

Literature Review of Technology Adoption Models at Firm Level; Special Reference to E-Commerce Adoption

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Abstract

With the onset of the fourth industrial revolution, technology has become a decisive part of human lives, and is used to speed up the processes of individuals and firms. The connected life employing the internet such as the adoption of e-commerce, which is an innovative technology adoption by firms as part of their business strategies is also one of the elements in the fourth industrial revolution. The successful innovative adoption is a critical task for any company and therefore, during the past few decades, the researchers have applied a few technological adoption models for their studies at the firm level. This paper aims to find-out the technological adoption models which were adopted by the researchers during the recent past for their technology adoption studies at a firm-level, especially on ecommerce adoption and implementation. Hence, this study focused on 50 empirical studies related to the technology adoption in different contexts within the past ten years and identified TOE and DOI theories, which are mostly applied or adopted by the researchers.

Index terms— adoption of e-commerce, e-business, technology adoption, TOE framework, DOI theory

1 Introduction

In the technology advancement era, Information and Communication Technologies (ICT) have become an integral part of modern humans' lives. People use technology to speed-up their necessary processes (Sigerson, Li, Cheung, and Cheng, 2017). On the other hand, the internet becomes an essential service of every life, and eventually, it was the best innovator, which enhances the lives of many (Garín-Muñoz et al., 2019).

In the new era, a series of innovations that leverage the internet could have a significant impact on the global trades. Currently industries are at the commencing of the fourth industrial revolution. The third industrial revolution was launched in the 1960s and called as a computer or electronic revolution, which used electronics and information technology to automate production. The fourth revolution is building on the third revolution, and it is the fusion of technology (Chinoracký & ?orejová, 2019). The use of Artificial Intelligence (AI), Internet of Things (IoT), Cloud computing, Machine learning (ML), etc. involves speeding up the process and enhancing performance (Syam & Sharmab, 2018). The fourth industrial generation classifies firms into two main segments; wholly digital companies, such as Google, Yahoo, LinkedIn, Facebook, etc. which are purely internetbased business models. Partly digitalized or goingdigital are the companies that are different from the existing "brick-and-mortar" businesses that are adopting digital technologies into their existing business (Eden, 2018). The connected life using the internet is also one of the elements in the fourth industrial revolution, such as the adoption of e-commerce (Xu, David, & Kim, 2018). E-commerce is a business strategy and modern trending art of trading goods and services using the

2 II. Models of Technology Adoption

The Technology Acceptance Model (TAM) developed by Davis (1986) is widely referred to as the Information System (IS) success model. TAM enables us to comprehend and explain user behavior in IS implementation. The model suggests two factors of "perceived usefulness" and "perceived ease of use" that influence the use and success of the system and address the issue of why users accept and reject the information system. This model is an adaptation of the well-known model of the social psychology domain; the Theory of Reasoned Action (TRA) model by Fishbein and Ajzen (1975) and explains how a person's attitude and subjective norms affect that person's behavioral intention. The Theory of Planned Behavior (TPB) by Ajzen (1985, 1991) is also an extension of TRA. It suggests that behavioral intention is jointly determined by a person's attitude and subjective norms, like TRA, but with the addition of perceived behavioral control.

The TAM has been continuously studied and expanded. The two upgrades are TAM2 by Venkatesh and Davis (2000) and UTAUT by Venkatesh (2003). TAM2 rationalized the fact that perceived usefulness is depending on other factors, including the user's experience, voluntariness, subjective norm, image, job relevance, and result demonstrability. The theory of Acceptance and Use of Technology (UTAUT) aims to explain a user's intention to use IS and subsequent usage behavior. The theory holds the four constructs of performance expectancy, effort expectancy, social influence, and facilitating conditions. The first three elements influence the behavioral intention, and the fourth element is a direct determinant of user behavior. Gender, age, experience, and voluntariness of use are moderating the impact of the four constructs on usage intentions and behavior.

The Diffusion of Innovations Theory (DOI) was introduced by Rogers (1995), which explained the process of the members of a social system, communicated an innovation through specific channels over time, known as diffusion. The theory explained that the innovation and adoption transpired after going through several stages, including understanding, persuasion, decision, implementation, and confirmation. The Technology, Organization, Environment (TOE) framework was introduced by Tornatzky and Fleischer (1990), which depicts the entire process of innovation, which entrepreneurs adopt and implement those innovations within the context of a firm. Moreover, the TOE framework is an organization-level theory that explains three different elements of the firm, which influence the adoption decisions of technological innovation.

In the recent past, the Integrated model for the adoption of e-commerce among SMEs (IMAES) was introduced by Sanchez-Torres and Juarez-Acosta (2019). This model, integrated with the theory of contingency, DOI, and TAM. Further, the Technology Readiness Index (TRI) was introduced by Parasuraman in 2000. The model contends the tendency of individuals to pursue and utilize new technologies to achieve their goals. TRI measures the readiness of individuals to use new technologies and consists of four dimensions: optimism, innovativeness, discomfort, and insecurity.

Nevertheless, the theories of TAM, TPB, TRA, and UTAUT concentrate primarily on the individual level perception of technology acceptance and DOI, TOE, and IMAES are at the firm level theory of technology adoption. TRI is the combination of individual and companies' level perception of technology readiness.

3 III. Firm-Level Technology Adoption Models

As described above, there are few firm-level perceptions of technology adoption models.

4 a) Technological, Organizational, Environmental (TOE)

Framework TOE framework of Tornatzky and Fleischer 1990, identifies three aspects of an enterprise's context, that influence the process of adoption and implementation of technological innovation: The context portrays both the internal and external technologies relevant to the firm. The technological context denotes the internal current practices and equipment of the firm, and available technologies external to the firm. The organizational context refers to the descriptive measures about the organization, such as scope, size, and managerial structure. The environmental context is the arena in which a firm conducts its business, which consists of its industry, competitors, and government involvement. DOI is a theory of new ideas and technology spread through cultures, operating at the individual and firm-level. DOI theory sees innovations as being communicated through specific channels over time and within a particular social system (Rogers, 1995). Individuals possess different degrees of willingness to adopt innovations. Roger categorized the individuals into five adoption stages, such as innovators, early adopters, early majority, late majority, and laggards.

The innovation process in an organization is more complex. The DOI theory at the firm level is emphasized; the innovativeness is related to three independent variables such as Individual (leader) characteristics describes the leader attitude toward change. The Internal characteristics of organizational structure include; centralization of power and the control in a system are concentrated in the hands of a relatively few individuals, complexity is an organization member possess a relatively high level of knowledge and expertise, formalization is an organization emphasizes its members' following rules and procedures, interconnectedness is the units in a social system linked by interpersonal networks, organizational slack is uncommitted resources are available to an organization and size is the number of employees of the organization. The External characteristics of an organization refer to system openness.

5 Individual (Leader) Characteristics

Attitude towards change

6 External Characteristics of the Organization

System openness IV.

7 Internal Characteristics of Organizational Structure

Centralization Complexity Interconnectedness Organizational Slack Size Organizational Innovativeness

Empirical Literature

This study focuses on technology adoption models at firm-level with special emphasis on ecommerce adoption. The researcher reviewed 50 empirical studies from 33 countries, representing nine (09) regions such as Asia, Africa, Middle East, European Union, North America, Central America, South America, Eastern Europe, and Oceania, within the past ten years from 2011 to 2020 and five (05) empirical studies for each year.

© 2020 Global Journals The majority of technology adoption studies, particularly e-commerce adoption at the firm level, have adopted either TOE or DOI theory or combination of both. Limited studies have found that one of the main theories was adopted with another technology adoption theory (Table 02).

Putra and Santoso (2020) adopted the TOE framework in their study to investigate the interrelationships amongst contextual factors that influence e-business utilization and its impact on the performance of SMEs in Indonesia. Similarly, Yoon, Lim, and Park (2020) investigate the factors affecting the adoption of the smart farm in Korea, using the TOE framework. Ezzaouia and Bulchand-Gidumal (2020) applied the TOE model to examine factors in fluencing the adoption of information technology (IT) in the hotel industry in Morocco.

Oliveira, Martins, Sarker, Thomas, and Popovi? (2019) used the TOE framework to understand the SaaS (Software as a service) adoption in Portugal. They further explore the moderating effects of the environmental context in the adoption of SaaS and how it shapes the direct in fluences of the technological and organizational setting of the TOE model. Also, Govinnage and Sachitra (2019) examine the adoption of e-commerce in the retail SMEs sector by using the TOE framework and TAM in the Sri Lankan context. E-commerce adoption and its impact on customer satisfaction by using TRA, TPB, TAM, and DOI theories were investigated by Alnaser, Alrawashed, and Saeed (2018) in Jordan. Moreover, García-Moreno, Moreno, Nájera-Sanchez, and Pablos-Herederó (2018) used the TOE framework to study the organizational factors impacts on e-business adoption in Spain.

Indeed, Aboelmaged (2014) applied the TOE and TRI theories to analyze the TOE effects on emaintenance readiness in manufacturing firms in the United Arab Emirates. Furthermore, Lin (2014) used TOE to study the adoption of electronic supply chain management systems in Taiwan, and Cao, Jones, and Sheng (2014) used the TOE framework for the study of the adoption of hospital RFID patient tracking in the USA. DOI theory was adopted by Poorangi, Khin, Nikoonejad, and Kardevani (2013) to examine the ecommerce adoption in practitioner firm SMEs in Malaysia.

According to the empirical analysis (Table 3), the majority of the studies, 54% (27) have used the TOE framework to examine the technology adoption, and Oliveira and Martins (2010), study reiterates that the majority of firms in 27 countries of the European Union had used the TOE framework for technology adoption studies.

V.

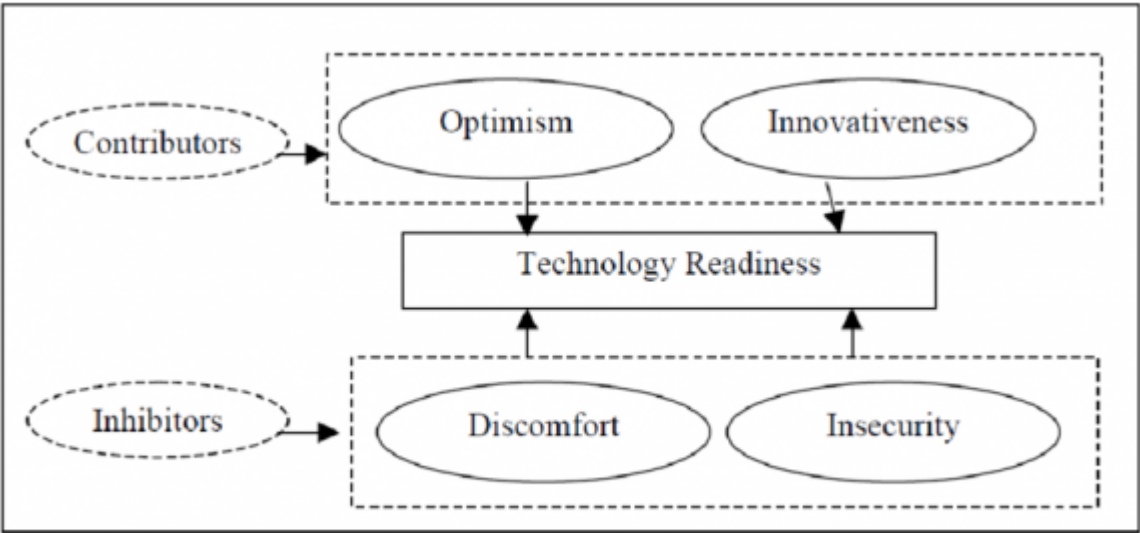
8 Conclusion

The purpose of this review is to identify theoretical models that were commonly adopted by the researchers for the technology adoption studies at the firm level, especially in e-commerce adoption and implementation, in different contexts.

Hence, based on the extensive review of the 50 empirical studies conducted in 33 countries, it is evident that the TOE was the most adopted framework at the firm level of technology adoption studies within the past 10 years. Technological-Organizational-Environmental factors are considered as the fundamental elements of innovative technology adoption in any organization. The DOI theory is the second-largest theory applied by the researchers.

This study helps future researches and recommends them to adopt these commonly tested theories in different contexts in the recent past, especially e-commerce related adoption studies at firm level. ¹

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12 Source: Parasuraman (2000, p. 34)

Figure 1: Figure 1 : 2 Global

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Figure 2: Table 1 :

2

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Year 2020

6

Volume XX Issue VI Version I TOE Theory

() B DOI
Global Journal of Management and Business Research TAM TOE and DOI TOE and TAM TOE and TRI TOE and TPB TOE and

General

10% (05) have adopted DOI theory for their studies. Another 8% (04) applied TAM and 6% (03) used TOE and DOI both for their studies.

Figure 3: Table 2 :

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Figure 4: Table 3 :

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