

Technology Acceptance: Theories and Applications in Digital Tech

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Abstract: Digital tech or also known as digital technology is a daily driver of mankind. As time evolved, the usage of this technology become multiplex in nature. The acceptance of the technology introduced and the factors that influence the decision to or not to adopt technology become crucial. The situation motivates this research to identify suitable theoretical frameworks to study the human acceptance of digital tech. Bibliographic study via the partial adoption of narrative review and bibliographic coupling had led to Technology Acceptance Model and Unified Theory of Acceptance and Usage of Technology as suitable theories for understanding human acceptance of digital tech. Several other theories: Theory of Planned Behaviour, Theory of Reasoned Action, Theory of Planned Behaviour, Innovation Diffusion Theory and Social Cognitive Theory are also suitable for understanding technology acceptance in digital technology.

Keywords: Technology Acceptance Model, Unified Theory of Acceptance and Use of Technology

1. Introduction

The presence of technology opens up various opportunities for facilitating the regular activities of human beings. Human discernments about digital communication and online interaction are enlightening as a result of the application of technology. Through technology, human beings are able to sustain life in the variability of accomplishments and include social life, education, and employment. Indirectly, it unwraps employment opportunities holistically and comprehensively for all parties. Based on the Gokhan report (2020), Malaysia is one of the initial countries to interchange 5G. According to the Malaysian Department of Statistics, technology and communication contributed 18.5 percent of the national economy in 2018. This consequence in 2018 since Malaysia's mobile broadband subscription is 36.79 million. Thus, the National Fiberisation and Connectivity Plan (NFCP) is

functioning towards providing high-speed digital connectivity throughout the country, comprising rural areas. These developments are important for dynamic Malaysia to endure the competition in the face of the Industrial Revolution 4.0 (IR4.0) era.

The proposal for the authorization of technology elucidates the concept of employment of civil servants in Malaysia. Former Prime Minister Tan Sri Muhyiddin Yassin unveiled the Malaysian Digital Economy Blueprint on February 19, 2021, as a creative approach to building a digital world for civil servants. This desire is known as MyDIGITAL, which necessitates three phases of implementation together with six main thrusts, 22 strategic initiatives, 48 national initiatives, and 28 sectoral initiatives until 2030. In fact, the government maintains that all civil servants develop extra intellectual skills in digital services in line by 2025 (Lutfan, 2021).

Cognizant of the significance of acceptance in technology, telecommunications companies are increasingly aiding the inordinate process of the digital in order to enhance an acceptance factor among the community and society. For example, Telekom Malaysia Berhad contributes to the Fiberisation determination for expanding broadband reportage. The Berita Harian Report (2021) enlightens that among the actions taken is to provide TM's existing fibre network of 600,000 kilometers (km) throughout the country in line with the country's Digital Network (JENDELA). This is critical in understanding the public's optimal recognition as being appealing in digital and technology.

2. Problem Statement

Digital technology has become a crucial, unified, and integrated element of human life in the 21st century. In today's information age, human is interacting with technologies that is not only digital in nature but involve much complex network of interrelated subcomponents and modules. For examples, we are using multiples digital technology such as web 2.0, mobile application and smart devices that were synchronize with each other via nodes of connectivity and cloud technology. The data and interaction with our devices or digital applications were collected using cookies or other analytical technology to be uploaded into the big data. This create a synchronization between our devices or digital application that may be assistive in nature.

Becoming assistive render, a digital technology intuitive for usage. This spearhead for the creation of assistive tech such as Augmented Reality and Virtual Reality. These technologies were first developed in computer science for application in industry to assist human in visualization. As technology evolves, it become imperative for different area of expertise to interact with each other. Digital technology enables the interaction computer science and education and realized the fact that augmentation in visualization is not only needed in industry, but it is also a fundamental skill in education. Thus, Augmented Reality and Virtual Reality are now part of educational technology.

The assistive nature of digital technology is not limited toward visualization per se. Human daily life is also assisted by tech. Siri, Cartona, Alexa and Bixby were colossal proofs of digital technology assistant in human life provided by tech giants of Apple, Microsoft, Amazon, and Samsung respectively. These digital assistants are not only tech enablers, but they make our life easier, organize and efficient. Siri that was first introduced into Apple ecosystem had triggered the application of Artificial Intelligence into smart devices then followed by Google Assistant made for Android. As competition between Apple and Google take place, Cartona play pivotal role in the development of Windows 10 by Microsoft. Today, these digital assistants are available in any smart phone and computer around the globe.

Shopping has never been any convenience that before. Online shopping is no longer the thing of future. Almost everyone with access to smart phone, computer and the Internet were experienced online shopping. The pandemic of Covid-19 had accelerated the maturation of techs linked to the new norm of purchasing. Giant Tech such as Alibaba, Amazon and eBay had flourish in the past decade. Alibaba acquisition of Lazada and the success of Singapore tech unicorn, Shopee further proliferate the application of e-commerce in Southeast Asia. Lazada and Shopee are the top brand recognized by netizen in the regional Malaysia, Singapore, and Philippines. Shopee is not the only tech unicorn that

begin as tech start up in Southeast Asia. Grab is a decacorn started in this region. Grab is now inclusive with numerous services offered such as accommodation, delivery, and online shop. Using digital technology, Grab and Uber, its former competitor in this region had provided us with hassle free, cost effective and economical alternative to public transport. It might eliminate the need for individually owned vehicle.

Autonomous vehicle is a giant leap in transportation technology. Tesla, founded in United States highly acclaimed Silicon Valley is at this time leading the technology. Its success is highly related to intuitiveness of its tech with users as well as other factor such as breakthrough in batteries technology that powered the autonomous plus electrical vehicle, EV. To this date, no clear competitors for Tesla as it is now dominating the market. The success of Tesla paved way to revolutionize modern transportation. Shift from naturally aspirated or induction combustion engine and hybrid to EV might come into existence. Likely upcoming contenders such as Apple with its own EV and Nissan with its current momentum of R&D toward its fleet of existing EV might further spice up the market. Consumers might have variety of selection once these techs become matured in the time to come.

Ability to make selection involve convoluted decision-making process. It is not only involved cognitive process such as critical, logical, and reasoning ability then always involve affective elements of persuasion, preference, and aesthetic. According to the Theory of Reasoned Action, there is reason behind every action made by mankind.

Therefore, how we can understand human in making decision? What are the factors that were taken into consideration for a technology to be accepted by mankind? These questions lead to the construction of the following research objective:

To identify the suitable theoretical frameworks to understand human acceptance of digital tech.

3. Methodology

This research is a bibliographic study anchored on analysing the existing volumes of scientific data. We partially adopted narrative review and bibliographic coupling techniques to scientifically mapping the suitable and renown literature in technology acceptance. Scopus was used as the sole database for the collection of articles. Articles collection was conducted on 25 October 2021. The articles search was performed in two sequential phases of phase 1 and phase 2.

4. Results

The articles search begins with the keyword of “technology acceptance” for phase 1. This resulted in 41814 documents with 13983 articles are from Computer Science, 12286 from Engineering, 8346 in Social Sciences, 7034 in Medicine, 5523 in Business, Management and Accounting with the balance were from multiple subject areas such as Energy, Environmental Science, Mathematics, Decision Sciences, Material Science and other related areas. In 2020 saw the higher number of articles at 3634 and the publications of 2019 to 2921 surpassed 3000 articles per year. Top five authors were Martina Ziefle affiliated at Rheinisch-Westfalische Technische Hochschule Aachen, Germany; Timothy Teo affiliated to Murdoch University, Australia; Yogesh K. Dwivedi affiliated at Swansea University, United Kingdom; Michael Siegrist from ETH Zurich, Switzerland and Ramayah from Universiti Sains Malaysia, Malaysia. The output of phase 1 search is as in Table 1.

Table 1: Output of phase 1 search

	Parameters	Articles, <i>n</i>
Subject Area	Computer Science	13983
	Engineering	12286
	Social Sciences	7034
	Medicine	5523

	Business, Management and Accounting	5523
Year	2021	3359
	2020	3634
	2019	3428
	2018	2698
	2017	2370
Top Authors	Martina Ziefle, Germany (<i>h</i> -index: 33)	162
	Timothy Teo, Australia (<i>h</i> -index: 37)	70
	Yogesh K. Dwivedi, United Kingdom (<i>h</i> -index: 70)	56
	Michael Siegrist, Switzerland (<i>h</i> -index: 66)	45
	Ramayah, Malaysia (<i>h</i> -index: 46)	42

The refinement was further made to identify the leading theoretical framework for technology acceptance. Leading theory is identifiable based on the number of citations. Citation data is as in Table 2.

Table 2: Citation data of phase 1

Authors	Article	Journal	Quartile	Citation, <i>n</i>
[1]	Perceived Usefulness Perceived Ease of Use, and User Acceptance in Information Technology	MIS Quarterly: Management Information Systems	Q1	25384
[2]	User Acceptance of Information Technology: Toward a Unified View	MIS Quarterly: Management Information Systems	Q1	16533
[3]	A Theoretical Extension of the Technology Acceptance Model: four Longitudinal Field Studies	Management Science	Q1	9601

Based on the data analysed, further break down into the theoretical content of the top three articles by [1], [2] and [3] were discussing about the follow theories as in Table 3.

Table 3: Theories

Authors	Theory	Fundamental Theory	Source of Fundamental Theory
[1]	Technology Acceptance Model	1. Theory of Reasoned Action	[4]

		1. Theory of Reasoned Action	[4]
		2. Technology Acceptance Model	[1]
		3. Motivational Model	[5]
[2]	Unified Theory of Acceptance and Use of Technology	4. Theory of Planned Behaviour	[6]
[3]		5. Technology Acceptance Model & Theory of Planned Behaviour	[7]
		6. PC Utilization	[8]
		7. Innovation Diffusion Theory	[9]
		8. Social Cognitive Theory	[10]

As show in Table 3, there two most prominent theory applied in understanding the acceptance of technology which are Technology Acceptance Model by Davis [1] and Unified Theory of Acceptance and Use of Technology by Venkatesh, Davis and their fellow researchers [2], [3]. These two models were constructed based on its predecessors such as Theory of Reasoned Action [4], Technology Acceptance Model (for Unified Theory of Acceptance and Use of Technology only), Motivational Model [5], Theory of Planned Behaviour [6], Innovation Diffusion Theory [9] and Social Cognitive Theory [10].

The search was later refined with the combination of “technology acceptance” and “digital technology” for phase 2. In this phase, 3720 documents were reported from the search. The subject areas are still leaded by Computer Science (articles, $n = 1503$), followed by Engineering (articles, $n = 997$) and Social Sciences (articles, $n = 837$). The third and fourth place also remain the same with Medicine at 572 articles and Business, Management and Accounting with 472 articles. The same pattern is observable at the frequency of articles publication according to years with 2019 to 2021 recorded the highest intensity. Output of phase 2 is as in Table 4.

Table 4: Output of phase 2 search

	Parameters	Articles, n
Subject Area	Computer Science	1503
	Engineering	997
	Social Sciences	837
	Medicine	572
	Business, Management and Accounting	472
Year	2021	490
	2020	471
	2019	385
	2018	248
	2017	200
Top Authors	Martina Ziefle, Germany (h -index: 33)	18
	Vishanth Weerakkody, United Kingdom (h -index: 39)	10

Three highest citation were [11]–[13]. However, [11] was not included in further analysis as it have more focus toward biometrics. Profile of articles with highest citation were as in Table 5.

Table 5: Citation data of phase 2

Authors	Article	Journal	Quartile	Citation, n
[12]	Determinants of User Acceptance of Digital Libraries: An Empirical Examination of Individual Differences and System Characteristics	Journal of Management Information Systems	Q1	493
[13]	Understanding Digital Inequality: Comparing Continued Use Behavioural Models of the Socio-Economically Advantaged and Disadvantaged	MIS Quarterly: Management Information Systems	Q1	416

The theories applied by the articles were as in Table 6.

Table 6: Theories

Authors	Theory	Source of Theory
[12]	Technology Acceptance Model	[4]
[13]	Technology Acceptance Model Theory of Planned Behaviour	[4] [6]

Finding as in Table 6 further reinforce the finding resulted in from phase 1 that Technology Acceptance Model and Theory of Planned Behaviour as the major theories explaining technology acceptance. Yet, the influence of Unified Theory of Acceptance and Use of Technology is still observable in [12] and [13].

5. Discussion

This paper is sought to identify the suitable theoretical frameworks for understanding technology acceptance in digital tech. This research had employed bibliographic approach to achieve the research objective stated via two phases article search.

From the total of 41814 documents, two major theories of technology acceptance were identified which are Technology Acceptance Model and Unified Theory of Acceptance and Usage of Technology. Theories such as Theory of Reasoned Action, Theory of Planned Behaviour, Innovation Diffusion Theory, and Social Cognitive Theory are also exhibited significant contribution to technology acceptance research.

The application of these theories were in line with extant literature. Zheng et al. [14] apply Technology Acceptance Model in understanding the major intention players in decision to adopt robo-advisors in Malaysia retail market. The same theory serve as fundamental theory in study about the intention to use digital learning technologies in Switzerland [15]. The acceptance of digital technology such as remote teaching-learning systems [16], wearable devices [17], online streaming services [18], and electric vehicle [19] were studied using Technology Acceptance Model.

Our finding about Unified Theory of Acceptance and Use of Technology as one of important theory in technology acceptance of digital technology is also in concurrent with previous research. The theory of Unified Theory of Acceptance and Use of Technology is the fundamental theoretical framework in the acceptance of digital health did by Philippi et al. [20]. The same theory was also applied in other digital technology such as digital payments [21], digital health consultation [22], and mobile application [23].

The contribution of our paper is, we had identified several theoretical frameworks suitable for technology acceptance research in digital technology which are Technology Acceptance Model and Unified Theory of Acceptance and Use of Technology.

6. Conclusion

Digital technology or shortly known as digital tech, is now an incorporated element of human life. It opens to various options that available for human to make decision. The process of making decision is a nonlinear process that need to be understood. Therefore, a theoretical framework that able to explain this decision-making process is needed. To understand this process, the Technology Acceptance Model and Unified Theory of Acceptance and Usage of Technology are suitable to be employed for future related research about digital technology acceptance.

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