Jurnal Kejuruteraan 34(3) 2022: 347-352
https://doi.org/10.17576/jkukm-2022-34(3)-01

E-Procurement Adoption in the Malaysian Construction Sector: Integrating Diffusion of Innovations and Theory of Planned Behaviour Framework

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Received 4 July 2021, Received in revised form 28 September 2021
Accepted 30 October 2021, Available online 30 May 2022

ABSTRACT

In recent years, environmental problems have become more prominent in the construction industry. The production and use of building materials are still one of the main reasons for various ecological and environmental challenges in the industry. Compared with traditional building materials, green building materials are environmentally friendly. Therefore, the adoption of green building materials in the construction industry can generally solve the industry's ecological and environmental problems and promote green and low-carbon development. Research on contractors' green procurement behaviour can promote the construction industry's sustainable development. Many scholars discuss and agree that the implementation of e-procurement is a green approach towards sustainable construction. However, current evidence indicates that procurement stakeholders, especially contractors, are struggling to implement e-procurement effectively. Therefore, there is a need to study contractors' behaviour in relation to green e-procurement. In response, this study investigates the adoption of e-procurement by Malaysian contractors by adopting planned behaviour theories and diffusion of innovations in their decision-making process. Here, a conceptual framework has been developed which focuses on factors influencing contractors' adoptions. The framework can be used for understanding the contractors' adoption decision of e-procurement. The result will help to find the critical key factors affecting green procurement behaviour from contractors' perspectives and extend the theories further. This framework is also in tandem with the Construction Industry Development Board (CIDB), Construction 4.0 Strategic Plan (2021-2025) in identifying critical factors that affect the adoption of green procurement on construction projects.

Keywords: e-Procurement; theory of planned behaviour; diffusion of innovations; conceptual framework

INTRODUCTION

Electronic procurement (e-procurement) means that organisations can automate the procurement of goods and services through web-based applications. Therefore, e-procurement can rationalise organisational expenditures, reduce management costs, and improve operational efficiency (Gardenal 2013). Generally, procurement is one of the most critical areas in an organisation's cost structure (Amemba et al. 2013). By converting the manual procurement procedures to date into an Internet-based electronic system, the e-procurement procedure allows government contracting authorities to electronically purchase goods and services from their suppliers (Sila 2013). In turn, suppliers will benefit from being able to display their products on the World Wide Web. They (suppliers) can receive, manage, and process government purchase orders and receive payments from contractors online using the electronic procurement system. By automating the entire procurement cycle in the electronic procurement system, suppliers can benefit from a broader range of buyers than ever before, with lower operating costs, shorter turnaround times, more revenue and higher customer satisfaction. Evidence from the existing literature reveals significant benefits of e-procurement implementation. As we all know, e-procurement can reduce transaction costs, leading to better decision-making and higher procurement value (Mohd Nawi et al. 2017). There is also evidence that e-procurement benefits the operators of small businesses to reduce bureaucracy in dealing with the authorities while also providing opportunities to enter the government electronic market (Mohd Nawi et al. 2017).

In addition, as technology advances, various forms of online platforms tend to provide integrated software packages such as social networks, which may bond the boundaries between one form of technology and another (Park 2015). In addition, e-procurement also assists in

providing online services through the Internet. Another definition is that suppliers and buyers use the Internet and information technology applications to exchange goods and services. The e-procurement system uses Internet-based information and communication technology to purchase, easily completing the search, purchase, negotiation, order and reception, and post-purchase review processes (Oh, Yang, and Kim 2014). As more and more users connect via the Internet, the application allows transactions or purchases with other entities. Some studies show that e-procurement is used as a supplementary program for e-government systems (Sutcliffe 2006). However, a lack of in-depth understanding of the theoretical and practical basis of the procurement process in public policy and administration may limit the inherent benefits of adopting the procurement process (Sutcliffe 2006). In the same way, understanding the role of information technology in running procurement procedures, system software and hardware make e-procurement easier to understand.

From the literature reviewed in this article, it is obvious that further research is needed on the factors that influence the adoption of e-procurement in construction projects in the Malaysian context. This study explores this issue and aims to investigate the factors that influence the adoption of e-procurement in construction projects in developing countries. This study will focus on the group of G1-G7 contractor's point of view because, in the procurement involving subcontractors and suppliers, their e-procurement implementation rate is still very low. The main research question of this research is how contractors evaluate the factors that influence the level of adoption/adoption of e-procurement concepts in construction projects and how they make decisions about whether to adopt them. In response, this research uses Innovation Diffusion Theory (IDT) and Planned Behaviour Theory (TPB) to provide a framework for developing and understanding factors that influence the unused e-procurement adoption in Malaysia.

E-PROCUREMENT

E-PROCUREMENT AS AN INNOVATION

Innovation is a new idea, practice, or object considered by an individual or other adopting unit (Rogers 2003). It includes all new or old product and service sets, but when the user uses it or when the user thinks it is new, it presents unparalleled usage, which becomes an innovation. If people think it is new, it may still be an innovation (Sahin 2006). According to (Froese and Rankin 2014), innovation is at the centre of the key strategic goal of sustainable development. Innovation systems are seen as different institutions contributing to innovation, namely developing, disseminating, and implementing new competitive technologies (Rogers 1995). Therefore, the e-procurement concept as a new approach can be viewed as basically an innovation.

E-PROCUREMENT ADOPTION AS A CHOICE

As we all know, the construction industry is making slow progress in adopting e-procurement as a new concept or practice. Before a company chooses to adopt a new concept or practice, it must first evaluate the benefits it will obtain and compare it with the costs or risks involved (Nemoto, Vasconcellos, and Nelson 2010). In other words, weighing the relationship between the benefits and costs of a new approach helps companies choose to adopt or not to adopt new concepts or practices (Hall and Khan 2003). This is one of the key criteria for adopting new practices or concepts (Sieber & Valor, 2008). The choice to adopt innovation is made through cost-benefit analysis in an uncertain environment. Benefits refer to the relative advantages that innovation and sustainability can provide to companies (Mahat, Tah, and Vidalakis 2016, 2019). At the same time, costs/risks include incompatibility with existing habits and values, difficulty in use, inability to conduct trials, and lack of obvious business impact (Rogers 1995).

E-PROCUREMENT AS GREEN PROCUREMENT

Electronic procurement, commonly referred to as e-procurement, can be defined as the automation of an organisation's procurement process using a web-based application (Croom and Brandon-Jones 2007). E-procurement involves e-bidding, and e-ordering, which can help simplify information management and exchange. E-procurement promotes paperless management and increases productivity. Tender advertisements will also be digitised, including the submission of tenders. Therefore, the application of e-procurement provides support for the transformation of traditional procurement to Green Procurement (GP) (Bohari and Xia 2015). The idea of initiating GP is to incorporate the elements of protecting the natural environment into procurement delivery activities (Bohari et al. 2017) and promote value for money. The tangible benefits are easy to quantify, such as cost and time savings, which translate into increased efficiency and efficiency of the organisation, and increased revenue due to entering new markets or new business opportunities (Eei, Husain, and Mustaffa 2012). The use of electronic methods can provide two types of benefits. Intangible benefits are other benefits, such as improved customer satisfaction, better integration of business processes, and better communication with other companies to improve business relationships. These benefits are difficult to quantify (Eei, Husain, and Mustaffa 2012). For example, e-bidding can help reduce costs through the extensive use of traditional documents.

THEORETICAL BASIS OF THE RESEARCH

INNOVATIONS DIFFUSION THEORY (IDT)

Diffusion refers to how innovation is communicated between social systems through specific channels over a period of time. Assuming the decision to adopt (an innovation) is

authoritative or collective, the social system innovation decision members need to go through four stages (Rogers 1995). Knowledge is the first stage in which social system members begin to understand ideas about innovation and its functions. Persuasion is the second stage; in this stage, they form an attitude towards innovation (favourable or disadvantageous). Deciding whether to adopt or not to adopt is the third stage, the "decision-making". The implementation of innovation occurs in the fourth stage of "confirmation", during which users also evaluate innovations based on their decisions (see Figure 1).

Based on cost-benefit analysis, the dissemination of innovation theory contains some innovative features that affect the persuasive stage. These characteristics are as follows: comparative advantage (the degree to which people think that innovation is better than others, and therefore may produce a comparative advantage in innovation), compatibility (consistent with the organisation's existing values and habits, experience and needs), complexity Responsibility (the effort required to use innovation without difficulty), testability (the degree to which an organisation can experiment on a limited basis), and observability (provide visibility and visibility of results for the organisation).

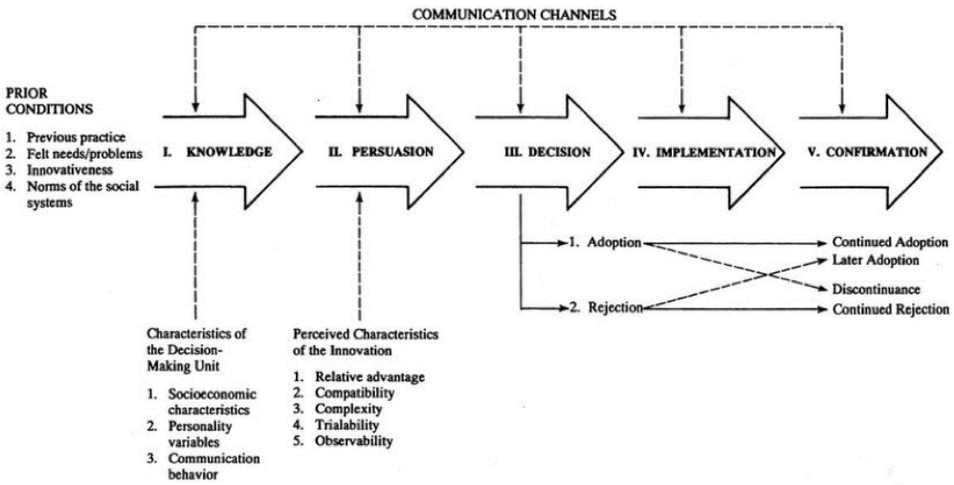

FIGURE 1. A Model of Five Stages in the Innovation-Decision Process. Source: Everett M. Rogers'. Diffusion of Innovations, Fifth Edition. Copyright (c) 2003 by The Free Press.

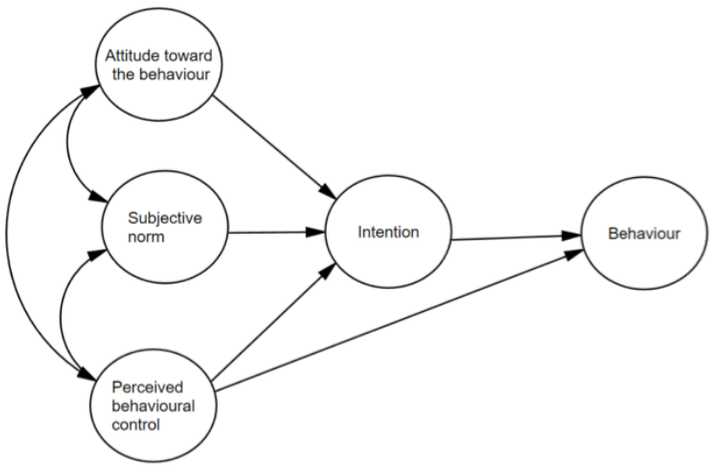

FIGURE 2. Theory of planned behaviour. (Ajzen, 1985)

THEORY OF PLANNED BEHAVIOUR (TPB)

The theory of planned behaviour (TPB) (see Figure 2) is an extension of the theory of reason action (TRA), aimed at addressing its limitations. In addition to personal attitudes towards behaviour and its subjective norms from TRA, TPB also includes perceivable behaviour control structures. Perceived behavioural control is the individual's belief about how easy or difficult it will be to perform the behaviour (Ajzen 1991). Recently, (Ajzen et al. 2012) added different combinations of antecedents to the original constructs of the theory, namely, behavioural beliefs (beliefs about the behaviour), normative beliefs (beliefs about what others think about the behaviour), and control beliefs (beliefs about one's level of control over one's behaviour). Precise behavioural control is another determinant of behaviour and refers to the individual's control over behavioural factors such as resources (e.g., money, time, skills) or others' cooperation.

Although the addition of perceived behaviour control can enhance the prediction of actual behaviour in TPB, the variety of labels and operational definitions of this structure used in empirical research means that it is still controversial. People have doubts about distinguishing between perceived behavioural control and intention (Kraft et al. 2005). In addition, the predictability of intentions is expected to vary with behaviours and situations. In institutions with strong attitudes and strong subjective norms, perceived behavioural control is less predictive of intentions (Armitage and Conner 2001).

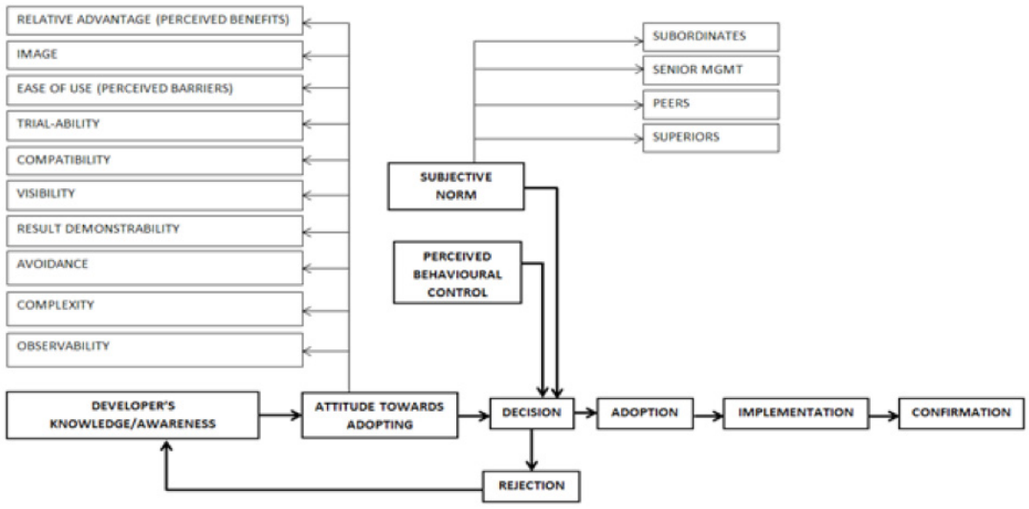

FIGURE 3. A conceptual framework for e-procurement adoption in construction projects (Source; adapted from Rogers' innovation diffusion theory (IDT) and Ajzen theory of planned behaviour (TPB).

THE CONCEPTUAL FRAMEWORK

ADOPTION

Figure 3 indicates the proposed framework. In this study, E-procurement (EP) adoption in residential building projects is the behaviour of interest and the dependent variable.

ATTITUDE TOWARDS ADOPTING

This research focuses on a person's cognitive aspects or perceptions of behaviour. In diffusion theory, perceptions that are believed to affect attitudes have been regarded as the perceived characteristics of innovation and have been shown in multiple studies related to adoption/rejection decisions. Compatibility, relative advantage and complexity are always associated with innovative behaviour (Tornatzky and Klein 1982). In Innovation Diffusion Theory, Rogers had earlier identified these characteristics of trialability and observability (Rogers 1995). The study will include characteristics that include compatibility, relative advantage, complexity, trialability and observability. Finally, a sixth feature is included, that is, image because Rogers once said that although the image may be classified as a relative advantage, in some cases, it is itself a motivating factor. The next step is to develop an instrument to measure these various characteristics. In the process of instrument development, observability will be divided into two different structures: provability and visibility, and thus be divided. As a result, the seven perceivable characteristics of e-procurement will eventually be adopted in construction projects.

SUBJECTIVE NORM

One of the underlying determinants of behaviour is subjective norms (SN). SN is formed by a person's motivation to follow what others think they expect to do (normative beliefs). Several people may act as "reference objects" which may influence a person's behaviour in adopting GP / e-procurement in a con-struction project. These include senior managers.

PERCEIVED BEHAVIOURAL CONTROL

Perceived behaviour control is an individual's belief in the ease or difficulty of performing a behaviour, while SN refers to the perceived social pressure to perform a certain behaviour (Ajzen, 2012). SN sets an informal requirement; it is up to the individual to conform to others' expectations.

BEHAVIOUR

Behavioural intentions were not included in the study design. If there are no other variables to intervene once the attitude and subjective norms are formed, or if the behaviour is to be executed immediately, the intention can be removed from the model without losing information. The intent is used to predict behaviour, so it has the value of "it is important to measure it as close as possible to behaviour observation angle" (Ajzen 1980). In this study, we are not trying to predict future behaviour; instead, we try to determine the relationship between current behaviour and subjective norms and attitudes.

METHODOLOGY

To test the proposed conceptual framework, the followings are the proposed research process and analysis:

Phase 1 – Review Current Understanding of Green Procurement Adoption.

The first task is to review the concept, principles and understanding of GP in developed countries. In addition, to review the behavioural aspects of players in the construction industry and particularly on GP and bring together all constructs and variables related to the behavioural aspects. The literature search will use resources and information from journals, articles, books and the Internet.

Phase 2 – Establish New Dimensions from the Qualitative Approach

Semi-structured interviews will be used to explore the factors that influence the adoption of GP. The subject of the interviewees is an expert with GP from the construction industry to give insight into the factors of GP adoption. The factors found will be formed into several new dimensions and incorporated into the existing research theories. The recorded data from the interviews session will be transcribed and analyse using ATLAS.ti software.

Phase 3 – Establish a Theoretical Model from the Quantitative Approach

A questionnaire survey method will be used to analyse the model. The subjects of the survey are the project manager of the client company since they have the authority to decide for the company. The design of the questionnaire is based on the TPB theory dimensions and other dimensions from interviews. Pre-tests, reliability will be conducted. On this basis, the questionnaire will be further revised. The semi-structured questionnaire will be used in this study; a mixture of closed-ended, open-ended, and partially closed-ended questions allows the respondents to choose the most relevant answers and add extra information if they wish, representing their opinions. The questionnaire will use the Likert seven-point table, scored 1–7, indicating "very disapproval to an agreement". The final questionnaire consists of two parts, respectively, the respondents' basic information and the specific questions of GP adoption. The internet-mediated questionnaire (via e-mails using google forms or survey monkey will be used to ease the distribution of the questionnaires.

CONCLUSIONS

There are various policies and strategies from the government sector, private agencies, and educational institutions to encourage the adoption of sustainable construction in their procurements initiatives. Many scholars discussed and agreed that using e-procurement is a green approach towards sustainable construction. Past studies have emphasised the need for further research on adopting the e-procurement adoption framework and factors that influence e-procurement adoption in construction projects in Malaysia. This research outcome will provide value-added to the existing literature by exploring the TPB theory in GP. The contractors are the main player in GP for construction projects; however, the outcome of this study could also potentially help the government plan for TPB to enhance GP adoption through policies and strategic planning.

This research will support the green growth policies that encourage environmental protection and the engagement of stakeholders. Contractors can be the key channel to promote the industry to shift towards green practices. The specific TPB criteria for GP will help the stakeholders to understand how to expedite the process to adopt GP and provide a platform for the successful adoption of GP among contractors. According to the literature review, a conceptual framework for the use of e-procurement has been developed for construction projects in the Malaysian construction industry. It will be further studied in the next phase of this study. In short, this research has established a framework that explains the degree of adoption of e-procurement.

ACKNOWLEDGEMENT

This work was supported by the Universiti Teknologi MARA (UiTM) Cawangan Sarawak, Malaysia.

DECLARATION OF COMPETING INTEREST

None

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