How to Cite:
Salmassi, A. R. N., Kazemi, M., Mehraeen, M., & Malekzadeh, G. A review of most applicable theories and models of technology acceptance. *International Journal of Health Sciences*, 6022-6032. Retrieved from https://sciencescholar.us/journal/index.php/ijhs/article/view/13419

A review of most applicable theories and models of technology acceptance

Ali Reza Naghehchi Salmassi
Department of Management, Faculty of Economics and Administrative Sciences, Ferdowsi University of Mashhad, Mashhad, Iran

Mostafa Kazemi*
Department of Management, Faculty of Economics and Administrative Sciences, Ferdowsi University of Mashhad, Mashhad, Iran
Corresponding author email: kazemi@um.ac.ir

Mohammad Mehraeen
Department of Management, Faculty of Economics and Administrative Sciences, Ferdowsi University of Mashhad, Mashhad, Iran

Gholamreza Malekzadeh
Department of Management, Faculty of Economics and Administrative Sciences, Ferdowsi University of Mashhad, Mashhad, Iran

***Abstract*---**One of the first steps to initiate a technology-related business is to perceive factors that would help users accept technology. In this regard, different models have been introduced to explain technology acceptance and determine users' needs. These theories have psychological origins and involve comprehensively cognitive backgrounds which deal with components that predict the user's behavior. Prediction of user's behavior which is a major element of technology development success helps clarify the latent angles of the technology and business development for the developers. In the meantime, this article reviews general concepts of technology acceptance models and theories to provide valuable data about technology acceptance and adoption. Also, the goal of this article is to train and demonstrate these theories for the readers.

Keywords*---Acceptance Model; Acceptance Theory; Adoption Model; Adoption Theory.***

Introduction

According to the literature, the word acceptance conveys different senses. Collins defines acceptance to mean "taking or receiving something", "giving a positive answer to", "self-tolerance or self-compliance", and "receiving along with approval or admission" (Collins, 2000). Generally, acceptance denotes a reaction to an external offer which associates with "the act of accepting", and finally "a positive response" (Hitzeroth & Megerle, 2013). According to Renaud and van Biljon (2008), the adoption of technology is a multi-stage process that begins with the user's awareness of the technology and continues with his/her welcoming and adoption (selection, purchase, commitment to use) and then with continued use of it (Kubanov, S. I., et. al., 2019; Elena, M., et. al., 2021). The determination of issues relating to the user's decisions to accept a system can greatly help system developers design a system (Mathieson, 1991). In this line, various models and theories have been developed to determine the factors affecting users' acceptance of technology.

Over the past thirty years, we have been witnessing a growing interest of the research community in the category of acceptance and adoption of technology in personal and organizational domains (Davis, 1989; Compeau & Higgins, 1995; Goodhue, 1995; Leonard-Barton & Deschamps, 1988; Marikyan, & Papagiannidis, 2021). Almost, all of the previous academic contributions consider users' acceptance to be one of the most critical factors affecting the development of information technology.

1. Review of the Literature

Table 1 gives a general review of models and theories of technology acceptance. As seen, many components of prediction of the users' behavior are summarily provided.

Table 1 Summary of the most widely used user acceptance theories

Theory	Reference	The main components of user behavior prediction
Theory of Reasoned Action	Fishbein&Azjen (1975)	Attitudes, Subjective norms, intentions
Theory of planed behavior (TPB)	Azjen(1991)	Attitudes, Subjective norms, Perceived behavioral control
Technology acceptance model (TAM) (Latest version)	Venkatesh, & Davis, (1996)	The direct effect of perceived usefulness and perceived ease of use on behavioral intention and the indirect effect of external factors on behavior

Unified theory of acceptance and use of technology (UTAUT)	Venkatesh et al., (2003)	Performance Expectancy (perceived usefulness, external motivation, job fit, comparative advantage, Result Expectancy) Effort expectancy (perceived ease of use and complexity), social influence and facilitating conditions
Diffusion of Innovations (DOI)	Rogers (1995)	User's perception of technology such as advantage, compatibility, testability and observability
Task technology fit model (TTFM)	(Goodhue & Thompson, 1995)	Fitting technology to users' tasks and needs (communication with users, reliability, compatibility, ease of use, authentication, ease of use and training, quality, on time production and identification ability)

Theory of Reasoned Action (TRA)

Reasoned action theory is one of the early theories used to explain the use of computers and behavior of accepting novel technologies. Consistent with the TRA theory, tendency (intention) to a behavior is formed based on the individual's subjective norms and attitudes about that behavior. The individual's attitudes of his/her deep beliefs will lead to outcomes of the behavior and evaluation of those outcomes. The individual's subjective norms are also derived from his/her subjective beliefs about expectations perceived by a reference group, motivation, and tendency to compliance with those beliefs and expectations (Fishbein & Ajzen,1975). The reasoned action theory is also given in Figure 1.

In other words, Fishbein and Ajzen define "attitude" to be the individual's evaluation of an object, "belief" to be a bond between an object and some of the characteristics, and "behavior" to be an outcome or intention. Attitudes are based on a set of beliefs about a behavior target (e.g., a debit card is good). Also, the individual's subjective norms are in fact an immediate attitude of the society towards some specific behavior (e.g., my peers use a debit card as having it brings credibility) (Lai, 2017; Fishbein & Ajzen,1980).

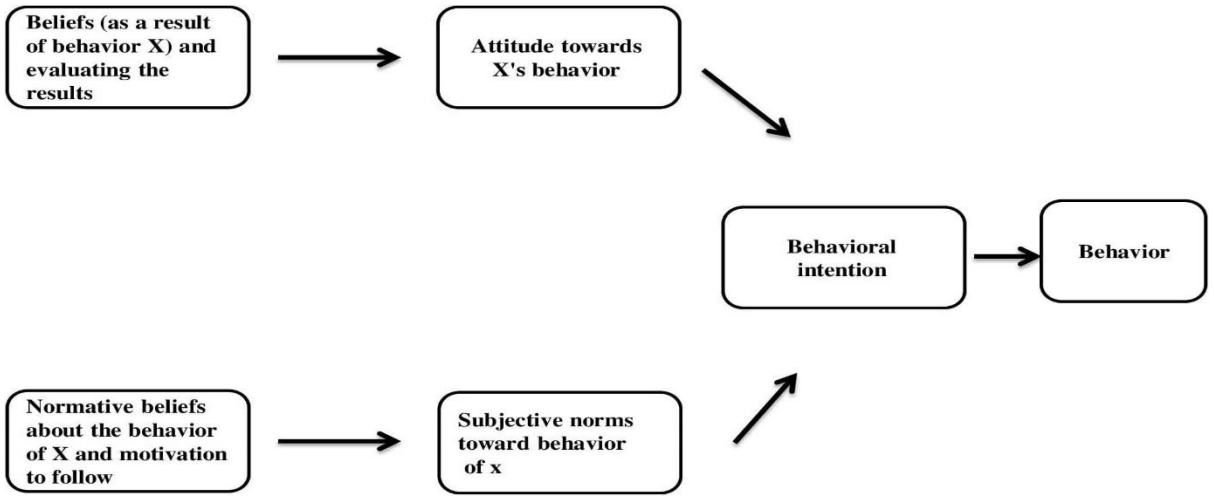

Figure 1 | Theory of Reasoned Action (Fishbein and Ajzen, 1975)

Theory of Planned Behavior (TPB)

Theory of Planned Behavior was raised and developed based on the reasoned action theory by Ajzen in 1991. This theory seeks to predict the occurrence of a behavior. Accordingly, this theory states that people rationally assess the outcomes before performing a specific activity (Ajzen, 2011). Three factors of attitude, subjective norms and perceived behavioral control predict the intention to do a behavior. By attitude, it is meant the pleasantness, desirability, and usefulness of doing a behavior for the individual which depends on his/her judgements about the relevant outcomes and effects (Ajzzen, 1991). Perceived behavioral control denotes ease or non-ease of doing a behavior, while subjective norms refer to the social pressure perceived by the people about doing a behavior and the effects of the society on the individual (Ajzen, 1991; Ajzen, 2002). The theory of planned behavior has been well utilized in many studies to predict users' behaviors in various domains (Godin et al., 2008).

Figure 2. gives the planned behavior theory.

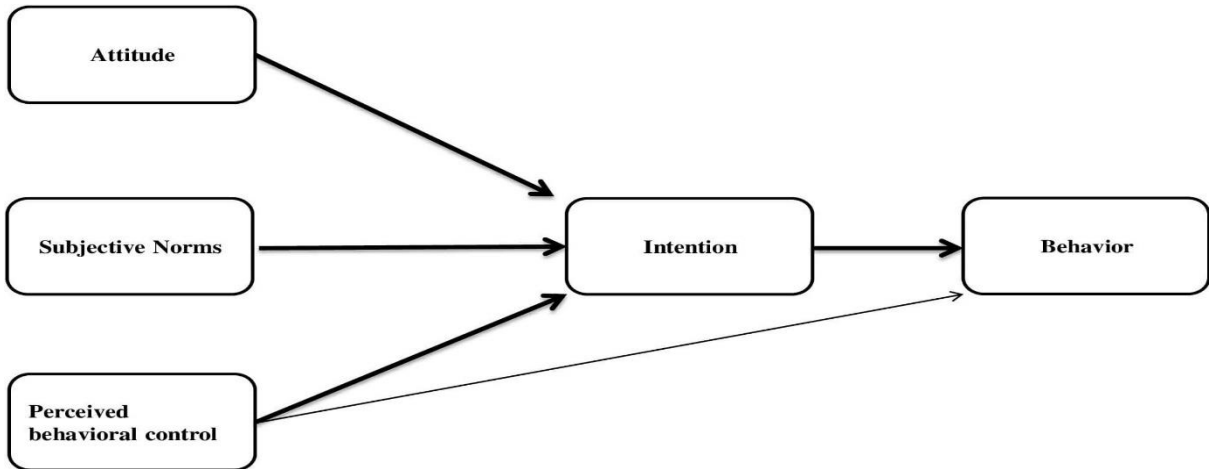

Figure 2 | Theory of planed behavior (Ajzen, 1991)

Technology Acceptance Model (TAM)

This model has a major role in perceiving the use of information systems and acceptance behavior of information systems (Malhotra, Y., & Galletta, 1999; Hufnagel, & Conca, 1994; David et al. 1989). The technology acceptance model is the most widely used model of users' acceptance and use of technologies (Venkatesh, 2000). The latest version of the technology acceptance model was developed by Venkatesh and Davis (1996). Figure 3 below illustrates a model of technology acceptance.

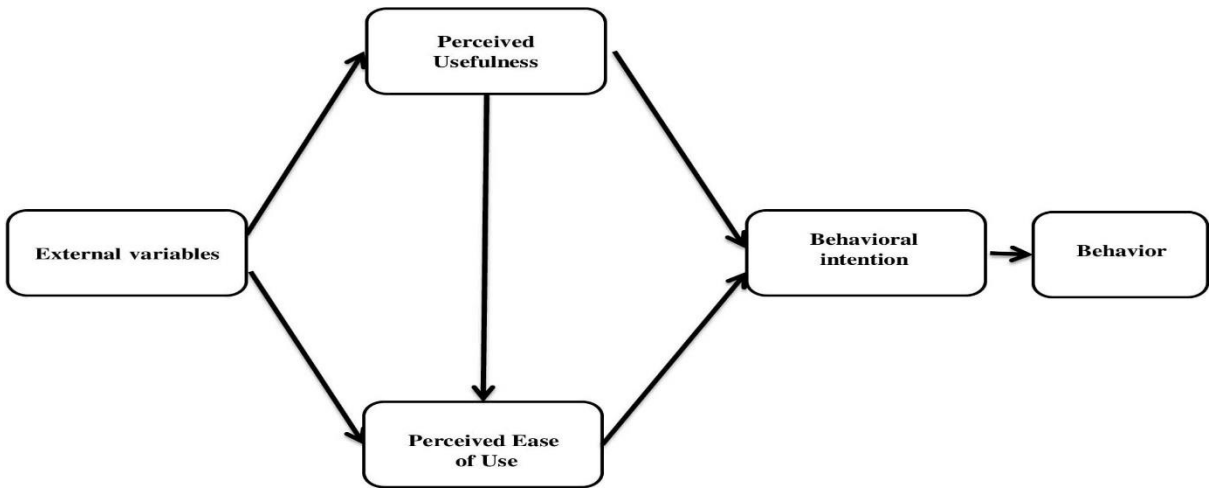

Figure 3 | Technology acceptance model (Venkatesh&Davis,1996)

In this model, Davis suggests the direct effects of perceived usefulness and ease of use on the behavioral intention which removes the need for the component of attitude (Lai, 2017). Training of the users, characteristic of the system, users' participation in designing the nature of implementing the processes, etc. are what are referred to as external factors in this model (Lin, et al. 2011). The component of perceived usefulness in the technology acceptance model refers to a degree to which the computer system user believes that the use of the system will increase his/her performance (Opoku, 2020). In general, the said model focuses on a computer user with a perceived usefulness concept aimed at explaining the way users perceive usefulness. This model, however, has ignored social processes of development and implementation of information systems (Bagozzi, 2007).

Unified Theory of Acceptance and Use of Technology (UTAUT)

Venkatesh et al. (2003) studied and reviewed previous models and theories to introduce a unified theory of acceptance and use of technology, as given in Figure 4. The UTAUT theory involves four predictors of users' behavioral intention, which includes performance expectancy, effort expectancy, social influence and facilitating conditions. The component of performance expectancy in the UTAUT model is made of five similar constructs of perceived usefulness, external motivation, occupational match, relative advantage, and result expectancy. However, effort expectancy demonstrates concepts of perceived ease of use and complexity. Four components of gender, age, voluntary use and experience are determined as modifiers for the four predictors of behavioral intention in relation to the users' use of an information system. As for the social background, Venkatesh et al.'s validation tests showed that social influence on voluntary use is not significant (Venkatesh et al. 2003; Lai, 2017).

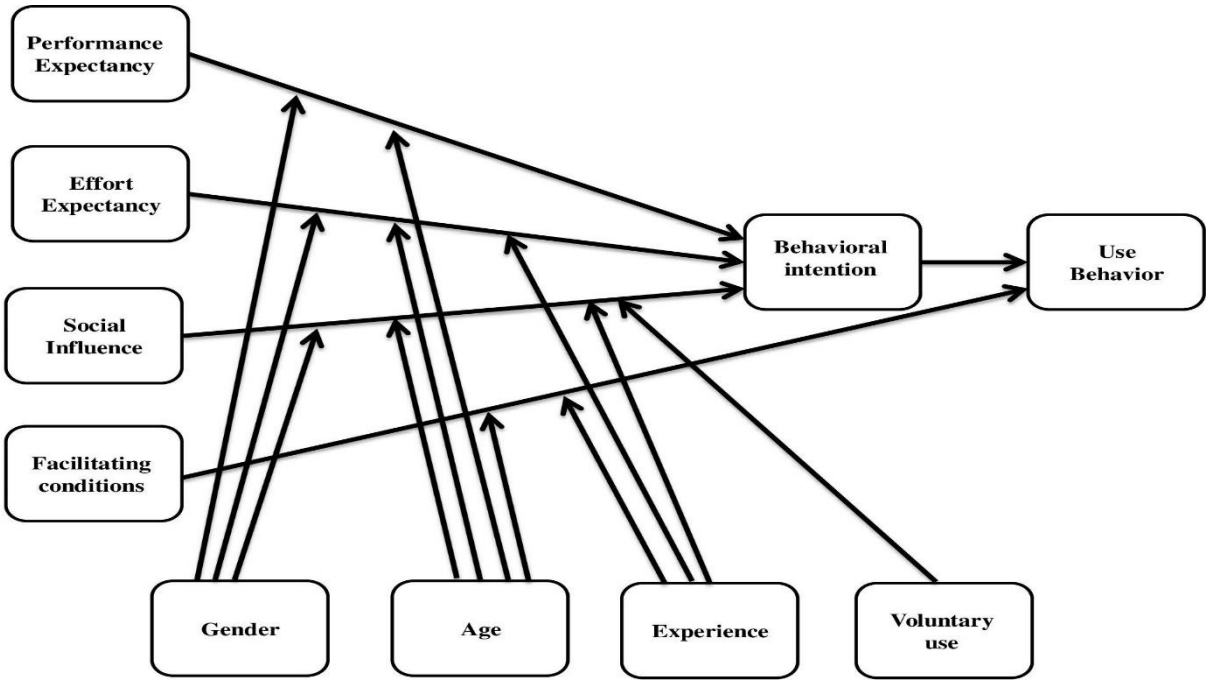

Figure 4 | Unified theory of acceptance and use of technology ((Venkatesh. el 2003).

Task Technology Fit Model (TTFM)

Goodhue and Thompson (1995) developed the Task Technology Fit Model to explain the use of technology to examine the way technology fits users' tasks and needs. Figure 5 illustrates the task technology fit model. This theory is aimed at increasing the knowledge of using and applying technology in specific and general domains. In this theory, the way information technology affects the efficiency of users in organizations is investigated. In fact, this theory is aimed at testing and confirming the hypothesis that the use of information systems will increase efficiency provided that technology performance fits users' needs (Goodhue & Thompson, 1995; Marikyan, & Papagiannidis, *2021).*

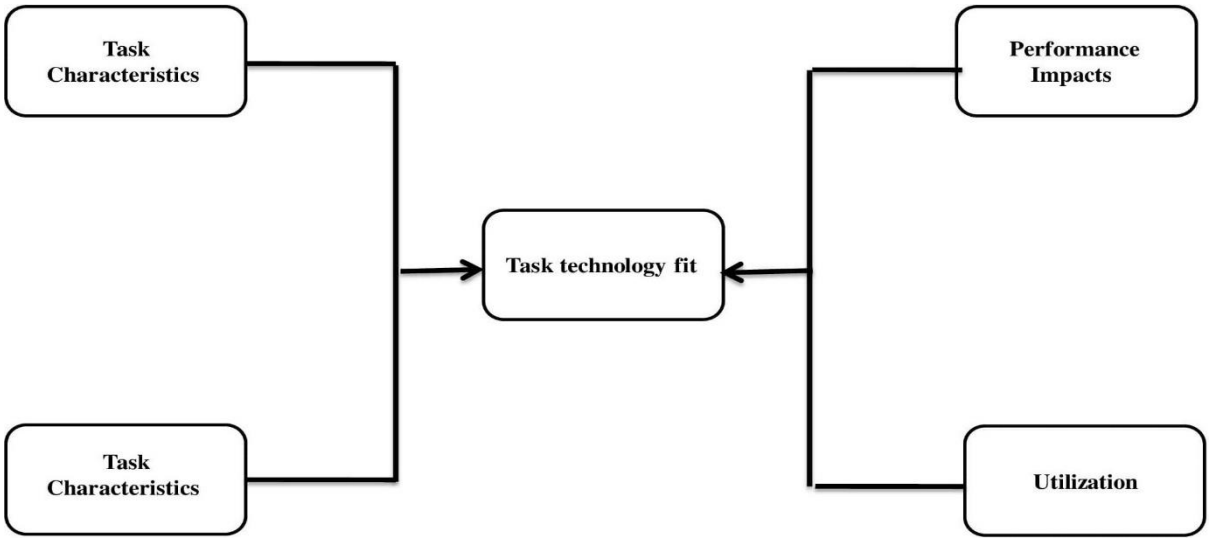

Figure 5 | Task technology fit model (Goodhue and Thompson, 1995)

Diffusion of Innovations Theory

Diffusion of innovations (DOI) is a theory which was developed by Rogers in 1995. This theory explains the quality and reasons of the diffusion of new ideas and technologies in a social system. Diffusion is a process in which innovation expands over time among participants in a social system. Adoption of innovation in the diffusion of innovation theory has been suggested as a process to gather data and reduce lack of confidence consistent with technology evaluation. User's perception of technology (e.g., advantage, compatibility, testability and observability) affects his/her decision to use that technology (Rogers, 1995). Major components of this theory are: innovation, communication channels, time and a social system that affect the expansion of a new idea; these four components and types of innovation are investigated. Decision about innovation among members of a social system includes five stages: achievement of knowledge, persuasion to apply, decide, and implement decision to apply and confirm innovation (Sila, 2015).

Discussion

The present research was aimed at investigating and reviewing the most important and applicable theories of technology acceptance and adoption. The technology acceptance model, planned behavior theory, unified model of technology use and acceptance, diffusion of innovation theory, task technology fit model and reasoned action theory serve as the most applicable theories, as suggested by Olushola, Epiwal (2017), Legris et al. (2003). For Venkatesh et al. (2003), the technology acceptance model is widely used in various researches. This model provides basic principles to determine the effects of external variables on beliefs, attitudes and external intentions (Legris et al. 2003). Few numbers of components of this model can be a reason for its application, because compared to other models with the capability of equal interpretation, the efficacy of a model

with fewer components is greater than that of other models (Bagozzi, 1992). Advantages of TAM model include rationality, ease of use and easy perception which make it be preferred by researchers over other models.

References

Ajzen, I. (2011). The theory of planned behavior. Handbook of Theories of Social Psychology: Volume 1, 438–459. https://doi.org/10.4135/9781446249215.n22

Ajzen, I. (2011). Theory of Planned Behavior. Encyclopedia of Health and Behavior. https://doi.org/10.4135/9781412952576.n208

Ajzen, I. (1991). The Theory of Planned Behavior. Organizational Behavior And Human Decision Processes, 50(2), 179-211. https://doi.org/10.1016/0749-5978(91)90020-t

Ajzen, I. (2002). Perceived Behavioral Control, Self-Efficacy, Locus of Control, and the Theory of Planned Behavior1. Journal of Applied Social Psychology, 32(4), 665–683. https://doi.org/10.1111/j.1559-1816.2002.tb00236.x

Bagozzi, R.P. (1992). The self-regulation of attitudes, intentions, and behavior. Social Psychology Quarterly, 55(2), 178-204

Bagozzi, R. (2007). The Legacy of the Technology Acceptance Model and a Proposal for a Paradigm Shift. Journal of the Association for Information Systems, 8(4), 244–254. https://doi.org/10.17705/1jais.00122

Collins. (2000). Collins English Dictionary & Thesaurus. HarperCollins, London.

Compeau, D.R. & Higgins, C.A. (1995). Application of Social Cognitive Theory to Training for Computer Skills. Information Systems Research, 62, 118-143

Davis, F. D., Bagozzi, R. P., & Warshaw, P. R. (1989). User Acceptance of Computer Technology: A Comparison of Two Theoretical Models. Management Science, 35(8), 982–1003. http://www.jstor.org/stable/2632151

Davis, F.D. (1989). Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology. MIS Quarterly, 133, 319

Elena, M., Sergey, T., Anna, D., Alevtin, M., Natalya, T., Irina, T., ... & Elena, N. (2021). Technology Optimization for the Production of Meat Paste with Lithium. International Journal of Pharmaceutical Research & Allied Sciences, 10(1), 100-108.

Fishbein, M., & Ajzen, I. (1975). Belief, Attitude, Intention, and Behavior: An Introduction to Theory and Research. Reading, MA: Addison-Wesley.

Goodhue, D.L. (1995). Understanding User Evaluations of Information Systems. Management Science, 4112, 1827-1844

Goodhue, D. L., & Thompson, R. L. (1995). Task-technology fit and individual performance. MIS Quarterly, 213–236.

Godin, G., Bélanger-Gravel, A., Eccles, M., & Grimshaw, J. (2008). Healthcare Professionals' intentions and behaviours: A systematic review of studies based on social cognitive theories. Implementation Science, 3(1). https://doi.org/10.1186/1748-5908-3-36

Hitzeroth, M., & Megerle, A. (2013). Renewable energy projects: Acceptance risks and their management. Renewable and Sustainable Energy Reviews, 27, 576–584. https://doi.org/10.1016/j.rser.2013.07.022

Hufnagel, E. M., & Conca, C. (1994). User response data: The potential for errors and biases. Information Systems Research, 5(1), 48–73. https://doi.org/10.1287/isre.5.1.48

Lai, P. C. (2017). the literature review of technology adoption models and theories for the novelty technology. Journal of Information Systems and Technology Management, 14(1). https://doi.org/10.4301/s1807-17752017000100002

Kubanov, S. I., Savina, S. V., Nuzhnaya, C. V., Mishvelov, A. E., Tsoroeva, M. B., Litvinov, M. S., ... & Povetkin, S. N. (2019). Development of 3d bioprinting technology using modified natural and synthetic hydrogels for engineering construction of organs. International Journal of Pharmaceutical and Phytopharmacological Research, 9(5), 37-42.

Legris, P., Ingham, J., Collerette, P. (2003). Why do people use information technology? A critical review of the technology acceptance model. Information & Management, 40, 191-204.

Leonard-Barton, D. & Deschamps, I. (1988). Managerial Influence in the Implementation of New Technology. Management Science, 3410, 1252-1265.

Lin, F., Fofanah, S. S., & Liang, D. (2011). Assessing citizen adoption of e-Government initiatives in Gambia: A validation of the technology acceptance model in information systems success. Government Information Quarterly, 28(2), 271–279. https://doi.org/10.1016/j.giq.2010.09.004

Malhotra, Y., & Galletta, D. F. (n.d.). Extending the technology acceptance model to account for social influence: Theoretical bases and empirical validation. Proceedings of the 32nd Annual Hawaii International Conference on Systems Sciences. 1999. HICSS-32. Abstracts and CD-ROM of Full Papers. https://doi.org/10.1109/hicss.1999.772658

Mathieson, K. (1991). Predicting user intentions: Comparing the technology acceptance model with the theory of planned behavior. Information Systems Research, 2(3), 173–191. https://doi.org/10.1287/isre.2.3.173

Marikyan, D. & Papagiannidis, S. (2021) Unified Theory of Acceptance and Use of Technology: A review. In S. Papagiannidis (Ed), TheoryHub Book. http://open.ncl.ac.uk

Olushola, T., Abiola, T. A. (2017). The Efficacy of Technology Acceptance Model: A Review of Applicable Theoretical Models in Information Technology Researches. Journal of Research in Business and Management, 4(11), 70-83

Opoku, M. O., & Enu-Kwesi, F. (2020). Relevance of the technology acceptance model (TAM) in information management research: a review of selected empirical evidence. Pressacademia, 7(1), 34–44. https://doi.org/10.17261/pressacademia.2020.1186

Renaud, K., & van Biljon, J. (2008). Predicting technology acceptance and adoption by the elderly. Proceedings of the 2008 Annual Research Conference of the South African Institute of Computer Scientists and Information Technologists on IT Research in Developing Countries Riding the Wave of Technology - SAICSIT '08. https://doi.org/10.1145/1456659.1456684

ROGERS, E. M. (1995). Diffusion of innovations. Free Press.

Sila, I. (2015). The state of empirical research on the adoption and diffusion of business-to-business e-commerce. International Journal of Electronic Business, 12(3), 258. https://doi.org/10.1504/ijeb.2015.071386

Venkatesh, V., & Davis, F. D. (1996). A Model of the Antecedents of Perceived Ease of Use: Development and Test. Decision Sciences, 27(3), 451–481. https://doi.org/10.1111/j.1540-5915.1996.tb00860.x

Venkatesh, V. (2000). Determinants of Perceived Ease of Use: Integrating Control, Intrinsic Motivation, and Emotion into the Technology Acceptance Model.

Information Systems Research, 11(4), 342–365. https://doi.org/10.1287/isre.11.4.342.11872

Venkatesh, Morris, Davis, & Davis. (2003). User Acceptance of Information Technology: Toward a Unified View. MIS Quarterly, 27(3), 425. https://doi.org/10.2307/30036540

Venkatesh, V., Bala, H. (2008). Technology Acceptance Model 3 and a Research Agenda on Interventions. Decision Science, 39 (2), 273-312.