Journal of Engineering and Technology Management 47 (2018) 53–67

Contents lists available at ScienceDirect

Journal of Engineering and Technology Management

journal homepage: www.elsevier.com/locate/jengtecman

New approach to Rogers' innovation characteristics and comparative implementation study

Murat Oturakci[a,*], Oya H. Yuregir[b]

[a] Industrial Engineering Department, Faculty of Engineering, Adana Science and Technology University, Adana, Turkey
[b] Industrial Engineering Department, Faculty of Engineering and Architecture, Cukurova University, Adana, Turkey

ARTICLE INFO

JEL Classification:
O32
M15

Keywords:
Innovation characteristics
ERP applications
Organizational characteristics
Factor analysis

ABSTRACT

This study aims to develop a research model that analyzes the effects of the innovation and organizational characteristics in literature on ERP application users' rates of adoption. Innovation characteristics model in literature is extended and new research model, which includes both innovation and organizational characteristics, is developed and both models are tested on 403 users with factor analysis. Moreover, the sample is divided into 10 categories to observe how characteristics differentiate in both models in each category. Results indicate that categorizations of the sample have distinctive impacts for both models and create dynamic structure which flexes the rigidity in literature.

1. Introduction

With the advancement of information technology, producers, distributors and retailers have started to perform many of their business tasks electronically. Basically, all the companies that try to increase their efficiency have started to establish electronic work models in order to compete and improve their position. They have increasingly tended to resort to ERP applications to increase their effectiveness. As ERP software markets are featured as high potential margin and intense competition, these systems have gained much attention from both practitioners and researchers (Kao and Hsu, 2011). With the increase in ERP applications use, continuous research in development and improvement has been underway and companies have started to concentrate on innovation management. Therefore, innovation has been an important focus for the attention of academic circles and policy makers in industries (Koc, 2011). Innovation is an idea, practice, or object that is perceived as new by an individual or other unit of adoption. Rate of adoption is the relative speed with which an innovation is adopted by members of a social system (Rogers, 1995). According to diffusion of innovation theory, five different attributes of innovations are described. Each of these is somewhat empirically interrelated with the other four, but they are conceptually distinct (Rogers, 1995). The way people in a social system perceive the five attributes of an innovation determines its rate of adoption. The five attributes are Relative Advantage, Compatibility, Complexity, Trialability, and Observability (Rogers, 1995; Do, 2008).

Relative advantage is the degree to which an innovation is perceived as being better than the idea it supersedes (Rogers, 1995). The sub-dimensions of this attribute include economic profitability, savings of time and effort, low initial cost, social prestige. Compatibility is the degree to which an innovation is perceived as consistent with the existing values, past experiences, and needs of potential adopters (Rogers, 1995). The sub-dimensions of this attribute include socio-cultural values and beliefs, past experiences, needs of potential adopters and name (Do, 2008). Complexity is the degree to which an innovation is perceived as relatively difficult to understand and use. The sub-dimensions of this attribute include ease of using and ease of understanding (Rogers, 1995).

* Corresponding author at: Gültepe Mahallesi, Çatalan Caddesi No:201/501250 Seyhan, Adana, Turkey.
E-mail address: moturakci@adanabtu.edu.tr (M. Oturakci).

https://doi.org/10.1016/j.jengtecman.2017.12.004
Received 27 May 2016; Received in revised form 6 October 2017; Accepted 20 December 2017

Trialability is the degree to which an innovation may be experimented with on a limited basis (Rogers, 1995). The sub-dimensions are the ability of adopters to try an innovation on installment basis, re-invention, partial trying and the ease of trying (Do, 2008). Observability is the degree to which the results of an innovation are visible to others (Rogers, 1995). The sub-dimensions of this attribute are the difficulty in observing and in describing to others (Do, 2008).

Five different characteristics and their affect on innovation adoption rates in various fields have been searched in previous conducted studies since those are the determinants of innovation adoption rate according to Rogers.

Moore and Benbasat (1991) have reported on the development of an instrument designed to measure the various perceptions that an individual may have of adopting an information technology (IT) innovation, using five characteristics of Rogers' with two newly developed ones such as voluntariness and image characteristics. Agarwal and Prasad (1998) have reported the results of a field study examining adoption of information technology innovation represented by an expert systems application using relative advantage, ease of use and compatibility as perceptions in their research model. Results have shown that compatibility does not provide a definitive answer to the role of compatibility in determining intentions. Chong et al. (2001) have surveyed the perceptions and experience of Australian small- and medium sized enterprises (SMEs) in the adoption and implementation of Internet-based Electronic Commerce. Employing Rogers's model of innovation diffusion as the framework and considering Electronic Commerce (EC) as a form of new innovation, they have analyzed factors affecting EC implementation success. The findings have shown that only 3 characteristics (relative advantage, compatibility and complexity) to make a significant contribution to the implementation success of Internet-based EC adoption. Carter and Belanger (2004) use Moore and Benbasat's (1991) perceived characteristics of innovating constructs to identify factors that influence citizen adoption of e-Government initiatives. The findings have shown that relative advantage, perceived image, and perceived compatibility are significant elements of e-Government adoption. Lee and Kim (2007) have reported on the development of a model of Internet-based information systems (IIS) implementation in business-to-consumer electronic commerce based on IS implementation and technology innovation–implementation studies. Their research model suggests that eight factors, comprising the characteristics of IIS technology innovation (compatibility, relative advantage, complexity), organizational factors, and IS related factors affect the implementation success of IIS. Hashem and Tann (2007) have investigated the key determinants of the adoption of innovation of ISO 9000 Standards. Study has used all five characteristics of innovation as one of the determinant group of factor. The results show that characteristics of innovation, characteristics of the external environment and organizational characteristics are significantly associated with the adoption of ISO 9000 standards by manufacturing companies. Liao and Lu (2008) have developed a technology adoption model to predict the users' intention of adoption and their continued use behavior. The results have shown significant evidence in support of the hypothesis. The findings indicate that perceptions of relative advantage and compatibility are significantly related to users' intention to use e-learning. Lin (2008) has aimed to develop a research model to examine innovation characteristics and organizational learning capabilities as the determinants of e-business implementation success. After results from 163 information system manager have been collected, two innovation characteristics which are relative advantage and compatibility and four organizational learning capabilities: managerial commitment, system orientation, knowledge acquisition and knowledge dissemination have significant effects on e-business implementation success. Damanpour and Schneider (2009) have sought to develop direct and moderating hypotheses for the relationship between innovation characteristics, managerial characteristics, and innovation adoption in public organizations. The findings have suggested that both innovation characteristics and manager characteristics influence the adoption of innovation; however, they do not reveal significant moderating effects of manager characteristics on the relationship between innovation characteristics and innovation adoption. Dizgah et al. (2011), have aimed to investigate relationship between innovation characteristics and organizational learning capabilities in implementation success of the e-business. The research was conducted in 92 companies and findings are in the direction of previous researches. Rahimnia (2012) have investigated the effects of innovations on e-commerce in the form of a business frame and innovation considerations. In the study, innovation culture has been considered as an effective factor on innovation's components and then they are regarded according to Rogers's theory and e-commerce development has been considered. Hameed and Counsell (2014), have examined the association between innovation or technological characteristics and IT innovation adoption by using five of Rogers' innovation characteristics with an addition of cost characteristic. They have concluded that relative advantage, compatibility, cost, observability and trialability have significant relationships with IT adoption while complexity of the innovation has no impact on the decision to adopt IT in organizations. Lawson-Body et al. (2014), have researched that a veteran's intention to adopt e-Gov services is determined by the interaction between the digital divide and five innovation characteristics such as relative advantage, perceived compatibility, perceived complexity, subjective norms and perceived risk. Theere are also some studies that focus on new technology models with innovation determinants, rate of adoption and diffusion of innovation (Wu and Chiu, 2015; Ram et al., 2014; Hameed et al., 2012; Gerstlberger et al., 2016) (Table 1).

When the effects of technology on innovation are considered, it is an undeniable necessity to make the innovation characteristics table more flexible. To illustrate, if organizational structures and components of businesses do not support and motivate innovation, it becomes exceedingly difficult to gain success of innovative actions such as to generate new ideas, turn them into innovative solutions, products and services and for businesses to adopt new techniques and applications (Uzkurt, 2008). Hence, it is necessary to mention organizational characteristics that affect rate of innovation adoption. These characteristics are Centralization, Specialization, Autonomy, Commitment, Free Resources, Organizational Differentiation, Management Mentality, Communication, Technological Environment, Socio-cultural Environment, Economic Environment, Market Environment, Leader Strategy, Imitation Strategy, Defensive Strategy, Traditional Strategy, Market Orientation, Organizational Learning, Knowledge Management (Uzkurt, 2008). In recent years, there are plenty of studies that focus on various organizational characteristics with innovation characteristics (Díaz-García et al., 2013; Marvel et al., 2015; Shukla et al., 2015; Subramanian et al., 2015).

According to previous studies, which consider innovation characteristics effects in adoption rate, reveal following gaps in