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Research article

Students' acceptance to distance learning during Covid-19: the role of geographical areas among Indonesian sports science students

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ABSTRACT

This study was conducted to investigate the perspectives of sports science students on factors affecting distance learning in the setting of Indonesian higher education institutions (HEIs). This study proposed an extended technology acceptance model (TAM) with eight variables; experience, enjoyment, self-efficacy, perceived ease of use, perceived usefulness, attitude, intention to use, and actual use. An online survey was used to collect data from 1291 respondents. The structural model was examined through the partial least square structural equation modeling (PLS-SEM). The multi-group analysis (MGA) was conducted to understand the role of geographical areas in moderating all hypothetical relationships. The findings show that the respondents were not excited about online learning due to weak means (below 3) for most items of five variables; enjoyment, perceived ease of use, perceived usefulness, attitude, and intention to use. All relationships were supported except the relationship between experience and perceived usefulness. The strongest significant relationship emerged between intention to use and actual use. Meanwhile, the least significant relationship was found between self-efficacy and perceived usefulness. Three out of 12 hypotheses were confirmed regarding the differences of geographical areas (rural and urban) regarding all relationship paths. The findings add to a deeper understanding of the acceptability of distance learning during pandemics like COVID-19.

1. Introduction

The world health organization (WHO) declared COVID-19 as a global pandemic in March 2020. The last report on June 23, 2021 (the writing of this manuscript) showed that the overall number of cases exceeded 177 million globally. Mortality remained high, with over 9000 deaths recorded each day; however, all areas except two (Eastern Mediterranean and Africa) reported decreased new deaths. Compared to the previous week of May 2021, the global number of cases and fatalities dropped by 6% and 12%, respectively, with slightly more than 2.5 million cases and over 64,000 deaths (WHO, 2021). In education, one of the efforts to decrease the pandemic spread was to close schools at all levels. The distance learning policy was issued with the help of the available technologies in facilitating teaching and learning activities, replacing face-to-face instruction.

Educational researchers have already conducted extensive studies on the global pandemic (Abbas et al., 2021; Andersson and Grönlund, 2009; Watermeyer et al., 2021). In Indonesia, like in other countries, COVID-19 also has significant impacts on education. Higher education institutions (HEIs) have maximized their efforts to substitute face-to-face learning with distance learning (Watermeyer et al., 2021). Courses, persons, and technology were all challenges in distance education; these issues affect

both developed and developing countries. Access to technology is more pronounced in developing countries (Andersson and Grönlund, 2009). To go deeper into the challenges of distance learning during the pandemic, academics are recommended to understand factors affecting this new pedagogical approach (Rizun and Strzelecki, 2020), especially in a specific study context and among others particular objects. Therefore, this study aims to disclose factors affecting distance learning in the context of Indonesian HEIs; it is conducted to understand the perceptions of sports science students. Besides, differences were also elaborated regarding all paths in the structural model based on respondents' geographical areas (urban and rural). Two research questions were established regarding the aims of the study:

1. What factors affecting distance learning among Indonesian sports science students during COVID-19?
2. How are all paths in the structural model different based on respondents' geographical areas?

2. Review of literature

2.1. Distance learning during COVID-19 pandemic

Distance learning has been around for a long time in higher education. Distance learning is far from a new phenomenon. Tracing its history, it began in the early 18th century as a correspondence study to allow learners outside of the city to continue their education without having to be on-site. Since then, it has progressed and grown in popularity, especially with the rapid expansion of technological innovation (Kentnor, 2015). Other modules in distance education, such as blended learning (or hybrid learning), have also emerged, defining a combination of face-to-face and technology-mediated instructions that provides a resilient and accessible learning experience. In the current condition, many educational institutions have been forced to adopt distance learning to keep up with the current pandemic, the COVID-19 (Alqurshi, 2020; Kawaguchi-Suzuki et al., 2020). Nations are forced to implement preventive measures of the COVID-19 spread, including suspending face-to-face learning. Specifically, HEIs responded to this massive transition by launching distance learning, utilizing existing learning support systems like social media and learning management systems (Aristovnik et al., 2020; Coman et al., 2020). Although this shift offers continuity to the learning process, it also exacerbates educational gaps among students, particularly those in rural regions or low-income areas with a lack of basic information and technology skills. Such qualities might be challenging to access of technological resources needed to support the distance learning trend. Considering that the current scenario may endure longer, a long-term move to online learning is suggested. The condition requires HEIs to prepare and equip themselves with the instruments needed to facilitate acceptance, especially among users (Shawaqfeh et al., 2020). Therefore, this study explores factors affecting students' acceptance of distance learning and whether or not the paths differ based on geographical areas, rural and urban.

2.2. Teaching methods in Indonesian HEIs during the COVID-19

Due to the COVID-19 pandemic, many schools and colleges around the world have been closed. Many universities in Indonesia also carry out similar policies, for example, the Universitas Indonesia, Universitas Gajah Madha, and Universitas Negeri Makassar. This policy that aims to prevent the spread of COVID-19 infection aligns with WHO's call that all elements of society need to stop and minimize the impact of the disease. This policy encourages HEIs to conduct distance learning methods. Guided by the ministry of education and culture, Indonesian HEIs use various tools in delivering their teaching and learning process during the closure. Social media like Facebook, Youtube, and WhatsApp are integrated during instructional activities (Chan et al., 2020; Sobaih et al., 2020). Learning management systems, such as Edmodo, Moodle, Atutor,

and Olat, have also been options for lecturers in teaching their students (Cavus et al., 2021; Raza et al., 2021). Some universities have established their learning management systems facilities to facilitate the teaching (Universitas Indonesia with EMAS, Universitas Gajah Madha with eLisa, and Universitas Negeri Makassar with SYAM OK UNM). However, most HEIs lecturers rely on video conferencing applications to meet the needs of virtual meetings conducted mainly through two tools; Zoom and Google meet (Yudha et al., 2021).

2.3. Proposed model

This study applied an extended technology acceptance model (TAM) from Davis (1989) with eight variables; experience, enjoyment, self-efficacy, perceived ease of use, perceived usefulness, attitude, intention to use, and actual use. Geographical area was also included to understand differences regarding demographic information between the paths. For the structural model and difference tests, twelve hypotheses were included, respectively. We discussed the proposed model with two statisticians and one educational expert; the model in Figure 1 is elaborated in detail.

2.4. TAM variables: perceived ease of use, perceived usefulness, attitude, intention to use, and actual use

In the field of social science, TAM is a common model adopted by many educational researchers. The model states that people's feelings about behavioral intention toward adopting a system, which in this study is in the setting of distance learning, is predicted by their perceived usefulness and perceived ease of use (Davis, 1989). TAM's original premise is that perceived ease of use is claimed to predict perceived usefulness. Furthermore, the system's attitudes and perceived usefulness impact behavioral intention (the degree to which people perform or do not perform for a given future activity). Finally, behavioral intention predicts the actual use of a system (Davis, 1989). Besides the original constructs, some external factors were associated with the first TAM constructs (Rejón-Guardia et al., 2020; Venkatesh et al., 2003).

One of the most significant components in TAM is the perceived usefulness. Perceived usefulness is defined as the degree to which system users feel that the system will increase their performance (Davis, 1989); in this study, we determined the system as distance learning. Further, users' attitude and intention to use a system is influenced by their perceived usefulness (Davis, 1989). The perceived usefulness of a system is also expected to influence the user's decision to accept or reject it. The degree to which a person believes that using any system is straightforward and friendly is described as perceived ease of use (Iqbal and Bhatti, 2017). From the TAM concept, perceived ease of use is one of the drivers that can affect perceived usefulness and attitude toward a system. Users are more willing to adopt a new approach if they believe it is simple to use (Mukminin et al., 2020).

Attitude is defined as users' certain behavior linked with the use of a system (Davis, 1989). In the original TAM model, attitude is hypothesized to influence intention to use. Further, intention to use in this study is described as students' desire to utilize technologies for the distance learning setting; the intention is expected to significantly influence actual use (Zardari et al., 2021). The final part of the TAM is the actual use, or the act of applying a system, which expresses the reality of users to utilize or not to utilize technology. In this study, the actual use is the implementation of technology for distance learning (Davis, 1989). In the proposed model of this study, actual use has no impact on the other components since it is the final stage of the technology acceptance model.

2.5. External variables; experience, enjoyment, and self-efficacy

This study suggested extended factors such as enjoyment, self-efficacy, and experience to predict perceived ease of use and usefulness (Rizun and Strzelecki, 2020). In this study, experience is defined as the
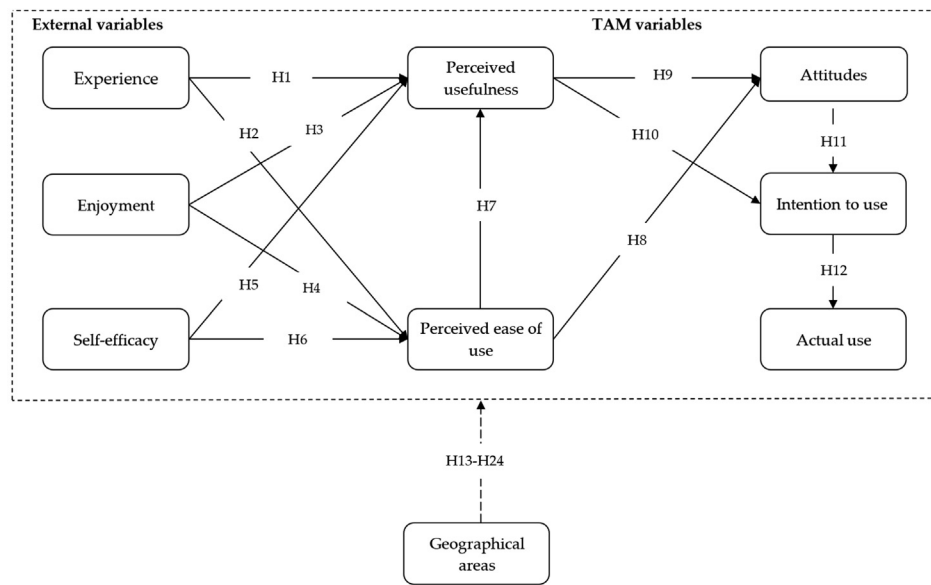
Figure 1. A proposed model.

amount and type of technical abilities for distance learning that a person has acquired through time (Abdullah and Ward, 2016). One of the most significant external variables is experience. Individuals with more advanced technological abilities are more likely to be enthusiastic about using any online/distance learning instrument (Rizun and Strzelecki, 2020). This study expects the distance learning experience during COVID-19 influences perceived ease of use and usefulness.

Furthermore, enjoyment or pleasure is defined to be the degree to which the action of implementing any system is seen to become pleasurable, independent of the results. A pleasant system seems to be viewed as simple to use and beneficial in which users' desire can increase. Many studies have shown that users' perceptions of ease of use are influenced by how much fun they have when using a system. In addition, researchers have discovered a substantial positive relationship between enjoyment and perceived usefulness, which boosts students' actual use (Rizun and Strzelecki, 2020). Self-efficacy in this study is described as the confidence to complete a task using technology for distance learning during COVID-19. Students with stronger e-learning self-efficacy are more inclined to employ e-learning and computer-supported education. Self-efficacy is thought to impact perceived ease of use and perceived usefulness. All hypotheses included in this study are performed in Figure 1, and prior studies related to TAM application in recent years within the educational environment are shown in Table 1.

2.6. Geographical areas in moderating hypothetical relationships

In addition to the structural assessment, geographical areas (rural and urban) were included to understand how all hypothetical relationships are different. Prior studies have focused on the differences in technology integration based on demographic information (Aslan and Zhu, 2017; Habibi et al., 2021; Ramírez-Correa et al., 2015; Ullah et al., 2021; Yang and Hsieh, 2013). For example, genders were significantly different regarding multimedia utilization for learning (Ramírez-Correa et al., 2015). Based on the geographical areas, rural and urban, learning behavioral patterns and access to technology were revealed to be significantly different (Habibi et al., 2021; Yang and Hsieh, 2013). Therefore, besides hypotheses for the structural model, twelve hypotheses (H13–H24) were included regarding the differences between geographical areas regarding all paths (Figure 1), for example, there is a significant difference regarding the relationship between experience and perceived usefulness based on respondents' geographical areas (H13), and there is a significant difference regarding the relationship between

intention to use and actual use based on respondents' geographical areas (H24).

3. Materials and methods

3.1. Research method

This research was conducted using an online survey from March 2021 to June 2021 in five Indonesian HEIs, after the Indonesian government announced school closures on May 20, 2020. Surveys offer a high level of general capabilities when it comes to representing a broad group of people. Because of the large number of people that respond to surveys, the information acquired provides a more accurate picture of the broader population's relative qualities. Aside from low-cost research, surveys can be sent to participants in various ways, including e-mail, print, and the internet. Due to the survey method's high representativeness, statistically significant results are often easier than other data collection methods. As a result, the data gathered may be measured with better precision (Evans and Mathur, 2005). However, there are a few survey weaknesses that can be problematic. The survey cannot be altered at any point throughout the data collection procedure. Participants may not be able to give precise answers to controversies-related questions due to difficulties recalling relevant facts. Before the primary data collection, the survey instrument was developed and validated to assess variables that predict the distance learning by Indonesian sports science students during Covid-19. The model measurement and evaluation were carried out using SmartPLS 3.3 through PLS-SEM procedures (Mukminin et al., 2020; Yusop et al., 2021).

3.2. Instrumentation

Review of literature can help researchers in defining and analyzing ideas and concepts related to the theoretical research framework and instrumentation. The instrument is designed to meet the research goals (Habibi et al., 2020). This study used an adapted survey to assess the elements that influence students' acceptance of distance learning (Rizun and Strzelecki, 2020; Sabah, 2016; Venkatesh et al., 2003, 2008). The new instrument for the current study was produced based on the adaptation process; the indicators differed and were developed to meet COVID-19 and distance learning settings. Twenty-nine indicators were modified for the instrument during the initial set-up procedures. The indicators were addressed with three educational technology specialists

Table 1. Some recent TAM-related studies in the educational context.

No	Sources	Method	Results
1	(Scherer et al., 2019)	Meta-analysis	TAM explained technology acceptance adequately; yet, the role of certain key constructs and the importance of external variables contrasted some existing beliefs about the TAM.
2	(Mutambara and Bayaga, 2021)	A survey involved 550 high school students, and the data were analyzed using PLS-SEM.	The original TAM variables (perceived attitude, perceived usefulness, and perceived ease of use) had direct correlations with behavioral intention and played mediating roles between the external variables and behavioral intention
3	(Baber, 2021)	The study was conducted on the 375 students in universities of South Korea during Covid-19.	The results suggested that all factors in TAM positively influenced the behavioral intention to use and accept the e-learning system by the learners during this pandemic.
4	(Rizun and Strzelecki, 2020)	PLS-SEM was employed to test the proposed research model. The survey gathered data from 1692 Polish students.	The strongest exogenous variable of student's acceptance of education shift to distance learning was enjoyment. Perceived ease of use and perceived usefulness were also reported to be significant in affecting attitude towards and intention to use
5	(Hanham et al., 2021)	An online survey was completed by 365 undergraduate students from a university in Sydney, Australia. Confirmatory factor analysis, SEM, and MGA analyses were used to analyze the data.	Facilitating conditions were positively associated with the perceived usefulness, which was positively associated with academic self-efficacy. Surprisingly, perceived ease of use did not have a statistically significant association with perceived usefulness. Academic self-efficacy was positively related to academic achievement.
6	(Racero et al., 2020)	The suggested structural model was tested using Lisrel software with a total of 352 valid replies.	The results confirmed the positive influence of the intrinsic motivations, autonomy, and relatedness, to improve perceptions regarding the usefulness and ease of use of open-source software, and; therefore, on behavioral intention to use the software.
7	(Zardari et al., 2021)	The information was gathered from 650 university students. After data filtering, structural equation modeling was used to evaluate 513 valid replies.	Satisfaction, perceived ease of use, perceived usefulness, information quality, self-efficacy, social influence, and benefits were reported to be significant in predicting behavioral intention regarding e-learning portal acceptance. Perceived ease of use significantly predicted perceived usefulness and pleasure. The appeal had a significant effect on pleasure and satisfaction. Enjoyment is significantly correlated with satisfaction
8	(Sukendro et al., 2020)	The research was conducted through a survey of 974 students analyzed with PLS-SEM of expanded TAM with enabling conditions as the external component.	Significant relationships between facilitating condition and perceived ease of use and between facilitating condition and perceived usefulness were reported. The significant relationships among core components of TAM were found except for one, the relationship between perceived usefulness and attitude.

from Malaysia and Indonesia via video conferences as part of the content validity process to ensure that the instrument was appropriate for the context and setting (Halek et al., 2017). Ten indicators were updated after the video call meetings. In contrast, three others were deleted as suggested by the experts. The complete instrument and raw data of the current study are accessible on https://data.mendeley.com/v1/dataset s/publish-confirmation/r8dj8hcgjf/1.

3.3. Population, sample, and data collection

The population of the current study covers all sports science students in Indonesian HEIs. Sports science students were selected as the survey respondents since not many studies were conducted within the area. The target population includes sports science students in four Indonesian cities. We distributed the survey through Google Forms with a random sampling technique to collect data for the analysis. The questionnaire (n. 26) was piloted on a small group of students to examine reliability; the Cronbach alpha test was conducted. All variables were reliable, with alphas values of > .70. The final set of questions was improved after the pilot study, and the questionnaire was disseminated. The survey was distributed on June 1, 2021, and was open until June 15, 2021; the majority of answers came in the first week. Active students from three institutions were asked to take part in the study via an electronic invitation. The survey received 1472 responses; *1291 data were measurable.* One hundred and eighty-one responses were dropped because missing values appeared or the same answers for every question were identified. Nine hundred and ninety-four are male students; meanwhile, 296 female respondents are females. Eight hundred respondents are from rural areas, and 489 are from urban areas. The study and data collection were conducted according to the guidelines of Declaration of Helsinki, and approved by *Lembaga Pengabdian dan Penelitian,* Universitas Negeri Makassar on July 7 2021.

3.4. Data analysis

Three phases are involved in evaluating PLS-SEM findings. The first phase is a review of the measurement model. This is an essential component of the evaluation since it ensures that the measurement quality is maintained. The measurement model was done to examine the reliability and validity of the variables. There are four assessments for the measurement models; we assessed and reported the computation of reflective indicator loadings, internal consistency reliability, convergent validity, and discriminant validity). Secondly, the examination of the structural model was carried out after the measurement model process. The structural model examines the structural theory, which entails considering the given hypotheses and addressing the connections among the latent variables (Hair et al., 2019). To assess the structural model, some measures were reported, namely Coefficient of determination (R^2), effect sizes (f^2), predictive relevance (Q^2), model fit, and statistical significances. Finally, multi-group analysis (MGA) was done to understand the moderating roles of geographical areas, urban and rural, to determine the difference between all paths of the structural model (Carranza et al., 2020; Matthews, 2017).

4. Results

4.1. Preliminary findings

The percentage of missing data in the present study ranged from 0% to .5 percent for each item. The missing data was utterly random (MCAR). Table 1 displays the means, standard deviations, correlation matrices, skewness, and kurtosis for all variables; univariate normality was found for experience, enjoyment, self-efficacy, perceived ease of use, perceived usefulness, attitude, intention to use, and actual usage

(skewness and kurtosis values in the range of the cut-off values). The Likert scale went from 1 to 5, with 5 being the highest score. Most items achieved means of below three: enjoyment, perceived ease of use, usefulness, attitude, and intention to use. The findings show that users were not excited; these feelings suggest that distance learning could have a lesser potential than face-to-face learning.

4.2. Measurement model

The examination of the measurement model in this study includes reflective metrics. We began by looking at the indicator loadings. Loadings greater than .50 show that the construct accounts for more than half of the variation in the indicator (Noor et al., 2019). The internal consistency dependability of the constructions was tested. Better numbers imply higher levels of dependability for the composite reliability criteria. Reliability ratings of .70–.95 are considered "acceptable to good" (Hair et al., 2019). Internal consistency dependability is measured using Cronbach's alpha, which assumes the same criteria. Reliability ratings of .70–.95 are considered appropriate (Shmueli et al., 2019). The convergent validity, or the amount to which a construct converges in its indicators by explaining the variance of the items, was then computed. The items' average variance extracted (AVE) linked with a specific construct is used to measure convergent validity. The AVE must be .500 or greater to be considered acceptable (Ogbeibu et al., 2021), accounting for (more than) 50% of the variation in its components on average. Discriminant validity is the final stage (Palos-Sanchez et al., 2019) that demonstrates how empirically different a concept is from others. In PLS-SEM, discriminant validity is determined by examining heterotrait–monotrait ratio of correlations. If the route model includes variables defined as conceptually and extremely similar, a value of .900 is proposed as a threshold. In PLS-SEM, the heterotrait–monotrait ratio criterion is a novel requirement for assessing discriminant validity that outperforms the Fornell–Larcker criterion and cross-loading assessments (Hair et al., 2019). Tables 2 and 3 inform the results of the measurement model; all computations were reported to meet the criteria in the examination.

4.3. Structural model

Researchers (Henseler et al., 2014; Ringle et al., 2020) recommend looking at measures like R^2, f^2, Q^2, model fit, and statistical significances to assess the structural model (See Tables 4 and 5). We followed (Hair et al., 2019) recommendation regarding R^2 values; the values of .670, .330, and .190, respectively, indicate strong, moderate, and weak. The f^2 values of .020, .150, and .350, according to (Ringle et al., 2020), suggest small, medium, and large effects, respectively. Furthermore, for a given endogenous component, Q^2 values larger than zero indicate a reasonable degree of prediction accuracy (Hair et al., 2014; Ringle et al., 2020). Based on the recommended assessment standards, the Q^2 findings indicate sufficient prediction accuracy for exogenous variables (Hair et al., 2014; Ringle et al., 2020). According to Henseler (Henseler et al., 2016), the SRMR is the only approximate model fit criteria for evaluating PLS modeling, consistent with prior research (Sarstedt et al., 2016). The bootstrap-based test was also used to calculate values for the discrepancy measures, which include the squared euclidean distance (d_ULS) and the geodesic distance (d_G) (Henseler et al., 2016). Table 3 compares the values of the SRMR, d_ULS, and d_G discrepancy measures; SRMR below .08 shows a valid and reliable model. To test for statistical significance, Hair et al. (2019) recommend a minimum t value of 1.65 at $p < .05$. The structural model was estimated using the consistent PLS bootstrapping option with 5,000 subsamples in this investigation (Lowry and Gaskin, 2014). All hypotheses were supported but H1 (the relationship between experience and perceived usefulness, t = .1900; p = .8500). The strongest correlation emerged between intention to use and actual use, supporting the last hypothesis (H12) with a t value of 26.6890. In contrast, the lowest correlation was reported between self-efficacy and perceived usefulness with a t value of 3.050.

4.4. MGA results

As previously informed, eight hundred respondents of this study lived in rural areas; while, 489 stayed in urban areas. The moderating roles of geographical areas, urban and rural, were examined through MGA

Table 2. Normality, descriptive statistics, and measurement model criteria.

Construct	Items	Mean	SD	Kurt.	Skew.	Mark	Load	α	rho_A	CR	AVE
Perceived usefulness	PU1	2.5630	1.2910	-.8110	.4240		.9150	.8960	.8970	.9350	.8280
	PU2	2.5480	1.2540	-.7240	.4430		.9260				
	PU4	2.7750	1.2840	-.9300	.2390		.8890				
Perceived ease of use	PEOU1	3.0300	1.2860	-.9920	-.0020		.8210	.8900	.8940	.9240	.7520
	PEOU2	2.6890	1.2330	-.7850	.2930		.8890				
	PEOU3	2.5770	1.1970	-.6250	.4080		.8810				
	PEOU4	2.8200	1.2470	-.8520	.1920		.8760				
Attitude	ATU2	3.2830	1.1560	-.6170	-.1650		.8330	.7200	.7940	.8730	.7760
	ATU3	2.8610	1.1850	-.7080	.1080		.9260				
Intention to use	ITU1	2.6050	1.2730	-.8670	.3060		.9030	.9090	.9100	.9430	.8460
	ITU2	2.4950	1.2030	-.6630	.4060		.9300				
	ITU3	2.5390	1.2220	-.7150	.3910		.9260				
Actual use	AU1	3.0810	1.2430	-.8340	-.0730		1.0000	1.0000	1.0000	1.0000	1.0000
Experience	EXP1	3.3990	1.2330	-.7870	-.2810		.7890	.8590	.8870	.9030	.7000
	EXP2	3.6540	1.2200	-.6230	-.5400		.8060				
	EXP3	3.3780	1.2170	-.7950	-.2520		.8880				
	EXP4	3.1390	1.2330	-.8420	-.0640		.8600				
Enjoyment	EJ1	2.6940	1.2300	-.7550	.2630		.9490	.9410	.9420	.9620	.8950
	EJ2	2.8060	1.2210	-.7620	.2070		.9430				
	EJ3	2.7000	1.2350	-.7690	.2530		.9470				
Self-efficacy	SE1	3.0910	1.1630	-.5850	-.0040		.8950	.8870	.8880	.9300	.8160
	SE2	3.0990	1.1520	-.5390	.0100		.9130				
	SE3	3.0550	1.1340	-.4590	.0040		.9010				

Table 3. Heterotrait–monotrait ratio for discriminant validity (<.900) (Hair et al., 2019).

	Actual use	Attitude	Enjoyment	Experience	Intention to use	Perceived ease of use	Perceived usefulness
Attitude	.6180						
Enjoyment	.5940	.7770					
Experience	.4700	.6700	.6660				
Intention to use	.6220	.7570	.8180	.5430			
Perceived ease of use	.5820	.8530	.7730	.6190	.7590		
Perceived usefulness	.5340	.8190	.7630	.5540	.8010	.8300	
Self-efficacy	.5260	.7260	.6920	.6100	.6380	.6440	.6180

Table 4. The results of the structural model, f^2, SRMR, d_ULS, and d_G (Henseler et al., 2014; Ringle et al., 2020).

H	Path	β	t values	p values	Sig	f^2	Items	Value
H1	Experience - > Perceived usefulness	.0050	.1900	.8500	No	.0000	SRMR	.053
H2	Experience - > Perceived ease of use	.1440	5.0700	.0000	Yes	.0260	d_ULS	.762
H3	Enjoyment - > Perceived usefulness	.3110	9.2350	.0000	Yes	.0970	d_G	.334
H4	Enjoyment - > Perceived ease of use	.5110	16.8430	.0000	Yes	.2800		
H5	Self-efficacy - > Perceived usefulness	.0800	3.0500	.0020	Yes	.0090		
H6	Self-efficacy - > Perceived ease of use	.1710	6.0150	.0000	Yes	.0360		
H7	Perceived ease of use - > Perceived usefulness	.4750	13.4150	.0000	Yes	.2720		
H8	Perceived ease of use - > Attitude	.4280	11.5280	.0000	Yes	.1790		
H9	Perceived usefulness - > Attitude	.3620	9.9690	.0000	Yes	.1280		
H10	Perceived usefulness - > Intention to use	.5410	18.6240	.0000	Yes	.3590		
H11	Attitude - > Intention to use	.2670	8.8150	.0000	Yes	.0870		
H12	Intention to use - > Actual use	.5930	26.6890	.0000	Yes	.5410		

Table 5. The results of R^2 and Q^2.

Path	R^2	Q^2
Received usefulness	.618	.508
Perceived ease of use	.540	.402
Attitudes	.544	.408
Intention to use	.561	.471
Actual use	.351	.349

computation for H13 to H24. The MGA results revealed that respondents' geographical areas do not significantly moderate the impact of most predictors on their exogenous constructs; thus, the results show that the MGA process rejects nine hypotheses out (H13, H14, H16, and H17, H18, H20, H22, H23, H24) of twelve hypotheses. For example, the p-value of the difference regarding the relationship between experience and perceived usefulness was insignificant (β = 0.227; p = 0.0840) that rejects H13. Another example is the difference regarding the path coefficient between intention to use and actual use that was also insignificant (β = 0.0140; p = .7770), rejecting hypothesis 24. Three hypotheses were reported to be accepted: H15, H19, and H21. Geographical areas, urban and rural, were significantly different regarding the relationships between enjoyment and perceived usefulness (β = 10.2470; p < .001), supporting H15. Similarly, the path differences between perceived ease of use and perceived usefulness (β = 0.2320; p < .01) and between perceived usefulness and attitude (β = -0.1540; p < .05) were also reported to be significant. All information about the detail of the computational results on the MGA approach is informed in Table 6.

5. Discussion

Consistent with prior studies (Racero et al., 2020; Rizun and Strzelecki, 2020; Zardari et al., 2021), the extended TAM used in this study successfully explained the distance learning process of adoption, as seen by Indonesian sports science students. The specific major, sports science, involved in this study helps us focus on a certain field of study. Other researchers can conduct studies in other areas or all fields regarding the implementation of technology into teaching. Based on the findings, the scale can be studied and adopted in the future by other academics interested in performing studies in the relevant field, especially during pandemics like Covid-19. The instrument contributes significantly to the advancement of academic approaches for structural equation research. The model is reported to be valid and reliable based on the content validity and measurement model processes. From the descriptive statical findings, it could be discussed that the students of the current study have a low perception (means below three or disagree) on enjoyment, perceived ease of use, perceived usefulness, attitude, and intention to use regarding distance learning due to the COVID-19. From the results, only items from three variables, namely experience, enjoyment, and actual use, gained mean values of slightly above 3. The previous study also reported these low and medium means of items (Rizun and Strzelecki, 2020); the location of the study was categorized as a developing country, similar to this study setting.

Through bootstrapping process with 5,000 sub-samples, the findings revealed that all hypotheses were supported for the non-original TAM variables; however, one correlation between experience and perceived usefulness was insignificant. The insignificant relationship might appear because the sports science students involved in this study perceived the first experience of attending online learning due to pandemics like COVID-19. In other words, they have no experience in doing online learning before. This research took place during the COVID-19 epidemic, which has affected every country on the planet and has left no country unaffected. All educational stakeholders, including sports science students, should adjust to the new reality and condition as fast as possible. The survey could refer to the respondents' perception regarding teaching and learning processes during the COVID-19 distance learning phase, during which they were all required to switch from face-to-face to online instruction (Rizun and

Table 6. MGA results regarding all paths based on respondents' geographical areas, rural and urban.

H	Path	β rural	β urban	p value rural	p value urban	β rural-urban	p value rural-urban
H13	Experience - > Perceived usefulness	0.0360	-0.0480	0.2240	0.2330	0.0840	0.0940
H14	Experience - > Perceived ease of use	0.1710	0.0870	0.0000	0.0450	0.0840	0.1310
H15	Enjoyment - > Perceived usefulness	0.2170	0.4640	0.0000	0.0000	-0.2470	0.0000
H16	Enjoyment - > Perceived ease of use	0.5010	0.5290	0.0000	0.0000	-0.0280	0.6490
H17	Self-efficacy - > Perceived usefulness	0.0630	0.1070	0.0490	0.0110	-0.0450	0.4020
H18	Self-efficacy - > Perceived ease of use	0.1720	0.1730	0.0000	0.0010	-0.0010	0.9950
H19	Perceived ease of use - > Perceived usefulness	0.5640	0.3320	0.0000	0.0000	0.2320	0.0010
H20	Perceived ease of use - > Attitude	0.4760	0.3620	0.0000	0.0000	0.1130	0.1400
H21	Perceived usefulness - > Attitude	0.2980	0.4510	0.0000	0.0000	-0.1540	0.0490
H22	Perceived usefulness - > Intention to use	0.5420	0.5380	0.0000	0.0000	0.0040	0.9570
H23	Attitude - > Intention to use	0.2700	0.2640	0.0000	0.0000	0.0060	0.9210
H24	Intention to use - > Actual use	0.5970	0.5830	0.0000	0.0000	0.0140	0.7770

Strzelecki, 2020). In addition, the experience was reported to significantly perceived ease of use. Enjoyment is significantly related to perceived usefulness and perceived ease of use. Besides, self-efficacy was a significant predictor of perceived usefulness and perceived ease of use, similar to previous studies (Mutambara and Bayaga, 2021; Rizun and Strzelecki, 2020; Sukendro et al., 2020; Zardari et al., 2021).

For TAM, all exogenous variables were significantly related to the endogenous variables. Perceived ease of use was a significant predictor of perceived usefulness and attitude, and perceived usefulness gained significant relationships with attitude and intention to use. Besides, the attitude was reported to be significant in predicting intention to use. Finally, the relationship between intention to use and actual use was informed to be the strongest. The significance revealed by this study could be a guide for all Indonesian stakeholders to face challenges during future pandemics, especially for sports science students. The introduction to distance learning should be supported by appropriate policies in improving perceived usefulness, perceived ease of use, attitude, and intention to use distance learning technology (Sukendro et al., 2020; Zardari et al., 2021). The study results can be justified to confirm the first research questions in which most relationships are supported based on the data analysis. The proper and appropriate infrastructure, training, seminar, curriculum, and quality tutors should support the system. Specific sports-based instructional activities should always be improved during distance learning (Sukendro et al., 2020).

Besides the structural model, the current study also investigated the role of geographical areas in moderating the relationships of all paths. The effects of the endogenous constructs on the exogenous constructs are not significantly moderated by the geographical areas of the sports science students involved in this study. Only three relationships are significantly different; enjoyment - > perceived usefulness, perceived ease of use - > perceived usefulness; and perceived usefulness - > attitude. The equality of students' perception could trigger the dominance of the insignificances, knowledge, skills, and information regarding the use of technology in education (Habibi et al., 2021; Yang and Hsieh, 2013). More studies should be conducted regarding demographic information towards technology integration, especially during pandemics like COVID-19. Even though most paths are not significantly different, respondents living in urban areas have higher perceptions of all items and constructs than those in rural areas. The computation of MGA in the smartPLS revealed that most paths have no differences regarding geographical areas; only a few significant differences are reported to confirm the second research question. The findings might refer to the slight differences in internet access infrastructure, where most rural areas have lower connection speeds than urban areas.

6. Conclusions

The current study took place during the COVID-19 pandemic, which has left no country unaffected. Most HEIs should focus on distance learning as an effort to replace face-to-face instruction. This scheduling allowed students to provide the most up-to-date feedback on the approaches and devices utilized within the distance learning and explore their emotions while still experiencing the situation. The study is based on a survey of sports science students who were asked how they felt about distance learning during COVID-19. The survey provided an opportunity to examine students' attitudes about distance learning and, in particular, the instruments used by HEIs in the process. If the COVID-19 scenario requires HEIs to continue operating online, this research will significantly contribute to policymaking.

Nonetheless, some limitations emerged from the study. The specific sample of the study is one of the limitations; thus, respondents from across fields of study should be considered. The current study does not provide other types of demographic information except the area of the respondents. Therefore, comparative analyses on other demographic information like genders and years in university are also recommended to understand COVID-19's influence on HEIs. The article includes a quick analysis of the condition of Indonesian HEIs distance learning due to COVID-19. The article does not provide a complete picture of what is happening in higher education. However, we believe that sharing experience is vital in the current circumstances and that each HEI contributes significantly to the worldwide fight with similar situations in the future. It is also suggested to undertake further in-depth analysis on the experiences of educational institutions, analyzing more examples and using different methods such as observation, interview, and experimentation for future research.

Declarations

Author contribution statement

Syahruddin Syahruddin, Mohd Faiz Mohd Yaakob: Conceived and designed the experiments; Wrote the paper.

Abdul Rasyad, Arif Wahyu Widodo, Sukendro Sukendro: Performed the experiments; Analyzed and interpreted the data.

Suwardi Suwardi, Ahmad Lani, Liliana Puspa Sari, Mansur Mansur: Performed the experiments; Contributed reagents, materials, analysis tools or data.

Razali Razali, Asry Syam: Performed the experiments.

Data availability statement

Data associated with this study has been deposited at Mendeley under https://data.mendeley.com/v1/datasets/publish-confirmation/r8d j8hcgjf/1.

Declaration of interests statement

The authors declare no conflict of interest.

Additional information

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References

Abbas, H.S.M., Xu, X., Sun, C., 2021. China health technology and stringency containment measures during COVID-19 pandemic: a discussion of first and second wave of COVID-19. Health Technol. 11 (2).

Abdullah, F., Ward, R., 2016. Developing a general extended technology acceptance model for E-learning (GETAMEL) by analysing commonly used external factors. Comput. Hum. Behav. 56, 238–256.

Alqurshi, A., 2020. Investigating the impact of COVID-19 lockdown on pharmaceutical education in Saudi Arabia – a call for a remote teaching contingency strategy. Saudi Pharmaceut. J. 28 (9).

Andersson, A., Grönlund, Å., 2009. A conceptual framework for E-learning in developing countries: a critical review of research challenges. Electron. J. Inf. Syst. Dev. Ctries. 38 (1).

Aristovnik, A., Keržič, D., Ravšelj, D., Tomaževič, N., Umek, L., 2020. Impacts of the COVID-19 pandemic on life of higher education students: a global perspective. Sustainability 12 (20).

Aslan, A., Zhu, C., 2017. Investigating variables predicting Turkish pre-service teachers' integration of ICT into teaching practices. Br. J. Educ. Technol. 48 (2), 552–570.

Baber, H., 2021. Modelling the acceptance of e-learning during the pandemic of COVID-19-A study of South Korea. Int. J. Manag. Educ. 19 (2).

Carranza, R., Díaz, E., Martín-Consuegra, D., Fernández-Ferrín, P., 2020. PLS–SEM in business promotion strategies. A multigroup analysis of mobile coupon users using MICOM. Ind. Manag. Data Syst. 120 (12).

Cavus, N., Mohammed, Y.B., Yakubu, M.N., 2021. Determinants of learning management systems during covid-19 pandemic for sustainable education. Sustainability 13 (9).

Chan, A.K.M., Nickson, C.P., Rudolph, J.W., Lee, A., Joynt, G.M., 2020. Social media for rapid knowledge dissemination: early experience from the COVID-19 pandemic. Anaesthesia.

Coman, C., îru, L.G., Meseşan-Schmitz, L., Stanciu, C., Bularca, M.C., 2020. Online teaching and learning in higher education during the coronavirus pandemic: students' perspective. Sustainability 12, 24.

Davis, F.D., 1989. Perceived usefulness, perceived ease of use, and user acceptance of information technology. MIS Q.: Manag. Inf. Syst. 13 (3), 319–339.

Evans, J.R., Mathur, A., 2005. The value of online surveys. Internet Res. 15 (2), 195–219.

Habibi, A., Yusop, F.D., Razak, R.A., 2020. The role of TPACK in affecting pre-service language teachers' ICT integration during teaching practices: Indonesian context. Educ. Inf. Technol. 25 (3), 1929–1949.

Habibi, A., Yaakob, M.F.M., Mukminin, A., Muhaimin, M., Prasojo, L.D., Yusop, F.D., Muzakkir, M., 2021. Teachers' digital technology access to motivation, skills and use: a structural equation modeling study. Aslib J. Inf. Manag. ahead-of-p No. ahead-of-print.

Hair, J.F., Sarstedt, M., Hopkins, L., Kuppelwieser, V.G., 2014. Partial least squares structural equation modeling (PLS-SEM): an emerging tool in business research. Eur. Bus. Rev. 26.

Hair, J.F., Risher, J.J., Sarstedt, M., Ringle, C.M., 2019. When to Use and How to Report the Results of PLS-SEM. Eur. Bus. Rev.

Halek, M., Holle, D., Bartholomeyczik, S., 2017. Development and evaluation of the content validity, practicability and feasibility of the Innovative dementia-oriented Assessment system for challenging behaviour in residents with dementia. BMC Health Serv. Res. 17 (1).

Hanham, J., Lee, C.B., Teo, T., 2021. The influence of technology acceptance, academic self-efficacy, and gender on academic achievement through online tutoring. Comput. Educ. 172.

Henseler, J., Dijkstra, T.K., Sarstedt, M., Ringle, C.M., Diamantopoulos, A., Straub, D.W., Ketchen, D.J., et al., 2014. Common beliefs and reality about PLS: comments on Rönkkö and evermann (2013). Organ. Res. Methods 17 (2), 182–209.

Henseler, J., Hubona, G., Ray, P.A., 2016. Using PLS path modeling in new technology research: updated guidelines. Ind. Manag. Data Syst. 116 (1), 2–20.

Iqbal, S., Bhatti, Z.A., 2017. What drives m-learning? An empirical investigation of university student perceptions in Pakistan. High Educ. Res. Dev. 36 (4), 730–746.

Kawaguchi-Suzuki, M., Nagai, N., Akonoghrere, R.O., Desborough, J.A., 2020. COVID-19 pandemic challenges and lessons learned by pharmacy educators around the globe. Am. J. Pharmaceut. Educ.

Kentnor, H.E., 2015. Distance education and the evolution of online learning in the United States. Curric. Teach. Dialog. 17 (2).

Lowry, P.B., Gaskin, J., 2014. Partial least squares (PLS) structural equation modeling (SEM) for building and testing behavioral causal theory: when to choose it and how to use it. IEEE Trans. Prof. Commun. 57 (2), 123–146.

Matthews, L., 2017. Applying multigroup analysis in PLS-SEM: a step-by-step process. Part. Least Squares Path Model.: Basic Concepts Methodol. Issues Appl.

Mukminin, A., Habibi, A., Muhaimin, M., Prasojo, L.D., 2020. Exploring the drivers predicting behavioral intention to use m-learning management system: partial least square structural equation model. IEEE Access 8.

Mutambara, D., Bayaga, A., 2021. Determinants of mobile learning acceptance for STEM education in rural areas. Comput. Educ. 160.

Noor, Md S., Rasoolimanesh, S.M., Jaafar, M., Barghi, R., 2019. Inscription of a destination as a world heritage site and residents' perceptions. Asia Pac. J. Tourism Res. 24 (1).

Ogbeibu, S., Jabbour, C.J.C., Gaskin, J., Senadjki, A., Hughes, M., 2021. Leveraging STARA competencies and green creativity to boost green organisational innovative evidence: a praxis for sustainable development. Bus. Strat. Environ.

Palos-Sanchez, P.R., Robina-Ramirez, R., Velicia-Martin, F., 2019. What role does corporate governance play in the intention to use cloud computing technology? Symmetry 11 (10).

Racero, F.J., Bueno, S., Gallego, M.D., 2020. Predicting students' behavioral intention to use open source software: a combined view of the technology acceptance model and self-determination theory. Appl. Sci. 10 (8).

Ramírez-Correa, P.E., Arenas-Gaitán, J., Rondán-Cataluña, F.J., 2015. Gender and acceptance of e-learning: a multi-group analysis based on a structural equation model among college students in Chile and Spain. PloS One 10 (10).

Raza, S.A., Qazi, W., Khan, K.A., Salam, J., 2021. Social isolation and acceptance of the learning management system (LMS) in the time of COVID-19 pandemic: an expansion of the UTAUT model. J. Educ. Comput. Res. 59 (2).

Rejón-Guardia, F., Polo-Peña, A.I., Maraver-Tarifa, G., 2020. The acceptance of a personal learning environment based on Google apps: the role of subjective norms and social image. J. Comput. High Educ. 32 (2), 203–233.

Ringle, C.M., Sarstedt, M., Mitchell, R., Gudergan, S.P., 2020. Partial least squares structural equation modeling in HRM research. Int. J. Hum. Resour. Manag. 31 (12), 1617–1643.

Rizun, M., Strzelecki, A., 2020. Students' acceptance of the covid-19 impact on shifting higher education to distance learning in Poland. Int. J. Environ. Res. Publ. Health 17 (18).

Sabah, N.M., 2016. Exploring students' awareness and perceptions: influencing factors and individual differences driving m-learning adoption. Comput. Hum. Behav. 65, 522–533.

Sarstedt, M., Hair, J.F., Ringle, C.M., Thiele, K.O., Gudergan, S.P., 2016. Estimation issues with PLS and CBSEM: where the bias lies! J. Bus. Res. 69 (10), 3998–4010.

Scherer, R., Siddiq, F., Tondeur, J., 2019. The technology acceptance model (TAM): a meta-analytic structural equation modeling approach to explaining teachers' adoption of digital technology in education. Comput. Educ. 128, 13–35.

Shawaqfeh, M.S., Al Bekairy, A.M., Al-Azayzih, A., Alkatheri, A.A., Qandil, A.M., Obaidat, A.A., Al Harbi, S., et al., 2020. Pharmacy students perceptions of their distance online learning experience during the COVID-19 pandemic: a cross-sectional survey study. J. Med. Edu. Curricular Dev. 7.

Shmueli, G., Sarstedt, M., Hair, J.F., Cheah, J.H., Ting, H., Vaithilingam, S., Ringle, C.M., 2019. Predictive model assessment in PLS-SEM: guidelines for using PLSpredict. Eur. J. Market. 53 (11).

Sobaih, A.E.E., Hasanein, A.M., Elnasr, A.E.A., 2020. Responses to COVID-19 in higher education: social media usage for sustaining formal academic communication in developing countries. Sustainability 12 (16).

Sukendro, S., Habibi, A., Khaeruddin, K., Indrayana, B., Syahruddin, S., Makadada, F.A., Hakim, H., 2020. Using an extended Technology Acceptance Model to understand students' use of e-learning during Covid-19: Indonesian sport science education context. Heliyon 6 (11).

Ullah, A., Pinglu, C., Ullah, S., Abbas, H.S.M., Khan, S., 2021. The role of E-governance in combating COVID-19 and promoting sustainable development: a comparative study of China and Pakistan. Chin. Political Sci. Rev. 6 (1).

Venkatesh, V., Morris, M.G., Davis, G.B., Davis, F.D., 2003. User acceptance of information technology: toward a unified view. MIS Q.: Manag. Inf. Syst. 27 (3), 425–478.

Venkatesh, V., Brown, S.A., Maruping, L.M., Bala, H., 2008. Predicting different conceptualizations of system USE: the competing roles of behavioral intention, facilitating conditions, and behavioral expectation. MIS Q.: Manag. Inf. Syst. 32 (3), 483–502.

Watermeyer, R., Crick, T., Knight, C., Goodall, J., 2021. COVID-19 and digital disruption in UK universities: afflictions and affordances of emergency online migration. High Educ. 81 (3).

WHO, 2021. COVID-19 Weekly Epidemiological Update 35. World Health Organization, pp. 1–3. No. June.

Yang, C., Hsieh, T.C., 2013. Regional Differences of Online Learning Behavior Patterns, 31. Electronic Library, pp. 167–187. No. 2.

Yudha, C.B., Zulela, Z., Handayani, T., 2021. Learning in networks during the covid-19 pandemic. Jurnal Basicedu 5 (2).

Yusop, F.D., Habibi, A., Razak, R.A., 2021. Factors Affecting Indonesian Preservice Teachers' Use of ICT during Teaching Practices through Theory of Planned Behavior, 11. SAGE Open. No. 2, p. 215824402110275.

Zardari, B.A., Hussain, Z., Arain, A.A., Rizvi, W.H., Vighio, M.S., 2021. Development and validation of user experience-based e-learning acceptance model for sustainable higher education. Sustainability 13 (11).