTORS OF BRIDGE SIMULATOR LABORATORY ADAPTION : BASED PROJECT MODEL

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Article history:

Received: January 24, 2023

Revised: June 6, 2023

Accepted: June 18, 2023

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Keywords:

Bridge Simulator;

Task Technology Fit;

Technology Acceptance;

Adoption Intention.

Abstract

One of the learning models that are often used and developed is PjBL (*Project Based Learning*). PjBL is a teaching approach built on learning activities and real tasks that provide challenges for learners related to everyday life to solve in groups (*Goodman and Stivers 2010*) [1]. Bridge Simulator is one of the supporting suggestions in implementing PjBL in vocational learning, which has become a national and international standard regulated by the Ministry of Transportation and IMO (*International Maritime Organization*) [2], where users/students can apply the PjBL method with the BRM (*Bridge Resource Management*) concept. The focus of this study is how the adaptation of learning models with simulators by school residents including students, measurements using the D&M model and TTF model, that the adaptation of simulator learning shows positive results.



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1. INTRODUCTION

Learning models for education are growing, with various models applied by each Educational Unit, where these models are developed in line with the needs of facilities and infrastructure and educational facilities that have been determined by the government according to the standards of facilities and infrastructure. The learning models are divided into several groups in line with the demands of K13 [3], and also the independent curriculum.

Technology has an important role in the application of learning models applied by educational units, especially vocational-oriented education, such as Maritime Education where one of the methods used in the application of learning models is PjBL (*Project Based Learning*). The use of facilities and infrastructure, one of which is the bridge simulator laboratory, is an important capital to increase the competence of students as a qualified learning tool, according to regulations that have been standardized nationally and internationally.

At this time there has been no research related to the adoption of the bridge simulator for the PjBL learning model, many of which focus only on the application of competency standards on each indicator in the bridge simulator and the achievement

of existing competencies in the bridge simulator, according to international standards DNV [4] and national standards PK-16 [5].

Therefore, we are interested in conducting research primarily to analyze the characteristics of bridge simulator laboratory systems and their correlation with technology adoption behavior, especially the factors related to tasks, technology, and humanity that drive bridge simulator laboratory adoption.

Some of the research questions that will be answered in this study are: (1) What are the determinants that affect the adoption of bridge laboratories, perceptions of usability, and perceptions of ease of use for users in Indonesia? (2) Do Task Technology Fit (TTF), technology-driven, and human-driven have a direct effect on perceived usability and perceived ease of use on bridge laboratory adoption? (3) does the perception of usability and the perception of ease of use affect the adoption of bridge laboratories? To answer this question and provide a better understanding of the Integrative factors of bridge laboratory adoption in Indonesia, we developed a theoretical model combining the DeLone & McLean (D&M) model and the TTF model [6].

Based on that, research using the D&M model and the TTF model were combined in the adoption of the bridge simulator laboratory. Since our research is based on two established theories, integration into one model contributes to the discipline of information systems (SI). We hope this study provides insight into ideas for schools so that they implement appropriate policies to implement the bridge simulator laboratory learning model.

The systematics of this paper is arranged in Part 2, presenting a bridge simulator Laboratory in Indonesia. Part 3 presents the theory of technology adoption and acceptance. The methodology is in Section 4. Section 5 contains results, data analysis, and hypothesis testing using Structural Equation Modeling (SEM), while factor analysis, path analysis, and regression were performed using SmartPLS 3.2 software. Section 6 shows the discussion of this research including theoretical and managerial implications. Section 7 presents the conclusions of the study.

II. LITERATURE

2.1. Bridge simulator laboratory in Indonesia

Learning by using the bridge simulator Laboratory began to be applied and required for maritime or shipping schools that will graduate their students to have a sailor's Professional Certificate.

2.2. Task-Technology Fit

Among the factors driving technology, adoption is the ability of technology to provide efficiency and effectiveness to tasks performed by humans. One of the most popular theories to represent this situation is Task Technology Fit (TTF) [7]. In this TTF theory, there are three main drivers that drive technology adoption, namely technology characteristics, task characteristics, and task-technology suitability. Research in Information Systems has advanced technology-for-performance as a model for linking information technology and individuals, encouraging the perspective of individual users to make more effective use of Information Systems [7]. In other words, the proposed model is a technological attribute that refers to the technology consumed by individuals to perform their tasks and a task characteristic that refers to the activities performed by individuals in influencing user adoption.

The TTF Model plays an important role in the field of information technology use and has been commonly applied to previous research [8][9][10]. The condition in which technological features can help someone in carrying out the task and by the needs of the task is called the technological suitability of the task. The function of the three components, namely, individual properties, technological attributes, and task characteristics are the task-technological suitability proposed in the TTF model. In turn, Technology-Task conformance directly impacts user adoption, and through TTF, variables of

technical indicators and task characteristics are proposed to indirectly influence adoption.

Research has been conducted to use information systems or sustainable use of Information Systems based on the TTF model including knowledge management [11], e-book adoption [12], e-learning [9][13][14], wireless technology adoption [10], mobile banking Services [15], and data mining tools [16]. We discussed it in our research model to understand the task-driven issues behind user adoption intentions in the bridge simulator lab.

2.3. DeLone and McLean IS Success Model

The DeLone and McLean (D&M) Model as an attribute of technological quality was originally derived from a mathematical modification of Harrison and Weaver's theory of communication [17]. The degree of effectiveness of such an impact on the recipient is one of the early models for identifying the level of information.

The other two early models were the technical level of accuracy and efficiency of the system that generated them and the semantic level model, that is, the ability to transfer messages [17]. In later developments, Mason [18] applied the early theory of Information Systems (SI) by developing the effectiveness of three subcategories (1) reception of Information, (2) influence on the receiver, and (3) influence on the system. Figure 2 is an early D&M model that contains the relationship between system quality and information quality. In the figure, there are six components in the information system that is the point of successful application of information systems. They consist of user satisfaction, individual impact, organizational impact, system usage, system quality, and information quality. This statement is known as the general theory of SI success. Early D&M model changes were made after research emerged[19]. The study stated that service quality was found to also have an impact on the measurement of system quality. Therefore, D&M's success model includes system quality, information quality, and service quality.

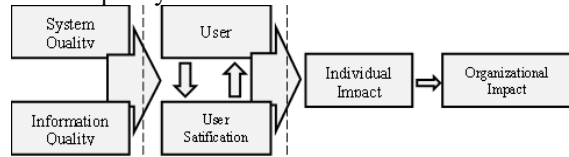


Figure 1. DeLone and McLane (D&M) Model

The development of taxonomy SI success continues to be pursued by researchers. Petter, DeLone, and McLean conducted a review spanning fifteen years (1992-2007) of levels of analysis, different types of IS, and different contexts to expand the taxonomy of IS success [20].

Motivated by the need to understand the success of SI and its effects, this study adds the critical success factors in addition to the quality of information with accessibility factors [21] and design factors [22]. All three are driving indicators of

technology-based issues. However, the characteristic focus of tasks has so far been applied to activities supported by organizations, so in this study, we are interested in analyzing at the individual level, as was done in the study [23]. The researcher developed a successful model of D&M IS as a theoretical basis such as Knowledge Management System (KMS) [24], learning system[25][26], and implementation of resource planning system (ERP) [27].

The D&M success Model allows it to be combined with several other theories. Some researchers combine it with the theory of acceptance and use of integrated technologies, such as in research on electronic patient registration systems [28] or in other research on online services and repurchase intentions [29] or intentions to continue Mobile Payment Services [30]. In addition, the basic D&M model has also been used in the evaluation of electronic health records [31], but to our knowledge, there is no literature on the D&M model in the adoption of the bridge simulator laboratory.

2.4. Technology Readiness Index

User readiness is an important part of increasing the likelihood of bridge simulator Lab adoption in learning success. User readiness is an important factor in the development and innovation in the field of Education. A person's acceptance of new technologies is influenced by the structural and psychological aspects of innovation in technology. Readiness to adopt and use new technology is the tendency of individuals to try and use new technology in achieving goals in daily activities.

The readiness of individuals for the adoption of new technologies can already be measured by the Technology Readiness Index (TRI) method [32]. This technology was developed to assess individual thinking and general confidence in new technologies. It is clear that an individual's assessment of the adoption of new technology results in two judgments that are positive if the individual agrees to use the new technology so that the individual can become a pioneer. While a negative view or assessment of new technology will cause individuals to be skeptical or even reject the presence of new technology. Assessment of positive and negative responses from users leads to the emergence of thoughts about the four dimensions of insecurity, optimism, discomfort, and innovation [32]. In this study, innovative dimensions were used.

The dimension of innovation can affect the increase in user readiness in using the latest technology which refers to the extent to which a person will experiment with technology and is eager to try the latest technology-based services.

The emergence of the bridge simulator laboratory as a new system is currently considered one of the breakthroughs or innovations that serve users in the health sector in Indonesia. The learning that has been done conventionally has changed with the ease of offering learning through the bridge simulator

Laboratory PjBL model. Thus, it becomes interesting to know how users adopt innovations in education such as this bridge simulator laboratory learning. This became the basis for the selection of innovation factors from the Technology Readiness Index in this study to determine whether individual barriers to adopting the bridge simulator laboratory system are influenced by personal innovation factors.

Barriers associated with personal innovation to users can lead to slow adoption of new learning models such as bridge simulator Labs. Although there have been previous studies addressing individual and organizational adoption [7], we believe that none of the studies focused on the adoption of the bridge simulator laboratory focused on human factors. Therefore, we are interested in taking personal innovation [33][34] as a human-driven indicator in this study to determine the effect of the adoption of bridge simulator laboratory intentions.

III. RESEARCH METHODS

In understanding the adoption of individuals of new technologies, personal traits certainly cannot be ignored. Current individual or user adoption models have taken these important factors into account to explain user adoption behavior [35].

Personality factors, behavioral beliefs, and social influences in several studies [36][37] show varying influences on the intended use of information systems from initial implementation to information system running. Therefore, a bridge simulator laboratory is a type of system whose use is based on the user's decision regarding a learning model, three main problems arise to understand the user's intention towards the continuous use of a bridge simulator laboratory such as task-driven, technology-driven, and human-driven. Thus, four theoretical concepts namely task-driven, technology-driven, human-driven, and the technology acceptance model test this sustainable usage behavior. The illustration in Figure 2 gives an idea of this research model. Hypothesis development is discussed in the next section.

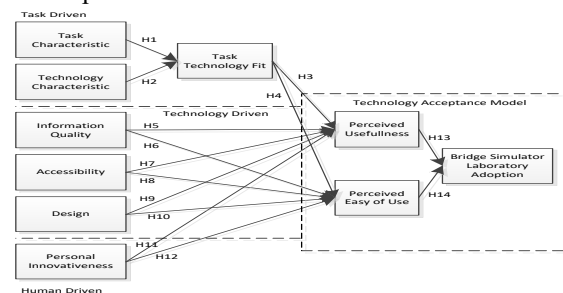


Figure 2. Conceptual Model

3.1. The Task-Driven Issue

In the context of IS, the TTF model is often used. Previous studies using TTF models such as the intention to use KMS testing proposed by [8] used TTF models in which the task and characteristics of the KMS were positively related to task-technology suitability.

The characteristics of the tasks and technological characteristics in this study refer to [7][10]. Other researchers propose a mixture of TTF and TAM models for mobile device use [38]. Other researchers found that task characteristics play an important role in determining task-technology suitability in statistical modelling and project management tools, Task modelling in DMT [16] integrates TTF with TAM to investigate determinants of e-commerce user acceptance [39].

Thus, by involving the TTF model in this study, it is expected that users will find the bridge simulator laboratory useful when the system helps users in their learning activities [32]. In particular, if the bridge simulator laboratory can adequately meet the information needs of users in effective learning activities, users will consider the bridge simulator laboratory as a suitable system for their learning model. As discussed above, this study proposes the following hypotheses:

- H1 - Bridge Simulator task characteristics have a positive impact on task-technology compatibility.
- H2 - Technological characteristics in bridge simulators have a positive impact on the task-technological fit.

In Information Systems theory, the relationship between task-technology suitability and its use has been well established [13][16][40][41]. Previous research [13] has expanded the post-acceptance model with a combination of TTF and ECM to examine intentions for the continuation of IS. The results show that task-technology suitability is related to perceived usefulness.

The suitability of task technology is listed in several articles [40][42][43][23]. It is a proposed model to test the relationship between perceived task-technology suitability and system factors to encourage students to use e-learning systems [41]. In particular, studies [16] have found that the fit between task and technology has a positive influence on perceived usefulness in the use of DMT. Overall, the results showed that task matching technology positively affects perceived benefits. The study offers the next hypothesis:

- H3 - Task suitability technology has a positive impact on the perception of ease of use.
- H4 - Task suitability technology has a positive impact on perceived usability.

3.2. The Technology Driven Issue

The quality of information can contribute to user satisfaction because users can know information about the quality of the system [22]. The quality of the system in the form of the use of the most advanced technology, the advantages of system functions and key features as well as software that is easy to use, easy to learn, easy to maintain, and user-friendly [44]. Users target the quality of Information System content in format, understanding, relevance, accuracy, accessibility, completeness, adequacy of

consistency, consistency, and timeliness, as described in the study [22][45][46][47].

The relationship between information quality and perceptions of ease of Use and usability of systems has often been used as a research model [33][48][49][50][51][52] where research shows that the relationship of information quality positively affects perceived benefits and perceived ease of use. The Bridge laboratory is predictable in providing information that is following user needs, accurate, current, complete, clear, and in a good format so that users can consider adopting a system in the bridge simulator laboratory. To determine the relationship between the quality of bridge laboratory information with the perception of ease of Use and usability of the system, then put forward supporting hypotheses:

- H5 - The quality of the information in the bridge simulator system positively affects perceived usability.
- H6 - The quality of the information in the bridge simulator system positively affects the perception of ease of use.

A system that has problems when accessed means having problems in use. While the system is easily accessible and has no constraints in use will be the user's choice for more frequent and easier use [53][54]. The system can be accessed unhindered if there is a fast internet connection and the right technical infrastructure, so accessibility is not hampered. Users tend to ignore the system if there are network connection constraints and internet speed [53][55]. Reliability system accessibility is an important factor.

The Model used to predict the adoption of system use associated with TAM in the study [53][56][57] states that system accessibility has been considered a significant external factor. In bridge laboratory, allegedly technical aspects of accessibility such as bridge laboratory can be accessed anytime and anywhere. Bridge laboratory can be accessed in any condition and can be accessed through various media (smartphones, laptops, etc.) this technical accessibility is a critical success factor that determines the usefulness of the system and the usefulness felt by users in adopting bridge laboratory. Then formulated the hypothesis as follows:

- H7 - Accessibility in the bridge simulator system positively affects perceived benefits.
- H8 - Accessibility in the bridge simulator system positively affects the perception of ease of use.

The design in this study follows DeLone and McLean, 2016 [20][22][58]. Design becomes important if it is associated with user adoption in a system. The design was prepared with careful consideration. Many studies on design evaluation such as Allen et al. [59] present an evaluation designed to assess the quality level of a web application mock-up design. Design Usability Evaluation (DUE) technology can be used to find problems affecting navigation and ease of use of

applications [60]. The purpose of this study is to improve the usability and usefulness of the system perceived by the user. The user-friendly design will provide usability and usability perceived by the user [61].

Among the attitude factors, aesthetics and design have the most significant influence [62][63]. Various aspects can determine the attitude towards online systems such as the availability of product information, the presence of convenience, optimization of time, and effort given [64]. Furthermore, a web design made according to aesthetics and experience becomes a factor taken into account by the user. Other studies [65] have examined website use on indirect perceived benefits and intentions, perceived ease of Use, and cognitive absorption of design effects.

Users want a bridge laboratory system design that has an attractive appearance and has the features and functions that users need. The structured appearance of the bridge laboratory system influences the perception of usability and the perception of ease of use in adopting this system. Based on this, the following hypothesis was formulated:

- H9 - The design in the bridge simulator system positively influences perceived benefits.
- H10 - The design in the bridge simulator system positively affects the perception of ease of use.

3.3. The Human-Drive Issue

Personal innovativeness in this study refers to [33][34]. Personal innovativeness is one of the variables in human-driven issues. This variable refers to the willingness of individuals to try new types of systems in healthcare adoption so that they do not resist when new systems are introduced, as proposed by [66]. The study investigates how individuals through personal innovation adopt devices that can be used in healthcare. Personal innovativeness [34] is a desire that arises in an individual as the first to use new technology.

Individuals feel excited and feel it is important to be the first to have new technology and always want to use technology products. Previous researchers [33][34] stated that an individual's willingness to try new technologies is a personal innovation in technology. Different innovations in each individual will differentiate the way individuals react to new technologies. In general, users who have innovative technology tend to quickly accept the new technology offered [67].

The Bridge laboratory system has high innovation such as ease of access to every process in the system. High innovation in bridge laboratory will certainly make it easier for users to adopt bridge laboratory.

Users who have higher innovation towards new it certainly needs to be associated with the usefulness and usefulness felt by the individual. In detail, we hypothesized that there is an influence of personal innovation in bridge Labs on the perceived usefulness and usefulness of individuals in adopting bridge Labs:

- H11 - personal innovativeness positively affects perceived benefits.
- H12 - personal innovativeness positively affects the perception of ease of use.

3.4. The Technology Acceptance Model Issue

Behavioral intention aspects of TAM, i.e., perceived benefits and perceived ease of use [68] in literature and studies are often used. Many successful studies have shown the relationship between these factors in the use of Information Systems. In this study, perceived usefulness and perceived ease of Use follow the work in [68][69], and adoption refers to the study in [70]. In the context of bridge Laboratories, the ease and usefulness of using bridge laboratories will certainly affect the user's intention to use bridge laboratories.

In this study, the perceived benefits can be described as the relative perceived benefits of the bridge laboratory system. The easier the bridge laboratory technology, the greater its usefulness for consumers. Bridge laboratory is easy to learn and easy to use because of its simple way of use. Users find it easy to use bridge Labs as it is easy to navigate. Users adopt and desire to use bridge Labs in the future. Thus, two hypotheses are formed:

- H13 - perceived usability has a positive impact on the application of bridge simulator.
- H14 - perceived ease of use has a positive impact on the implementation of the bridge simulator.

IV. RESULTS

4.1. Respondent Demographics

The accumulated data obtained 162 respondents consisting of 95 men and 8 women. Demographic data collection of respondents who participated in the questionnaire in this study can be seen in Table 1 shows that most respondents are in the range of 14 to 35. This shows that respondents are in the productive age of learners. The level of education of the respondents was mostly high school. In terms of profession, most respondents are engaged in maritime education. Description of respondents who use bridge simulator.

Table 1. Respondent Demographic

Items	Frequency	Percentage (%)
Sex		
Male	154	95
Female	8	5
Age		
14-20	43	27
21-29	38	23
30-35	35	22
36-40	19	12
41-45	15	9
>45	12	7
Education		
High Senior School	84	52
Diploma	13	8
Bachelor	12	7
Postgraduate	7	4
Student	46	28

4.2. Analysis of the Measurement Model

Before analyzing and measuring the proposed conceptual model, the first step is to test the surveying instruments. This step is completed by testing the validity and reliability of the research instruments.

In this section, the statistical values are compared with the calculation of the questionnaire results, mainly related to the convergent validity of each construct. The first step is to test the reliability and validity. Composite Reliability (CR) on PLS is used to test reliability. Table 2 is the test result where it can be seen that the value of CR index in all constructs > 0.7 and Cronbach's Alpha meet the criteria. Determination of convergent validity values follows a criterion [71] where all items are statistically significant and must have a value > 0.60 or ideally 0.70. In addition, the Average Variance Extracted (AVE) value must be > 0.50 for construction. The validity of the discriminant is measured using a criterion in which the square root of the AVE for a construct must be greater than its correlation with other constructs.

In line with these criteria, all question items appear to have a value greater than 0.60, and all construction items meet the criteria. Table 2 shows the reliability and validity of the resulting converges. These indices simultaneously demonstrate a high degree of convergent reliability and validity.

Table 2. Convergent validity

Construct	Items	Outer Loading	Cronbach's Alpha	Composite Reliability	Average Variance Extracted (AVE)
AC	AC1	0,953	0,930	0,955	0,877
	AC2	0,934			
	AC3	0,923			
AI	AI1	0,957	0,935	0,958	0,885
	AI2	0,934			
	AI3	0,931			
DE	DE1	0,908	0,935	0,959	0,886
	DE2	0,952			
	DE3	0,963			
IQ	IQ1	0,884	0,955	0,965	0,848
	IQ2	0,921			
	IQ3	0,933			
	IQ4	0,938			
	IQ5	0,928			
PE	PE1	0,913	0,921	0,950	0,864
	PE2	0,959			
	PE3	0,916			
PI	PI1	0,934	0,945	0,960	0,858
	PI2	0,922			
	PI3	0,942			
	PI4	0,907			
PU	PU1	0,929	0,954	0,966	0,878
	PU2	0,954			
	PU3	0,945			
	PU4	0,920			
TC	TC1	0,893	0,887	0,930	0,816
	TC2	0,938			
	TC3	0,878			
TCC	TCC1	0,897	0,908	0,942	0,845
	TCC2	0,940			
	TCC3	0,920			
TTF	TTF1	0,895	0,936	0,954	0,839
	TTF2	0,939			
	TTF3	0,912			
	TTF4	0,918			

The diagonal line in Table 3 clearly shows that the value on the diagonal line has a greater discriminant value than the discriminant value below it, so it is

declared valid. This means that the indicator can construct the variables formed in this bridge laboratory research. The results showed a high degree of discriminant validity.

Table 3. Discriminant validity

Construct	AC	AI	DE	IQ	PE	PI	PU	TC	TCC	TTF
AC	0,937									
AI	0,77	0,94								
DE	0,34	0,66	0,941							
IQ	0,35	0,66	0,798	0,921						
PE	0,91	0,88	0,695	0,772	0,930					
PI	0,99	0,66	0,768	0,734	0,686	0,926				
PU	0,89	0,77	0,810	0,750	0,757	0,744	0,937			
TC	0,24	0,55	0,720	0,772	0,658	0,634	0,702	0,903		
TCC	0,678	0,55	0,775	0,812	0,637	0,684	0,699	0,747	0,919	
TTF	0,45	0,66	0,854	0,843	0,772	0,746	0,824	0,787	0,787	0,916

In this study, we also calculated the Variance Inflation Factor (VIF). The values obtained ranged from 2,230 to 7,350 and were still smaller than 10.0 [72][73]. There is no VIF value above 10.0, so it can be stated that there is no significant multicollinearity problem in the bridge Laboratory user questionnaire data set in this study.

4.3. Analysis of the Structure Model

Two conditions need to be considered in evaluating the structure model formed to obtain the path coefficient (ε) and the coefficient of determination (R2).

The first condition in PLS is that there is no significance test or confidence interval estimation, and the second condition is that the coefficient of determination of PLS analysis is identical to that found in multiple regression analysis. Figure 5 shows the output of the estimated path coefficients (ε) and explanatory power (R2).

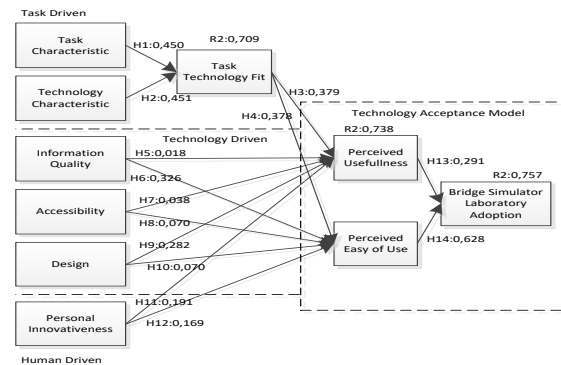


Figure 3. Result of the structural model

Therefore, task-driven variables with the construction of task characteristics and technological characteristics through task-technology fit simultaneously explain 73.8% of the variables in perceived benefits ($R^2 = 0.738$). The bootstrap procedure is used to obtain path coefficients, statistics, statistical significance, and relevant parameters such as mean, standard error, and load items [74][75].

All relationships in the conceptual model are supported by data. Task-driven variables are driven by task characteristics, technology characteristics, and task-technology fit. Modelling of task characteristics and technology characteristics has a significant influence on the Task-Technology Fit ($\epsilon = 0.450$ and 0.451). Thus, hypotheses 1 and 2 are supported. Task-driven variables consisting of task characteristics and technology characteristic bridge laboratories have a positive impact on task-technology fit.

Both constructions simultaneously accounted for 70.9% of the variance in the task-technology fit ($R^2 = 0.709$). The Task-technology fit in the bridge laboratory was critical in determining the perceived benefits ($\epsilon = 0.379$). Hypothesis 3 supports the data. Therefore, the task-driven variable with the construction of task characteristics and technology characteristics through task-technology fit simultaneously explained 73.8% of the variables in the perceived benefit ($R^2 = 0.738$). The results of data analysis for Hypothesis 4 were accepted because the task-technology fit bridge laboratory system had positive and significant results on the perception of perceived usefulness. The relationship was positively correlated ($\epsilon = 0.378$). The relationship that occurs is correlated, so the higher the task technology fit indicator in the bridge laboratory, the higher the perceived ease perceived by the user or vice versa.

Technology-driven variables are driven by Information quality, accessibility, and design. Hypotheses 5 and 6 are also supported by the data. Information quality has a positive and significant effect on perceived usefulness ($\epsilon = 0.018$) and perceived ease ($\epsilon = 0.326$). Accessibility is a technology-driven variable construct and is an important precursor of perceived usefulness ($\epsilon = 0.038$) and perceived ease of use ($\epsilon = 0.070$).

Thus, hypotheses 7 and 8 are supported. For Hypothesis 9 and 10, the design of the bridge laboratory system harms perceived ease of use ($\epsilon = -0.070$). The relationship that occurs is negatively correlated, so the higher the design indicator in the bridge laboratory, the lower the perceived ease of use Felt by the user, or vice versa.

The results of data analysis for Hypothesis 10 were rejected because the design of bridge laboratory system did not have a positive and significant effect on perceived ease of use. The relationship is negatively correlated ($\epsilon = -0.070$) while the design of

bridge laboratory system has a positive impact on perceived usefulness ($\epsilon = 0.282$).

The relationships that occur are positively correlated, so hypothesis 9 is supported. Design in bridge laboratory systems positively influences perceived usefulness. The three constructs simultaneously accounted for 73.8% ($R^2 = 0.738$) of the variance in perceived usefulness of vulnerability and accounted for 66% ($R^2 = 0.660$) of the variance in perceived ease of use, and the remainder was influenced by other variables.

Human-driven variables are driven by personal innovativeness whose relationship is described in hypotheses 11 and 12. The results showed that hypothesis 11 was supported by data. Personal innovativeness has a positive and significant effect on perceived usefulness ($\epsilon = 0.191$). In contrast to Hypothesis 11, the results of data analysis for hypothesis 12 were rejected because Personal Innovation did not have a positive and significant effect on perceived ease of use. Technology acceptance model variables are driven by perceived usefulness and perceived ease of use for adoption variables obtained from task-driven, technology-driven, and human-driven variables. In hypotheses 13 and 14, supported by the data, perceived usefulness had a positive effect on adoption ($\epsilon = 0.291$). Perceived ease of use is a construct of the TAM model variable and has a positive effect on adoption ($\epsilon = 0.628$). Therefore, both constructions simultaneously accounted for 75.7% ($R^2 = 0.757$) in adoption.

Table 4 shows the hypothesis test results (t-value) based on structural model test results using SmartPLS. Fourteen hypotheses were tested, eight were accepted, and six were rejected (in red).

Tabel 4. Hypothesis testing result

Hipotesis	(ϵ)	Mean (M)	(ST DEV)	T Statistics	P Values	Conclusion	
H1 TC -> TTF	0,450	**	0,447	0,083	5,407	0,000	Accepted
H2 TCC -> TTF	0,451	**	0,451	0,088	5,117	0,000	Accepted
H3 TTF -> PU	0,397	**	0,386	0,158	2,515	0,012	Accepted
H4 TTF -> PE	0,378	**	0,343	0,155	2,443	0,015	Accepted
H5 IQ -> PU	0,018		0,000	0,124	0,143	0,886	Rejected
H6 IQ -> PE	0,326	**	0,317	0,122	2,672	0,008	Accepted
H7 AC -> PU	0,038		0,050	0,076	0,499	0,618	Rejected
H8 AC -> PE	0,070		0,085	0,086	0,818	0,414	Rejected
H9 DE -> PU	0,282	**	0,267	0,140	2,02	0,044	Accepted
H10 DE -> PE	0,070		0,064	0,120	0,582	0,561	Rejected
H11 PI -> PU	0,191		0,218	0,137	1,399	0,162	Rejected
H12 PI -> PE	0,169		0,191	0,100	1,693	0,091	Rejected
H13 PU -> AI	0,291	**	0,299	0,121	2,403	0,017	Accepted
H14 PE -> AI	0,628	**	0,621	0,106	5,934	0,000	Accepted

Path- ϵ : ** $p < 0.05$, *** $p < 0.01$

V. CONCLUSION

This study proposes and tests user adoption intention models on bridge laboratory use of task characteristics, technology characteristics, task technology suitability, information quality, accessibility, design, and personal innovation through

perceived usability and perceived ease of use. This Model can provide a first step toward the implementation of bridge laboratory systems in Indonesia. This Model tends to produce preferred data because it requires a user-related perspective to determine the characteristics of the bridge laboratory system taking into account the technical aspects to allow customers to focus on the technology characteristics seen in the bridge laboratory.

The most dominant factor that directly affects the intention of users to adopt bridge laboratory systems is the characteristics of technology followed by usability perception and design factors. All three factors have a significant direct impact on the intention of users to adopt bridge laboratory systems. The perceived benefit factor has a positive utility, so it has a significant role in the implementation of bridge laboratory system. In contrast, the design factor on the perceived benefit as a negative utility in user trust did not have a significant impact on the intention of Indonesian users to use the bridge laboratory system. As a result, it can be concluded that Indonesian users can be characterized by their considerations for the perceived benefit factor they will get, and then they put aside designs that may be difficult to use, but they still have the intention to adopt new technologies.

Design issues related to perceived ease of Use and characteristics of technology also proved to be decisive for the adoption of bridge laboratory payments despite the indirect impact. Task suitability-technology, information quality, accessibility, and personal innovation also have an indirect impact on the adoption of bridge simulator labs through perceived usability. Therefore, bridge laboratory service providers should plan awareness programs regarding the benefits of use, quality of information, and ease of access to bridge laboratories so that customers are ready to advise their relatives to use bridge laboratory systems.

Overall, this study shows that the characteristics of the bridge laboratory system proved to have a significant effect on the intention to adopt a bridge laboratory for consumers in Indonesia. Finally, Indonesian users will tend to pay attention to the perceived benefits and accept the risks when adopting technology in the bridge laboratory system.

There are still limitations in this study and can be improved in future studies. First, the filling of the questionnaire is carried out independently, which needs to be controlled to ensure that the respondents who filled out the questionnaire are the right ones. This can result in bias in respondent's responses. To get the attention of respondents and to get more data, giving gifts to respondents will make it easier for researchers to get more data from respondents. In this study, we also offer rewards for selected respondents who have completed a given questionnaire.

Another comment is about the uneven distribution of respondent's settlement locations.

Second, this study only focuses on user adoption; further studies on the specific adoption of education experts and simulators need to be done to provide a comprehensive analysis of the adoption of bridge laboratories in Indonesia. Third, for the issue of user data security, further studies need to be carried out to determine the right balance between security, privacy, and traceability, so that user learning data is not spread to irresponsible parties.

REFERENCES

- [1] B. Goodman, "Project-Based Learning," *Educational psychology*, 2010. https://www.fsmlilitary.org/pdf/Project_Base_d_Learning.pdf
- [2] K. Udara, "Insan Transportasi Melayani Negeri," 2021, [Online]. Available: <https://transmediakemenhub.id/trans-utama-e301-2021/>
- [3] Z. Zetriuslita and A. Alzaber, "Model Model Pembelajaran Sesuai Tuntutan Kurikulum 2013 (Pelatihan Untuk Guru-Guru SMP Kampar Kiri Hilir Kabupaten Kampar)," *Community Educ. Engagem. J.*, vol. 2, no. 1, pp. 30–37, 2021, doi: 10.25299/ceej.v2i1.5981.
- [4] DNV, "DNV Certificate," *Certification of maritime simulator systems*. <https://www.dnv.com/services/certification-of-maritime-simulator-systems-2862>
- [5] M. Mudiyanto, D. Malik, and D. Soewono, "Kajian Peraturan Kepala Badan Pengembangan Sumber Daya Manusia Perhubungan Nomor : PK.16/BPSDMP-2017 tentang Pedoman Standarisasi Penyelenggaraan Simulator," *Saintara J. Ilm. Ilmu-Ilmu Marit.*, vol. 6, no. 2, pp. 143–146, 2022, doi: 10.52475/saintara.v6i2.178.
- [6] D. Riana, A. N. Hidayanto, S. Hadianti, and D. Napitupulu, "Integrative factors of e-health laboratory adoption: A case of Indonesia," *Futur. Internet*, vol. 13, no. 2, pp. 1–27, 2021, doi: 10.3390/fi13020026.
- [7] P. Ballarini, R. Guido, T. Mazza, and D. Prandi, "Taming the complexity of biological pathways through parallel computing," *Brief. Bioinform.*, vol. 10, no. 3, pp. 278–288, 2009, doi: 10.1093/bib/bbp020.
- [8] T. C. Lin and C. C. Huang, "Understanding knowledge management system usage antecedents: An integration of social cognitive theory and task technology fit," *Inf. Manag.*, vol. 45, no. 6, pp. 410–417, 2008, doi: 10.1016/j.im.2008.06.004.
- [9] W. S. Lin, "Perceived fit and satisfaction on web learning performance: IS continuance intention and task-technology fit perspectives," *Int. J. Hum. Comput. Stud.*, vol. 70, no. 7, pp. 498–507, 2012, doi: 10.1016/j.ijhcs.2012.01.006.

- [10] D. C. Yen, C. S. Wu, F. F. Cheng, and Y. W. Huang, "Determinants of users' intention to adopt wireless technology: An empirical study by integrating TTF with TAM," *Comput. Human Behav.*, vol. 26, no. 5, pp. 906–915, 2010, doi: 10.1016/j.chb.2010.02.005.
- [11] R. Z. Kuo and G. G. Lee, "Knowledge management system adoption: Exploring the effects of empowering leadership, task-technology fit and compatibility," *Behav. Inf. Technol.*, vol. 30, no. 1, pp. 113–129, 2011, doi: 10.1080/0144929X.2010.516018.
- [12] X. Liu, "Full-Text Citation Analysis : A New Method to Enhance," *J. Am. Soc. Inf. Sci. Technol.*, vol. 64, no. July, pp. 1852–1863, 2013, doi: 10.1002/asi.
- [13] T. J. Larsen, A. M. Sørenbø, and Ø. Sørenbø, "The role of task-technology fit as users' motivation to continue information system use," *Comput. Human Behav.*, vol. 25, no. 3, pp. 778–784, 2009, doi: 10.1016/j.chb.2009.02.006.
- [14] T. J. McGill and J. E. Klobas, "A task-technology fit view of learning management system impact," *Comput. Educ.*, vol. 52, no. 2, pp. 496–508, 2009, doi: 10.1016/j.compedu.2008.10.002.
- [15] T. Zhou, Y. Lu, and B. Wang, "Integrating TTF and UTAUT to explain mobile banking user adoption," *Comput. Human Behav.*, vol. 26, no. 4, pp. 760–767, 2010, doi: 10.1016/j.chb.2010.01.013.
- [16] T. C. K. Huang, I. L. Wu, and C. C. Chou, "Investigating use continuance of data mining tools," *Int. J. Inf. Manage.*, vol. 33, no. 5, pp. 791–801, 2013, doi: 10.1016/j.ijinfomgt.2013.05.007.
- [17] C. E. Shannon and W. Weaver, "The Theory of Mathematical Communication," *Int. Bus.*, p. 131, 1964, [Online]. Available: https://pure.mpg.de/rest/items/item_2383164_3/component/file_2383163/content
- [18] M. M. H. Khalid A. Eldrandaly, Soaad M. Naguib, "Measuring Information Output: A Communication Systems Approach," *North-Holland*, 1978.
- [19] L. F. Pitt, R. T. Watson, and C. B. Kavan, "Service quality: A measure of information systems effectiveness," *MIS Q. Manag. Inf. Syst.*, vol. 19, no. 2, pp. 173–185, 1995, doi: 10.2307/249687.
- [20] Delone and McLean, "The quest for the dependent variable. Information Systems Research," *Inf. Syst. Res.*, vol. 3, no. 1, pp. 60–95, 1992, [Online]. Available: <https://doi.org/10.1287/isre.3.1.60>
- [21] T. Dinev, V. Albano, H. Xu, A. D'Atri, and P. Hart, *Individuals' Attitudes Towards Electronic Health Records: A Privacy Calculus Perspective*. 2016. doi: 10.1007/978-3-319-23294-2_2.
- [22] W. H. DeLone and E. R. McLean, "Information Systems Success Measurement," *Found. Trends® Inf. Syst.*, vol. 2, no. 1, pp. 1–116, 2016, doi: 10.1561/29000000005.
- [23] H.-P. Lu and Y.-W. Yang, "Toward an understanding of the behavioral intention to use a social networking site: An extension of task-technology fit to social-technology fit," *Comput. Human Behav.*, vol. 34, pp. 323–332, 2014, doi: 10.1016/j.chb.2013.10.020.
- [24] N. F. Velasquez, A. Durcikova, and R. Sabherwal, "Studying knowledge management system success in system administration," *Proc. 42nd Annu. Hawaii Int. Conf. Syst. Sci. HICSS*, pp. 1–7, 2009, doi: 10.1109/HICSS.2009.407.
- [25] M. L. Cheok and S. L. Wong, "Predictors of E-learning satisfaction in teaching and learning for school teachers: A literature review," *Int. J. Instr.*, vol. 8, no. 1, pp. 75–90, 2015, doi: 10.12973/iji.2015.816a.
- [26] H. F. Lin, "Measuring online learning systems success: Applying the updated DeLone and McLean model," *Cyberpsychology Behav.*, vol. 10, no. 6, pp. 817–820, 2007, doi: 10.1089/cpb.2007.9948.
- [27] W. H. Tsai, P. L. Lee, Y. S. Shen, and H. L. Lin, "A comprehensive study of the relationship between enterprise resource planning selection criteria and enterprise resource planning system success," *Inf. Manag.*, vol. 49, no. 1, pp. 36–46, 2012, doi: 10.1016/j.im.2011.09.007.
- [28] É. Maillet, L. Mathieu, and C. Sicotte, "Modeling factors explaining the acceptance, actual use and satisfaction of nurses using an Electronic Patient Record in acute care settings: An extension of the UTAUT," *Int. J. Med. Inform.*, vol. 84, no. 1, pp. 36–47, 2015, doi: 10.1016/j.ijmedinf.2014.09.004.
- [29] M. H. Hsu, C. M. Chang, K. K. Chu, and Y. J. Lee, "Determinants of repurchase intention in online group-buying: The perspectives of DeLone & McLean is success model and trust," *Comput. Human Behav.*, vol. 36, pp. 234–245, 2014, doi: 10.1016/j.chb.2014.03.065.
- [30] T. Zhou, "An empirical examination of continuance intention of mobile payment services," *Decis. Support Syst.*, vol. 54, no. 2, pp. 1085–1091, 2013, doi: 10.1016/j.dss.2012.10.034.
- [31] C. Bossen, L. G. Jensen, and F. W. Udsen, "Evaluation of a comprehensive EHR based on the DeLone and McLean model for IS success: Approach, results, and success factors," *Int. J. Med. Inform.*, vol. 82, no. 10,

- pp. 940–953, 2013, doi: 10.1016/j.ijmedinf.2013.05.010.
- [32] L. M. Ling and C. M. Moi, “PROFESSIONAL STUDENTS’ TECHNOLOGY READINESS, PRIOR COMPUTING EXPERIENCE AND ACCEPTANCE OF AN E-LEARNING SYSTEM,” 2007.
- [33] K. A. Al-Busaidi, “Learners’ perspective on critical factors to LMS success in blended learning: An empirical investigation,” *Commun. Assoc. Inf. Syst.*, vol. 30, no. 1, pp. 11–34, 2012, doi: 10.17705/1cais.03002.
- [34] I. L. Wu, J. Y. Li, and C. Y. Fu, “The adoption of mobile healthcare by hospital’s professionals: An integrative perspective,” *Decis. Support Syst.*, vol. 51, no. 3, pp. 587–596, 2011, doi: 10.1016/j.dss.2011.03.003.
- [35] R. Agarwal and J. Prasad, “The antecedents and consequents of user perceptions in information technology adoption,” *Decis. Support Syst.*, vol. 22, no. 1, pp. 15–29, 1998, doi: 10.1016/S0167-9236(97)00006-7.
- [36] E. Karahanna, D. Straub, and N. Chervany, “Information Technology Adoption Across Time: A Cross-Sectional Comparison of Pre-Adoption and Post-Adoption Beliefs,” *MIS Q.*, vol. 23, pp. 183–213, 1999, doi: 10.2307/249751.
- [37] P. Legris, J. Ingham, and P. Colletette, “Why do people use information technology? A critical review of the technology acceptance model,” *Inf. Manag.*, vol. 40, pp. 191–204, 2003, doi: 10.1016/S0378-7206(01)00143-4.
- [38] C. Tam and T. Oliveira, “Understanding the impact of m-banking on individual performance: DeLone & McLean and TTF perspective,” *Comput. Human Behav.*, vol. 61, pp. 233–244, 2016, doi: 10.1016/j.chb.2016.03.016.
- [39] N. Maizura, M. Man, S. Alqatan, and R. Mohamad, “A theoretical discussion of factors affecting the acceptance of m-commerce among SMTEs by integrating TTF with TAM,” *Int. J. Bus. Inf. Syst.*, vol. 26, p. 66, 2017, doi: 10.1504/IJBIS.2017.10006282.
- [40] S.-H. Chang, C.-H. Chou, and J.-M. Yang, “The Literature Review of Technology Acceptance Model: A Study of the Bibliometric Distributions,” in *PACIS 2010 - 14th Pacific Asia Conference on Information Systems*, 2010, p. 158.
- [41] W.-S. Lin and C.-H. Wang, “Antecedences to continued intentions of adopting e-learning system in blended learning instruction: A contingency framework based on models of information system success and task-technology fit,” *Comput. Educ.*, vol. 58, pp. 88–99, 2012, doi: 10.1016/j.compedu.2011.07.008.
- [42] T. T. Kim, Y. Suh, G. Lee, and B. Choi, “Modelling roles of task-technology fit and self-efficacy in hotel employees’ usage behaviours of hotel information systems,” *Int. J. Tour. Res.*, vol. 12, pp. 709–725, 2010, doi: 10.1002/jtr.787.
- [43] T.-K. Yu and T.-Y. Yu, “Modelling the factors that affect individuals’ utilisation of online learning systems: An empirical study combining the task technology fit model with the theory of planned behaviour,” *Br. J. Educ. Technol.*, vol. 41, pp. 1003–1017, 2010, doi: 10.1111/j.1467-8535.2010.01054.x.
- [44] N. Gorla, T. Somers, and B. Wong, “Organizational impact of system quality, information quality, and service quality,” *J. Strateg. Inf. Syst.*, vol. 19, pp. 207–228, 2010, doi: 10.1016/j.jsis.2010.05.001.
- [45] S. W. Bailey, J.E. and Pearson, “Developing a tool for measuring computer user satisfaction, bailey.pdf.” 1983.
- [46] P. . Seddon, “A respecification and extension of the DeLone and McLean model of IS. Information Systems Research,” *Inf. Syst. Res.*, vol. 8, no. 3, pp. 240–253, 1997, [Online]. Available: <https://pubsonline.informs.org/doi/abs/10.1287/isre.8.3.240>
- [47] J. Roca, C.-M. Chiu, and F. Martínez López, “Understanding e-Learning continuance intention: An extension of the technology acceptance model. International Journal of Human-Computer Studies, 64(8), 683-696,” *Int. J. Hum. Comput. Stud.*, vol. 64, pp. 683–696, 2006, doi: 10.1016/j.ijhcs.2006.01.003.
- [48] E. Lwoga, “Critical success factors for adoption of web-based learning management systems in Tanzania,” *Int. J. Educ. Dev. Using Inf. Commun. Technol.*, vol. 10, pp. 4–21, 2014.
- [49] Y.-M. Cheng, “Effects of quality antecedents on e-learning acceptance,” *Internet Res. Electron. Netw. Appl. Policy*, vol. 22, 2012, doi: 10.1108/10662241211235699.
- [50] T. Ahn, S. Ryu, and I. Han, “The impact of Web quality and playfulness on user acceptance of online retailing,” *Inf. Manag.*, vol. 44, pp. 263–275, 2007, doi: 10.1016/j.im.2006.12.008.
- [51] H.-J. Chen, “Linking employees’ e-learning system use to their overall job outcomes: An empirical study based on the IS success model,” *Comput. Educ.*, vol. 55, pp. 1628–1639, 2010, doi: 10.1016/j.compedu.2010.07.005.
- [52] S. Ghazal, H. Al-Samarraie, and H. Aldowah, “‘I am Still Learning’: Modeling LMS Critical Success Factors for Promoting Students’ Experience and Satisfaction in a

- Blended Learning Environment,” *IEEE Access*, vol. 6, p. 77201, 2018, doi: 10.1109/ACCESS.2018.2879677.
- [53] M. Masrom, O. Zainon, and R. Rahiman, “Critical Success in E-learning: An Examination of Technological and Institutional Support Factors,” *Int. J. Cyber Soc. Educ. Pages*, vol. 1, pp. 131–142, 2008.
- [54] P. Tantipongnant and P. Laksitamas, “An Analysis of the Technology Acceptance Model in Understanding Students’ Behavioral Intention to Use University’s Social Media,” pp. 8–12, 2014, doi: 10.1109/IIAI-AAI.2014.14.
- [55] W. C. Poon, K. Low, and G.-F. Yong, “A study of Web-based learning (WBL) environment in Malaysia,” *Int. J. Educ. Manag.*, vol. 18, pp. 374–385, 2004, doi: 10.1108/09513540410554031.
- [56] S. Y. Park, M.-W. Nam, and S.-B. Cha, “University students’ behavioral intention to use mobile learning: Evaluating the technology acceptance model,” *Br. J. Educ. Technol.*, vol. 43, pp. 592–605, 2011, doi: 10.1111/j.1467-8535.2011.01229.x.
- [57] B. Wu and C. Zhang, “Empirical study on continuance intentions towards E-Learning 2.0 systems,” *Behav. Inf. Technol.*, vol. 33, pp. 1027–1038, 2014, doi: 10.1080/0144929X.2014.934291.
- [58] W. DeLone and E. McLean, “The DeLone and McLean Model of Information Systems Success: A Ten-Year Update,” *J. Manag. Inf. Syst.*, vol. 19, pp. 9–30, 2003, doi: 10.1080/07421222.2003.11045748.
- [59] M. Allen, L. M. Currie, S. Bakken, V. L. Patel, and J. J. Cimino, “Heuristic evaluation of paper-based Web pages: A simplified inspection usability methodology,” *J. Biomed. Inform.*, vol. 39, no. 4, pp. 412–423, 2006, doi: <https://doi.org/10.1016/j.jbi.2005.10.004>.
- [60] L. Rivero, M. Kalinowski, and T. U. Conte, “Practical Findings from Applying Innovative Design Usability Evaluation Technologies for Mockups of Web Applications,” *2014 47th Hawaii Int. Conf. Syst. Sci.*, pp. 3054–3063, 2014.
- [61] I.-F. Liu, M. Chen, Y. Sun, D. Wible, and C.-H. Kuo, “Extending the TAM model to explore the factors that affect Intention to Use an Online Learning Community,” *Comput. Educ.*, vol. 54, pp. 600–610, 2010, doi: 10.1016/j.compedu.2009.09.009.
- [62] K.-L. Hsiao and C.-C. Chen, “What drives smartwatch purchase intention? Perspectives from hardware, software, design, and value,” *Telemat. Informatics*, 2017, doi: 10.1016/j.tele.2017.10.002.
- [63] W. Wu and D. Shang, “Employee Usage Intention of Ubiquitous Learning Technology: An Integrative View of User Perception Regarding Interactivity, Software, and Hardware,” *IEEE Access*, vol. PP, p. 1, 2019, doi: 10.1109/ACCESS.2019.2893311.
- [64] P. Klaus and S. Maklan, “Towards a Better Measure of Customer Experience,” *Int. J. Mark. Res.*, vol. 55, pp. 227–246, 2013, doi: 10.2501/IJMR-2013-021.
- [65] L. Visinescu, A. Sidorova, M. Jones, and V. R. Prybutok, “The Influence of Website Dimensionality on Customer Experiences, Perceptions and Behavioral Intentions: An Exploration of 2D vs. 3D Web Design,” *Inf. Manag.*, vol. 52, pp. 1–17, 2015, doi: 10.1016/j.im.2014.10.005.
- [66] H. Li, J. Wu, Y. Gao, and Y. Shi, “Examining Individuals’ Adoption of Healthcare Wearable Devices: An Empirical Study from Privacy Calculus Perspective,” *Int. J. Med. Inform.*, vol. 88, 2016, doi: 10.1016/j.ijmedinf.2015.12.010.
- [67] O. Kwon, K. Choi, and M. Kim, “User acceptance of context-aware services: Self-efficacy, user innovativeness and perceived sensitivity on contextual pressure,” *Behav. IT*, vol. 26, pp. 483–498, 2007, doi: 10.1080/01449290600709111.
- [68] F. Davis and F. Davis, “Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology,” *MIS Q.*, vol. 13, pp. 319–, 1989, doi: 10.2307/249008.
- [69] S. Srivastava, S. Chandra, and Y.-L. Theng, “Evaluating the Role of Trust in Consumer Adoption of Mobile Payment Systems: An Empirical Analysis,” *Commun. Assoc. Inf. Syst.*, vol. 27, 2010, doi: 10.17705/1CAIS.02729.
- [70] M. T. Restivo and M. G. Da Silva, “Portuguese Universities Sharing Remote Laboratories,” *Int. J. Online Biomed. Eng.*, vol. 5, no. 6, p. 16, 2009, doi: 10.3991/ijoe.v5s2.1090.
- [71] L. R. Kahle and N. K. Malhotra, “Marketing Research: An Applied Orientation,” *J. Mark. Res.*, vol. 31, no. 1, p. 137, 1994, doi: 10.2307/3151953.
- [72] A. Diamantopoulos and J. Siguaw, “Formative Versus Reflective Indicators in Organizational Measure Development: A Comparison and Empirical Illustration,” *Br. J. Manag.*, vol. 17, pp. 263–282, 2006, doi: 10.1111/j.1467-8551.2006.00500.x.
- [73] J. Hair, W. Black, B. Babin, and R. Anderson, *Multivariate Data Analysis: A Global Perspective*. 2010.
- [74] Jr Hair, J. Risher, M. Sarstedt, and C. Ringle, “When to use and how to report the results of PLS-SEM,” *Eur. Bus. Rev.*, vol. 31, 2018,

doi: 10.1108/EBR-11-2018-0203.

- [75] W. Chin, "Issues and Opinion on Structural Equation Modeling," *MIS Q.*, vol. 22, 1998.