Task-Technology Fit

The Task-Technology Fit model postulates that the match between task requirements and technology characteristics predicts the utilisation of the technology and individuals' performance.

By Davit Marikyan (Business School, University of Bristol, UK) & Savvas Papagiannidis (Business School, Newcastle University, UK)

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Theory Factsheet

Proposed By: Goodhue & Thompson, 1995

Parent Theory: Theory of work adjustment, DeLone and Mclean IS Success Model, Theory of Reasoned Action

Related Theories: Technology Acceptance Model, Unified Theory of Acceptance and Use of Technology

Discipline: Information systems management

Unit of Analysis: Individual

Level: Micro-level

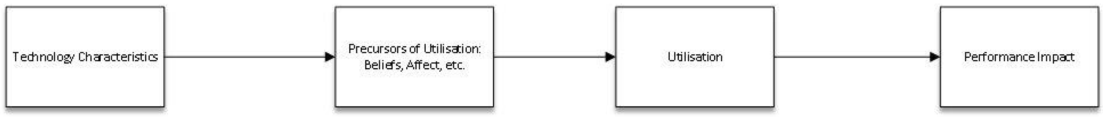
Type: Theory for Explaining and Predicting

Operationalised: Quantitatively

Introduction

The Task-Technology Fit Model was developed by (Goodhue & Thompson, 1995) to explain the utilisation of technology by examining the fit of technology to users' tasks/requirements. The purpose of the theory was to add to the body of knowledge on technology utilisation in the private and public contexts, which had limited explanation as to how the acceptance of technology contributes to individuals' performance. TTF was the first theory that aimed to explore the post-adoption aspect of technology utilisation, unlike other prior research, which had mainly focused on the antecedents of use and intention (Goodhue & Thompson, 1995). Specifically, by 1995, the literature on the IS management domain was characterised by two streams of research, namely focusing on technology utilisation and task-technology fit. The research on technology utilisation mostly examined the relationships between attitudes, beliefs, their associated factors and the use of information communication technologies (Goodhue & Thompson, 1995;Cheney, Mann & Amoroso, 1986;Doll & Torkzadeh, 1991; Lucas, 1975; Lucas, 1981; Robey, 1979; Thompson, Higgins & Howell, 1994;Swanson, 1987). This stream was represented by theories such as the Theory of Reason Action (TRA), the Theory of Planned Behaviour (TPB) and Technology Acceptance Model (TAM) (Fishbein & Ajzen, 1975;Davis, 1989; Bagozzi, 1982). For instance, TRA and TPB measure the likelihood of technology acceptance by investigating the effects of attitude toward behaviour, subjective norm and perceived behavioural control (Fishbein & Ajzen, 1975; Ajzen, 2011). TAM explains and predicts the use of technology and behavioural intention by examining the core constructs, which are perceived usefulness and perceived ease of use (Venkatesh et al., 2003). The research in that domain was complemented by research findings on the factors that relate to attitudes and beliefs, such as technology characteristics (e.g. quality) (Lucas, 1975; Olson & Ives, 1982) or situational factors (e.g. social influence) (Davis, 1989; Baroudi, Olson & Ives, 1986; Hartwick & Barki, 1994; Venkatesh & Davis, 2000). The acceptance of technology was mostly considered to be the manifestation of intention or use behaviour. The key factors of those studies are summarised in Figure 1.

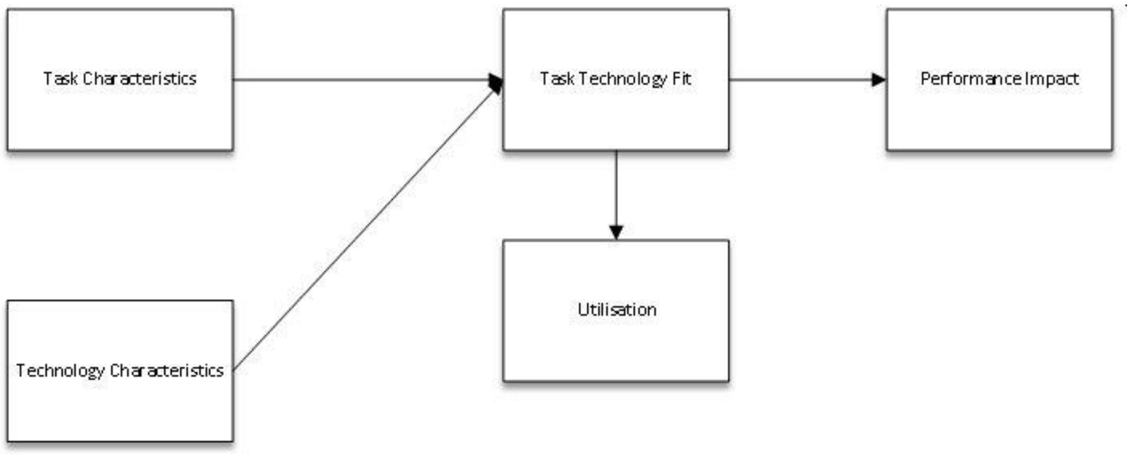
Figure 1: Utilisation Focus Model



Although, in line with those theories, the individual's performance was not explicitly measured, the assumption of the research was that technology acceptance correlates with increased performance. However, there are two reasons that jeopardise the accuracy of the conclusions of the research about the impact on performance using those theories (i.e. TRA, TAM, TPB). First, the antecedents of technology acceptance are perceptual, which means that they reflect individuals’ awareness of the event, which they can report. The major limitation of self-reported measures is that there is a risk of discrepancy between the individuals’ perception and objective observation (de Guinea, Titah & Léger, 2014). Secondly, the acceptance of technology does not necessarily mean that users improve their performance (Goodhue & Thompson, 1995). Some evidence suggested that the adoption and the extensive use of technology (PCs) had a weak, non-significant or even negative effect on personal productivity and efficiency (Weill, 1992). In addition, the utilisation of technology had been largely examined in work settings, which are characterised by mandatory use. Therefore, the improvement of performance indicators may correlate not simply with extensive use, but rather with the ability of technology to address the needs and requirements of the user (i.e. task-technology fit) (Goodhue & Thompson, 1995).

The second stream of research reflected the focus on technology performance and task-technology fit. Figure 2 depicts the main variables and relationships explored in that research line. The literature was represented by experimental research studies confirming the difference in performance outcome depending on task requirements (Baroudi, Olson & Ives, 1986; Dickson, DeSanctis & McBride, 1986). Several other studies confirmed the correlation between the technology-fit factor and technology adoption, both in organisational and private settings (Cooper & Zmud, 1990; Tornatzky & Klein, 1982). Also, the research provided evidence that the mismatch between technology characteristics and tasks hinders the decision-making process (Vessey, 1991). However, the reliability of the findings of prior studies was questionable, as they did not measure performance per se. For example, some studies used the utilisation construct as a proxy (Lucas, 1975; Lucas, 1981), although it was confirmed that utilisation does not have a strong power to predict performance (Goodhue & Thompson, 1995). Given the lack of common ground between the two streams of research, TTF theory was developed to bring together evidence from the two research lines. The objective of the theory was to test and confirm the assumption that the utilisation of information systems results in increased performance only on condition that technology functionality corresponds to users' task requirements (Goodhue & Thompson, 1995).

Figure 2: Fit Focus Model



Theory

TTF has a conceptual version, named the Technology-to-Performance Chain (TPC) model. TPC ,which resulted from the merger of the two research streams, explains the relationships between the three main component of the chain, namely task-technology fit, utilisation and performance impact (Figure 3). Task-technology fit is the interdependence between an individual (a technology user), technology (data, hardware, software tools and the services they provide) and task (activity carried out by individuals to produce the required output) characteristics. The degree to which technology is capable of performing a user's tasks is contingent on the degree to which individual abilities, task requirement and technology functionalities match (Goodhue & Thompson, 1995). The utilisation component reflects the act of using the system evaluated by the frequency or diversity of use (Davis, 1989; Thompson, Higgins & Howell, 1994). The utilisation is determined by a number of attitudinal and belief factors, contributing to the use of technology both in mandatory and voluntary settings. These factors include, but are not limited to, social norms, attitude to behaviour and expected consequences (Bagozzi, 1982; Fishbein & Ajzen, 1975). The performance impact relates to what can be achieved by performing the portfolio of tasks. TPC is a complex conceptual model, which makes it challenging for empirical testing. Therefore, core components and assumptions were used to develop a simplified and a measurable TTF model (Figure 4).

Figure 3: Technology to Performance Chain

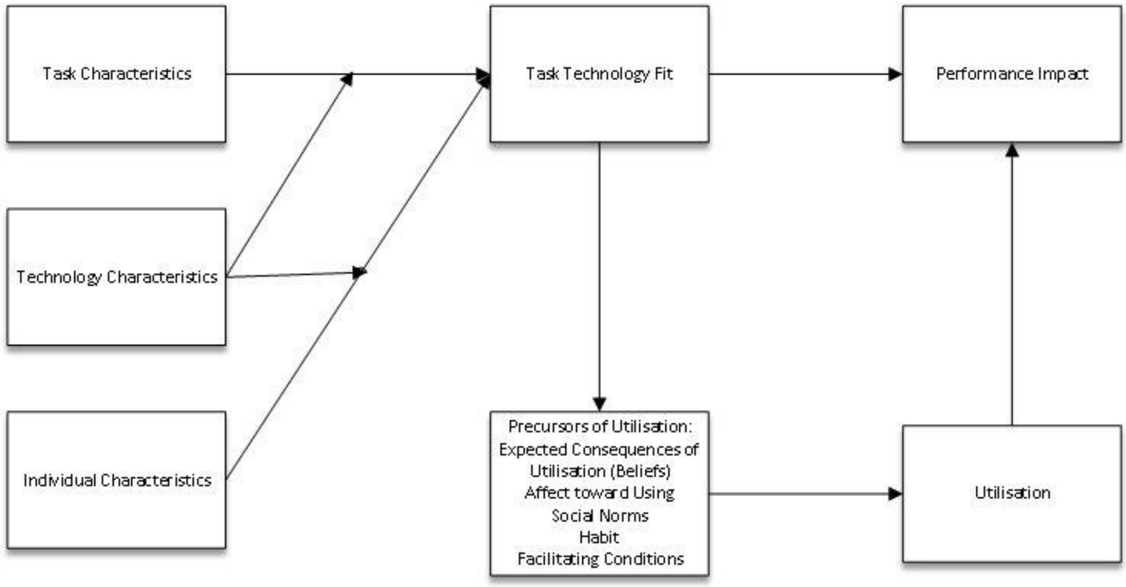
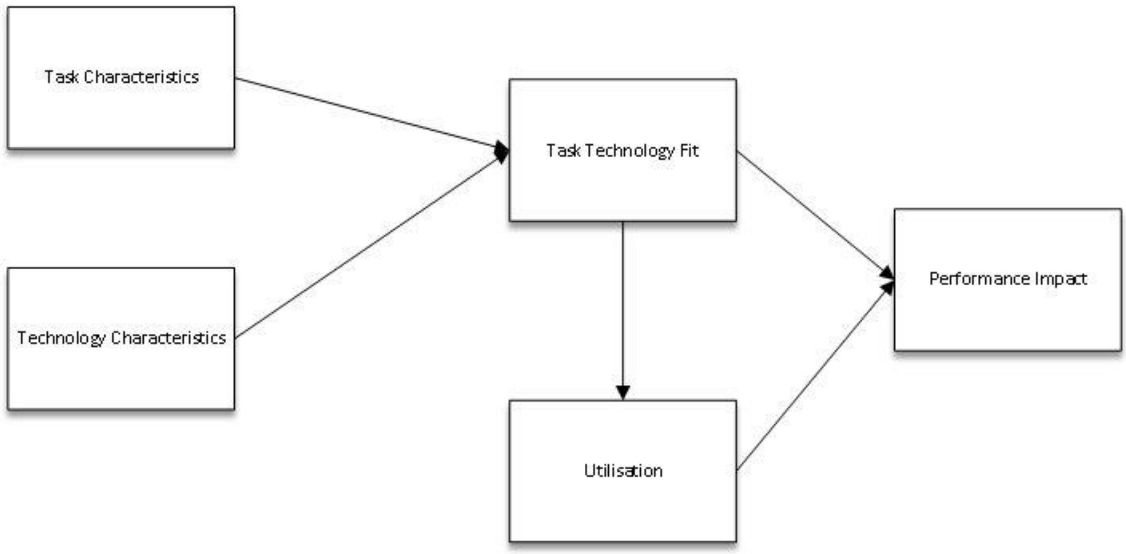


Figure 4: Task Technology Fit



TTF includes five constructs that represent the model, namely, task characteristics, technology characteristics, task-technology fit, technology utilisation and performance impact. While task characteristics and technology characteristics reflect the specific dimensions of the technology and its utilisation, the general task-technology fit factor captures individuals' perceptions of task-technology fit (Goodhue & Thompson, 1995; Goodhue, 1992). The TTF model also has three propositions. The first proposition states that the user's evaluation of task-technology fit is determined by both task characteristics and characteristics of the technology. The degree to which a system assists an individual in performing his or her portfolio of tasks is measured by users' rating of eight dimensions: quality, locatability, authorisation, compatibility, production timeliness, systems reliability, ease of use/training and relationship with users. Task characteristics are measured by task non-routineness, interdependence and job title. Those are the factors that might make a user rely more heavily on certain aspects of the information technology. Technology characteristics refer to technology-specific attributes or functions. The second proposition of the theory states that the utilisation of information systems by individuals is dependent on the perceived fit. The third proposition of the theory postulates that a positive evaluation of task-technology fit not only predicts utilisation, but positively influences perceived performance (the accomplishment of a portfolio of tasks by an individual) (Goodhue & Thompson, 1995).

The development of the conceptual model of technology-to-performance chain and the measurable TTF model contributed to the literature in a number of ways. First, TPC goes beyond the DeLone and McLean model by not only illustrating the effect of utilisation and user attitude on individuals' performance, but also by explaining how technology contributes to improved performance (DeLone & McLean, 1992). This became possible by incorporating the task-technology fit factor and explicitly examining the relationship between technology and task, utilisation and performance. Second, the TTF model offered a theoretical framework for considering a number of issues related to technology performance. The issues included, but were not limited to, measurements of the management of information systems success, exploring and understanding the importance of individuals' engagement with technology and its impact on performance, and the use of TTF will reveal the issues related to IS use (Goodhue & Thompson, 1995). Third, the TTF model sheds light on the role of technology fit and utilisation in performance, by demonstrating that 14 per cent of the variance in perceived performance is due to the role of TTF and only 4 per cent is due to the effect of utilisation (Goodhue & Thompson, 1995). Although the overall predictive strength of the model is not high, the TTF model attracted the attention of future research to the fit factor (Dishaw & Strong, 1998;Palvia & Chervany, 1995;Strong, 1997; Strong, Lee & Wang, 1997; Wu & Chen, 2017). Finally, by testing the dimensions of TTF, it is possible to gain insights as to what can be done to improve the user experience in terms of ease of use, concerns about the reliability of the system, etc(Goodhue & Thompson, 1995).

Theory Extensions

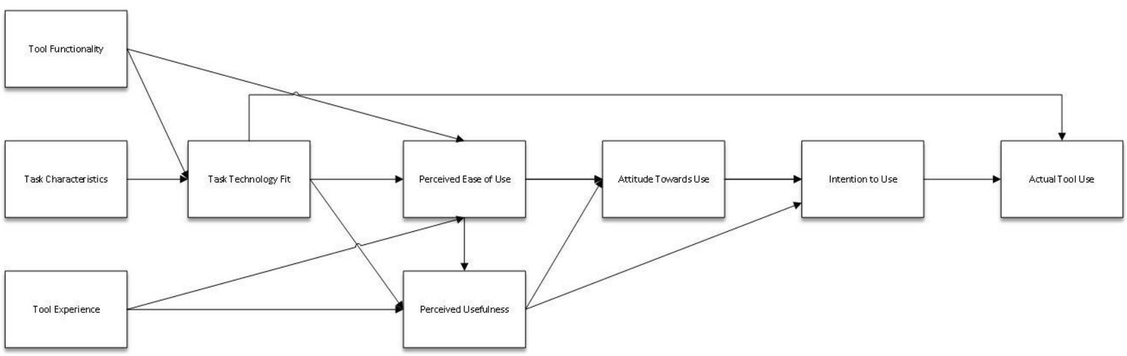
Task Technology Fit and Technology Acceptance Model

TTF was extended by Dishaw and Strong by integrating it with TAM (Dishaw & Strong, 1999) as illustrated in Figure 5. TAM postulates that the use of technology raises cognitive evaluation in the form of perceived ease of use and perceived usefulness, which, in turn, motivate behavioural intention and subsequent use behaviour (Davis, 1993; Davis, 1989). Perceived ease of use refers to the degree to which technology use is free from effort (Davis, 1989), while perceived performance refers to the degree to which the user thinks that technology improves performance (Bandura, 1982). The rationale for the extension development was the combination of the two dominant theories on technology acceptance with the purpose of increasing TTF's predictive power (Dishaw & Strong, 1999). Although TTF had received wide application in research (Zigurs & Buckland, 1998;Maruping & Agarwal, 2004; Fjerrnestad & Hiltz, 1997), TTF alone was not very robust in predicting utilisation. The explanatory power of the model underperformed compared to other theories, such as TAM. TTF explained only 2 per cent of the variance in the utilisation and 14 per cent of the variance in performance, compared to 40 per cent of the variance in use explained by TAM (Goodhue & Thompson, 1995; Davis, 1989). On the one hand, both theories adopt the user perceptive on the use and evaluation of technology and explore outcomes, such as adoption, acceptance and performance. On the other hand, TTF and TAM provide complementary insights into the utilisation of technology. TAM focuses on the intention of use, while TTF focuses on the outcome of use. TAM is a competing theory providing a contrasting vantage point on technology utilisation.

In the extension, the relationships between variables within TAM and the TTF model were left unchanged. As in the original model, TAM represents the interaction between perceived usefulness and perceived ease of use, having an effect on attitude, intention and use behaviour (Davis, 1993; Davis, 1989). TTF represents the model examining actual tool use, affected by TTF and tool experience, the former, in turn, being affected by tool functionality and task requirements. To simplify measurement, the fit factor is employed as a unidimensional construct. Seven additional links were introduced to integrate TAM and TTF variables, supported by prior studies. Specifically, the model suggests that TTF influences individuals' perceptions (Dishaw & Strong, 1999). The support for the relationships is rooted in the definitions of perceived usefulness, perceived ease of use and TTF (Goodhue & Thompson, 1995;Goodhue, 1995). If an individual thinks that the given technology has a good fit with the task, the perception of usefulness and ease of use will rise. Also, the model introduces the correlation between tool experience, functionality and perceived ease of use. This means that elevated functionality of the technology is related to the idea that the technology is sophisticated and complex to use. Thus, there will be a negative effect of tool functionality on perceived ease of use. On the other hand, individuals with experience are more likely to perceive the technology as being easy to use. Lastly, the model has a theorised path between task characteristics and acceptance. The relationship is based on the assumption that the more complex the task is, the lower the individual's interest in a given technology (Dishaw & Strong, 1999).

TTF-TAM adds to the literature by providing a theory which explains technology acceptance based on attitude/behaviour mechanisms and by putting forward rational determinants of acceptance (e.g. factors such as fit and job performance) (Dishaw & Strong, 1999). Such a combination addresses the gap raised in research, arguing that individuals might not have a good attitude towards the technology, but accept it as it increases their performance (Letchumanan & Tarmizi, 2011; Goodhue & Thompson, 1995). The extension of the theory also addresses the limitation of TTF related to its low predictive power. The comparative empirical validation of TAM, TTF and combined TTF/TAM theories confirmed that the integrated model explains 51 per cent of the variance in the utilisation construct, compared to 36-41 per cent if two models are examined separately (Dishaw & Strong, 1999).

Figure 5: TTF-TAM



Task technology fit and Unified Theory of Acceptance and Use of Technology

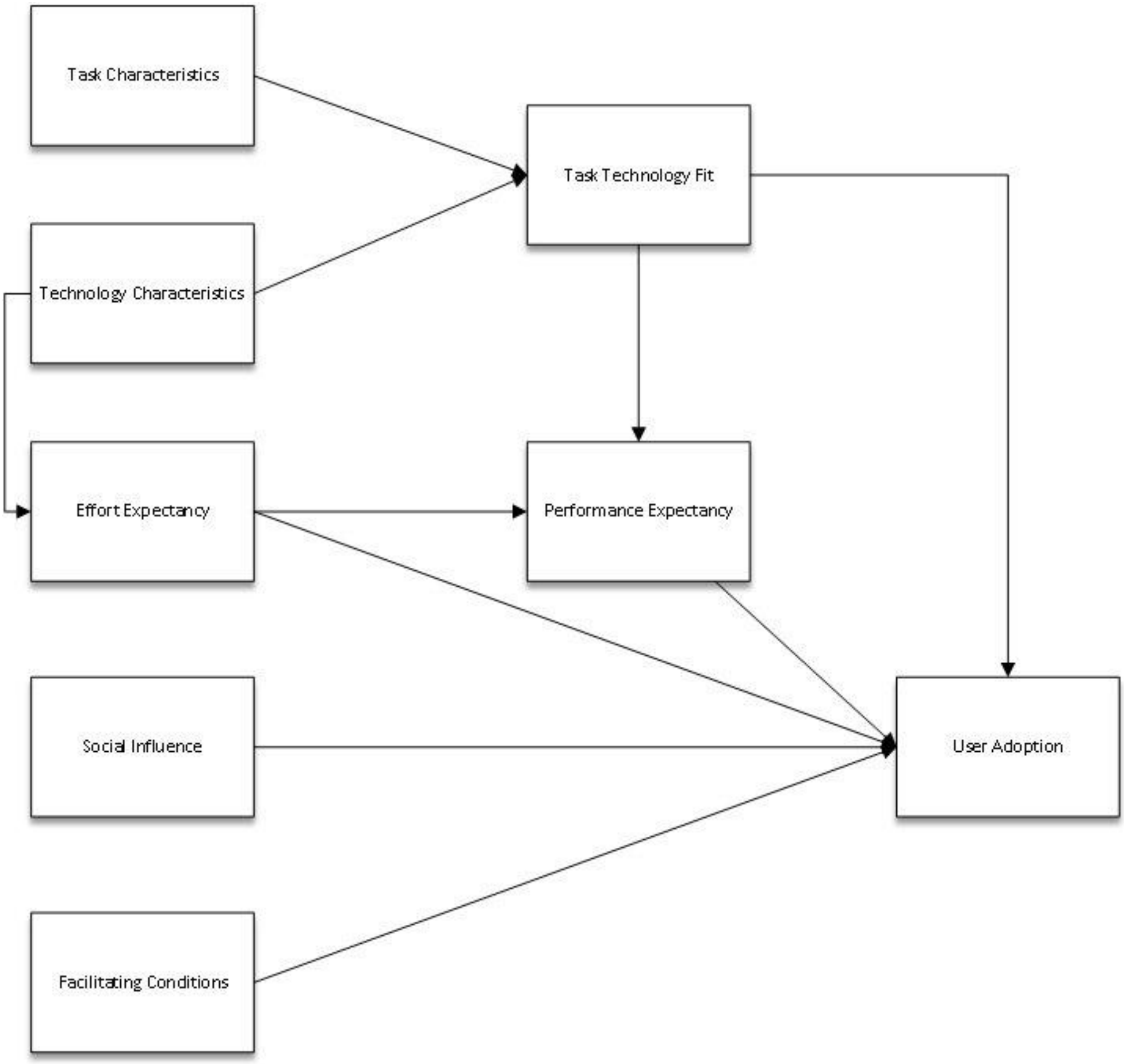
The second update of the TTF model was by extending it with a Unified Theory of Acceptance and Use of Technology (Zhou, Lu & Wang, 2010) (Figure 6). UTAUT is the comprehensive framework on technology adoption, which postulates that the likelihood of adopting technology is dependent on the direct effect of four key constructs, namely performance expectancy, effort expectancy, social influence, and facilitating conditions, as well as four moderators (Venkatesh et al., 2003). Performance expectancy and effort expectancy share a great deal of similarity with perceived usefulness and perceived ease of use from TAM, since they pertain to users' evaluation of technology use and outcome, based on expectations prior to actual use (Davis, 1989;Venkatesh et al., 2003). Social influence refers to the belief that other people think that the technology needs to be adopted, whereas facilitating conditions imply the beliefs about the availability of technical infrastructure that may support the use of the technology (Venkatesh et al., 2003).

The development of TTF-UTAUT was aimed at addressing several gaps in prior research. Firstly, mobile banking adoption was an under-researched topic, since it was primarily dominated by the focus on utilisation (Aldás-Manzano, Ruiz-Mafé & Sanz-Blas, 2009; Ha, Yoon & Choi, 2007; Chen, Yen & Chen, 2009; Hsu, Lu & Hsu, 2007). That means that the research mostly investigated the user perception of usefulness, compatibility and the relative advantage of technology, and overlooked the role of technology fit in adoption (Goodhue & Thompson, 1995;Goodhue, 1995). Also, the integration of TTF with UTAUT was motivated by the lack understanding of the conditions and user-perceived factors explaining the utilisation of technology. Although TTF-TAM (Dishaw & Strong, 1999) shed light on the role of perceived usefulness and perceived ease of use, the role of facilitating conditions and social influence was not examined. Facilitating conditions and social influence were found to be crucial in predicting adoption behaviour, as suggested by UTAUT (Venkatesh et al., 2003). UTAUT outperforms other technology acceptance theories (e.g. TAM) in terms of explaining technology adoption and includes a wide range of factors that effect individuals' intention to use and use behaviour (Venkatesh et al., 2003;Zhou, Lu & Wang, 2010).

The TTF-UTAUT model postulates that technology adoption is predicted by the perceived fit between tasks and technology. In line with the TTF model, the fit between technology and tasks is predicted by technology and task characteristics (Goodhue & Thompson, 1995). The positive relation between task technology fit and user adoption is drawn from the original theory. It states that irrespective of the attitude that individuals hold about technology, they are not likely to adopt it, if there is a mismatch between the technology's functionality and task requirements (Goodhue & Thompson, 1995; Goodhue, 1995). Secondly, in line with the UTAUT model, the user adoption of technology is predicted by the effort expectancy, performance expectancy, facilitating conditions and social influence (Venkatesh et al., 2003). Third, performance expectancy is influenced by perceived fit (Zhou, Lu & Wang, 2010). The correlation between TTF and performance expectancy is supported by prior studies confirming that TTF affects perceived usefulness (Dishaw & Strong, 1999). Perceived usefulness is similar to performance expectancy in that both variables measure the expected impact of technology use on performance (Venkatesh et al., 2003;Davis, 1989). The relationship implies that when technology functionality has the capability of completing the required tasks, individuals' performance expectation increases accordingly (Zhou, Lu & Wang, 2010). Fourth, effort expectancy is affected by technology characteristics. The link between task characteristics and effort expectancy suggests that technologies with higher functionality require less effort to use them (Zhou, Lu & Wang, 2010).

The examination of the model demonstrated high predictive strength, with UTAUT (45.7%) and TTF (43.3%) explaining less variance in technology adoption compared to a newly proposed extension (57.5%) (Zhou, Lu & Wang, 2010). Also, the predictive power is stronger compared to TTF-TAM by 6 per cent (Zhou, Lu & Wang, 2010; Dishaw & Strong, 1999). Follow-up studies demonstrated the validity of the model by confirming that its explained variance was higher than 50 per cent (Abbas et al., 2018). The extended version of the theory contributes to the literature by providing a behavioural model which can robustly predict adoption. In addition to the increased predictive strength, the model provides evidence about additional factors explaining adoption behaviour (Zhou, Lu & Wang, 2010).

Figure 6: TTF-UTAUT Model



Applications

Due to the complexity and multidimensionality of TTF, the validation of the hypothesised relationship and the role of construct dimensions did not bring consistent results across the studies. It was found that the factors representing task-technology fit exhibited different strength and significance when testing the utilisation of different technologies. When examining enterprise architecture management systems, only four fit dimensions were supported: locatability, systems reliability, production timelines and ease-of-use (Eybers et al., 2019). The examination of the use of knowledge management technology found that only output quality and compatibility determine the utilisation of the technology (Teo & Men, 2008). When investigating the adoption of enterprise system management tools, only four dimensions (locatability, systems reliability, production timelines and ease-of-use) were significant (Eybers et al., 2019). However, the study on the adoption of an electronic health-record system supported the role of each TTF dimension (Dwivedi, WadeScott & Schneberger, 2012). Given the inconsistent results of the empirical validation of the model, it became common practice to avoid complexities with operationalising the model, by adopting a fit-as-match approach. Such an approach implies that TTF has become a first-order construct and users are simply asked whether the technology suits their tasks (Furneaux, 2012).

A multi-item first-order TTF construct has become widely adopted across studies, which contributed to the wide application of the theory in examining technology utilisation and adoption (Lin, 2012; Wu & Chen, 2017; Lin & Huang, 2008). For example, the adoption of a knowledge management system was examined by employing the TTF scale with eight items (Lin & Huang, 2008). A one-dimensional TTF scale was used to explore the direct and indirect effect of the construct on continuous intention to use (Lin, 2012;Wu & Chen, 2017). The use of the model in the e-learning context indicated that TTF is a vital component in exploring the improvement of students' grades following the adoption of the system (McGill & Klobas, 2009). The effect of variables in the model was also confirmed when exploring the use of e-books by teachers and technology effect on their performance. Although the variance in the use behaviour was minimal (7%), the model accounted for 50 per cent of the variance in performance, meaning that technology fit improves the quality of teaching, the quality of research, improves productivity and job performance (D'Ambra, Wilson & Akter, 2013). A strong predictive power of TTF-TAM was confirmed in studies focusing on the use of e-commerce tools and online courses, explaining 76 per cent of the variance in the intention to adopt e-commerce (Shih & Chen, 2013) and 95.7 per cent of the variance in continuance intention to use online courses (Wu & Chen, 2017). In addition, the effect of UTAUT and TTF factors were significant for the prediction of mobile banking usage (Abbas et al., 2018), whereas for internet banking adoption the effort expectancy was not important (Tarhini et al., 2016). Given the wide application of TTF and its extensions with one-dimensional constructs for a range of technologies, the findings on the predictive strength and the role of factors were mainly consistent, which demonstrates good external validity of the theory.

Although, the theory was originally developed for adoption by individuals, it was adapted in order to be applied to the group-level context by making group performance an outcome variable (Zigurs & Buckland, 1998). Group performance is defined as a multifaceted variable, which can be manifested as efficiency, process quality, output quality, consensus or satisfaction (Fjerrnestad & Hiltz, 1997; Delgado Piña, María Romero Martínez & Gómez Martínez, 2008). For example, the examination of group support systems (GSS) confirmed that the fit factor is a crucial construct in predicting the use of the system by a group of people (Zigurs & Buckland, 1998). TTF explained the use and effectiveness of information communication technologies in virtual teams. By understanding the degree to which technology satisfies the needs for different interpersonal interactions, the adoption of TTF made it possible to select the best technologies that will support group tasks (e.g. conflict management, motivation/confidence building and affect management) and increase group performance (Maruping & Agarwal, 2004).

TTF, TTF-TAM and TTF-UTAUT were tested in different geographical locations and cultural settings, providing partial confirmation of the model's validity. TTF theory was tested in the Chinese consulting industry and confirmed only partial validity of the model in determining utilisation and performance. Only the output quality and compatibility dimensions were significant for predicting utilisation (Teo & Men, 2008). The application of TTF-TAM to study the continuous intention to use mobile banking in China resulted in the theory explaining 53 per cent of the variance in the outcome variable. Specifically, the continuous intention to use was positively affected by perceived usefulness and task-technology fit. Although the effect of perceived ease of use on CIU was not significant, it had a positive effect on perceived usefulness (Yuan et al., 2016). Similarly, the validation of TTF-TAM was successful when studying the adoption of visual analytics in Jordanian enterprises. It was found that task, technology, and user characteristics are the main antecedents of TTF. TTF positively contributes to perceived usefulness and ease of system use, which, in turn, predict intention to use visual analytics systems. The model explained around 60 per cent of the variance in behavioural intention (Daradkeh, 2019). However, the validation of the TTF model and its extensions in comparative studies demonstrated that the effects of the variables are different due to the diversity in cultures, values, beliefs and work attitudes. For example, the examination of the fit of technology to managerial tasks in Greece and the US showed that the two samples distinguish between different TTF dimensions. The findings enabled researchers to conclude that managers perform activities and interact with technology differently in the countries being investigated (Ferratt & Vlahos, 1998). The utilisation of the TTF-UTAUT model to examine mobile payment use intention in Korea and China showed that the model is more applicable to predicting consumer behaviour in China. TTF explained almost 81 per cent of the variance in the behavioural intention of Chinese consumers and confirmed that the effect of all but effort expectancy was significant. The only two predictors of the usage intention of Korean consumers were social influence and TTF, which cumulatively accounted for around 60 per cent of the variance in the outcome variable (Lin et al., 2019). The study examining the moderating effect of Hofstede's cross-cultural dimensions on TTF model sheds light on the reason for inconsistent findings across cultures. It was found that individualism and uncertainty avoidance moderate the effect of TTF constructs. The findings suggested that uncertainty avoidance decreases the effect of TTF on individual performance and the tendency to individualism decreases the effect of TTF on use behaviour (Tam & Oliveira, 2019). That means that the criteria that people use to evaluate technology fit to their requirements may depend on norms and should be considered when adapting the technology for various cultural contexts.

While most of the research undertaken used variance-based approaches to explore the relationship between the constructs (Eybers et al., 2019; Teo & Men, 2008; Shih & Chen, 2013), a few research papers employed fuzzy-set Qualitative Comparative Analysis (fsQCA) and crisp set Qualitative Comparative Analysis (csQCA) approaches (Mikalef & Torvatn, 2019; Weber et al., 2016). These are the methods based on Boolean algebra, which make it possible to determine the relationship between the configurations of conditions and outcomes. FsQCA and csQCA helped researchers to uncover unique combinations of task-technology fit factors leading to better individual and organisational performance and productivity (Mikalef & Torvatn, 2019).

The applications of the TTF model and its extensions are summarised in Table 1.

Table 1: Theory Applications

Reference	Application	TTF	TTF-TAM	TTF-UTAUT
(Eybers et al., 2019)	Architecture management systems	X		
(Teo & Men, 2008) (Lin & Huang, 2008)	Knowledge management technology	X		
(Dwivedi, WadeScott & Schneberger, 2012)	electronic health-record system	X		

(Lin, 2012) (Wu & Chen, 2017) (McGill & Klobas, 2009)	Web learning system	X		
(D'Ambra, Wilson & Akter, 2013)	E-books	X		
(Shih & Chen, 2013)	E-commerce		X	
(Abbas et al., 2018) (Tarhini et al., 2016)	Mobile and internet banking			X
(Marikyan, Papagiannidis & Alamanos, 2021)	Smart technology		X	

Reference	Geography	TTF	TTF-TAM	TTF-UTAUT
(Teo & Men, 2008)	China	X		
(Lin et al., 2019)	China			X
(Daradkeh, 2019) (Yuan et al., 2016)	China		X	
(Ferratt & Vlahos, 1998)	Greece	X		
(Ferratt & Vlahos, 1998)	USA	X		
(Lin et al., 2019)	Korea			X

Reference	Methodology	TTF	TTF-TAM	TTF-UTAUT

(Eybers et al., 2019) Teo & Men, 2008	Variance-based approach	X		
(Shih & Chen, 2013)	Variance-based approach		X	
(Lin et al., 2019) (Abbas et al., 2018)	Variance-based approach			X
(Mikalef & Torvatn, 2019)	fsQCA	X		
(Weber et al., 2016)	csQCA	X		

Limitations

The TTF theory and its extensions have a number of limitations, among which are the complexity of the models, which makes it difficult to test empirically, weak predictive power, and the lack of focus on situational and personal factors. The most important shortcoming of the original TTF model is that due to multi-dimensional constructs, the applicability of the theory in different situations and scenarios is limited. Therefore, there are very few studies which tested all dimensions of task-tech technology fit (Eybers et al., 2019;Teo & Men, 2008; Dummy7). To make the model more universal, scholars predominantly use one-dimensional scales, which downgrades the comprehensiveness of the model in terms of explaining specific factors within the task-technology fit domain, facilitating or inhibiting the utilisation and users' performance.

TTF models have been criticised for a lack of focus on individuals' psychological and situational factors, such as the role of top management, trust (between team members and team leaders) and the responsibilities of team members (Agarwal, Sambamurthy & Stair, 2000). Individual differences can have an underlying impact on the final outcome of technology utilisation (Staples, Hulland & Higgins, 1999). For example, following the argument that TTF-TAM needed to measure self-efficacy, Strong et al. (2006) tested the effect of the construct by integrating it with the model. Although the significance of computer self-efficacy was confirmed, the updated model did not find wide implications. Also, TTF-UTAUT was criticised for a lack of focus on factors which may shape the adoption behaviour of end-users. That limitation motivated the update of the model by integrating it with trust (Oliveira et al., 2014). Still, future research is required to explore other psychological variables or situational conditions that would improve the explanatory role of the theory.

The generalisability of the research findings using TTF was questioned when scholars found contingency in the situational and contextual factors (Table 2). The applications of the model in different geographical locations characterised by different cultures, social norms and values demonstrated that the factors of TTF, TTF-TAM and TTF-UTAUT perform differently (Yuan et al., 2016; Daradkeh, 2019; Lin et al., 2019). Individuals' personal beliefs, values and cultural differences in organisations can have an impact on the outcome, which have been ignored in those models. Only few studies (Tam & Oliveira, 2019; Ferratt & Vlahos, 1998) have examined the effect of cultural dimensions (individualism and uncertainty avoidance) on TTF. That signals the need for future research to incorporate the values and cultural differences of individuals when employing TTF. In addition, there is a need to explore whether factors such as organisational culture, social norms and environmental factors have an effect on TTF and subsequently on technology adoption and acceptance (Lee, Cheng & Cheng, 2007).

Table 2: Contingency factors

Source	Theory	Situation factors
(Yuan et al., 2016)	TTF	Culture
(Daradkeh, 2019)	TTF-TAM	Individual characteristics (innovativeness)
(Lin et al., 2019)	TTF-UTAUT	Culture
(Tam & Oliveira, 2019)	TTF	Culture
(Ferratt & Vlahos, 1998)	TTF	Culture and socio-technical system
(Lee, Cheng & Cheng, 2007)	TTF	Individual characteristics (cognitive factors, socio-demographic factors, experience)

Concepts

Task Characteristics (Task Equivocality, Task Interdependence) (Independent): The factors that might move a user to rely more heavily on certain aspects of the information technology. (Goodhue & Thompson, 1995)

Task-Technology Fit (Independent/Dependent): The degree to which a technology assists an individual in performing his or her portfolio of tasks, more specifically. (Goodhue & Thompson, 1995)

Utilisation (Independent/Dependent): The behaviour of employing the technology in completing tasks. (Goodhue & Thompson, 1995)

Performance Impact (Dependent): The accomplishment of a portfolio of tasks by an individual. (Goodhue & Thompson, 1995)

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