

The Acceptance Level of Digital Natives towards the Interactive Kiosk in the Museum: Tam-Based Research Instrument

Mohd Nasiruddin Abdul Aziz¹, Siti Norlizaiha Harun², Mohd Khairi Baharom³, Mohd Khairulnizam Ramlie⁴, Ahmad Sofiyuddin Mohd Shuib⁵

^{1,3,4,5}Faculty of Art & Design, Universiti Teknologi MARA, Perak Branch, Seri Iskandar Campus, Perak, Malaysia

nasiruddin_abdulaziz@yahoo.com, mohdk135@uitm.edu.my, nizamramlie@gmail.com, sofiyuddin@yahoo.com

²Faculty of Architecture, Planning, and Surveying, Universiti Teknologi MARA, Shah Alam, Selangor, Malaysia
norliharun@gmail.com

Article Info

Volume 81

Page Number: 1032- 1044

Publication Issue:

November-December 2019

Abstract

Previous studies claimed that digital natives and digital immigrants refer to the division between the students and teachers that have different levels of accessibility in manipulating the digital tools in the learning environment. There is a potential for different acceptance levels between the digital natives and digital immigrants when they come as a museum visitor and use the interactive kiosk as a digital learning tool. However, digital natives' needs are the priority in this research due to their new generation and the growth of technology. Thus, this paper aims to examine the acceptance levels of digital natives towards the use of the interactive kiosk in the museum. There are two phases of research stages involved in this research which are identifying the digital native visitor, and examining their acceptance levels towards the interactive kiosk. Based on the literature studies, the Technology Acceptance Model (TAM) has been adopted and modified in this research context. The evaluation consists of perceived usefulness, perceived ease of use, attitude towards using, and intention to use. This paper presents the development of the research instrument that had been tested in the pilot-test stage. The research instrument will be used for the main survey in future stages, and can also be a reference to the other researchers in related studies.

Article History

Article Received: 3 January 2019

Revised: 25 March 2019

Accepted: 28 July 2019

Publication: 25 November 2019

Keywords: Digital Natives, Digital Immigrants, Museum, TAM, Interactive Kiosk

1 INTRODUCTION

Prensky [1] called the arrival of digital technology in the digital era in the last decade of the twentieth century as 'singularity', referring to the changes of things for which there is absolutely no going back. The different kinds of exposure and

experiences have divided the people in this generation into two categories: "digital natives" and "digital immigrants". A number of studies has proven that the digital natives and digital immigrants show different levels of acceptance of and accessibility to digital technology[2]–[7]. There are potential

conflicts in technology accessibility between these two generations because of their thinking patterns, experiences, and digital exposure. The early exposure to the digital world has led the digital natives to show positive behaviour towards learning styles using the technology rather than the digital immigrants. The different kinds of technology accessibility may affect the acceptance level of the technology [8], specifically in the museum context.

The majority of the studies have differentiated digital natives and digital immigrants between today's students and their teachers [2]. Prensky [1] claimed that the population of digital immigrants consists mostly of teachers. However, this paper will look into different perspectives where the students and teachers will be considered as a group of museum visitors with different technology accessibility capabilities because of their different preferences towards the technology in learning styles.

In line with the development of technology, the museum sector needs to keep moving forward in order to stay relevant for the digital natives as the new and future generation. The museums need to follow the latest trend by implementing modern technology and unique features to their content in the exhibit hall. For the past 10 years, the development of the digital approach in Malaysian museums has been increasing drastically since a local research found that the level of ICT used in Malaysian museums was very low and 30 years behind the other developed countries, such as the U.S., the U.K., and Canada [9].

The Department of Museums Malaysia, under the Ministry of Tourism, Arts, and Culture has become a driver and role model for museum development in Malaysia[10]. As an effort for the

development of digital use in Malaysian museums, several digital interactive kiosks were implemented as a contemporary digital approach in the exhibit hall in the Music Museum, in Kuala Lumpur. The use of interactive technology in museums has been proven to effectively increase the levels of experience and cognitive engagement of the visitors [11].

However, does there exist a division of the digital native and digital immigrant visitors in the Malaysian museums? What is the acceptance level of the digital natives towards the interactive kiosks in the museums? The answers to these questions are important to understand the future visitors and development activities for a better future in the Malaysian museum sector. The acceptance levels of visitors towards new technology is important because it can be a significant waste if not widely accepted by the target users [12].

In order to make sure the museum sector in Malaysia keeps on moving forward in this digital era, the author of this paper believes that the study on the digital natives as the current and oncoming generation is the priority rather than the minority group, which consists of the digital immigrants. Previous studies suggested that the digital immigrants need to assimilate with and adapt to the digital native's culture to stay relevant in this digital era[1], [13], [14]. Thus, this paper aimed to examine the acceptance level of digital natives and the relationships of the variables towards the intention to use the interactive kiosk in the museum. Based on the literature reviews, the Technology Acceptance Model (TAM) has been adopted and modified to the context of this study.

2 LITERATURE REVIEW

2.1 The Interactive Kiosk in the Music Museum

An interactive kiosk is a computer terminal installed with hardware and software that provides access to information for communication, entertainment, or education. The use of interactive technology in museums has been proven to effectively increase the level of experience and cognitive engagement of the visitors [11].

Based on the site visit and literature review in the preliminary study amongst 21 museums under the Department of Museums Malaysia, this research chose the interactive kiosk in the Music Museum as the single case study because of the good condition on the physical access and high visitor population compared to the other kiosks in other museums. The Music Museum is located at the National Museum of Malaysia, in Kuala Lumpur. The museum has become one of the main attractions in the capital city of Malaysia for the locals and tourists.

The interactive kiosk in the museum provides information on the traditional music instruments of Malaysia (Figure 1). There are five interactive kiosks provided, and all the kiosks use the same interface design with different contents. The visitors can explore the information in the kiosk system using the navigation button through the information text, graphic images, audio samples, and demonstration videos.

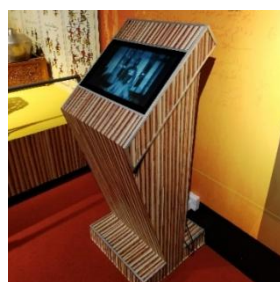


Figure 1: The Interactive kiosks in the Music Museum

2.2 Technology Acceptance Model (TAM)

Previous studies have introduced many theories in order to understand how the users make decisions towards the technology applications, such as the Theory of Planned Behaviour (TPB) [15], Innovation Diffusion Theory (IDT) [16], Unified Theory of Acceptance and Use of Technology (UTAUT) [17], the FITT framework [18], and the Technology Acceptance Model (TAM) [19]. All those theories have been used in research to understand the user's feedback towards the implementations of any new technology application.

The TAM theory was constructed based on the principles of the attitude paradigm from psychology[15]. The principles explain how to measure the behaviour-relevant components of attitudes, differentiate between beliefs and attitudes, and explain how external stimuli are generated linked to beliefs, attitudes, and behaviour. The theoretical model of the TAM is based the Theory of Reasoned Action (TRA). The TRA is the theory of individuals' intended behaviours. An

individual's performance is determined by the individual's attitude and subjective norms concerning the behaviour in question. Ajzen and Martin [15] also emphasised that the individual's beliefs and motivation interact with the existing behaviour.

As mentioned by Abu-Dalbouh [21], the Technology Acceptance Model (TAM) by Davis [19] has become the most frequently used as compared to other theories. Based on a meta-analysis study by King and He [22], the TAM theory has been widely used in research related to various types of technology applications with various prediction components because of its understandability and simplicity.

2.3 Related Studies

The TAM has been used by a number of researchers in museum studies to predict the acceptance of the visitors towards the use of interactive technology. Kang, Jang, and Jeong [23] extended the variables in the TAM to study visitor satisfaction and revisit intentions toward a mobile guide system and its effect on overall museum experience. Based on the 408 respondents' feedback, the study found that perceived usefulness, perceived enjoyment, and perceived interactivity had direct positive effects on visitor satisfaction towards the mobile guide system. In addition, the experience of using the museum's mobile guide system significantly influenced the experience of visiting the museum. Awang, Yaakub, and Othman [24] also added perceived enjoyment variables to investigate the acceptance of visitors towards the virtual museum. However, the researchers found that usefulness was the most influential factor towards the intention to use rather than the ease of use and the enjoyment.

Nizar and Rahmat [25] used the TAM to examine the use of mobile technology in a museum with three factors: perceived usefulness, perceived ease of use, and attitude. The research found that attitude was the most influential factor to the visitors in using the mobile technology in the museum because of their adaptations and daily use of mobiles in their lives. Their empirical data were also in line with Davis [19], where the perceived usefulness and perceived ease of use positively impacted on the visitor's decision to use the technology. Weng, Yang, Ho, and Su [26] also used the same three variables (perceived usefulness, perceived ease of use, and attitude) to study the intentions of teachers to use multimedia in their classes, and the result showed positive effects on all the relationships of the variables.

Many studies depended on two core variables, perceived usefulness and ease of use, to predict the acceptance of the technology as suggested by Davis [27]. However, those two variables have also shown non-significant results in certain studies [11], [26]. Arbaugh and Duray [28] were unable to validate any relationships of ease of use and usefulness with learning. Similar with Porter and Donthu [29], the researchers found that the intention of using the system was influenced by the perceived enjoyment, but not from the perceived usefulness of the learning tool.

According to the related research above, the author of this study believes that the TAM is suitable for and effective in this research context to predict the acceptance levels of the digital native visitors towards the interactive kiosk in the Music Museum. The latest research from local [25] and international [26] researchers has validated that perceived usefulness, perceived ease of

use, and attitude are the core variables to investigate the acceptance towards technology. Thus, this research has adapted the research framework into this research context.

3 THEORETICAL FRAMEWORK AND HYPHOTHESIS

3.1 Theoretical Framework

This research is being conducted based on the TAM framework as presented in Figure2. The same framework has been used in year 2018 by Weng et al. [26] and Nizar and Rahmat [25]for different contexts of study. The construct variables were adopted and the items were modified to suit this study. The validity of the TAM has been confirmed by numerous experiments by Davis (1989) and many follow-up research works from different research contexts[21], [30].

According to Davis [19], the intentions of individuals to accept technology depend on the attitude of perceived usefulness and perceived ease of use. In line with the principles of the attitude paradigm and the Theory of Reasoned Action, the TAM involved two primary predictors that stood as the independent variables, which were the Perceived Ease of Use and Perceived Usefulness. Perceived Ease of Use is measured by the individual beliefs that using a particular system is free of physical and mental effort. Meanwhile, Perceived Usefulness is measured by individual beliefs that using a particular system will enhance task performance.

A recent local study found that the museum visitors had strong positive attitudes towards the use of technology and it had led them to use the technology, directly [25]. Specifically, previous studies in kiosk technology have found that the intentions to

use the kiosk were determined by the attitudes towards the use[12]. The intention to use stood as a dependent variable and was the indicator to predict the acceptance levels of the digital native visitors towards the use of the interactive kiosk in the museum.

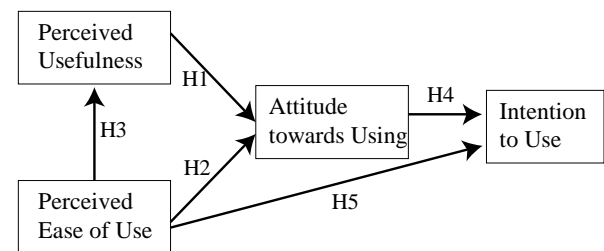


Figure 2: Research Framework (adopted from [25], [26])

3.2 Hypothesis

Perceived usefulness and perceived ease of use are the primary key factors in predicting user satisfaction with information systems [12], [31]. Both of those core variables were found to be significant in affecting the attitude of users [32]. In this research context, Doran et al.[33] mentioned that an interactive technology with low-cost, easy to implement, digital solutions in traditional elements in a museum can increase the visitor interest and interaction for digital natives. Research on visitor learning found that an interactive kiosk useful to the visitors because it is capable of promoting engagement and encouraging the visitors to explore the rest of the museum exhibits [34]. The literature reviews showed that the perceived usefulness and perceived ease of use of the interactive technology in museums had significant impacts on the attitude towards using, directly.

H1: Perceived Usefulness positively affects the attitude of digital natives towards using the interactive kiosk in the museum.

H2: Perceived ease of use positively affects the attitude of digital natives towards using the interactive kiosk.

An easy system will be directly useful to the user when it increases the job performance. The digital native prefers to receive information quickly, with less text and more fun, and be instantly useful for them [14]. Previous studies found that perceived ease of use affected usage, directly and indirectly, through perceived usefulness[27], [35]

H3: Perceived ease of use positively affects the perceived usefulness of the interactive kiosk.

Previous research found that the younger visitors decided to visit the museum influenced by their intention to use the technology provided in the exhibition halls [36]. Prensky [1] claimed that the digital natives have productive learning habits, attitudes, and behaviours in their leisure activities with the interaction of digital technology. The habits and behaviours of digital natives influenced their technology use patterns in the learning environment[37]. Based on that literature, this research predicts that the digital natives with frequent technology use have significantly strong intentions to use the interactive kiosk in the museum.

H4: Attitude towards using positively affects the intention to use the interactive kiosk.

There are extensive empirical research works that have proven the easy system was significantly linked to the intention through its impact on usefulness[35]. The intention to use by the Net-Generation was influenced by technological setting without distractions[4].

H5: Perceived ease of use positively affects the intention to use the interactive kiosk.

4 RESEARCH METHODOLOGY

This paper has investigated the acceptance levels of the digital natives and the relationship of the variables towards the interactive kiosk in the museum based on the TAM theory, quantitatively. There are two phases involved in this research. The first phase is to identify the existence of the digital natives and digital immigrants from amongst the museum visitors based on the learning styles. The second phase is to examine the acceptance levels of the digital native visitors towards the interactive kiosk. The questionnaire survey has been adopted and modified in this research context from the related previous studies.

4.1 Instrument Construction

A set of questionnaires with three sections has been developed for this research; Section A: Demographic information, Section B: Psychographic Information, and Section C: The acceptance level. The psychographic information is phase 1 of this research, where the dichotomous questions provide the intent to identify the digital native respondents based on the behaviours of their learning styles. Section C consists of four variables: perceived usefulness, perceived ease of use, attitude towards using, and intention to use. The questionnaire has been constructed in the Malay and English languages to facilitate the local and non-local respondents in the museum. In order to enhance the validity of the questionnaires, one language expert, two lecturers from graphic design department of a public university, and a museum curator were invited to go through the content, give opinions for revisions, and verify the suitability of the questions.

4.1.1 Phase 1: Identifying the Digital Natives

In order to identify the existence of the division of digital natives and digital immigrants, a set of questions has been provided in the psychographic section of the survey questionnaire based on the behaviours of the learning styles as mentioned in numerous previous research studies. The dichotomous questions are intended to split the digital native from the digital immigrant visitors based on two possible answers (Yes/No). This method has been adapted and modified from Toledo's[14] discussion, where the division can be made based on two optional answers. Those who mostly choose

“Yes” will be categorised as digital natives, whilst those with mostly “No” will be considered as digital immigrants. Gender, age, occupation, and education level will also be collected in the demographic section to see if there is any relationship that has an effect on the division of these two groups of visitors. Some of the previous studies had found that socio-economic status, cultural background, and gender had potential effects on the differentiation between the digital natives and digital immigrants[38], [39]. A thematic analysis has been conducted based on previous related literature and the closed-ended dichotomous questions were set as given below in Table 2:

Table 1. The dichotomous questions

References	Theme	Questions	Yes	No
[1], [5], [33], [40]– [43][5], [33], [40]– [43]	Entertainment	Do you think learning is supposed to be entertaining and fun?		
[2], [5], [13], [44]	Digital Use	Do you prefer to learn using digital tools rather than books?		
[1], [2], [13], [44][1], [2], [13], [44]	Less Text	Do you prefer to see the images rather than a long text?		
[3], [14], [39], [45], [46]	Skills	Can you use a new digital gadget without reading the manual?		
[2], [7], [40], [47]	Multi-task	Can you listen to music, talk on the phone, and use the computer at the same time?		
[1], [38], [48]	Internet	Do you really need the internet to learn or to work?		
[2], [5], [43], [46]	Environment	Do you prefer to learn out of the school environment rather than in the traditional school classroom?		

4.1.2 Phase 2: Examine the acceptance level

The second phase of this research intends to examine the acceptance levels of digital native visitors and the relationships of the variables towards the interactive kiosk

based on their intentions to use. The survey instrument is based on the constructs validated in previous related studies and adapted to the context of this study [26], [31], [49], [50]. A previous study

emphasised that Davis' instrument had a very high level of factorial validity and construct reliability [51]. There are 4 constructs in the survey: perceived usefulness, perceived ease of use, attitude, and intention to use. All the questionnaire items are measured using a 5-point Likert scale ranging from “strongly disagree” to “strongly agree”. The acceptance level will be measured by 6 items for perceived ease of use, 6 items for perceived usefulness, 5 items for attitude towards using, and 5 items for intention to use. All the adopted measure items from the previous research were tested and reached significance levels of 3.5, and the correlation coefficients were all above 0.400. Only one

“satisfaction” (IT5) items has been added in the variable intention to use because the satisfaction of the museum visitors is the most important for a museum exhibition [52]. The success of any museum exhibition rely on the visitor’s satisfaction [52] because satisfaction is a major measure of continuance intention to use of any information systems[53]. The visitor’s satisfaction is related to their experiences and it is important for a museum to achieve their objectives as an attraction for an informal learning environment [54]. The survey questions have been provided as shown in Table 2.

Table 2. Measures Item

Constructs	Code	Measure Items	References
Perceived Usefulness	PU1	I can get information through the kiosk quickly.	[19], [49]
	PU2	Using the kiosk facilitates my museum visit activities.	
	PU3	Using the kiosk would increase my knowledge.	
	PU4	Using the kiosk would increase the learning effectiveness in the museum.	
	PU5	Using the kiosk would make it easier to learn in the museum.	
	PU6	I believe the kiosk is useful in museum learning.	
Perceived Ease of Use	EU1	I feel at ease learning how to use the kiosk.	[19], [26]
	EU2	The kiosk system is controllable.	
	EU3	My interaction with the kiosk is clear and understandable.	
	EU4	The kiosk is flexible to use.	
	EU5	It is easy for me to become skilful using the kiosk.	
	EU6	I believe the kiosk is easy to use.	
Attitude toward Using	AT1	Using the kiosk to learn in the museum is good.	[26]
	AT2	Using the kiosk to learn in the museum is favourable.	
	AT3	It is a positive influence for me to use the kiosk in the museum.	
	AT4	I think it is valuable to use the kiosk in the museum.	
	AT5	I think it is a trend to use the kiosk in the museum.	
Intention to Use	IT1	I prefer to use the interactive kiosk in the museum rather than the static display in the future.	[50]
	IT2	I plan to revisit the museum and use the kiosk in the	

future.

IT3	I think the interactive kiosk should be implemented in another museum.
IT4	I will recommend to other visitors to use the kiosk.
IT5	Overall, I am satisfied with the interactive kiosk.

5 PILOT-TEST

The questionnaire was distributed to the visitors in the Music Museum through a random sampling method in the pilot-test stage. A sample of 30 visitors was collected for reliability analysis. In order to test the internal consistency of the questionnaires, all of the 22 item variables had been tested in Cronbach's alpha using SPSS version 23. The results showed that the Cronbach's alpha of all the items was 0.967, indicating excellent reliability.

6 FUTURE WORK

Currently, this research is in the pilot-test stage. The methodology process, theoretical framework, and the research instrument have been developed as provided in this paper. For the next stages, this research will make several steps in the data gathering process. In the context of the museology study, Diamond [55] claimed that 96 visitors was a sufficient sample size to make generalisations and produce conclusions for a museum that has one million visitors per year, with a ten percent sampling error. According to Raosoft's sample size calculator, a sample of 259 was the minimum size to represent the 792 weekly visitors' population of the Music Museum. Therefore, in order to reduce the error percentage in this study, 400 questionnaires will be prepared and distributed randomly to the museum visitors at the entrance door. The respondents will answer the questions based on their immediate response after using the

interactive kiosk in the museum. The research assistant will assist the respondents closely for any questions regarding the survey process. Finally, the questionnaires will be collected before the respondents exit the museum.

Based on the dichotomous questions on preference of learning styles (refer to Table 1), the most "yes" answers will be considered as the digital natives' group and selected for the hypothesis testing in the next stages. After the division of the respondents, the data will be screened to ensure that the data is useable, reliable, valid, clean, and ready for further statistical analyses.

A factor analysis will be conducted for each item. The low factor loading items will be deleted due to less reliability and validity. Next, the researchers will examine the relationships amongst perceived usefulness, perceived ease of use, attitude to use, and intention to use, statistically, by using the Partial Least Square Structural Equation Modelling (PLS-SEM) technique, SmartPLS software. According to Chin, Marcolin, and Newsted (2003), PLS is capable of detecting and estimating the interaction effects amongst quantitative variables accurately and easily.

The result will be discussed after the hypothesis testing and model validation on the perceived usefulness, perceived ease of use, attitude to use, and intention to use. The acceptance level will be identified by using a hierarchical component and the relationship results of each construct. The model of the

research will be confirmed later based on the validated hypotheses.

7 CONCLUSION

The development of technology in the learning environment and the rise of digital natives' generation have forced the museum sector to spend a certain amount of money in developing and providing interactive kiosks as learning tools. The digital immigrants need to assimilate and adapt to the digital native's culture to stay relevant in this digital era. There are numerous previous studies which have proven that the acceptance of technology can be predicted through the intention to use. There are many empirical data showing that perceived usefulness, perceived ease of use, and attitude towards using have been tested and that they significantly give impact to the intention to use the technology in various research contexts. This paper adapted the previous research framework and modified it in the development of the research instrument as presented in this paper. The statistical data will be collected for the main survey and analysed in the future to confirm the hypothesis. The researchers hope that the incoming results of this research will benefit the museum sector, especially in Malaysia, to understand the visitors' needs and can, directly, be a reference model for museum improvement.

ACKNOWLEDGEMENTS

This research work is supported by the Ministry of Higher Education Malaysia. The authors would like to express their gratitude to the Faculty of Art and Design, Universiti Teknologi MARA, Perak Branch, Seri Iskandar Campus and the Research Management Centre, Universiti Teknologi MARA Shah Alam for providing and

managing the fund from the Fundamental Research Grant Scheme (FRGS) [Ref. No. 600-IRMI/FRGS 5/3 (004/2017)].

REFERENCES

- [1] M. Prensky, "Digital Natives, Digital Immigrants Part 1," *Horiz.*, vol. 9, no. 5, pp. 1–6, Sep. 2001.
- [2] A. J. Autry and Z. Berge, "Digital natives and digital immigrants: Getting to know each other," *Ind. Commer. Train.*, vol. 43, no. 7, pp. 460–466, 2011.
- [3] J. Günther, *Digital Natives & Digital Immigrants 1 . Different Generations*. Germany: Studienverlag GmbH, 2005.
- [4] C. Jones and G. Healing, "Net generation students: Agency and choice and the new technologies," *J. Comput. Assist. Learn.*, vol. 26, no. 5, pp. 344–356, 2010.
- [5] M. Prensky, "Digital Natives, Digital Immigrants Part 2: Do They Really Think Differently?," *Horiz.*, vol. 9, no. 6, pp. 1–6, 2001.
- [6] Q. Wang, M. D. Myers, and D. Sundaram, "Digital Natives and Digital Immigrants," *Bus. Inf. Syst. Eng.*, vol. 5, no. 6, pp. 409–419, Dec. 2013.
- [7] M. Zenios and E. Ioannou, "Digital Natives and Digital Immigrants Revisited: A Case of CALL," *Lect. Notes Comput. Sci. (including Subser. Lect. Notes Artif. Intell. Lect. Notes Bioinformatics)*, vol. 10925 LNCS, pp. 99–110, 2018.
- [8] N. Charness and W. R. Boot, "Aging and Information Technology Use," *Curr. Dir. Psychol. Sci.*, vol. 18, no. 5, pp. 253–258, 2009.
- [9] J. A. A. Bakar, P. S. J. Kassim, and M. Mahmud, "The level of information and communication technology use by museums in Malaysia," *Proc. 2010 Int. Symp. Inf. Technol. - Syst. Dev. Appl. Knowl. Soc. ITSIM'10*, vol. 3, pp. 1462–1467, 2010.
- [10] Jabatan Muzium Malaysia, *Direktori Muzium-Muzium Jabatan Muzium Malaysia*. Kuala Lumpur: Jabatan

- Muzium Malaysia, 2012.
- [11] J. Pallud, "Impact of interactive technologies on stimulating learning experiences in a museum," *Inf. Manag.*, vol. 54, no. 4, pp. 465–478, 2017.
 - [12] M. Kim and H. Qu, "Travelers' behavioral intention toward hotel self-service kiosks usage," *Int. J. Contemp. Hosp. Manag.*, vol. 26, no. 2, pp. 225–245, 2014.
 - [13] S. Bayne and J. Ross, "The 'digital native' and 'digital immigrant': A dangerous opposition," *Annu. Conf. Soc. Res. into High. Educ.*, pp. 1–6, 2007.
 - [14] C. A. Toledo, "Digital Culture: Immigrants and Tourists Responding to the Natives' Drumbeat," *Int. J. Teach. Learn. High. Educ.*, vol. 19, no. 1, pp. 84–92, 2007.
 - [15] R. J. Hill, M. Fishbein, and I. Ajzen, "Belief, Attitude, Intention and Behavior: An Introduction to Theory and Research.," *Contemp. Sociol.*, vol. 6, no. 2, p. 244, 1977.
 - [16] Rogers, *Diffusion of Innovations*, 4th ed. New York: Free Press, 1995.
 - [17] V. Venkatesh, J. Y. L. Thong, and X. Xu, "Journal of the AIS Association for Information Systems Unified Theory of Acceptance and Use of Technology: A Synthesis and the Road Ahead," *J. Assoc. Inf. Syst.*, vol. 17, no. 5, pp. 328–376, 2016.
 - [18] E. Ammenwerth, F. Ehlers, U. Kutscha, A. Kutscha, R. Eichstadter, and F. Resch, "Supporting Patient Care by Using Innovative Information Technology," *Dis. Manag. Heal. Outcomes*, vol. 10, no. 8, pp. 479–487, 2002.
 - [19] F. D. Davis, "Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology," *MIS Q.*, vol. 13, no. 3, p. 319, 1989.
 - [20] I. Ajzen and F. Martin, *Understanding Attitudes and Predicting Social Behavior*, Illustrate. New York: Prentice-Hall, 1980.
 - [21] H. M. Abu-Dalbouh, "A questionnaire approach based on the technology acceptance model for mobile tracking on patient progress applications," *J. Comput. Sci.*, vol. 9, no. 6, pp. 763–770, 2013.
 - [22] W. R. King and J. He, "A meta-analysis of the technology acceptance model," *Inf. Manag.*, vol. 43, no. 6, pp. 740–755, 2006.
 - [23] J. H. Kang, J. C. Jang, and C. Jeong, "Understanding museum visitor satisfaction and revisit intentions through mobile guide system: moderating role of age in museum mobile guide adoption," *Asia Pacific J. Tour. Res.*, vol. 23, no. 2, pp. 95–108, 2018.
 - [24] N. Awang, A. R. Yaakub, and Z. Othman, "Assessing user acceptance towards virtual museum: The case in kedah state museum, malaysia," *Proc. 2009 6th Int. Conf. Comput. Graph. Imaging Vis. New Adv. Trends, CGIV2009*, pp. 158–163, 2009.
 - [25] N. N. M. Nizar and M. K. Rahmat, "Examining The Museum Visitors Use Of Mobile Technology Through Technology Acceptance Model (TAM)," *J. Tour. Hosp. Environ. Manag.*, vol. 3, no. September, pp. 14–24, 2018.
 - [26] F. Weng, R.-J. Yang, H.-J. Ho, and H.-M. Su, "A TAM-Based Study of the Attitude towards Use Intention of Multimedia among School Teachers," *Appl. Syst. Innov.*, vol. 1, no. 3, p. 36, 2018.
 - [27] F. D. Davis, "A Combined Phase and Force Compensation Method for Real-time Hybrid Testing," *15th World Conf. Earthq. Eng.*, vol. 13, no. 3, pp. 319–340, 1989.
 - [28] J. B. Arbaugh and R. Duray, "Technological and Structural Characteristics, Student Learning and Satisfaction with Web-Based Courses," *Manag. Learn.*, vol. 33, no. 3, pp. 331–347, Sep. 2002.
 - [29] C. E. Porter and N. Donthu, "Using the technology acceptance model to explain how attitudes determine Internet usage:

- The role of perceived access barriers and demographics,” *J. Bus. Res.*, vol. 59, no. 9, pp. 999–1007, 2006.
- [30] Q. Ma and L. Liu, “The Technology Acceptance Model,” in *Journal of Organizational and End User Computing*, vol. 16, no. 1, 2005, pp. 112–128.
- [31] V. Venkatesh and F. D. Davis, “A Model of the Antecedents of Perceived Ease of Use: Development and Test,” *Decis. Sci.*, vol. 27, no. 3, pp. 451–481, 1996.
- [32] T. Saenphon, “An Analysis of the Technology Acceptance Model in Understanding University Student’s Awareness to Using Internet of Things,” vol. 12, pp. 61–64, 2017.
- [33] K. Doran, A. Boyce, A. Hicks, J. Payton, and T. Barnes, “Creation of a game-based digital layer for increased museum engagement among digital natives,” *2012 2nd Int. Work. Games Softw. Eng. Realiz. User Engagem. with Game Eng. Tech. GAS 2012 - Proc.*, pp. 31–34, 2012.
- [34] S. Allen and J. Gutwill, “Designing With Multiple Interactives: Five Common Pitfalls,” *Curator Museum J.*, vol. 47, no. 2, pp. 199–212, 2010.
- [35] V. Venkatesh and F. D. Davis, “A Theoretical Extension of the Technology Acceptance Model: Four Longitudinal Field Studies,” *Manage. Sci.*, vol. 46, no. 2, pp. 186–204, 2000.
- [36] R. Owen, D. Buhalis, and D. Pletineckx, “Visitors’ Evaluations of Technology Used at Cultural Heritage Sites,” *Inf. Commun. Technol. Tour. 2006*, pp. 383–393, 2007.
- [37] P. Thompson, “The digital natives as learners: Technology use patterns and approaches to learning,” *Comput. Educ.*, vol. 65, pp. 12–33, 2013.
- [38] S. Bennett, K. Maton, and L. Kervin, “The ‘digital natives’ debate: A critical review of the evidence,” *Br. J. Educ. Technol.*, vol. 39, no. 5, pp. 775–786, 2008.
- [39] J. Waycott, S. Bennett, G. Kennedy, B. Dalgarno, and K. Gray, “Digital divides? Student and staff perceptions of information and communication technologies,” *Comput. Educ.*, vol. 54, no. 4, pp. 1202–1211, 2010.
- [40] B. Cornu, “Digital Natives: How Do They Learn? How To Teach Them?,” *Inst. Information Technol. Educ.*, vol. 52, no. 2, pp. 2–11, 2011.
- [41] R. Hammady, M. Ma, and N. Temple, “Augmented Reality and Gamification in Heritage Museums,” *Springer Int. Publ.*, vol. 13, no. 6, pp. 181–187, 2016.
- [42] Y. Tisserand *et al.*, “Preservation and Gamification of Traditional Sports,” in *Mixed Reality and Gamification for Cultural Heritage*, M. Ioannides, N. Magnenat-Thalmann, and G. Papagiannakis, Eds. Cham: Springer International Publishing, 2017, pp. 421–446.
- [43] J. Gaston, “Reaching and teaching the digital natives,” *Libr. Hi Tech News*, vol. 23, no. 3, pp. 12–13, 2006.
- [44] G. A. Gunter, R. F. Kenny, and E. H. Vick, “Taking educational games seriously: Using the RETAIN model to design endogenous fantasy into standalone educational games,” *Educ. Technol. Res. Dev.*, vol. 56, no. 5–6, pp. 511–537, 2008.
- [45] H. Kopáčeková, “Characteristics of digital natives generation in the context of mobile learning,” *Int. Conf. Inf. Digit. Technol. IDT 2015*, no. November, pp. 155–160, 2015.
- [46] H. Green and C. Hannon, *Their Space Education for a digital generation*. London: Demos, 2007.
- [47] I. Jukes and A. Dosaj, “Understanding Digital Kids: teaching and Learning in the New Digital Landscape,” *Singapore MOE Mass Lect.*, no. June, 2006.
- [48] S. Jones and M. Madden, “Internet Goes to College: How Students are Living in the Future with Today’s Technology,” *Pew Internet Am. Life Proj.*, no. January,

- pp. 1–23, 2002.
- [49] F. D. Davis, “User acceptance of information technology: system characteristics, user perceptions and behavioral impacts,” *Int. J. Man. Mach. Stud.*, vol. 38, no. 3, pp. 475–487, Mar. 1993.
 - [50] B. C. Lee, J. O. Yoon, and I. Lee, “Learners’ acceptance of e-learning in South Korea: Theories and results,” *Comput. Educ.*, vol. 53, no. 4, pp. 1320–1329, 2009.
 - [51] G. S. Hubona and T. G. Whisenand, “External Variables and the Technology Acceptance Model,” *Extern. Var. Technol. Accept. Model*, p. 6, 1995.
 - [52] N. Kamaruddin, “Understanding of Basic Design Process and Techniques for Effective Museum Exhibition Design,” vol. VI, no. Vi, pp. 98–101, 2019.
 - [53] M. N. A. Rahman, S. N. A. Syed Zamri, and L. K. Eu, “A Meta-Analysis Study of Satisfaction and Continuance Intention to Use Educational Technology,” *Int. J. Acad. Res. Bus. Soc. Sci.*, vol. 7, no. 4, pp. 1059–1072, 2017.
 - [54] T. T. Trinh and C. Ryan, “Museums, exhibits and visitor satisfaction: a study of the Cham Museum, Danang, Vietnam,” *J. Tour. Cult. Chang.*, vol. 11, no. 4, pp. 239–263, 2013.
 - [55] J. Diamond, *Practical Evaluation Guide: Tools for Museums and Other Informal Educational Settings (American American Association for State and Local History Book Series)*. United States of America: AltaMira Press, 1999.
 - [56] W. W. Chin, B. L. Marcolin, and P. R. Newsted, “A Partial Least Squares Latent Variable Modeling Approach for Measuring Interaction Effects: Results from a Monte Carlo Simulation Study and an Electronic-Mail Emotion/Adoption Study,” *Inf. Syst. Res.*, vol. 14, no. 2, pp. 189–217, Jun. 2003.