

# Key Factors in Accessibility to and Acceptance of a Website for University Students with Visual Impairment

Phatthanan Sirikitsathian<sup>a</sup>, Chanboon Sathitwiriawong<sup>b</sup>, Singha Chaveesuk<sup>c\*</sup>, <sup>a,b</sup>Faculty of Information Technology, King Mongkut's Institute of Technology Ladkrabang, Thailand, <sup>c</sup>King Mongkut's Institute of Technology Ladkrabang Business School, King Mongkut's Institute of Technology Ladkrabang, Bangkok, Thailand, Email: <sup>c\*</sup>[singha@it.kmitl.ac.th](mailto:singha@it.kmitl.ac.th)

Visually impaired students often have trouble accessing and using websites. Therefore, we aimed to investigate factors affecting visually impaired students' accessibility to and acceptance of a website. The research tool was a valid and reliable survey questionnaire with Likert-scale items. Responses to the questionnaire were elicited from 274 visually impaired students at several universities in the Central region of Thailand and analysed by structural equation modelling (SEM). It was found that four main UTAUT factors as well as the website's quality and internet anxiety were significant factors affecting behavioural intention to use a website that led to actual use of the website. Website developers should take heed of these factors when developing a website for this group of users. The findings provide some essential information on accessibility-and-acceptance-promoting web design and development.

**Key words:** *Technology acceptance, Website accessibility, Website quality, Internet anxiety, Visual impairment, UTAUT.*

## Introduction

Internet access plays an important role in the everyday life of Thai people. A survey result in 2019 from Electronic Transactions Development Agency (ETDA) shows that Thai internet users access the internet for 10 hours and 5 minutes a day on average (ETDA, 2019). The most frequent internet activity has been social media activity (e.g., Facebook, Twitter, and Instagram) at 91.2%, followed by television program or video clip viewing, as well as music



listening at 71.2%, searching for information at 70.7%, email transactions at 62.5%, and online shopping at 60.6%. It is also noted that the number of internet users shopping for merchandise and services online this year has increased from last year. All in all, Thailand is transitioning into a digital society (Saengchai & Jermsittiparsert, 2019), i.e., more and more Thai people are performing their everyday activities digitally (Sutduean, Sutduean, & Jermsittiparsert, 2019), as can be seen in the ever-increasing number of Thai internet users.

Thailand's Department of Empowerment of Persons with Disabilities (2019) reported that, in 2019, there were 2,015,385 registered disabled people in Thailand, 2.89% of the whole population. Among the disabled people in this group, 74.31% are literate. Therefore, a lot of disabled people can benefit from access to useful information, including those in the learning age who need to explore information from websites to educate themselves and to raise their quality of life.

This issue was not only an issue for Thai visually impaired students. Some research papers have reported website accessibility problems of visually impaired students in other countries. For instance, Agangiba et al. (2017) reported that, even though website accessibility issues have been realised globally for some time now, visually impaired students in Ghana still had this issue and other obstacles. Therefore, the importance of website accessibility and comprehension of website content cannot be over-exaggerated. Suggestions from several papers are unanimous. Website developers should have sufficient training in aspects of website accessibility so that websites they develop can support every user equally well (Agangiba et al., 2017; Maisak & Brown, 2014; Fecke et al., 2015, Abu-Doush et al., 2013).

Furthermore, it is necessary to investigate factors affecting access to website which would lead to better acceptance of technology by disabled users. Since content accessibility by visually impaired users is a good indicator of successful websites, website designers and developers need to realise the importance of content accessibility. This also includes the need to continuously evaluate and improve accessibility in order to keep the number of disabled visitors to the website high (Kurt, 2011).

Nevertheless, there has not been a lot of research on website usage by visually impaired users. Among the few that have been done, factors affecting website acceptance by visually impaired students has not been investigated.

For all of these reasons, this study aims to investigate factors affecting IT technology acceptance by visually impaired students in Thailand's universities. Our research framework is based on well-established UTAUT theory and two new factors—website quality and internet anxiety, found within the current literature.

## **Theoretical Background**

### ***Website Accessibility***

An accessible website is a website that has been designed with all users in mind, including seniors and disabled people; all of them should be able to access, understand, and use the content of the website (Pluemsamrungit, 2012). Website developers need to realise the importance of high standards for a website. Accessibility should be comprehensive. For example, user's ability to access a piece of information on a website depends on the website's presentation method and the way to navigate to that piece of information within the context of the presentation method. These presentation and navigation methods strongly affect the website accessibility for visually impaired users. For instance, a user who does not have clear vision may not be able to navigate to the desired piece of information because they cannot see the navigation buttons clearly. Website developers also need to consider usages of colour, colour contrast, and font colour and size. Moreover, inclusion of a text-to-speech feature will facilitate website accessibility for this group of users.

Web Content Accessibility Guidelines (WCAG) are established guidelines for website developers. They were drawn up by the Web content Accessibility Guidelines Working Group composed of World Wide Web Consortium or W3C and Web Accessibility Initiative or WAI (W3C, n.d.). The current version of WCAG is WCAG 2.1 (W3C, 2018; W3C, n.d.) considers the four accessibility principles are perceivability, operability, understandability, and robustness.

### ***Unified Theory of Acceptance and Use of Technology***

Unified Theory of Acceptance and Use of Technology (UTAUT) was developed by Venkatesh et al. (2003). UTAUT has been used in many research works to investigate factors such as 'intention to use' and 'technology acceptance behaviour' of users (Saqr & Bhattacharjee, 2012; Boontarig et al., 2012; Ibrahim & Zakaria, 2015; Al-Qeisi et al., 2014). UTAUT is composed of three main factors affecting user's behavioural intention—performance expectancy, effort expectancy, and social influence—and facilitating conditions, another main factor affecting use behaviour, which consist of four moderator variables: gender, age, experience, and voluntariness of use. These four variables act as a modifier of the UTAUT model, boosting its accuracy in predicting use behaviour.

From the literature review, Venkatesh et al. (2016); Williams et al. (2015); Akbar (2013) reported that in the context of acceptance of information technology, UTAUT is a very popular model that can explain acceptance behaviour of users well. Moreover, it can explain and predict newer technology acceptance behaviour in various contexts (Tan, 2013; Mensah, 2019; Kurfal et al., 2017; Vongjaturapat et al., 2015).

Therefore, the authors have based this study on UTAUT and two new external factors and expected them to be able to explain the acceptance or refusal to use a website for visually impaired students. The UTAUT model with two additional factors is explained below.

## **Research model**

### ***Performance Expectancy***

Performance expectancy is a metric of personal belief toward system usage whether it will help achieve a specified goal (Venkatesh et al., 2003). Performance expectancy is a main factor of UTAUT for predicting behavioural intention in using information technology and communication (Venkatesh et al., 2012). Saqr and Bhattacharjee (2012) brought UTAUT into investigation of factors affecting website accessibility of visually impaired people and found that performance expectancy truly influenced behavioural intention. In addition, Almaiah et al. (2019) used UTAUT to examine factors affecting acceptance to learn via a mobile device of college students. Other studies (Martins et al., 2014; Mukred, 2019) reported that performance expectancy and behavioural intention influence each other.

### ***Effort Expectancy***

Effort Expectancy is a factor indicating an information system's ease of use (Venkatesh et al., 2003). Effort expectancy is another main factor in UTAUT. It has been widely used to investigate intention to use a technology (Venkatesh et al., 2012). For instance, Saqr and Bhattacharjee (2012) used UTAUT to investigate factors affecting website accessibility of visually impaired people and found that effort expectancy truly influenced behavioural intention. Mohammed et al. (2019) used UTAUT to investigate factors affecting acceptance of learning via a mobile device of college students. Many other studies (Martins et al., 2014; Mukred et al., 2019) support this relationship between effort expectancy and behavioural intention to use.

### ***Social Influence***

Social Influence is a factor indicating the level of personal perception of new technology that influences users' personal belief in using new technology (Venkatesh et al., 2003). Social influence is another main factor in UTAUT that has been widely used to investigate intention to use new technology (Venkatesh et al., 2012). For instance, Hoque and Sorwar (2017) used social influence to investigate factors affecting mobile health usage of seniors in Bangladesh. Several other studies (Martins et al., 2014; Almaiah et al., 2019) support that social influence and behavioural intention influences each other.

### ***Facilitating Conditions***

Facilitating conditions are a factor affecting usage behaviour, indicating the level of user's belief in the organisation and technical infrastructure supporting the information system (Venkatesh et al., 2003). Facilitating conditions is another main factor in UTAUT and has been widely used to investigate intention to use a technology (Venkatesh, 2012). For instances, Saqr and Bhattacharjee (2012) used UTAUT to investigate factors affecting website accessibility of visually impaired people and found that facilitating conditions influenced usage behaviour; Attuquayefio and Addo (2014) used UTAUT to investigate the acceptance of information and communication technologies of college students and found that facilitating conditions significantly affected usage behaviour.

### ***Website Quality***

A quality website is friendly to users. The information that it contains is easily accessible. The quality of a website strongly affects user's acceptance of the website. DeLone and McLean (2003) presented a model of successful information systems. That model includes three quality factors affecting system usage: system quality, information quality, and service quality. Al-Qeisi et al. (2014) added an additional website design quality into UTAUT in a study and found that the general information and the characteristics of data in a website were most important for the users. The website design quality affected usage behaviour both directly and indirectly, leading to more intention to use. Ho et al. (2012) reported that website quality affected Internet search behaviour. Several other studies (Ibrahim & Zakaria, 2015; Sambasivan et al., 2010) reported that website quality affected users' intention to use a website.

### ***Internet Anxiety***

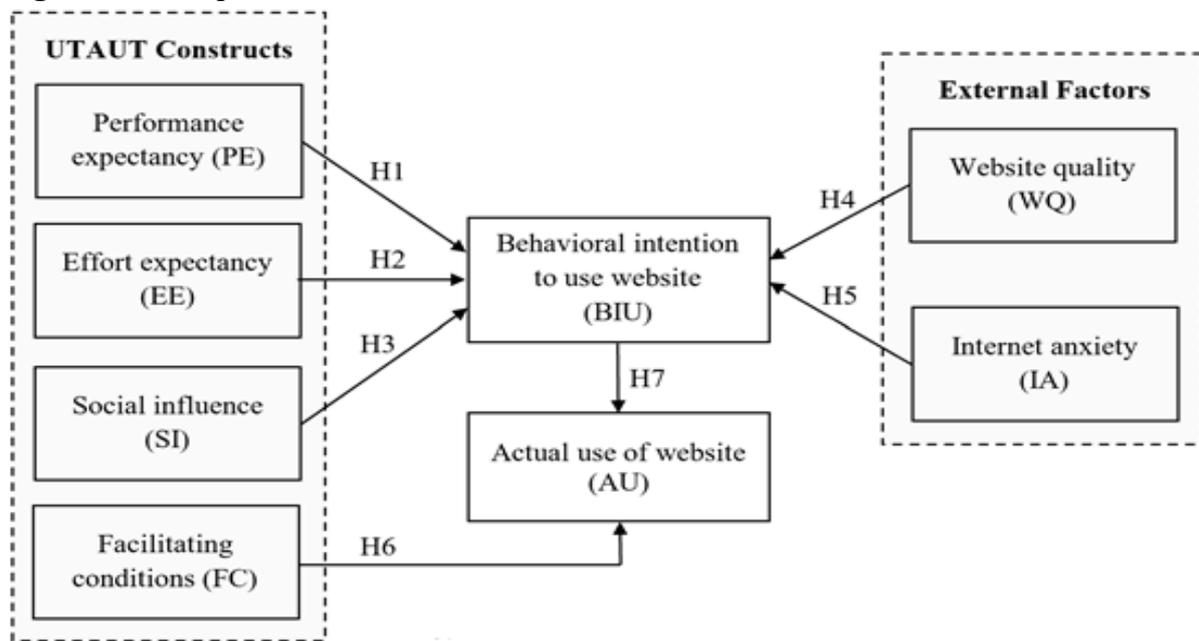
Internet anxiety is a personal trait of users. The cause of the anxiety may be a concern about the dangers in surfing the internet or about not being able to control an internet session while interacting with other users on the internet (Joiner et al., 2005).

Hoque et al. (2017) investigated the influence of technology anxiety factor on mobile health service for seniors in Bangladesh and found that the said factor also significantly affected the behavioural intention of the users. Although there are a lot of studies of external factors affecting users' website usage acceptance, not all basic factors have been covered. Some basic factors were covered by Loiacono et al. (2013). They investigated several factors including perceived convenience and perceived reliability, and found that they affected the acceptance of audio and music websites by visually impaired users. Boontarig et al. (2012) reported that perceived value affected the intention to use electronic health service for seniors in Thailand. Almaiah et al. (2019) investigated students' acceptance of a mobile learning system and found

that factors affecting their acceptance of the system was perceived compatibility, self-efficacy, perceived information quality, availability of resources, perceived awareness, perceived trust, and perceived security.

The aim of our study was to investigate factors affecting website acceptance by visually impaired students. The factors were several main factors in UTAUT framework and two additional external factors—website quality and internet anxiety—observed frequently in recent literature (Figure 1).

**Figure 1.** Conceptual framework



**Note:** H1-H7 are relationships between factors in our hypotheses

## Research Methodology

### *Sample and Data Collection Method*

The population in this study is visually impaired students in governmental and private higher education institutes in Thailand. A group was sampled from the population by simple random sampling. The sample group was a group of visually impaired university students in the central region of Thailand who had already had computer experience and used websites in their daily life.

This study was a quantitative study of degree of users' website acceptance. The research instrument was a questionnaire; 350 of the questionnaires were mailed to the participants via regular postal service. The number of responses was 274, a 78.3% response rate, which was

sufficient for the analysis and complied with the criterion of the relationship-finding structural equation modelling (SEM) technique that we used.

### ***Instrument Development***

The questionnaire, the research instrument, was developed by modifying some of the questionnaires found from the literature (Venkatesh et al., 2003; Saqr & Bhattacharjee, 2012; Ekizoglu & Ozcinar, 2011; Venkatesh et al., 2012; Shin et al., 2013). The 63 items in the questionnaire were evaluated by three information technology experts of their content validity in terms of Index of Item–Objective Congruence (IOC) to be more than 0.5. The questionnaire was checked for its reliability before use. The reliability was indicated with a Cronbach’s Alpha Coefficient, which should be and was higher than 0.7 ( $\alpha > 0.7$ ).

### ***Evaluation of the Research Model***

This study used a Structural Equations Model (SEM) to analyse the relationships between seven factors affecting actual use of website included in our formulated hypotheses (Figure 1). The SEM analysis started with checking the reliability of the questionnaire with the value of its Cronbach’s Alpha coefficient, then checking the construct validity of the items in the questionnaire, and finally, checking three more entities: model-fit indices with a Confirmatory Factor Analysis (CFA) (Hooper et al., 2008); relationships between factors with a path analysis; and path coefficients for inputting into statistical software.

### **Statistical Analysis and Results**

Table 1 shows that the majority of visually impaired subjects in this study were males and studying toward a bachelor’s degree. They were a mix of about the same number of blind persons and low-vision persons. They had 1-3 years of computer experience, and their main purpose in accessing a website is to search for desired information. Their common website accessing device was a smartphone, and they used a screen reader software for convenience in absorbing the information.

**Table 1:** Demographics of participants (n=274)

Demographics		Frequency	Percentage
Gender	Male	167	60.9
	Female	107	39.1
Level of education	Diploma	5	1.8
	Bachelor’s Degree	269	98.2
Degree of visual impairment	Blind	138	50.4
	Low vision	136	49.6

Computer experience	Less than 1 year	50	18.2
	1-3 years	75	27.4
	4-6 years	42	15.3
	7-9 years	38	13.9
	More than 10 years	69	25.2
Purpose of a visit to a website	To communicate	26	9.5
	To search for information	212	77.4
	To access entertainment programs	36	13.1
Device for accessing a website	Computer (Desktop/Laptop)	71	25.9
	Smartphone	186	67.9
	Tablet	17	6.2
Application or device that eases use of a website (more than one choice is possible)	Screen magnification software	100	36.5
	Screen reader software	158	57.7
	Thai text to speech software	157	57.3
	Refreshable braille display	9	3.3

The influences of factors affecting website accessibility of visually impaired students were statistically significant at  $\alpha < 0.05$ . All results from the CFA are listed in Table 2.

Performance expectancy consisted of three observed variables - perceived usefulness, relative advantage, and outcome expectancy. The factor loading of all of these variables was near to 1 and statistically significant at  $\alpha < 0.05$ . Relative advantage was the indicator with the maximum loading factor. It was able to explain most of the variance in performance expectancy, at 63%. The indicator with the minimum loading factor was outcome expectancy that was able to explain the variance in performance expectancy at 56%.

Effort expectancy consisted of three observed variables—perceived ease of use, complexity, and ease of use. The factor loading of every of these variables was near to 1 and statistically significant at  $\alpha < 0.05$ . Ease of use was the indicator with the maximum loading factor. It was able to explain most of the variance in effort expectancy, at 79%. The indicator with the minimum loading factor was perceived ease of use that was able to explain the variance in effort expectancy at 25%.

Social influence consisted of three observed variables—subjective norm, social factor, and image. The factor loading of every of these variables was near to 1 and statistically significant at  $\alpha < 0.05$ . Subjective norm was the indicator with the maximum loading factor. It was able to explain most of the variance in social influence, at 69%. The indicator with the minimum loading factor was social factor that was able to explain the variance in social influence at 53%.

Facilitating conditions consisted of three observed variables - perceived behavioural control, facilitating conditions, and compatibility. The factor loading of all of these variables was near to 1 and statistically significant at  $\alpha < 0.05$ . Facilitating conditions, the observed variable, was the indicator with the maximum loading factor. It was able to explain most of the variance in facilitating conditions (the factor), at 79%. The indicator with the minimum loading factor was compatibility that was able to explain the variance in facilitating conditions (the factor) at 62%.

Website quality consisted of three observed variables - system quality, information quality, and service quality. The factor loading of every of these variables was near to 1 and statistically significant at  $\alpha < 0.05$ . Information quality was the indicator with the maximum loading factor. It was able to explain most of the variance in website quality, at 59%. The indicator with the minimum loading factor was service quality that was able to explain the variance in website quality at 53%.

Internet anxiety consisted of three observed variables - security anxiety, anxiety of using the internet to follow the latest trend, and anxiety of becoming an internet addict. The factor loading of all of these variables was near to 1 and statistically significant at  $\alpha < 0.05$ . Anxiety on using the internet to follow the latest trend was the indicator with the maximum loading factor. It was able to explain most of the variance in Internet anxiety, at 75%. The indicator with the minimum loading factor was anxiety of becoming an internet addict that was able to explain the variance in Internet anxiety at 68%.

Behavioural intention to use a website consisted of three observed variables—intention, plan, and prediction. The factor loading of all of these variables was near to 1 and statistically significant at  $\alpha < 0.05$ . Plan was the indicator with the maximum loading factor. It was able to explain most of the variance in behavioural intention to use a website, at 72%. The indicator with the minimum loading factor was intention that was able to explain the variance in behavioural intention to use a website at 43%.

**Table 2:** CFA results on the observed variables

Variables	Observed variables	Factor Loading	R <sup>2</sup>	AVE	Cronbach's Alpha
Performance expectancy	PERU	0.76	0.57	0.590	0.88
	READ	0.80	0.63		
	OUTE	0.75	0.56		
Effort expectancy	PERE	0.50	0.25	0.541	0.88
	COMP	0.77	0.59		
	EASE	0.89	0.79		
Social influence	SUBN	0.83	0.69	0.617	0.90
	SOCF	0.73	0.53		

	PERE	0.80	0.64		
Facilitating conditions	PERB	0.82	0.67	0.693	0.92
	FACC	0.89	0.79		
	COMT	0.79	0.62		
Website quality	SYSQ	0.74	0.55	0.558	0.91
	INFO	0.77	0.59		
	SERQ	0.73	0.53		
Internet anxiety	SEAN	0.85	0.72	0.714	0.90
	ANUF	0.86	0.75		
	ANIA	0.82	0.68		
Behavioural intention to use website	INT	0.62	0.43	0.579	0.85
	PLAN	0.85	0.72		
	PRED	0.80	0.64		

Actual use of website is a ratio variable of which reliability cannot be computed.

Two factors—behavioural intention to use and facilitating conditions—directly and positively affected actual use of website. Five factors—effort expectancy, social influence, performance expectancy, website quality, and internet anxiety—indirectly and positively affected actual use of website.

Table 3 shows a summary of the influence of every factor on website accessibility of visually impaired students, ranked from the highest to the lowest.

**Table 3:** Summary of direct, indirect, and total effects on the acceptance model of actual use of website

Variable	Direct effect	Indirect effect through other variables	Total effect
Behavioural intention to use website (BIU)	0.961	0	0.961
Facilitating conditions (FC)	0.528	0	0.528
Internet anxiety (IA)	0	$(0.541 * 0.961) = 0.518$	0.518
Effort expectancy (EE)	0	$(0.263 * 0.961) = 0.250$	0.250
Social influence (SI)	0	$(0.093 * 0.961) = 0.086$	0.086
Performance expectancy (PE)	0	$(0.072 * 0.961) = 0.067$	0.067
Website quality (WQ)	0	$(0.061 * 0.961) = 0.058$	0.058
$\chi^2/df = 1.132$ , GFI = .953, AGFI = .906, CFI = .996, RMSEA = .022, RMR = .024			

Relationships between variables in the model were checked with path analysis. Table 4 shows results of hypothesis testing of the seven formulated hypotheses. Five hypotheses were accepted (H2, H3, H4, H5, H7), while two were rejected (H1, H6).

**Table 4:** Results of Path Analysis of the Structural Model

Hypotheses	Estimate	C.R. (T-value)	Result
H1: PE → BIU	0.072	0.838	Rejected
H2: EE → BIU	0.263	2.228	Accepted
H3: SI → BIU	0.093	2.290	Accepted
H4: WQ → BIU	0.061	2.009	Accepted
H5: IA → BIU	0.541	4.774	Accepted
H6: FC → AU	0.528	1.389	Rejected
H7: BIU → AU	0.961	1.981	Accepted

**Note:** Critical ratio (T-value) more than 1.96 are significant at  $\alpha < 0.05$ .

## Discussion and Conclusion

The main objective of this study was to find out the significant influences of factors in the Unified Theory of Acceptance and Use of Technology (UTAUT) and two new factors—website quality and internet anxiety—on actual use of website by visually impaired university students in the central region of Thailand. It was found that out of the 7 factors, 5 factors strongly influenced actual use of website: behavioural intention to use, effort expectancy, social influence, website quality, and internet anxiety. The behavioural intention to use a website was the factor that influenced actual use of website the strongest. Behavioural intention to use a website significantly affected actual use of website ( $\alpha < 0.05$ ) with a correlation coefficient of 0.961. This finding agrees well with the findings from Venkatesh et al. (2003) and Venkatesh et al. (2012). The benefits to visually impaired students from actual use of website are several, such as using a website to support convenient, everyday living activities, to search for educational information, or to earn a living. These benefits affected users' behaviour—namely, to achieve these benefits, a user would formulate a plan, raise an expectation, and strengthen his or her intention to use a website. This behavioural intention to use then led to actual use of website. A design and development of website for visually impaired students should enable users to search for the information that they want conveniently, so that they can bring the pieces of information found into good use, for example, the information would make their everyday living more convenient.

Next, internet anxiety influenced actual use of website substantially (at  $\alpha < 0.01$ ) with a correlation coefficient of 0.541, agreeing well with the findings from Nihat & Zehra (2011) and Rakibul & Golam (2017). Internet usage could make some users anxious by several reasons: worrying about other people coming to know the information that they wanted to keep

private; anxious when they are in an unfamiliar situation, e.g., new notifications coming in while using a website; not sure what button to click to agree to the terms and conditions of something offered on the website without reading those terms and conditions out carefully; and using the Internet too much would deteriorate their relationships with other people around them. To prevent users' anxiety of using the Internet, designers and developers of websites have to realise the importance of privacy and implement their website accordingly. In addition, they need to project an image of trust and reliability of their website. When users feel safe and secure using the internet, they are likely to use a website more frequently.

Next, effort expectancy strongly influenced actual use of website at  $\alpha < 0.05$  with a correlation coefficient of 0.263, agreeing well with the findings from Venkatesh et al. (2003); Saqr & Bhattacharjee (2012); Mukred et al. (2019); and Suksa-ngiam & Chaiyasoonthorn (2015). When website users began to use a website, perceived its ease of operations, and understood its complexity, they would be able to use the website with no problem. They would be able to access their desired pieces of information and understand them well. These processes led to an expectation of difficulty or ease in using a website. An expectation of ease in using a website led to more frequent visits to it. The design and development of a website should result in a website that is easy to understand and convenient to communicate with other users. The website should provide rapid download and offer assistant applications especially for visually impaired students, to help them navigate its webpages and understand its content more thoroughly.

Next, social influence significantly influenced actual use of website at  $\alpha < 0.05$  with a correlation coefficient of 0.093, agreeing well with findings from Venkatesh et al. (2003); Rakibul & Golam (2017); and Mohammed et al. (2019). Social influence covers support from people around users like their parents, friends, instructors, and caretakers in various social environments like university as well as popular, high-status social image of website users. If these people recognise the benefits of website usage and keep on providing continuing support for users (support including private and government agents that made decisions on website usage policies and website user safety), visually impaired students are likely to visit a useful website. At present, the good social image of website users in Thailand is a good social influence. To conclude, if the social influence is positive, more visually impaired students will use a website.

Subsequently, website quality significantly influenced actual use of website at  $\alpha < 0.05$  with a correlation coefficient of 0.061, agreeing well with findings from Delone & McLean (2003) and Al-Qeisi et al. (2014). When users realise the good quality of a website—methodical operation, valid and reliable pieces of information, and good website services—and become impressed with their good usage experience, they will visit the website again in the future. As visually impaired students use keyboard to navigate webpage as well as screen reader software to voice out messages, designers and developers of websites need to provide these important



features in their website in order to attract them, in addition to normal users to their website. Other aspects that should be considered are such as the following: the URL of the website should be easy to remember; website response should be swift; website hierarchical structure should be logical—menu buttons are positioned at easy-to-understand locations; presented pieces of information are valid, complete, and sufficient for user needs; and its website services should induce user satisfaction and reliability. To conclude, a positive user perception of the good quality of a website—easily accessible and understandable—leads to a revisit to the website.

On the other hand, two investigated factors were found not to have an influence on actual use of website: performance expectancy and facilitating conditions.

To conclude, five factors affecting website accessibility of visually impaired students in Thailand were confirmed to be significant but two were insignificant. These findings may directly benefit website developers in their effort to make their website accessible to all users.

## REFERENCES

- Abu-Doush, I., Bany-Mohammed, A., Ali, E., & Al-Betar, M. A. (2013). Towards a more accessible e-government in Jordan: an evaluation study of visually impaired users and Web developers. *Behaviour & Information Technology*, 32(3), 273-293.
- Agangiba, M. A., Nketiah, E. B., & Agangiba, W. A. (2017, September). Web Accessibility for the Visually Impaired: A Case of Higher Education Institutions' Websites in Ghana. *Proceedings of International Conference on Web-Based Learning* (pp.147-153). Springer, Cham.
- Ahmi, A., & Mahmood, R. (2016). Evaluating accessibility of Malaysian public universities websites using AChecker and WAVE. *Journal of ICT*, 15(2), 193-214. Retrieved from <http://repo.uum.edu.my/20878>
- Akbar, F. (2013). *What affects students' acceptance and use of technology?*. (Senior Honors Thesis). Retrieved from [https://kilthub.cmu.edu/articles/What\\_affects\\_students\\_acceptance\\_and\\_use\\_of\\_technology\\_/6686654/1](https://kilthub.cmu.edu/articles/What_affects_students_acceptance_and_use_of_technology_/6686654/1)
- Al-Qeisi, K., Dennis, C., Alamanos, E., & Jayawardhena, C. (2014). Website design quality and usage behavior: Unified Theory of Acceptance and Use of Technology. *Journal of Business Research*, 67(11), 2282-2290.
- Almaiah, M. A., Alamri, M. M., & Al-Rahmi, W. (2019). Applying the UTAUT Model to Explain the Students' Acceptance of Mobile Learning System in Higher Education. *IEEE Access*, 7, 174673-174686.
- Arif, M., Ameen, K., & Rafiq, M. (2018). Factors affecting student use of Web-based services Application of UTAUT in the Pakistani context. *The Electronic Library*, 36(3), 518-534.
- Attuquayefio, S., & Addo, H. (2014). Using the UTAUT model to analyze students' ICT adoption. *International Journal of Education and Development using ICT*, 10(3). 147-156. Retrieved from <https://www.learntechlib.org/p/148478>
- Boontarig, W., Chutimaskul, W., Chongsuphajaisiddhi, V., & Papasratorn, B. (2012). Factors influencing the Thai elderly intention to use smartphone for e-Health services. *Proceeding of 2012 IEEE symposium on humanities, science and engineering research* (pp. 479-483). Kuala Lumpur:IEEE.



- Chang, M. Y., Pang, C., Tarn, J. M., Liu, T. S., & Yen, D. C. (2015). Exploring user acceptance of an e-hospital service: An empirical study in Taiwan. *Computer Standards & Interfaces*, 38, 35-43.
- Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS quarterly*, 13(3), 319-340.
- Delone, W. H., & McLean, E. R. (2003). The DeLone and McLean model of information systems success: A ten-year update. *Journal of Management Information Systems*, 19(4), 9-30.
- Department of Empowerment of Persons with Disabilities. (2019). *the situation of disabled people in Thailand Report*. Retrieved from <http://dep.go.th/Content/View/5805/1>
- Ekizoglu, N., & Ozcinar, Z. (2011). A study of developing an anxiety scale towards the internet. *Procedia-Social and Behavioral Sciences*, 15, 3902-3911.
- Electronic Transactions Development Agency. (2019). *Thailand internet user behavior 2019*. Retrieved from <https://www.eta.or.th/publishing-detail/thailand-internet-user-behavior-2019.html>
- Fecke, A., Jeleniowski, S., & Joisten, M. (2015). Accessible Websites for the Visually Impaired: Guidelines for Designers. In *Mensch & Computer Workshopband* (pp. 419-422). Berlin, Boston: De Gruyter.
- Fianu, E., Blewett, C., Among, G. O. A., & Ofori, K. S. (2018). Factors affecting MOOC usage by students in selected Ghanaian universities. *Education Sciences*, 8(2), 70-85.
- Ho, L. A., Kuo, T. H., & Lin, B. (2012). The mediating effect of website quality on Internet searching behavior. *Computers in Human Behavior*, 28(3), 840-848.
- Hooper, D., Coughlan, J., Mullen, M. (2008). Structural Equation Modeling: Guidelines for Determining Model Fit, *Electronic Journal of Business Research Methods*, 6(1). 53-60.
- Hoque, R., & Sorwar, G. (2017). Understanding factors influencing the adoption of mHealth by the elderly: An extension of the UTAUT model. *International Journal of Medical Informatics*, 101, 75-84.
- Ibrahim, O. A., & Zakaria, N. H. (2015). Towards the Development of an Adoption Model for E-Government Services in Developing Countries. *Proceeding of 2015 Pacific Asia Conference on Information Systems*. Singapore.



- Im, I., Hong, S., & Kang, M. S. (2011). An international comparison of technology adoption: Testing the UTAUT model. *Information & Management*, 48(1), 1-8.
- Joiner, R., Gavin, J., Duffield, J., Brosnan, M., Crook, C., Durndell, A., ... & Lovatt, P. (2005). Gender, Internet identification, and Internet anxiety: Correlates of Internet use. *CyberPsychology & Behavior*, 8(4), 371-378.
- Kurfal, M., Arifoğlu, A., Tokdemir, G., & Paçın, Y. (2017). Adoption of e-government services in Turkey. *Computers in Human Behavior*, 66, 168-178.
- Kurt, S. (2011). The accessibility of university web sites: the case of Turkish universities. *Universal Access in the information society*, 10(1), 101-110.
- Loiacono, E. T., Djamasbi, S., & Kiryazov, T. (2013). Factors that affect visually impaired users' acceptance of audio and music websites. *International Journal of Human-Computer Studies*, 71(3), 321-334.
- Maisak, R., & Brown, J. (2014). Web accessibility on Thai higher education Websites. *Proceedings of the Ninth International Conference on Software Engineering Advances*. France.
- Martins, C., Oliveira, T., & Popovič, A. (2014). Understanding the Internet banking adoption: A unified theory of acceptance and use of technology and perceived risk application. *International Journal of Information Management*, 34(1), 1-13.
- Mensah, I. K. (2019). Factors Influencing the Intention of University Students to Adopt and Use E-Government Services: An Empirical Evidence in China. *SAGE Open*, 9(2) 111-136.
- Mukred, M., Yusof, Z. M., & Alotaibi, F. M. (2019). Ensuring the productivity of higher learning institutions through electronic records management system (ERMS). *IEEE Access*, 7, 97343-97364.
- Pluemsamrungsit, P. (2012). Web Accessibility. *Journal of Library and Information Science Srinakharinwirot University*, 4(2), 123-136. Retrieved from <http://ejournals.swu.ac.th/index.php/jlis/article/view/2165>
- Roig-Vila, R., Ferrández, S., & Ferri-Miralles, I. (2014). Assessment of Web Content Accessibility Levels in Spanish Official Online Education Environments. *International Education Studies*, 7(6), 31-45. Retrieved from <https://eric.ed.gov/?id=EJ1070064>



- Saengchai, S. & Jermsittiparsert, K. (2019). Supply Chain in Digital Era: Role of IT Infrastructure and Trade Digitalization in Enhancing Supply Chain Performance. *International Journal of Supply Chain Management*, 8(5), 697-707.
- Sambasivan, M., Wemyss, G. P., & Rose, R. C. (2010). User acceptance of a G2B system: A case of electronic procurement system in Malaysia. *Internet Research*, 20(2), 169-187.
- Samuel, N., & Hillar, A. (2014). Using the UTAUT model to analyze students' ICT adoption. *International Journal of Education and Development using Information and Communication Technology*, 10(3), 75-86.
- Sana'a, Y. (2016). A critical review of models and theories in field of individual acceptance of technology. *International Journal of Hybrid Information Technology*, 9(6), 143-158.
- Saqr, R., & Bhattacharjee, A. (2012). Web Accessibility: Factors Enabling the Visually Impaired to Using Websites. *Proceedings of Americas Conference on Information Systems*. United State.
- Shin, J. I., Chung, K. H., Oh, J. S., & Lee, C. W. (2013). The effect of site quality on repurchase intention in Internet shopping through mediating variables: The case of university students in South Korea. *International Journal of Information Management*, 33(3), 453-463.
- Suksa-ngiam, W., & Chaiyasoonthorn, W. (2015). The adoption of social media by Thai university students: Multiple group moderating effects. *Information Development*, 31(1), 69-82.
- Sutduean, J., Sutduean, C., & Jermsittiparsert, K. (2019). Finding Determinants of Big Data and Internet of Things Driven Competitive Advantage: An Empirical Study of Pharmaceutical Sector of Thailand. *Systematic Reviews in Pharmacy*, 10(2), 372-382. DOI: 10.5530/srp.2019.2.48.
- Tan, P. J. B. (2013). Applying the UTAUT to understand factors affecting the use of English e-learning websites in Taiwan. *Sage Open*, 3(4). 108-113.
- The World Wide Web Consortium. (2018, June 5). *Web Content Accessibility Guidelines (WCAG) 2.1*. Retrieved from <https://www.w3.org/TR/WCAG21>
- The World Wide Web Consortium. (n.d.). *Web Accessibility Initiative (WAI)*. Retrieved from <https://www.w3.org/WAI>
- Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. *MIS Quarterly*, 27(3) 425-478.



- Venkatesh, V., Thong, J. Y., & Xu, X. (2012). Consumer acceptance and use of information technology: extending the unified theory of acceptance and use of technology. *MIS Quarterly*, 36(1), 157-178.
- Venkatesh, V., Thong, J. Y., & Xu, X. (2016). Unified theory of acceptance and use of technology: A synthesis and the road ahead. *Journal of the Association for Information Systems*, 17(5), 328-376.
- Vongjaturapat, S., Chaveesuk, S., Chotikakamthorn, N., & Tongkhambanchong, S. (2015). Analysis of factor influencing the tablet acceptance for library information services: A combination of UTAUT and TTF model. *Journal of Information & Knowledge Management*, 14(3), 126-146. 1550023.
- Williams, M. D., Rana, N. P., & Dwivedi, Y. K. (2015). The unified theory of acceptance and use Of technology (UTAUT): a literature review. *Journal of Enterprise Information Management*, 28(3), 443-448.