

Conceptual Model of TAM and TTF Integration

Mediaty¹, Grace T. Pontoh^{2*}, Aini Indrijawati³, Ade Ikhlas Amal Alam⁴, Julius Jillbert⁵, Christoforus Yohannes⁶, Syaiful Ali⁷, Jacqueline Birt⁸, Astri Dyastiarini⁹, Wa Ode Rayyani¹⁰, Safria Syarifuddin¹¹, Muhammad Faisal Arif¹²

Abstract

This paper aims to examine the conceptual model in the integration of TAM and TTF for the use of information technology (IT). We searched for related articles, using the Publish or Perish and Watase UAKE applications, with the keywords “TAM” and “TTF. The results yielded 21 articles and we separated 15 articles with publications through journals with the reputation of Scopus Q1 and Q2. The results found that various studies have used the TTF model as an external variable of TAM. This shows that customers who feel that technology can help them complete tasks will have the perception that technology is useful for them. Finally, this study has implications for both producers and users. Manufacturers is suggested to create technology products that focus on completing customer tasks and providing information about the usefulness of technology. Customers are expected to learn various technological functions before the technology is adopted.

Keywords: *Conceptual Model, Integration, TAM, TTF.*

1. Introduction

About the use of technology, the TAM has become a model that psychologically explains user interactions with technology and how users perceive and use information technology (IT). This well-known model (Davis, 1989) is predicting user attitudes toward IT adoption very effectively, as suggested by Venkatesh & Davis (2000) and Chen (2019). The model is most often used as a theoretical foundation in predicting the intention to use IT (Shaikh & Karjaluoto, 2015). In Technology Acceptance Model (TAM) modeling, perceived ease of use is essential, which is described as the extent to which a person strongly believes that using a particular technology will be less of effort (Davis in Kee et al., 2022). When users feel the easiness of technology services, they are more willing to adopt technology (Gupta et al. in Rustariyuni et al., 2022).

TAM, PU, and PEOU are the determining factors in IT adoption. According to Davis (1989), this caused, first, “Someone's tendency to use technology or not when they feel

¹ Faculty of Economics and Business, Hasanuddin University, South Sulawesi, Indonesia

² Faculty of Economics and Business, Hasanuddin University, South Sulawesi, Indonesia, gracetpontoh@fe.unhas.ac.id, ORCID: 0000-0001-6672-5408

³ Faculty of Economics and Business, Hasanuddin University, South Sulawesi, Indonesia

⁴ Faculty of Economics and Business, Hasanuddin University, South Sulawesi, Indonesia

⁵ Faculty of Economics and Business, Hasanuddin University, South Sulawesi, Indonesia

⁶ Faculty of Economics and Business, Hasanuddin University, South Sulawesi, Indonesia

⁷ Universitas Gadjah Mada

⁸ University of Western Australia

⁹ Faculty of Economics and Business, Hasanuddin University, South Sulawesi, Indonesia

¹⁰ Faculty of Economics and Business, Hasanuddin University, South Sulawesi, Indonesia

¹¹ Faculty of Economics and Business, Hasanuddin University, South Sulawesi, Indonesia

¹² Faculty of Economics and Business, Hasanuddin University, South Sulawesi, Indonesia

confident it helps in doing a better job,” this statement refers to Perceived Usefulness (PU), whereas second, when one perceives technology as too difficult to use, they will decide not to adopt and use it even if the technology provides usability, that refers to the Perceived Ease of Use (PEOU). Some researchers suggest that PU and PEOU are the main factors for assessing behavioral intentions toward IT adoption (Kucukusta et al., 2015; Kim et al., 2010) with the highly predictive ability (Kiraz & Ozdemir, 2006; Teo, 2009). In addition to influencing IT adoption behavior, TAM is also used as a model to determine the ongoing intention of using IT (Chen, 2019; Lee et al., 2015; Foroughi et al., 2019; Baabdullah et al., 2019).

In addition to testing the PU and PEOU constructs in relation to influencing users to adopt TI and TAM also shows a positive relationship between the PU and PEOU constructs where PEOU is able to influence PU positively. That is, users who feel that technology is easy to use, make it easier for users to complete their tasks with technology, so that technology is increasingly useful (Daradkeh, 2019). However, some studies have suggested that PU and PEOU are incomplete predictors because of the lack of actionable guidance (Chen, 2019). Another study has also proposed (Davis, 1989) the use of external factors affecting the intentions and actual use of new technology through the influence of mediation on PU and PEOU (Daradkeh, 2019). Several studies have used external factors in TAM, such as self-efficacy and perception of risk, and compatibility (Alsoufi & Ali, 2014; Marakarkandy et al., 2017; Gumussoy et al., 2018; Jain & Agarwal, 2019), social influence and quality of the internet, and perceived trust (Bashir & Madhavaiah, 2015; and Usman et al., 2022).

In addition to TAM as an IT acceptance model, TTF is also a widely used model for researching IT acceptance. The TTF framework observes the need for compatibility between technologies and task requirements (Goodhue & Thompson, 1995), wherein if IT is considered capable of helping in carrying out daily tasks, then IT is likely received by users. Unlike other IT adoption theories with IT acceptance based on user perceptions and choices, TTF sees IT adoption based on the suitability of user task technology (Afshan & Sharif, 2015). If IT does not contribute to the performance of the task, then the user does not adopt IT (Junglas et al., 2008).

This model explains adoption with four constructions: task characteristics, technological characteristics, technological suitability of tasks, and usage. The task and tech determine the suitability of the technology of the task leading to the adoption and use of IT (Oliveira et al., 2014). Goodhue and Thompson (1995) provide opinions in task by including actions that have an impact on providing stimulus for users by relying more on certain aspects of IT that are appropriate to the task (Baabdullah et al., 2019). When the characteristics of the task require a high level of mobility, the use of IT will be optimal to carry out the task because it increases the focus on the task (Oliveira et al., 2014).

In addition, when the task is very urgent, the focus on user compatibility will be high when using IT (Zhou et al., 2010), means that the user's TTF is high. Another study (Goodhue & Thompson, 1995) suggested that technological characteristics are tools such as hardware and software that users use to carry out tasks (Valaei et al., 2019). If technology matches the performance of the task, then the user might adopt it (Schrier et al., 2010). The technological characteristics in the TTF model focus on the utilization where the use of the work is designed and not on the usefulness or quality of the adopted IT (Goodhue & Thompson, 1995).

Some studies have integrated technology acceptance theories such as the integration of TTF and Universal Theory of Acceptance and Use of Technology (UTAUT) (Zhou et al., 2010; Wu & Hu, 2017; Ahmed et al., 2017; Abbas et al., 2018; Lin et al., 2019). In addition to the integration of TTF and UTAUT, several studies have included Information Technology Management in the integration of the theory (Oliveira et al., 2014; Afshan & Sharif, 2015; Baganzi et al., 2021), the integration of UTAUT and DeLone & McLean

Model of Information System Success (D&M ISS) (Lin et al., 2019), and TAM and UTAUT (Abu-Taieh et al., 2022). Our research examines the integration of TAM and TTF in IT reception, such as mobile banking reception (Yuan et al., 2014; Baabdullah et al., 2019; Valaei et al., 2019; Rahi et al., 2021) and e-Wallet (Yaakop et al., 2021). In addition, some examined the use of various types of IT, such as e-Learning by Lin and Wang (2012), Wu and Chen (2017), Cheng (2019), and Vanduhe et al. (2020); tourism industry, e.g., hotel (Kim et al., 2010; Schrier et al., 2010), automobile telematics devices (Chen, 2019), Self-Service Analytics (SSA) (Daradkeh, 2019), and wireless technology (Yen et al., 2010).

TAM and TTF integration is shown with various constructs of both models. TTF constructs, such as task and technology characteristics, become external variables in TAM with an influence on PU and PEOU (Baabdullah et al., 2019; Rahi et al., 2021). In addition, TTF also becomes an external variable for TAM (Schrier et al., 2010; Wu & Chen, 2017; Daradkeh, 2019; Vanduhe et al., 2020). TTF is the dominant variable in the integration of TTF and TAM with TTF influence testers on PU and PEOU. The TTF construct can also directly affect IT acceptance, such as task and technology characteristics and TTF against Continued Intention (CI) (Yen et al., 2010; Valaei et al., 2019).

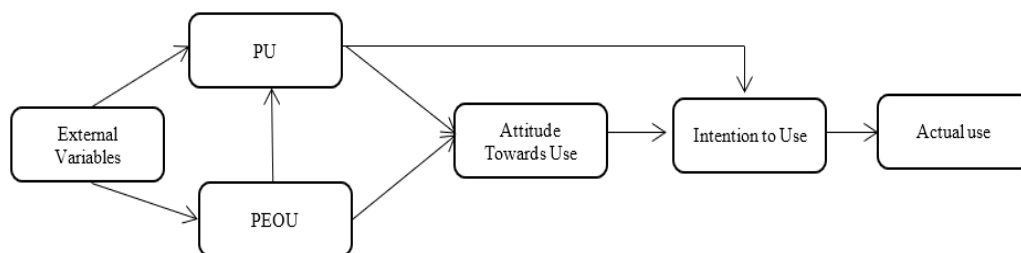
This research was carried out with a conceptual model study of the integration of TAM and TTF in IT acceptance. To our knowledge, there has been no research that has conducted a literature study specifically on the integration of TAM and TTF in various types of IT use by several users. This study aims to provide a deeper insight into the integration of the TAM and TTF for the use of IT. For this conceptual model study, we begin with an introduction in the first section, then the method we used in this review in the second part. Our third and fourth sections present the results and discussion, and our final section closes with conclusions and research advice.

2. METHOD

TAM & TTF Models

This research was carried out by integrating TAM and TTF to measure IT use. We use TAM developed by Davis (1985). TAM is a theory of intention that has gained widespread acceptance in recent years (Kim et al., 2010), and TAM has received widespread attention from researchers in the field of IT due to the following three things (Liao et al., 2009). First, in psychological theory, TAM has a strong foundation. Second, TAM can be used as a guideline for IT development. Finally, TAM is tested in previous studies that support the robustness of cross-time models, backgrounds, populations, and technology.

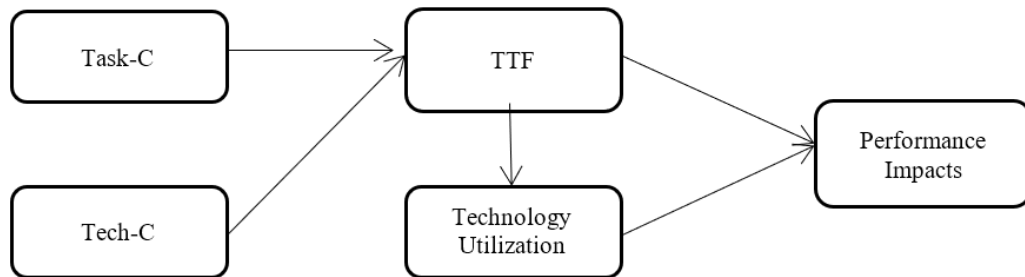
Figure 1. TAM Model (Davis, 1985)



TTF was developed by Goodhue and Thompson (1995) and refers to technology that helps individuals carry out task portfolios. The main effects include a significant relationship between the use of certain technologies and a person's performance with

appropriate use and the level of TTF affecting technology use (Lam et al., 2007). However, if technology is not by its duties, then it cannot be implemented successfully (Dishaw & Strong, 1999)

Figure 2. TTF Model (Goodhue & Thompson, 1995)



Article Search Methodology

Mapping research articles is performed using two applications, Publish or Perish and Watase UAKE, using keywords “TAM integration and TTF.” After we found various articles related to the keywords, we downloaded each article and traced the articles that examined the integration of TAM and TTF. Our search results found 21 articles; for the record, we did not use articles that examine the direct influence of TTF on IT use if the article does not conduct tests that integrate the TAM and TTF constructs. The article that we found was then traced to the journal ranking using Scimago. As a result, we found 15 articles published in journals with Scopus Q1 and Q2 ratings. Our search results are displayed in Table 1.

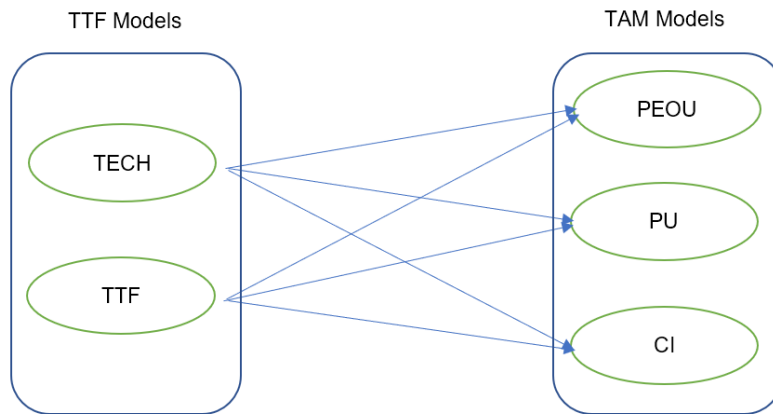
Table 1. Integration of TAM with TTF

Author's Name	Rank/Quartile	Content	Country
Dishaw, M. T. & Strong, D. M. (1999)	Q1	Software utilization Management Information System (MIS) literature	US
Kim, T. et al., (2010)	Q1	Hotel Information System (HIS)	South Korea
Schrier, T. et al. (2010)	Q1	Guest Empowerment Technologies (GET) Hotels	
Yen, D. C. et al. (2010)	Q1	Wireless Technology	
Lin, W.-S., & Wang, C.-H. (2012)	Q1	e-Learning System	China
Yuan, S. et al. (2014)	Q2	m-banking	China
Wu, B., & Chen, X. (2017)	Q1	Massive Open Online Courses (MOOCs)	China
Chen, N. H. (2019)	Q1	Automobile Telematics Devices	Taiwan
Cheng, Y. M. (2019)	Q2	Cloud-based e-Learning	Taiwan
Daradkeh, M. (2019)	Q1	Self-Service Analytics (SSA)	Jordan
Baabdullah, A. M. et al. (2019)	Q2	m-banking	Saudi Arabia
Valaei, N. et al. (2019)	Q1	m-banking	
Vanduhe, V. Z. et al. (2020)	Q1	Gamification Training	Cyprus

Rahi, S. et al. (2021)	Q2	Internet Banking	Pakistan
Yaakop, A. Y. et al. (2021)	Q2	e-Wallet	Malaysia

The results from the article search show that most were published by Scopus Q1 reputable journals with dominant publications originating from Elsevier Science and Emerald Insight. The results of TAM and TTF integration in 15 articles found that the TTF constructs serve as an external variable in IT acceptance. TTF constructs can be tested for their effects on PU and PEOU as well as their direct influence on IT acceptance. We have found the integration of TAM and TTF in 15 articles, which can be shown in Figure 3.

Figure 3. TAM and TTF Integration Framework



Notes: TASK: Task Characteristics; TECH: Technology Characteristics; TTF: Task Technology Fit; PU: Perceived Usefulness; PEOU: Perceived Ease of Use; CI: Continuous Intention

3. RESULTS

The results of the discussion show the relationship between TAM and TTF integration in the use of IT. Not all collected studies test all TAM and TTF variables as part of the integration, as shown in Figure 3. Results of the integration of TAM and TTF in various collected studies are shown in Table 2.

Table 2. Summary of the Integration between TAM with TTF

Research Variable		Researchers and Year of Research	Research Results
Independent	Dependent		
TECH	PEOU	(Yen et al., 2010); Baabdullah et al., 2019); (Rahi et al., 2021)	Significant influence
TECH	PU	(Yen et al., 2010)	Significant influence
TTF	PU	(Dishaw & Strong, 1999); (Kim et al., 2010); (Schrier et al., 2010); (Yen et al., 2010); (Lin & Wang, 2012); (Yuan et al., 2014); (Wu & Chen, 2017); (Cheng, 2019); (Chen , 2019); (Baabdullah et al., 2019); (Daradkeh, 2019); (Vanduhe et al., 2020); (Rahi et al., 2021); (Yaakop et al., 2021)	Significant influence with the exception of research from Yen et al. (2010) and Vanduhe et al. (2020)
TTF	PEOU	(Dishaw & Strong, 1999); (Kim et al., 2010); (Yen et al., 2010); (Schrier et al.,	Significant influence with the exception of research

		2010); (Wu & Chen, 2017); (Chen, 2019); (Daradkeh, 2019); (Vanduhe et al., 2020); (Rahi et al., 2021); (Yaakop et al., 2021)	from Yen et al. (2010)
TECH	CI	(Valaei et al., 2019)	Significant influence
TTF	CI	(Yuan et al., 2014); (Baabdullah et al., 2019); (Valaei et al., 2019)	Significant influence

The results show that some researchers make TTF an external variable to TAM to reflect external influences and explain IT acceptance (Davis, 1985). TTF is used to test its effect on PU in 14 out of 15 articles while 10 out of 15 articles test on PEOU. In addition, we found three articles that make TECH an external variable and specifically test its effect on PEOU. In addition, we found three articles that tested the direct influence of TTF on CI. We believe that this is the strongest part of the TAM and TTF integration relationship without compromising other TAM and TTF integration tests.

The study results showed the integration of TECH and PEOU, as did the results of previous studies (Yen et al., 2010; Baabdullah et al., 2019; Rahi et al., 2021) that found TECH affects PEOU. This shows that certain characteristics inherent in IT are a reflection of PEOU. In addition, effective and interactive technology can provide users with perceptions of ease of use of technology. Another inherent characteristic, the technological characteristics of TECH, can influence the perception of usability (PU) of users (Yen et al., 2010). This shows that users will believe that IT can help them complete tasks.

Furthermore, the integration relationship between TAM and TTF is presented through the influence of TTF on PU and PEOU. We start with the integration of TTF and PU, where technology that provides high task compatibility provides users with the feeling of IT usefulness. In addition, increasing technological suitability for users will give them confidence that technology provides more value. Although theoretically, TTF has an influence on PU, it is different from the findings of Yen et al. (2010) and Vanduhe et al. (2020) which show different results. This result may be due to a lack of training provided to users so that the usefulness of IT does not support them in completing tasks or the inability of users to optimize the use of IT in doing their work.

When the level of conformity of tasks and technology increases, users feel the ease of use of IT with integration through TTF and PEOU. Not all research results support the integration of TTF and PEOU. Yen et al. (2010) had different results because the lack of training in IT use leaves users with low perceptions of ease of use.

We discuss the results of research that examines the direct effect of the TTF construct on IT use. We started with the integration of TASK, TECH, and CI as the results of the study (Valaei et al., 2019). This shows that only the technological characteristics of IT, such as features that support the suitability of the task, make users have an ongoing intention to use IT.

The characteristics of the task do not make the user have ongoing intentions. This is because the characteristics are yet to determine the use of IT; hence, it is not related to ongoing intentions. The last part of TTF and CI integration shows all research supports this integration. This shows that as long as IT gives users conformity in carrying out their duties with high quality, users will be interested in using IT continuously.

In addition, we discuss the results of testing each of the TAM and TTF constructs in our study based on the research we collected such as the TAM construct which tests the effect of PU and PEOU on Continued Intention, and the effect of PEOU to PU. We present the results of this study in the following table;

Table 3. Test results for each construct in the TAM and TTF models

Research Variable		Researchers and Year of Research	Research Results
Independent	Independent		
PU	CI	(Cheng, 2019); (Chen, 2019); (Baabdullah et al., 2019); (Daradkeh, 2019); (Rahi et al., 2021); (Yaakop et al., 2021); (Kim et al., 2010); (Lin & Wang, 2012); (Schrier et al., 2010); (Wu & Chen, 2017); (Yen et al., 2010); (Yuan, 2014)	Significant influence
PEOU	CI	(Chen, 2019); (Baabdullah et al., 2019); (Daradkeh, 2019); (Yaakop et al., 2021); (Schrier et al., 2010); (Yen et al. 2010); (Yuan, 2014)	(Baabdullah et al., 2019) and (Yuan, 2014) found PEOU and CI had no effect, while other studies found a significant effect
PEOU	PU	(Chen, 2019); (Daradkeh, 2019); (Rahi et al., 2021); (Kim et al., 2010); (Vanduhe et al., 2020); (Wu & Chen, 2017); (Yen et al., 2010); (Yuan, 2014)	Significant influence
TASK	TTF	(Cheng, 2019); (Chen, 2019); (Baabdullah et al., 2019); (Rahi et al., 2021); (Schrier et al., 2010); (Valaei et al., 2019); (Yen et al., 2010)	Significant influence
TECH	TTF	(Cheng, 2019); (Chen, 2019); (Baabdullah et al., 2019); (Rahi et al., 2021); (Schrier et al., 2010); (Valaei et al., 2019); (Yen et al., 2010)	Significant influence

The results of research where PU has a significant effect on CI indicate that PU is a strong factor in predicting users' continuing intentions. Users who have identified and/or feel the use of IT generate an intention to use it, besides that users who feel IT is more useful and increase productivity in their daily activities, the intention to continue using IT is increasing. Then the results of research that tested the effect of PEOU on CI generally found positive results. However, in contrast to the relationship between PU and CI, in this section we found inconsistent results (Baabdullah et al., 2019) for mobile banking users in Saudi Arabia, this may be because mobile banking users do not care about the level of ease or difficulty in using m -banking. In addition, the same results were stated (Yuan et al., 2014) for mobile banking users in China whose perception of usability can influence their intention to return to using IT so that the ease of use of IT is considered unimportant. Lastly, to test the TAM construct, it was shown that all studies found the effect of PEOU on PU. Users who have felt that IT is easy to use will feel that IT is useful.

Furthermore, the results of research that tested the TTF construct showed that TASK had an influence on TTF with all the research results supporting it. This shows that customers have a greater tendency to utilize IT if the IT capabilities match the user's needs in completing their tasks. The same thing was also shown by several research results that TECH affects TTF. The features of an IT which are the characteristics of technology are of concern to users to determine the suitability of IT in assisting them in completing their daily tasks. A comparison of the TASK and TECH constructs in the TTF model provides evidence that TECH has a greater influence on TTF than TASK. Because some of the IT products on the market are products that use the latest technology, users may not know the benefits of IT in helping them carry out their tasks.

4. DISCUSSION

We divide this section into two, the first is TTF as an external variable for TAM and the direct integration of TTF into TAM. As in the framework, TASK, TECH, and TTF in the TTF model become TAM external variables where the influence of the two is tested on TAM constructs such as PU dan PEOU. Second, we discuss the direct integration in which TECH and TTF affect the intention to continue in TAM. Our additional analysis discusses how the TAM construct relates to technology use where PU and PEOU influence the intention to sustain, and the effect of PEOU on PU. For the TTF construct, we also discuss the relationship between TASK and TECH to TTF.

TTF and TAM Integration: External Variables

TTF constructs that become TAM external variables are the TECH and the suitability of TTF. TECH is an important factor in influencing the perception of ease of use (Baabdullah et al., 2019) by researching the use of m-banking. In m-banking there are a number of features that can make customers more interested and appreciate it more positively in terms of ease of use. In addition, m-banking is naturally a place where customers can access various banking services when needed, with fast and safe use. The results positively describe the quality that is reflected in the function of using m-banking and the ease obtained in using technology. Rahi et al. (2021) also found the same thing in the use of m-banking, where technological characteristics make it easy for users to transact with m-banking. Another study showed certain characteristics that wireless technology has in the company to make employees likely to have ease in its use (Yen et al., 2010). In addition to ease of use, technological characteristics influence perceptions of usability, although only found by Yen et al. (2010) which examines the use of wireless technology in companies. The more companies provide wireless technology, the more technology would be perceived as useful by employees, bringing them comfort in their daily tasks.

Furthermore, the suitability of task technology as an external variable affects PU and PEOU in integrating TAM and TTF. Various articles conducted this test, with a few conducting both tests in the use of IT, such as software utilization in MIS literature (Dishaw & Strong, 1999), Hotel Information System (HIS) (Kim et al., 2010; Schrier et al., 2010), massive open online courses (Wu & Chen, 2017), automobile telematics devices (Chen, 2019), and SSA (SadTAG), e-banking, and e-wallet (Yen et al., 2010; Rahi et al., 2021; Yaakop et al., 2021).

In using HIS, a stronger relationship was found in TTF and PU than PEOU. This shows that TTF in principle focuses on the user's perception of usability rather than the ease of use of HIS. When HIS is in accordance with the assignment in doing work, hotel employees consider HIS to be easy to use and useful (Kim et al., 2010) or provide more value for hotel end users (Schrier et al., 2010). From the perspective of e-learning use, Wu and Chen (2017) found the influence of TTF on PU and PEOU for MOOCs, a learning approach based on virtual technology. MOOCs provide opportunities for teachers to reach more students around the world and students can gain access to education with open scholarships provided by various universities (Alario-Hoyos et al., 2014). The functional suitability of MOOCs with certain tasks allows students to understand the ease of use and use of MOOCs (Wu & Chen, 2017).

Gamification Training technology (Vanduhe et al., 2020) found that only PEOU can be affected by TTF and that PU does not. An online-based training technology with the benefits of flexibility, ease of access, introduction of critical thinking skills, and achieving desired results is considered a mechanism that encourages motivation, participation, involvement, and collaboration (Stiegler & Zimmermann, 2015). The results do not support the integration of TTF and PU, indicating that instructors need training in the use of gamification technology.

The use of Automobile Telematics Devices gives TTF an influence on PU and PEOU (Chen, 2019). This system is the result of a combination of IT developments that provide additional services when using a vehicle with the scope of services for several applications in navigation, driving entertainment, safety, and security for drivers. In addition, the results of the integration of TTF and TAM through PU and PEOU support the use of SSA (Daradkeh, 2019). Technology provides an offer for users in carrying out business activities in access, analysis, and information that can assist in making decisions based on business data, without waiting for data from the IT department (Burke et al., 2016). In the e-banking and e-wallet industry (Rahi et al., 2021); and (Yaakop et al., 2021) found results that support the integration of TTF through its effect on PU and PEOU but differ from the results of the research found (Yen et al., 2010).

Research in the e-banking and e-wallet industry (Rahi et al., 2021; Yaakop et al., 2021) revealed findings that supported the integration of TTF through its influence on PU but not through PEOU (Yen et al., 2010). These results provide input for IT service providers by understanding the needs and desires of users who determine their behavior, understanding providers with what they can do to improve IT application features, and reducing usage barriers, such as ugly displays or less useful features.

Finally, some researchers have tested TTF only against PU, such as Lin and Wang (2012), Yuan et al. (2014), Cheng (2019), Baabdullah et al. (2019). Their results support the integration of TAM and TTF. It should be a concern that some research has led to the integration through TTF relationships with PU compared with PEOU. In m-banking, Baabdullah, et al. (2019) provide suggestions in m-banking applications to provide targeted users with features that have the function of carrying out adequate tasks with quality that can meet user needs, which would trigger that customers are more likely to consider the use of such technology in their daily lives, and therefore, they will have an intention with more interest in using technology in a sustainable way. Meanwhile Yuan et al. (2014) found that the TTF felt by IT users greatly affected PU. If users feel that m-banking services are not compatible with their daily tasks, then IT provides services with a low level of usability and this affects the user's intention to return to using m-banking services.

TAM and TTF Direct Integration

We note the minimal amount of research in the direct integration of TAM and TTF through the technology characteristics (TECH), and the suitability of the technology task (TASK) to the ongoing intention of using technology. Valaei et al. (2019) conducted tests of all TTF constructs and found that only TECH and TTF had an influence, whereas TASK is not. Slightly different results are found by Dishaw and Strong (1999) on the use of IT in the MIS literature which offers a general concept of data representation. These findings show that TASK is able to influence the use of TI while the results of TTF are different from those (Valaei et al., 2019). Other studies have focused on testing TTF for continuance intentions such as Yuan et al. (2014); and Baabdullah et al. (2019) whose results support the hypothesis.

The constructs in TTF contribute to IT adoption including m-banking banking applications (Valaei et al., 2019), these findings imply that the performance characteristics need to be aligned with the TASK and TECH constructs in the TTF model in order to better match when using m-banking applications. If users find that TASK and TECH are not compatible with their expectations of IT, then the adoption and or intention of continuing to use IT will be lower. Baabdullah et al. (2019) found a high TTF level for m-banking customers, and this reflects positively the intentions of customers using m-banking.

Users can feel that the m-banking service is not suitable for the task; they considered the service less useful and expressed low intention to continue using it. Yuan et al. (2014) provide input in banking to use principles that put users first when providing m-banking

services, by giving more priority to users to meet their needs. Banking can identify various users and provide services so as to meet the needs of different users, to achieve a good TASK match.

Supplementary Analysis

In this section, we add an analysis of the relationship between each construct from each model, both TAM and TTF. The first relationship is the relationship between PU and CI where all the research results we have collected show that PU is able to influence CI for users of information technology. For users of banking technology, m-banking is a more useful and productive technology by providing services to customers accessing various banking services without time and place limitations (Baabdullah et al., 2019). Business users who can recognize the use of IT, tend to have a higher intention to adopt it to develop their reports and analytics (Daradkeh, 2019). In addition to the PU and CI relationship, we found a relationship between PEOU and CI in the TAM construct, except for the research results presented (Baabdullah et al., 2019) and (Yuan et al., 2014).

When compared to the effect of PU and PEOU on CI, (Chen, 2019) found that PEOU has a stronger influence than PU for users of telematic technology in driving. This shows that the intention is high to use telematics because they believe that telematics provides convenience for drivers with more controlled driving functions, on the other hand, intentions can be lower because drivers feel that telematics does not provide much convenience for them in driving. Finally, the TAM construct relationship is the influence of PEOU on PU for users of information technology. For students, PEOU virtual technology-based online learning is a strong predictor of PU, in that the more virtual-based learning technology is perceived as easy to use, the more likely students will find the technology useful.

Furthermore, the test results between the TTF constructs show that task characteristics (TASK) can affect TTF and similarly, technology characteristics (TECH) have an influence on TTF. When compared to the TASK and TECH constructs in their effect on TTF. Cheng (2019) found that TASK was significantly stronger in influencing TTF than TECH for cloud-based e-learning technologies and tasks with certain characteristics such as unstructured tasks and teamwork tasks (Yang and Lin 2015). However, several research results have found different results that TECH is stronger than TASK in influencing TTF (Yen et al., 2010); (Afshan & Sharif, 2015); and (Gan, Li, and Liu 2017) where IT users perceive that technology functions by offering various features are more suitable than the requirements of the tasks being performed.

5. CONCLUSION

We used 15 articles that discussed the integration of TAM and TTF in the use of IT with Scopus publication rankings from various leading journals. Our observations show an integration model where the TTF construct affects the TAM constructs with two models. First, TTF as an external variable TAM, where the construct of TTF such as technical characteristics and the suitability of the technology of the task affects the perception of usability and perception of the ease of use, both TTF constructs are directly tested for their effect on the use of IT, which is a construct of TAM. Some more dominant studies have tested the integration of TAM and TTF by testing the effect of TTF on PU and PEOU, and this makes the TTF model an external variable for TAM. In addition, research examines the effect of TECH on PEOU, with the intention that technology must be designed in such a way that its functions provide ease of use to users who used it. Finally, integration through testing the effect of TTF on CI shows the technology that provides users task compatibility, so the value of IT in the user's view increases so that it affects usage on an ongoing basis.

In addition, testing the integration of the TAM and TTF models was carried out, both the TTF construct as an external variable from TAM and the construct were tested directly for its effect on intention to continue in the TAM model. Some of the studies that we collected also tested the relationship between the constructs of each model, such as the effect of PU and PEOU on CI, and the effect of PEOU and CI. While testing the constructs of each TTF model by examining the effect of TASK and TECH on TTF. This shows that the constructs of each model are very strong to be tested on IT usage with various benefits.

LIMITATION

Limitations have been noted in this study, especially in the selection of articles that focus on research that tests the construct relationship between TAM and TTF and how these constructs affect IT usage. Various articles use the TAM and TTF (without integration) in researching specific IT uses, and we believe that this research can provide different information on IT usage than just TAM and TTF integration. In addition, the focal point of our literature study on the integration of TAM and TTF has limitations given the various models that examine behavior in IT use, such as the UTAUT. Such integration studies can provide insights into the context of IT use. To conclude, we provide further research advice because the results of the study show TTF to be an external variable for TAM. In the future, studies can use the most dominant external variables to expand TAM and provide deeper insights into technology that can influence customer PU and PEOU in using IT.

IMPLICATIONS

This literature study has implications by adding deeper insights into the integration of TAM and TTF on the use of various types of IT, such as fintech, e-learning, tourism, and automotive technology. Technology producers can use the results of several studies in terms of technology products that can help consumers complete their tasks both individually and in groups, and in marketing aspects, how producers can provide information through technology that is useful to them. Technology can build user perception in terms of usability and ease of use and draw customers to use it, fulfill the consumer's needs and wants, and assess the suitability of technological functions.

ACKNOWLEDGEMENTS

This research was supported by LPPM Hasanuddin University Makassar South Sulawesi through the Collaborative Fundamental Research Scheme number: 00323/UN4.22/PT.01.03/2023. The author also thanks the parties who have contributed to the completion of this project.

References

- Abbas, S. K., Hassan, H. A., Iftikhar, S., & Waris, A. (2018). "Assimilation of TTF and UTAUT for mobile banking usage." *International Journal of Advanced Engineering, Management and Science*, 4 (4): 305–308.
- Abu-Taieh, E. M., AlHadid, I., Abu-Tayeh, S., Masa'deh, R., Alkhaldeh, R. S., Khwaldeh, S., & Alrowwad, A. (2022). "Continued intention to use of m-banking in Jordan by integrating UTAUT, TPB, TAM and service quality with ML." *Journal of Open Innovation: Technology, Market, and Complexity*, 8(3). DOI: 10.3390/joitmc8030120
- Afshan, S. & Sharif, A. (2015). "Acceptance of mobile banking framework in Pakistan." *Telematics and Informatics*, 33 (2): 370-387. DOI: 10.1016/j.tele.2015.09.005
- Ahmed, Z., Kader, A., Rashid, M. H. U., & Nurunnabi, M. (2017). "User perception of mobile banking adoption: An integrated TTF-UTAUT model." *Journal of Internet Banking and Commerce*, 22 (3).

- Alario-Hoyos, C., Perez-Sanagustin, M., Delgado-Kloos, C., Parada G., H. A., & Muñoz-Organero, M. (2014). "Delving into participants' profiles and use of social tools in MOOCs." *IEEE Transactions on Learning Technologies*, 7 (3): 260–66.
- Alsoufi, A. & Ali, H. (2014). "Customers' perception of m-banking adoption in kingdom of Bahrain: An extended of TAM." *International Journal of Managing Information Technology (IJMIT)*, 6 (1): 1–13. DOI: 10.48550/arXiv.1403.2828
- Baabdullah, A. M., Alalwan, A. A., Rana, N. P., Patil, P., & Dwivedi, Y. K. (2019). "An integrated model for m-banking adoption in Saudi Arabia." *International Journal of Bank Marketing*, 37 (2): 452–78. DOI: 10.1108/IJBM-07-2018-0183
- Baganzi, R., Makanga, B., & Kiconco, R. I. (2021). "Acceptance of the bank of Uganda internet banking system framework." *Open Journal of Business and Management*, 9 (6): 2894–2916. DOI: 10.4236/ojbm.2021.96162
- Bashir, I. & Madhavaiah, C. (2015). "Consumer Attitude and Behavioural Intention towards Internet Banking Adoption in India." *Journal of Indian Business Research*, 7(1):67–102. DOI: 10.1108/JIBR-02-2014-0013
- Burke, M., Wayne, S., & Shad, S. (2016). "The cure for ailing self-service business intelligence." *Business Intelligence Journal*, 21 (3): 1–11.
- Chen, N.-H. (2019). "Extending a TAM–TTF model with perceptions toward telematics adoption." *Asia Pacific Journal of Marketing and Logistics*, 31 (1): 37–54. DOI: 10.1108/APJML-02-2018-0074
- Cheng, Y.-M. (2019). "How does Task-Technology Fit influence cloud-based e-learning continuance and impact?" *Education + Training*, 61 (4): 480–99. DOI: 10.1108/ET-09-2018-0203
- Daradkeh, M. (2019). "Determinants of self-service analytics adoption intention: The effect of task-technology fit, compatibility, and user empowerment." *Journal of Organizational and End User Computing*, 31 (4): 19–45. DOI: 10.4018/JOEUC.2019100102
- Davis, F. D. (1985). "A Technology Acceptance Model for empirically testing new end-user information systems: Theory and results." Doctoral dissertation, Massachusetts Institute of Technology, Cambridge.
- Davis, F. D. (1989). "Perceived usefulness, perceived ease of use, and user acceptance of information technology." *MIS Quarterly*, 13 (3): 319–39. DOI: 10.2307/249008
- Dishaw, M. T. & Strong, D. M. (1999). "Extending the technology acceptance model with Task - Technology Fit constructs." *Information & Management* 36 (1): 9–21. DOI: 10.1016/S0378-7206(98)00101-3
- Foroughi, B., Iranmanesh, M., & Hyun, S. S. (2019). "Understanding the determinants of mobile banking continuance usage intention." *Journal of Enterprise Information Management*, 32 (6): 1015–33. DOI: 10.1108/JEIM-10-2018-0237
- Gumussoy, C. G., Kaya, A., & Ozlu, E. (2018). "Determinants of mobile banking use: An extended TAM with perceived risk, mobility access, compatibility, perceived self-efficacy and subjective norms." In F. Calisir & H. C. Akdag (Eds.), *Industrial Engineering in the Industry 4.0 Era. Lecture Notes in Management and Industrial Engineering*, pp. 225–238, New York: Springer.
- Goodhue, D. L., & Thompson, R. L. (1995). "Task-technology fit and individual performance." *MIS Quarterly*, 19 (2): 213–36. DOI: 10.2307/249689
- Jain, P., & Agarwal, G. (2019). "Factors affecting mobile banking adoption: An empirical study in Gwalior region." *The International Journal of Digital Accounting Research*, 19: 79–101. DOI: 10.4192/1577-8517-v19_4
- Junglas, I., Abraham, C., & Watson, R. T. (2008). "Task-technology fit for mobile locatable information systems." *Decision Support Systems*, 45 (4): 1046–57. DOI: 10.1016/j.dss.2008.02.007

- Kee, D. M. H., Lai, K. H., Lee, J. C., Lee, K. J., Lee, J. L., Yosanti, I., & Aryani, D. N. (2022). "You have a digital wallet? A study of E-Wallet during the COVID-19 pandemic." *International Journal of Accounting & Finance in Asia Pacific*, 5 (1), 24-38. DOI: 10.32535/ijafap.v5i1.1413
- Kim, T., Suh, Y. K., Lee, G., & Choi, B. G. (2010). "Modelling roles of task-technology fit and self-efficacy in hotel employees' usage behaviours of hotel information systems." *International Journal of Tourism Research*, 12 (6): 709–25. DOI: 10.1002/jtr.787
- Kiraz, E., & Ozdemir, O. (2006). "The relationship between educational ideologies and technology acceptance in pre-service teachers." *Educational Technology & Society*, 9 (2): 152–65.
- Kucukusta, D., Law, R., Besbes, A., & Legohérel, P. (2015). "Re-examining perceived usefulness and ease of use in online booking: The case of Hongkong online users." *International Journal of Contemporary Hospitality Management*, 27 (2): 185–98. DOI: 10.1108/IJCHM-09-2013-0413
- Lam, T., Cho, V., & Qu, H. (2007). "A study of hotel employee behavioral intentions towards adoption of information technology." *International Journal of Hospitality Management*, 26 (1): 49–65. DOI: 10.1016/j.ijhm.2005.09.002
- Lee, H., Harindranath, G., Oh, S., & Kim, D.-J. (2015). "Provision of mobile banking services from an actor-network perspective: Implications for convergence and standardization." *Technological Forecasting and Social Change*, 90: 551–61. DOI: 10.1016/j.techfore.2014.02.007
- Liao, C., Palvia, P., & Chen, J.-L. (2009). "Information technology adoption behavior life cycle: toward a Technology Continuance Theory (TCT)." *International Journal of Information Management*, 29 (4): 309–20. DOI: 10.1016/j.ijinfomgt.2009.03.004
- Lin, W.-S., & Wang, C.-H. (2012). "Antecedences to continued intentions of adopting e-learning system in blended learning instruction: A contingency framework based on models of information system success and Task-Technology Fit." *Computers & Education*, 58 (1): 88–99. DOI: 10.1016/j.compedu.2011.07.008
- Lin, X., Wu, R., Lim, Y.-T., Han, J., & Chen, S.-C. (2019). "Understanding the sustainable usage intention of mobile payment technology in Korea: Cross-countries comparison of Chinese and Korean users." *Sustainability*, 11 (19): 1–23. DOI: 10.3390/su11195532
- Marakarkandy, B., Yajnik, N., & Dasgupta, C. (2017). "Enabling internet banking adoption: An empirical examination with an augmented Technology Acceptance Model (TAM)." *Journal of Enterprise Information Management*, 30 (2): 263–94. DOI: 10.1108/JEIM-10-2015-0094
- Oliveira, T., Faria, M., Thomas, M. A.M., & Popovič, A. (2014). "Extending the understanding of mobile banking adoption: When UTAUT meets TTF and ITM." *International Journal of Information Management*, 34 (5): 689–703. DOI: 10.1016/j.ijinfomgt.2014.06.004
- Rahi, S., Khan, M. M., & Alghizzawi, M. (2021). "Extension of Technology Continuance Theory (TCT) with Task Technology Fit (TTF) in the context of internet banking user continuance intention." *International Journal of Quality and Reliability Management*, 38 (4): 986–1004. DOI: 10.1108/IJQRM-03-2020-0074
- Rustariyuni, S. D., Pudjiharjo, M., Burhan, M. U., & Satria, D. (2022). "Case study of successful utilization of digital technology innovations determinants of cooperative institutions in Bali: The impact of the Covid-19 pandemic." *International Journal of Applied Business and International Management*, 7 (3), 1-20. DOI: 10.32535/ijabim.v7i3.1789
- Schrier, T., Erdem, M., & Brewer, P. (2010). "Merging Task-Technology Fit and Technology Acceptance Models to assess guest empowerment technology usage in hotels." *Journal of Hospitality and Tourism Technology*, 1 (3): 201–17. DOI: 10.1108/17579881011078340
- Shaikh, A. A., & Karjaluo, H. (2015). "Mobile banking adoption: A literature review." *Telematics and Informatics*, 32 (1): 129–42. DOI: 10.1016/j.tele.2014.05.003
- Stiegler, A., & Zimmermann, G. (2015). "Gamification and accessibility." In J. Zhou, & G. Salvendy (Eds.), *ITAP 2015: Human Aspects of IT for the Aged Population. Design for Aging*, pp. 145-154. New York: Springer.

- Teo, T. (2009). "Modelling technology acceptance in education: A study of pre-service teachers." *Computers and Education*, 52 (2): 302–12. DOI: 10.1016/j.compedu.2008.08.006
- Usman, H., Mulia, D., Chairy, C., & Widowati, N. (2022). "Integrating trust, religiosity and image into technology acceptance model: The case of the Islamic philanthropy in Indonesia." *Journal of Islamic Marketing*, 13 (2): 381–409. DOI: 10.1108/JIMA-01-2020-0020
- Valaci, N. Nikhashemi, S. R., Bressolles, G., & Jin, H. H. (2019). "A(n) (a)Symmetric Perspective towards Task-Technology-Performance Fit in Mobile App Industry." *Journal of Enterprise Information Management*, 32 (5): 887–912. DOI: 10.1108/JEIM-07-2018-0157
- Vanduhe, V. Z., Nat, M., & Hasan, H. F. (2020). "Continuance intentions to use gamification for training in higher education: Integrating the Technology Acceptance Model (TAM), social motivation, and Task Technology Fit (TTF)." *IEEE Access*, 8: 21473–84.
- Venkatesh, V. & Davis F. D. (2000). "A theoretical extension of the technology acceptance model: Four Longitudinal field studies." *Management Science*, 46 (2): 186–204. DOI: 10.1287/mnsc.46.2.186.11926
- Wu, B., & Chen, X. (2017). "Continuance intention to use MOOCs: Integrating the Technology Acceptance Model (TAM) and Task Technology Fit (TTF) Model." *Computers in Human Behavior*, 67: 221–32. DOI: 10.1016/j.chb.2016.10.028
- Wu, R. , & Hu, L. J. (2017). "The comparative study on third party mobile payment between UTAUT2 and TTF." *Journal of Distribution Science*, 15 (11): 5–19.
- Yaakop, A. Y., Shi, Y. P., Foster, B., & Saputra, J. (2021). "Investigating E-Wallet adoption of COVID19 intra-period among Malaysian youths': Integrated Task-Technology Fit and Technology Acceptance Model framework." *International Journal of Data and Network Science*, 5 (3): 295–302. DOI: 10.5267/j.ijdns.2021.6.004
- Yen, D. C., Wu, C.-S., Cheng, F.-F., & Huang, Y.-W. (2010). "Determinants of users' intention to adopt wireless technology: An empirical study by integrating TTF with TAM." *Computers in Human Behavior*, 26 (5): 906–15. DOI: 10.1016/j.chb.2010.02.005
- Yuan, S., Liu, Y., Yao, R., & Liu, J. (2014). "An investigation of users' continuance intention towards mobile banking in China." *Information Development*, 32 (1): 20–34. DOI: 10.1177/0266666914522140
- Zhou, T., Lu, Y., & Wang, B. (2010). "Integrating TTF and UTAUT to explain mobile banking user adoption." *Computers in Human Behavior*, 26 (4): 760–67. DOI: 10.1016/j.chb.2010.01.013