Determinants of Teacher's Continuance Intention to Adopt Virtual Learning Environment in Malaysian Schools

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Abstract—The adoption of virtual learning environment (VLE) has started to gain serious attention worldwide including Malaysia, where its usage during the Covid-19 pandemic outbreak in particular has become a necessity. Nevertheless, the extent to which teachers have adopted the VLE and which factors are most influencing the continued intention to adopt VLE post pandemic remain ambigious. The objective of this conceptual study is to provide a conceptual framework in investigating the factors that most influence the continued intention to adopt VLE among teacher in Malaysian school. This study overview several important variables that may influence the continued intention to adopt VLE from three contexts (technology, organization and environment) which include relative advantage, compatibility. observability, technological infrastructure, school support, technical support and government support. Finally, this study can improve the understanding about which factors that may encourage or hinder the continued intention to adopt VLE in Malaysian school to enhance education quality for societal change.

Keywords—continued intention, virtual learning environment, TOE framework

1 Introduction

The rapid progress of information technology has affected the way human interact with each other. This progress has become one of the key issues in education especially in the school institution. This evolvement also affected not only to the students but also to the teachers who play crucial roles in order to ensure students can learn efficiently and effectively. In preparing the nation for the education transformation, the Malaysian Ministry of Education has conducted a comprehensive review of the education system in 2011 to develop a new Education Blueprint. The blueprint which is also known as Malaysian Education Blueprint (MEB) is a comprehensive plan for a rapid and sustainable transformation of Malaysia education system for the next 13 years (2013–2025). The establishment of the 1BestariNet project is one of the many initiatives identified under the MEB's first wave in order to ensure that 1BestariNet becomes the catalyst

for ICT innovation in education in Malaysia. With an estimated cost of RM1.5 billion (about US$500 million), this initiative made the nation one of the primaries within the world which provide internet connectivity to all the schools with 4G high speed internet through virtual learning environment (VLE) platform, the Frog VLE [1–2].

Malaysia's VLE adoption is considered one of a kind due to its widespread deployment across entire government public-school system, instead of targeted specific institution. The access to Frog VLE were given not only to 6 million students and 450,000 teachers, but also include the 4.5 million parents in the country [3]. Nevertheless, the low level of VLE utilization, particularly among teachers was not anticipated even though many efforts had been placed in order to encourage its usage. As a result, in June 2019, MOE decided to terminate the Frog VLE platform and replaced with Google Classroom [4]. Even though the former's service provider argued the superiority of Frog VLE than Google Classroom, the decision to shift from Frog VLE to Google classroom was finalized due to a number of serious drawbacks in Frog VLE implementation such as poor service and system quality which significantly affected the decision to use it among teacher [2].

Unexpectedly, COVID-19, a type of corona virus shook the whole world on 31 December 2019 when World Health Organization (WHO) received information regarding the sudden rise of pneumonia-related deaths in the city of Wuhan in China [5]. Covid-19 is a novel virus-based pandemic which has affected almost every aspect of human life globally including education. The unusual covid-19 pandemic has brought uncertainty to the Malaysian education system due to the unprecedented health fiasco [6]. Although VLE is not new to the students and teachers, due to Covid-19 pandemic, the implementation of VLE brought several new challenges for them. Specifically, a series of school closures due to movement restriction order has forced the teachers to conduct teching and learning through online. However, the extent to which teachers have adopted the VLE and which factors are most influencing the continued intention to adopt VLE remain unknown.

There are numerous studies focusing on the adoption and implementation of information technologies especially the VLE platform. However, majority of them focus more on individual analysis typically changes in attitudes and process among users [2,7–8]. Very little attempt has been made to use Technology-Organization-Environment (TOE) framework in order to investigate the factors influencing the teachers' continued intention to adopt VLE within the Malaysian public school environment. This study argues that technology alone cannot enable changes to happen naturally without appropriate intervention. This study also suggests that in order to materialize changes, technology factor must not only focuses on the changes in attitude and process among users, but technological, organizational and environmental contexts that may influence the adoption of VLE in school institution in Malaysia also need similar attention. Therefore, the purpose of this study is to investigate which factors that may positively or negatively influence the teachers' continued intention to adopt VLE in the Malaysian school institutions.

1.1 Virtual learning environment

VLE is among the top technologies adapted by many educational institutions especially during covid-19 pandemic [9]. Generally, VLE is a platform for teachers, parents and students to communicate with one another and share learning resources. Specifically, Hew [3] defined VLE as a cloud computing virtual learning environment communication platform that resembles the traditional classroom in all aspects and enables teachers and students to access, save, retrieve and sharing instructional resources anytime, anywhere on the cloud without storage limitation. Various VLE platforms that are currently being adopted and used in many institution include Google Classroom, Frog VLE, Edmodo, Moodle, Blackboard , Elluminate and Second Life [10].

2 Theoretical background

The focus of this section is to discuss the underpinning theory that have been adopted in this study. This study is a response to the call by Hew and Kadir [7] to examine the effects of technology-organizational-environment framework on teachers' acceptance of VLE. Although there are many studies address the adoption of VLE in the literature, very little attempts have been made to use TOE framework as the underpinning theory. This trend is predictable as most of the prior studies focused on the individual level analysis rather than organization [7]. The commonly used theories used in the prior studies to understand technology adoption at the individual level include the Theory of Planned Behaviour (TPB), the Technology Acceptance Model (TAM) [1,11], Channel Expansion Theory (CET) [12], and the Unified Theory of Acceptance and Use of Technology (UTAUT) [8]. While these theories do make significant contribution to the literature, it is important that scholars begin to examine the influence of technological, organizational and environmental contexts on the adoption of VLE. Therefore, this study adopted TOE framework as the underpinning theory in order to investigate the determinant factors that may influence the continued intention of teacher to adopt VLE in school institutions.

2.1 TOE framework

TOE framework was developed by Tornatzky and Fleischer [13] to examine organizational level adoption of various information system or information technology (IS/IT) products and services. The framework distinguishes between three different contexts which included technology, organizational and environmental contexts that may influence the adoption of innovation. Several prior studies have used TOE framework to understand various innovation adoptions at the individual or organizational level such as cloud computing in education [14] cloud computing [15] and e-learning [16]. Thus, it is suggested that the TOE framework is applicable to used in order to investigate factor influencing the continued intention to adopt VLE.

3 Research model and hypotheses

This study proposes a research framework that includes technological, organizational and environmental contexts, that may influence the teacher continued intention to adopt VLE in Malaysia school institution.

3.1 Technological context

The technological context refers to any technology that is either being used by the organization or that is available and is known to be potentially useful but is not yet being used [17]. Safari et al. [18], describes that the technological context in the TOE framework can be based on diffusion of innovation (DOI) theory. In DOI theory, Rogers [19] suggested five perceived characteristics of innovation which consisted relative advantage, compatibility, observability, trialability and complexity. However, this study considers only three factors which include relative advantage, compatibility and observability as they had emerged as the most significant factor as well as consistent linkages with the adoption of innovation in various contexts [14–15, 20]. Therefore, these factors will be considered in this study.

Relative advantage. Relative advantage can be defined as the degree to which the current VLE is superior than the prior VLE [21]. As highlighted earlier, school institutions in Malaysia had used Frog VLE before shifting recently to Google Classroom. Prior empirical studies showed that the likelihood of adopting new technology by organizations increase when they perceive that technology has more benefits than existing practise. There are various sub-dimensions of the relative advantage which may include time saving, profitability, social prestige and low initial cost [22]. However, in this study, the expected benefit of VLE may include the following: easy to use, save time and paperless, free-to-use platform, flexibility, mobile friendly and facilitates collaborative learning [23].

Venkatesh et al. [24], found that relative advantage is one of the major determinants of intention to adopt an information technology. Similar finding also be found in the various context related with the technological innovation. For instance, Merhi [25] found relative advantage has a positive related with the intention to use podcast among higher education students in United States. In addition, Gupta [26] confirmed that the relative advantage has significantly influence the intention to adopt massive open online courses (MOOCs) among student in Indian university. Based on the above explanation, the following hypotheses is developed and will be tested:

H1: Relative advantage significantly influences the continued intention to adopt VLE.

Compatibility. Compatibility is defined as the degree to which an innovation is perceived to be consistent with the potential users' existing values, previous experiences and requirements [27]. Worldwide, Internet has turned into the major form of information sharing and communication. Internet-based cloud platforms such as VLE will let education institutions to conveniently import or disseminate their academic services. Specifically for VLE, it is required to understand whether the technology is compatible with the existing technology in organization.

Prior empirical research found that the compatibility was a significant predictor influencing the adoption of VLE [8]. Meanwhile on a broader context, compatibility was found to be significantly and positively related with adoption of e-learning [28]. Similarly, Cheng [29] found that the users' perceived compatibility affected their intention to use m-learning. Thus, organizations are more likely to adopt an innovation if the new technology is recognized as being compatible with existing systems and organizational values and beliefs. Based on the above argument, this study proposes:

H2: Compatibility significantly influences the continued intention to adopt VLE.

Observability. Observability can be defined as the degree to which the results of an innovation are visible to others [19]. Observability is commonly understood as the capability to anticipate the overall impact of adopting an innovation. It has been asserted that when a technology is more noticeable, it will be more likely to be used by a person. In the same way, organizations also tend to adopt a technology that is more observable and widely used. This construct has been defined differently where some authors define it as the demonstrability of an innovation's outcomes [30–31], while others define it as visibility of the innovation itself [32].

Observability also depends on the nature of an innovation where some innovations may be difficult to be observed such as technology software that is observed differently than the hardware devices that is more tangible. Observing others successfuly using a new innovation will increase confidence on it which will increase the chance of both individual or organization to adopt the innovation [19]. Many studies report a significant relationship between observability and adoption and implementation of technological innovation [17,33]. Based on the above argument, the following hypothesis can be proposed:

H3: Observability significantly influences the continued intention to adopt VLE.

3.2 Organizational context

Organizational context can be defined as characteristics or resources of the organization that may facilitate or hinder the adoption of an innovation [34]. Previous studies on the adoption of It innovation have identified various dimension of organizational contexts that may describe why an organization will accept or reject an innovative practice [35]. Specifically, among the organizational context, technological infrastructure, school support and technical support emerged as among the critical and significant of organizational context in information technologies research [36].

Technological infrastructure. The environment surrounding technological infrastructure is undoubtedly dynamic and experiences changes that it requires systematic improvement on a regular basis, specifically in the school institution. Garba et al. [37], claimed that the essential elemants in constructing an ideal 21st century learning environment include providing the basic infrastructure and ICT facilities, and getting teachers to utilize these facilities in their teaching and learning activities. Meanwhile, Hiran and Henten [38] refers information technological infrastructure as the combination of physical devices like computer and networking hardware, and various software

and network components required for the existence, operation and management of an IT environment.

Previous studies found that inadequate number of computers, slow access to Frog VLE applications and Internet access problems were among the infrastructure problems faced by the Malaysian school institutions [39]. This finding is also consistent with another studies by Cheok and Wong [40] which also found that nearly all teachers complained the poor Internet connection and facilities as the greatest barrier in implementing e-learning. Slow internet connection and limited coverage of Internet access within school areas made it difficult for the teachers. In a recent progress, the widespread fiber installation by a telecommunication consortium to provide interim Internet service provider enables faster Internet within school compounds [4]. However, insufficient number of working computers to make e-learning possible during teaching and learning period compared to the large number of students still remains as a significant challenge. This problem is worsen during covid-19 pandemic where majority of students from lower-income families did not have computers or smartphones. In addition, limited coverage of Internet access and slow Internet connection were also among the major barriers in the adoption of VLE [41].

H4: Technological infrastructure significantly influences the continued intention to adopt VLE.

School support. School support can be defined as the degree to which a teacher observes the commitment from school administrators in ensuring a successful implementation and use of the VLE [42]. School support can be observed in different ways such as emphasizing on the importance of VLE to the school staff and teachers. The hesistancy and opposition to the idea of introducing VLE by school administrators can cause serious drawbacks to its adoption. Clearly, it is critical to have support from institutions at the early stage of adoption of VLE which may influence the acceptance among teacher and student. Schools administrators are headed by principals who have the ultimate responsibility for their school. Principals have different beliefs on how schools should be successfully run, and they possess different capacities to implement their desired policies. Even if principals are constrained by outside factors, these abilities and beliefs are likely to translate into different management practices that ultimately affect schooling outcomes. Studies show that when an organization fails to acquire adequate support from management for their IT projects, these projects can face little success or fail altogether [38]. Prior empirical studies found that the school supports had positively influenced the adoption of VLE. For instance, Hew and Kadir [12] found that school support has a positive influence on the intention to use VLE platform. Similarly, Khlaisang et al. [43] empirically showed school support among the important determinant which influence the adoption of VLE.

H5: School support significantly influences the continued intention to adopt VLE.

Technical support. Technical support is defined as procedures and approaches followed by the school to ensure seamless and continuous access to the VLE [44]. The support to provide a reliable technical infrastructure to offer user-friendly VLEs is inclusive of assuring uninterrupted access to the VLE among teachers and students,

operating a round-the-clock help desk to provide technical support, having educational multimedia production units and offering facilities to encourage involvement in e-learning [44]. Furthermore, allocating IT technical teams to provide and technical support allow the school teachers to concentrate on pedagogical issue rather than technical issues. Williams [45] also agreed that one of the factors that can help in the adoption of a new technology is technical support. With the availability of technical support, teachers will be less skeptical about the idea of adopting VLE since it make the usage easy for them. This is because technical support gives users the sense of safety in technology usage. On the contrary, the lack of technical support will lead to a failed technology adoption. Therefore, this study proposes that:

H6: Technical support significantly influences the continued intention to adopt VLE.

3.3 Environmental context

Environmental context represents the crucial factors which reside outside the organization that may influence the adoption and implementation of technological innovation. In the context of this study, government support has been selected as the sub-dimension of environmental context that may influence the teacher continued intention to adopt VLE in Malaysia school institution. This selection is based on the prior empirical studies which found that the government support such as policies and regulation have significantly influenced the adoption of innovative technology [46–47]. Additionally, it is vital to investigate how individuals perceive government support on technological innovations. In the Malaysian context, government has actively supported the use of technology in education. This effort can be seen through the introduction of 1Bestarinet program in 2012 and interim Internet in 2019 to provide high-speed Internet access and suitable virtual learning platforms bridge the digital divide between urban and rural areas [3–4].

Government support. The significance of technology utilization has been a determined agenda on government educational policy since the past decades. Government support is defined as financial backing and encouragement and regulation that are received from government in relation to the adoption and implementation of technology [46].

It is observed that governments worldwide have been supporting e-learning system and its implementation. In Lebanon for example, policymakers are involved to adopt an e-learning system as a substitute to the traditional practises [48]. Their education system has also authorized the use of e-learning system for teachers and students. Meanwhile in Pakistan, web-based learning systems have experienced massive experiments which involves classroom lectures, distance learning program, and online or offline study modes [16]. Thus, it is necessary for schools to adopt e-learning system in ensuring the quality of learning experience can be enhanced.

This support can also be an investment in infrastructure. Given a nation's economy is governed in a centralized manner by the governments, they have to play vital roles in encouraging teachers and students to be involved in technology adoption. This can be obtained by creating good policies, providing necessary financial investment in

technology, and having essential infrastructure to have seamless implementation. As stated earlier, Internet services and technological infrastructure are facilities that are esential for seamless VLE adoption and usage, which demand for a strong emphasis in Malaysia. Nevertheless with government support, these issues can be fixed in order to ease the adoption of VLE. This ensures an easy implementation of technology and encourages teachers to learn the skills that are necessary towards the VLE adoption. Previous research has found the government support are important drivers that may affect the adoption of innovative technology in developing countries. For instances, Lai and Lai [49] found that the government support significantly influence the intention to adopt electronic schoolbag. Therefore, this study proposes that:

H7: Government support significantly influences the continued intention to adopt VLE.

4 Conclusion

The significant contribution of TOE framework in understanding the adoption of various technological innovation at the individual and organizational levels has been demonstrated. However, literature review in VLE shows scarce evidence in terms of TOE framework application. While this study is certainly not exhaustive of all factors, it provides a good start by adding new knowledge to enhance the understanding on the adoption and implementation of VLE in school institution. This study also improves the knowledge relatead with the factors that drive VLE adoption in the Malaysian school institutions.

Meanwhile, this study is not without its limitations. The constructs suggested in this study may be limited to the adoption of VLE in Malaysian school institution. There could be other possible factors that might be different in other countries. Furthermore, this study does not differentiate VLE adoptions between Malaysian schools in the city and rural areas. School that are located in the rural areas by the nature and locality possess certain characteristics compared to the schools in the city which include resource limitation such as Internet services, and less influenced by external pressure. Thus, issues surrounding VLE adoption in rural areas could be different from city schools. On the other hand, this study has several implications for various stakeholders such as government, ministry of education, school administrative, teachers, parents and students. Government and administrators in school can utilize the framework and planning accordingly based on it, in order to establish smooth conditions for teachers' acceptance in the adoption and implementation of VLE.

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6 References

[1] J. S.-C. Yim, P. Moses, and A. Azalea, "Predicting teachers' continuance in a virtual learning environment with psychological ownership and the TAM: a perspective from Malaysia," *Educ. Technol. Res. Dev.*, vol. 67, no. 3, pp. 691–709, 2019, https://doi.org/10.1007/s11423-019-09661-8

[2] M. L. Cheok and S. L. Wong, "Frog virtual learning environment for Malaysian schools: exploring teachers' experience," in *ICT in Education in Global Context. Lecture Notes in Educational Technology*, J. Zhang, J. Yang, M. Chang, and T. Chang, Eds. Singapore: Springer, 2016, pp. 201–209, https://doi.org/10.1007/978-981-10-0373-8_10

[3] T. S. Hew, "Explicating the acceptance of virtual learning environment: the roles of channel expansion and the theory of self determination," PhD Thesis, Universiti of Malaya, Kuala Lumpur, 2017. [Online]. Available: http://studentsrepo.um.edu.my/7834/

[4] I. S. Ismail, "Syarikat ISP bekal perkhidmatan talian internet ke sekolah mulai 1 Julai," *Berita Harian*, 2019. https://www.moe.gov.my/en/menumedia/printed-media/newspaper-clippings/3-syarikat-isp-bekal-perkhidmatan-talian-internet-ke-sekolah-mulai-1-julai-berita-harian-28-jun-2019 (accessed Jun. 29, 2021).

[5] WHO Website, "Timeline: WHO's COVID-19 response," *World Health Organization*, 2020. https://www.who.int/emergencies/diseases/novel-coronavirus-2019/interactive-timeline?gclid=CjwKCAiAm-2BBhANEiwAe7eyFNjJS6g_6xnezo5YqcjNdLRm58TNQNmxpeFtC5gySIakOAktrSOElxoCdxoQAvD_BwE#category-Response (accessed Jul. 12, 2021).

[6] A. Bakar and S. Ramli, "Psychosocial support for healthcare frontliners during COVID-19 pandemic in Malaysia," *Asian J. Psychiatry J.*, vol. 54, no. 102272, pp. 19–21, 2020, https://doi.org/10.1016/j.ajp.2020.102272

[7] T. S. Hew and S. L. S. A. Kadir, "The drivers for cloud-based virtual learning environment: Examining the moderating effect of school category," *Internet Res.*, vol. 27, no. 4, pp. 942–973, 2017, https://doi.org/10.1108/IntR-08-2016-0256

[8] I. Mamat, A. S. M. Yusoff, W. S. W. Abdullah, and F. Z. A. Razak, "Factors contributing pre-school trainees teachers adoption of virtual learning environment: Malaysian evidence," *Turkish Online J. Educ. Technol.*, vol. 14, no. 2, pp. 73–79, 2015.

[9] S. A. Naroo, P. B. Morgan, L. Shinde, and A. Ewbank, "The impact of COVID-19 on global contact lens education," *J. Optom.*, vol. 15, no. 1, pp. 60–68, Dec. 2022, https://doi.org/10.1016/j.optom.2020.11.002

[10] A. Alqahtani, "Usability testing of google cloud applications: students' perspective," *J. Technol. Sci. Educ.*, vol. 9, no. 3, pp. 326–339, 2019, https://doi.org/10.3926/jotse.585

[11] A. H. A. Rashid, N. A. Shukor, Z. Tasir, and K. S. Na, "Teachers' perceptions and readiness toward the implementation of virtual learning environment," *Int. J. Eval. Res. Educ.*, vol. 10, no. 1, pp. 209–214, 2021, https://doi.org/10.11591/ijere.v10i1.21014

[12] T. S. Hew and S. L. S. A. Kadir, "Behavioural intention in cloud-based VLE: an extension to Channel Expansion Theory," *Comput. Human Behav.*, vol. 64, pp. 9–20, 2016, https://doi.org/10.1016/j.chb.2016.05.075

[13] L. Tornatzky and M. Fleischer, *The process of technological innovation*. Toronto, Ontario: Lexington Books, 1990.

[14] A. N. Tashkandi and I. M. Al-Jabri, "Cloud computing adoption by higher education institutions in Saudi Arabia: an exploratory study," *Cluster Comput.*, vol. 18, no. 4, pp. 1527–1537, 2015, https://doi.org/10.1007/s10586-015-0490-4

[15] J. Singh and V. Mansotra, "Factors affecting cloud computing adoption in the Indian school education system," *Educ. Inf. Technol.*, vol. 24, no. 4, pp. 2453–2475, 2019, https://doi.org/10.1007/s10639-019-09878-3

[16] M. Ali, S. Ali Raza, W. Qazi, and C.-H. Puah, "Assessing the E-learning system in higher education institutes: evidence from structural equation modelling," *Interact. Technol. Smart Educ.*, vol. 15, no. 1, pp. 59–78, 2018, https://doi.org/10.1108/ITSE-02-2017-0012

[17] A. R. Abu Bakar, S. Z. Ahmad, and N. Ahmad, "SME social media use: a study of predictive factors in the United Arab Emirates," *Glob. Bus. Organ. Excell.*, vol. 38, no. 5, pp. 53–68, 2019, https://doi.org/10.1002/joe.21951

[18] F. Safari, N. Safari, A. Hasanzadeh, and A. R. Ghatari, "Factors affecting the adoption of cloud computing in small and medium enterprises," *Int. J. Bus. Inf. Syst.*, vol. 20, no. 1, pp. 116–137, 2015, https://doi.org/10.1504/IJBIS.2015.070894

[19] E. M. E. Rogers, *Diffusion of innovations*, 5th ed. New York: The Free Press, 2003.

[20] A. Jeyaraj, J. W. Rottman, and M. C. Lacity, "A review of the predictors, linkages, and biases in IT innovation adoption research," *J. Inf. Technol.*, vol. 21, no. 1, pp. 1–23, Jan. 2006, https://doi.org/10.1057/palgrave.jit.2000056

[21] E. Rogers, *Diffusion of Innovations*, 5th ed. New York: Free Press, 2003.

[22] M. Oturakci and O. H. Yuregir, "New approach to Rogers' innovation characteristics and comparative implementation study," *J. Eng. Technol. Manag. – JET-M*, vol. 47, pp. 53–67, 2018, https://doi.org/10.1016/j.jengtecman.2017.12.004

[23] A. S. de C. Filho, W. de S. Fantini, M. A. Ciriaco, J. dos Santos, F. Moreira, and F. Moreira, "Health student using google classroom: Satisfaction analysis," in *Learning Technology for Education Challenges*, vol. 1011, L. Uden, D. Liberona, G. Sanchez, and S. Rodríguez-González, Eds. Cham: Springer, 2019, pp. 58–66, https://doi.org/10.1007/978-3-030-20798-4

[24] V. Venkatesh, M. G. Morris, G. B. Davis, and F. D. Davis, "User acceptance of information technology: toward a unified view," *MIS Q.*, vol. 27, no. 3, pp. 425–478, 2003, https://doi.org/10.2307/30036540

[25] M. I. Merhi, "Factors influencing higher education students to adopt podcast: an empirical study," *Comput. Educ.*, vol. 83, pp. 32–43, 2015, https://doi.org/10.1016/j.compedu.2014.12.014

[26] K. P. Gupta, "Investigating the adoption of MOOCs in a developing country: application of technology-user-environment framework and self-determination theory," *Interact. Technol. Smart Educ.*, vol. 17, no. 4, pp. 355–375, 2020, https://doi.org/10.1108/ITSE-06-2019-0033

[27] F. Calisir, C. A. Gumussoy, and A. Bayram, "Predicting the behavioral intention to use enterprise resource planning systems: an exploratory extension of the technology acceptance model," *Manag. Res. News*, vol. 32, no. 7, pp. 597–613, 2009, https://doi.org/10.1108/01409170910965215

[28] J. S. Nyeko and C. Ogenmungu, "Determinants of electronic learning adoption in higher institutions of learning in Uganda: a learners' perspective," *Glob. J. Comput. Sci. Technol.*, vol. 17, no. 1, pp. 7–20, 2017, [Online]. Available: https://computerresearch.org/index.php/computer/article/view/1515

[29] Y. M. Cheng, "Towards an understanding of the factors affecting m-learning acceptance: Roles of technological characteristics and compatibility," *Asia Pacific Manag. Rev.*, vol. 20, no. 3, pp. 109–119, 2015, https://doi.org/10.1016/j.apmrv.2014.12.011

[30] H. M. Sabi, F. M. E. Uzoka, K. Langmia, F. N. Njeh, and C. K. Tsuma, "A cross-country model of contextual factors impacting cloud computing adoption at universities in sub-Saharan Africa," *Inf. Syst. Front.*, vol. 20, no. 6, pp. 1381–1404, 2018, https://doi.org/10.1007/s10796-017-9739-1

[31] H. L. Liao and H. P. Lu, "The role of experience and innovation characteristics in the adoption and continued use of e-learning websites," *Comput. Educ.*, vol. 51, no. 4, pp. 1405–1416, 2008, https://doi.org/10.1016/j.compedu.2007.11.006

[32] G. C. Moore and I. Benbasat, "Development of an instrument to measure the perceptions of adopting an information technology innovation," *Inf. Syst. Res.*, vol. 2, no. 3, pp. 192–222, 1991, https://doi.org/10.1287/isre.2.3.192

[33] A. M. AlBar and M. R. Hoque, "Factors affecting cloud ERP adoption in Saudi Arabia: An empirical study," *Inf. Dev.*, vol. 35, no. 1, pp. 150–164, 2019, https://doi.org/10.1177/0266666917735677

[34] L. G. Tornatzky and K. J. Klein, "Innovation characteristic and innovation adoption implementation: A meta analysis of findings," *IEEE Trans. Eng. Manag.*, vol. 29, no. 1, pp. 28–43, 1982, https://doi.org/10.1109/TEM.1982.6447463

[35] M. A. Hameed, S. Counsell, and S. Swift, "A meta-analysis of relationships between organizational characteristics and IT innovation adoption in organizations," *Inf. Manag.*, vol. 49, no. 5, pp. 218–232, 2012, https://doi.org/10.1016/j.im.2012.05.002

[36] H. Gangwar, H. Date, and R. Ramaswamy, "Developing a cloud-computing adoption framework," *Glob. Bus. Rev.*, vol. 16, no. 4, pp. 632–651, 2015, https://doi.org/10.1177/0972150915581108

[37] S. A. Garba, Y. Byabazaire, and A. H. Busthami, "Toward the use of 21st century teaching-learning approaches: the trend of development in Malaysian schools within the context of Asia Pacific," *Int. J. Emerg. Technol. Learn.*, vol. 10, no. 4, pp. 72–79, 2015, https://doi.org/10.3991/ijet.v10i4.4717

[38] K. K. Hiran and A. Henten, "An integrated TOE-DoI framework for cloud computing adoption in the higher education sector: case study of Sub-Saharan Africa, Ethiopia," *Int. J. Syst. Assur. Eng. Manag.*, vol. 11, pp. 441–449, 2020, https://doi.org/10.1007/s13198-019-00872-z

[39] N. Ramli and S. Saleh, "FrogVLE application in science teaching in secondary schools in North Malaysia: teachers' perspective," *Educ. Sci.*, vol. 9, no. 4, pp. 1–11, 2019, https://doi.org/10.3390/educsci9040262

[40] M. L. Cheok and S. L. Wong, "Teachers' perceptions of E-learning in Malaysian secondary schools," *Malaysian Online J. Educ. Technol.*, vol. 5, no. 2, pp. 20–33, 2017.

[41] S. S. Zainol, S. M. Hussin, M. S. Othman, and N. H. M. Zahari, "Challenges of online learning faced by the B40 income parent in Malaysia," *Int. J. Educ. Pedagog.*, vol. 3, no. 2, pp. 45–52, 2021, [Online]. Available: http://myjms.mohe.gov.my/index.php/ijeap/article/view/13767

[42] V. Venkatesh and H. Bala, "Technology acceptance model 3 and a research agenda on interventions," *Decis. Sci.*, vol. 39, no. 2, pp. 273–315, 2008, https://doi.org/10.1111/j.1540-5915.2008.00192.x

[43] J. Khlaisang, T. Teo, and F. Huang, "Acceptance of a flipped smart application for learning: a study among Thai university students," *Interact. Learn. Environ.*, vol. 29, no. 5, pp. 772–789, 2021, https://doi.org/10.1080/10494820.2019.1612447

[44] G. Alenazi, "Institutional support for academic staff to adopt virtual learning environments (VLEs) in Saudi Arabian universities," PhD Thesis, Durham University, Durham, 2015.

[45] C. Williams, "Learning on-line: a review of recent literature in a rapidly expanding field," *J. Furth. High. Educ.*, vol. 26, no. 3, pp. 263–272, 2002, https://doi.org/10.1080/03098770220149620

[46] B. Zainab, M. A. Bhatti, F. B. Pangil, and M. M. Battour, "E-training adoption in the Nigerian civil service," *Eur. J. Train. Dev.*, vol. 39, no. 6, pp. 538–564, 2015, https://doi.org/10.1108/EJTD-11-2014-0077

[47] M. Amini, N. S. Safavi, R. M. Bahnamiri, M. M. Omran, and M. Amini, "Development of an instrument for assessing the impact of environmental context on adoption of cloud computing for small and medium enterprises," *Aust. J. Basic Appl. Sci.*, vol. 8, no. 10, pp. 129–135, 2014.

[48] G. Hofstede and G. Hofstede, *Cultures and organizations. software of the mind*, 2nd ed. New York: McGraw-Hill, 2005.

[49] I. K. W. Lai and D. C. F. Lai, "Student acceptance of electronic schoolbag systems: an empirical study in China," in *Lecture Notes in Computer Science (including subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics)*, 2013, pp. 334–344, https://doi.org/10.1007/978-3-642-39750-9_31

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