INFLUENCE PROCESSES FOR PRACTICING GREEN INFORMATION TECHNOLOGY: ELABORATION LIKELIHOOD MODEL

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Abstract

Green Information Technology (IT) adoption has been the focal point for Information System researchers in recent years. These studies have focused on identifying factors that influence individuals' intention or actual behavior either positively or negatively. To the best of the researchers' knowledge, no study has examined how persuasion can be used to influence Green IT practicing and if persuasive processes can better influence the adoption of Green IT initiatives. The purpose of this study, therefore, is to examine how process of external influences shape practicing of Green IT among potential users. Upon elaboration-likelihood model (ELM), we propose a research model to compare two alternative influence processes, the central and peripheral routes, in motivating the Green IT adoption. Drawing on the ELM, six hypotheses were developed and are going to be validated empirically using a survey from Users. This study contributes to the Green IT literature by addressing an unexplored area of research, namely the process of influence that can shape the perceptions of individuals towards the adoption of Green IT.

Keywords: Green IT, Elaborating Likelihood Model, Proenvironmental, Sustainability.

1   INTRODUCTION

Individual practicing and acceptance of Green Information Technology (Green IT) initiatives has been a central and recurrent theme in Information Systems (IS) research in recent years. Understanding Green IT acceptance and adoption is important because the expected benefits of practicing Green IT initiatives, such as reducing power consumption, lowering costs, and sustaining a healthy lifestyle, cannot be comprehended if individuals do not accept these initiatives for environmental sustainability purposes in the first place. Several perceptions have already been identified in prior research in this area (e.g., perceived ease of use, perceived usefulness, perceived behavioral control, and attitude) that are believed to influence the adoption and acceptance of Green IT initiatives by potential individuals and investigated the casual nature of their effects on adoption and acceptance (e.g., Kranz and Picot 2011; Kranz and Picot 2012; Lei and Ngai 2013; Mishra et al. 2014). This research also demonstrated the influence of external sources including primary sources, secondary sources, and work referents, such as family, friends, mass media, and peers, on shaping the perception of individuals regarding Green IT initiatives and hence indirectly influence their adoption and diffusion behavior (e.g., Kranz and Picot 2011; Kranz and Picot 2012; Mishra et al. 2014). In spite of the research on the adoption of Green IT in the literature, there is no such a research investigating the impact of influence processes on the adoption of Green IT. For instance, we are not aware of what type of information would influence the perceptions of individuals most effectively towards the adoption of Green IT initiatives.

The elaboration likelihood model (ELM) would help us in understanding the process of influencing on the adoption of Green IT. Upon the ELM, influence mechanisms are categorized into two types named as central and peripheral routes. Based on the processed information, this model explains individuals are influenced more by which route (Richard E Petty and Cacioppo 1986). While there may be other theoretical frameworks exploring the process of influences, the ELM appears to be suitable to explaining the "black box" of influences on the adoption of Green IT. Hence, the following research questions are derived:

> RQ1. What influence processes shape individual adoption of Green IT initiatives?

> RQ2. What factors moderate the impact of these influence processes on the attitude of potential users?

Understanding the impact of influence processes on the adoption of Green IT is important both theoretically and practically. Theoretically, such research can enrich the Green IT adoption literature by addressing an unexplored area of research, namely the process of influence that can shape the perceptions of individuals towards the adoption of Green IT. Furthermore, this research investigates the moderating factors that mitigate the effect of these influence processes on the perceptions of individuals towards the adoption of Green IT, and the temporal nature of such influence processes.

2   PRIOR RESEARCH

The majority of Green IT studies are focused on the introduction of research agenda (Elliot 2011; Esfahani et al. 2015a, 2015b; Jenkin et al. 2011; Melville 2010; Watson et al. 2010), and theoretically and empirically explaining the drivers and consequences of adopting organizational Green IT initiatives (Bose and Luo 2011; Chen et al. 2011; Molla and Abareshi 2012). Despite the importance of organizational Green motivations, actions, and factors that influence the adoption of these initiatives, they only tell part of the story (Molla et al. 2014). These studies have expanded our knowledge regarding the macro level factors influencing the adoption of Green IT. For the environmental sustainability and climate change issues which are the complex problems, besides the organizational factors, there is a need to identify and understand the individual drivers and motivations (Hasan and Dwyer 2010).

Theory	Source
Technology acceptance model	Kranz and Picot (2012)
Theory of planned behavior	Chow and Chen (2009), Zhang (2012), Kranz and Picot (2012), Kranz and Picot (2011)
Theory of reasoned action	Chow and Chen (2009), Mishra et al. (2014)
Diffusion of innovation	Bose and Luo (2011)
Belief action outcome	Molla et al. (2014), Gholami et al. (2013)
Social cognitive theory	Oakley and Salam (2011)

Table 1.   Theories used in the study of individual level Green IT practicing

Existing research in IS examined the individuals' adoption of Green IT using theories such as technology acceptance model (Dedrick 2010). TAM presumes that the adoption of an information systems and its usage is explained by two factors as (1) the perceived qualities of an information systems that make it easy to use, and (2) its perceived usefulness in improving individual's performance. TAM is rooted in the supposition that the motivation of individual's in adopting and diffusing information systems is for individual purposes. In contrast to the typical context of TAM in which the resources are private, environment is a public resource, with the implications for how users approach technological systems intended to enhance its sustainability (Melville 2010). Table 1 summarizes some theoretical frameworks that have been applied in different studies investigating the individual level practicing of Green IT initiatives.

The reviewed literature suggests that most Green IT adoption studies have focused on identifying factors that influence individuals' intention. These factors have either been shown to positively or negatively affect their behavior. TPB has been the primary theory although suggestions for new theories have been made. While TPB and its derivatives have explained individuals' Green IT practicing, it has not exactly explained adoption behavior. The presence of inconsistent findings using TPB (Kranz and Picot 2012; Zhang 2012) suggest that we try new or different theories in explaining individuals' adoption behaviors to Green IT practicing. To the best of researchers' knowledge, no study has examined how persuasion can be used to influence Green IT practicing and if persuasive processes can better influence the adoption of Green IT initiatives.

3   THEORETICAL BACKGROUND

Elaboration likelihood model (ELM) is rooted in social-psychology science and contends that the attitude of individuals can be changed through two "routes" including "central route" and "peripheral route", in which are different in the amount of processed thoughtful information or the demanded "elaboration" of individual subjects (Richard E Petty and Cacioppo 1986). The central route requires a person to think critically about issue-related arguments in an informational message and scrutinize the relative merits and relevance of those arguments prior to forming an informed judgment about the target behavior (Bhattacherjee and Sanford 2006). In Green IT practicing context, such argument may refer to the potential benefits of IT acceptance (whether to the environmental sustainability or the corporate itself), and/or costs and benefits of system adoption. The peripheral route involves less cognitive effort, where subjects rely on cues regarding the target behavior, such as number of prior users, endorsements from IT experts, and likeability of or affinity toward the endorser, rather than on the quality of arguments, in attitude formation. The central and peripheral routes of attitude change are typically operationalized in ELM research using the argument quality and peripheral cues constructs respectively.

Based on Bhattacherjee and Sanford (2006), central and peripheral routes are different in at least three ways. First, the type of processed information by each of these routes are different. Message-related information is processed by central routes while the peripheral routes process cues. Second, in the central route the amount of cognitive effort given to process the information is higher than the peripheral route. The central route demands the comprehension of the presented argument thoughtfully, evaluate the quality of those arguments, combine multiple and sometimes conflicting arguments together, then come up with an overall judgment, while the peripheral route only needs the association of the subject to its positive or negative cues (Richard E Petty and Cacioppo 1986; Richard E Petty et al. 1981). Third, the perceptions which are shaped through the central route are more stable, more predictive, and long lasting than the perceptions which are shaped through peripheral routes (Bhattacherjee and Sanford 2006; Richard E Petty and Cacioppo 1986).

According to ELM, the individuals who receive the information vary on their ability and motivation to elaborate the argument in which will determine how a given influence process would shape their attitude (Bhattacherjee and Sanford 2006). In the ELM the ability and motivation of individuals is captured by the construct named "elaboration likelihood". As Richard E. Petty and Wegener (1999) note, "The term 'elaboration' is used to suggest that people add something of their own to the specific information provided in the communication…beyond mere verbatim encoding of the information provided". Individuals who are high in ability and motivation are more likely to engage in careful scrutinizing of information message and, hence, to be more likely to be persuaded by argument quality rather than peripheral cues. In contrast, individuals with less ability and motivation are more likely to be motivated by peripheral cues than the central ones.

The ELM infers that individuals who are influenced by different routes, central or peripheral route, would not experience different outcomes. Surely, two individuals may arrive at the same conclusion (e.g., accept a given IT) even if such decision resulted from two entirely different (argument-based or cue-based) influence routes. In other words, "ELM suggests that (1) a common influence process can engender very different responses across different individuals in a given population, (2) a common influence process may result in varying responses for the same individual if her elaboration likelihood fluctuates with technology, time, or situational contexts, and (3) different influence processes may generate similar responses among a diverse population" (Bhattacherjee and Sanford 2006). In short, the influences of argument quality and peripheral cues on the attitudes of individuals are moderated by their elaboration likelihood.

Empirical studies have already been investigated ELM in the literature related to social psychology (e.g., Richard E Petty and Cacioppo 1986; Richard E Petty et al. 1981; Richard E. Petty and Wegener 1999) and marketing (e.g., Lord et al. 1995). However, it has seen limited use in Information Systems discipline and to the best of the researchers' knowledge none of the studies applied ELM in Green IT paradigm. Below, we employ ELM to investigate the impact of different influence processes on the adoption of Green IT.

4 RESEARCH MODEL AND HYPOTHESES DEVELOPMENT

To investigate the research questions, we have developed a research model based on ELM. Following innovation diffusion theory (IDT) (Rogers Everett 1995) which asserted that IT acceptance is fundamentally the problem of social influence, we can apply the ELM to understand the Green IT acceptance behavior. The notion of social influence is also emphasized in theory of reasoned action (TRA) (M. Fishbein and Ajzen 1975) and theory of planned behavior (TPB) (Ajzen 1991) under the construct of 'subjective norm', although it has not been investigated deeply in the Green IT acceptance literature. The ELM literature provides a theoretical and empirical basis for understanding alternative influence processes, their effects and moderating factors systematically.

To apply ELM to Green IT acceptance context, first we expanded the dependent variable (i.e., attitude) to include beliefs about Green IT, affects, and intention to accept Green IT initiatives. This expansion is justifiable as social psychology research views attitude as the combination of cognitions, affect, and

conations (Breckler 1984). In the IT adoption literature affect is commonly referred as attitude, cognition is related to the beliefs regarding the target behavior such as expected beliefs from the acceptance of the specific IT, and the conation is considered as the intention to practice the target behavior. Scholars are advised to refer to Breckler (1984) for a thorough discussion on attitude and its elements. Theories like TRA and TPB postulated that beliefs impact attitudes, which in turn influence intention to practice the target behavior. Although beliefs and attitudes are interrelated and in some instances attitudes are considered as beliefs, they are distinct. Based on Krech and Crutchfield (1948), belief is referred as "an enduring organization of perceptions and cognitions about some aspect of the individual world", while attitude is defined as "enduring organization of motivational, emotional, perceptual and cognitive processes with respect to some aspect of the individual's world". Hence, attitudinal change always requires a change in belief, while the reverse is not true: a belief can be changed independent of an attitude (Martin Fishbein and Ajzen 2011). Figure 1 depicts the structure of the developed research model and the development and justification of the hypotheses are presented in the following sections.

4.1 Green IT Attitude

Attitude is referred to as the degree to which an individual assesses a behavior as favorable or unfavorable (M. Fishbein and Ajzen 1975). Based on Molla et al. (2011), Green IT attitude refers to "sentiments, values, and norms in relation to climate change, eco-sustainability, and IT's role", in which includes to what extent users are aware of the influence of IT on environmental sustainability (Molla et al. 2014). In investigating the influence of attitude on practicing Green IT we should distinguish between those who believe in the role of humans in environmental degradation and climate change, and those who are climate change skeptics. Hence, the attitudes of former group may have a positive impact on their proenvironmental behavior while the latter have the negative influence (Hasan and Dwyer 2010).

The influence of attitude on practicing Green IT has already been influenced in prior research. In the study by Chow and Chen (2009), they have reported the positive influence of Green IT attitude on practicing of green computing. In another study the researchers explored the impact of university students' Green IT attitude on the adoption of proenvironmental IT practices (Thongmak 2012). Furthermore, Molla et al. (2014) reported that Users with the positive attitude towards Green IT are more tend to practice IT proenvironmentally. Hence, we posit that:

H1. *Users' Green IT attitude positively influence their intention to practice IT proenvironmentally.*

4.2 Green IT Belief

Belief is different with attitude in which it is related to the cognition dimension while attitude is the affect dimension (M. Fishbein and Ajzen 1975). Green IT belief reflects the enduring cognition of Users regarding the detrimental impact of IT on the environmental sustainability. M. Fishbein and Ajzen (1975) postulated that the most important predictor of individual's behavior is her intention which is in turn influenced by attitude towards that specific behavior. Changing the attitude is directly influenced by the change in beliefs, while "a belief can change independently of an attitude" (M. Fishbein and Ajzen 1975).

In the environmental psychology studies, the influence of personal beliefs on practicing proenvironmental behaviors have already been investigated such as environmental citizenship, willingness to reduce car use, and consumer behaviors (Nordlund and Garvill 2003; Steg 2005; Steg and De Groot 2010). Besides these general environmental beliefs, specific beliefs are also related to environmental behaviors (Stern 2000). Individuals who recognized the negative and positive influence of IT on the natural environment are more contributing to the formation of environmentally
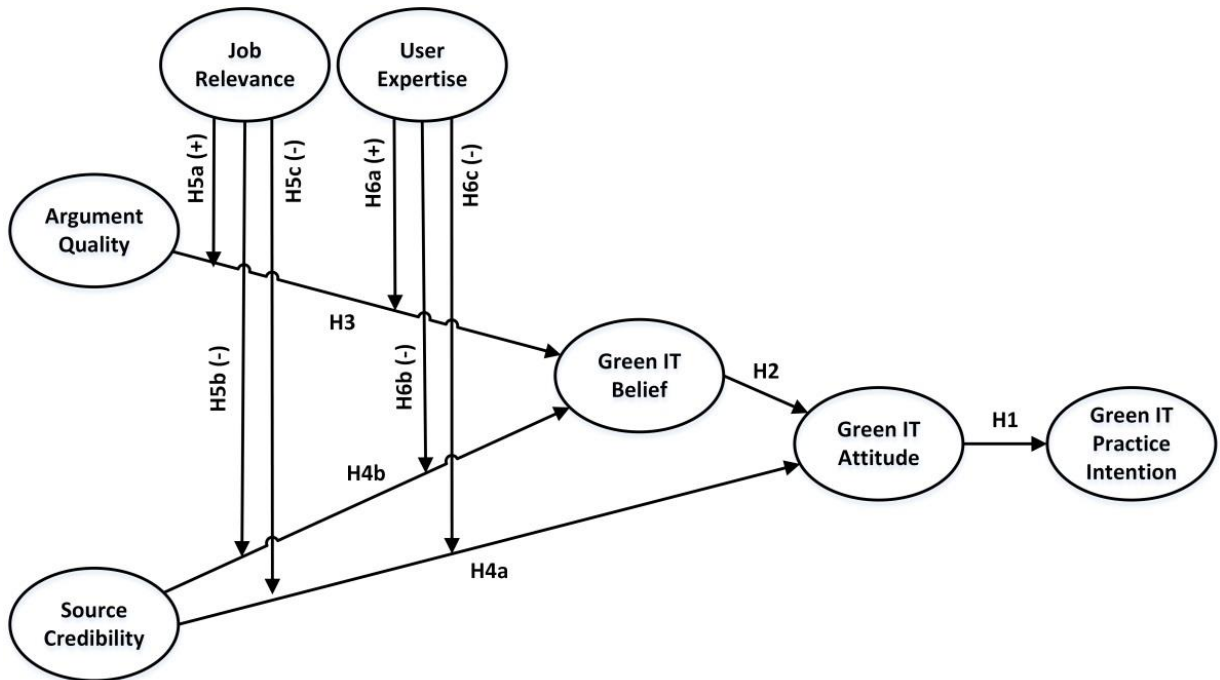
Figure 1.   Research Model

responsible norms and practices (Molla et al. 2014). In the study by Molla et al. (2014), they have reported the positive influence of Green IT beliefs on Users' Green IT attitude which consequently motivated them to practice IT proenvironmentally. Following the discussion above, we state that:

H2. *Users' Green IT beliefs positively influence their attitude towards Green IT.*

4.3   Argument Quality and Source Credibility

ELM posits that beliefs and attitudes are directly influenced by argument quality and peripheral cues. Based on Bhattacherjee and Sanford (2006), argument quality refers to "the persuasive strength of arguments embedded in an informational message", while peripheral cues relate to "meta-information about the message (e.g., message source) but not its embedded arguments". Among the various suggested peripheral cues in the literature, source credibility is the one with the most frequently referenced cues (Bhattacherjee and Sanford 2006). Source credibility is defined as "the extent to which an information source is perceived to be believable, competent, and trustworthy by information recipients" (Richard E Petty et al. 1981). This construct is related to practicing Green IT as IT practitioners and users often rely on experts to keep up with the rapid innovations and concerns in the market and society.

Given that Green IT belief and attitude are the important drivers of Green IT practicing, external influence in the practicing of IT proenvironmentally may be directed at informing potential users of the benefits and utility of Green IT acceptance (e.g., a report regarding the environmental impact of target Green IT initiative with conventional alternatives) or at improving individuals' affect toward Green IT acceptance (e.g., endorsement of a celebrity), or both approaches. Since, message arguments are influencing the individuals' rational judgment rather than their affect, argument quality is expected to impact belief rather than attitude, by enhancing individuals' beliefs about Green IT. Likewise, peripheral cues like source credibility are expected to influence individuals' attitude rather than their beliefs. Based on these expectations we postulate that:

H3. *The argument quality of Green IT informational messages has a positive influence on the potential Users' Green IT belief.*

H4a. *The source credibility of Green IT informational messages has a positive influence on the potential Users' Green IT attitude.*

Furthermore, the Green IT belief of Users may sometimes influenced by source credibility, specifically when the recommendation is from a well-known source or trusted IT expert. In this case, the effortful thinking process of Users would be substituted with the recommendation of experts and they would employ less effortful peripheral route decision process to assess the benefits of adopting Green IT. Hence, we state that:

H4b. *The source credibility of Green IT informational messages has a positive influence on the potential Users' Green IT belief.*

4.4 Moderating Variables

Based on ELM, the influence of argument quality and source credibility on the potential users to engage in the behavior is moderated by their ability and motivation to elaborate on the informational messages (Richard E Petty and Cacioppo 1986). Upon the prior studies and following the research by Bhattacherjee and Sanford (2006), in this paper we operationalize two moderating variables as job relevance and user expertise. Applied to Green IT context and taken from Bhattacherjee and Sanford (2006), we can define job relevance as "the message recipient's perceived relevance of a Green IT initiative to their work", and user expertise as "the message recipient's ability to use Green IT initiatives in general". Potential Users who see a Green IT initiative highly relevant to their work in which would enhance their work performance besides environmental sustainability would more intend to engage in effortful scrutiny of all available information, and hence more deeply rooted Green IT belief based on message arguments. These Users are hence less likely to need peripheral cues. Conversely, users who perceive the Green IT initiative less relevant to their work are less motivated to engage in extensive elaboration and likely are more tend to rely on peripheral cues such as source credibility to shape their belief and attitude towards Green IT. Thusly, we posit that:

H5. *Job relevance moderates (a) positively the association between argument quality and Green IT belief, (b) negatively the association between source credibility and Green IT belief, and (c) negatively the association between source credibility and Green IT attitude.*

Likewise, expert users are more apt to scrutinize messages about a Green IT initiative to identify a key adoption related argument and form an informed judgment about Green IT adoption. These Users would less rely on peripheral cues like advertisements as they try to portray a positive and unrealistic view of Green IT initiative, because they tend to maximize their sell. These users would use peripheral cues as a compliment to argument quality. In contrast, Users with less expertise would rely more on peripheral cues such as source credibility to frame their belief and attitude. Hence, we state that:

H6a. *User expertise moderates (a) positively the association between argument quality and Green IT belief, (b) negatively the association between source credibility and Green IT belief, and (c) negatively the association between source credibility and Green IT attitude.*

IMPLICATIONS OF THE STUDY

This study has several practical implications, especially regarding managing of Green IT practicing within organizations. IT managers due to the responsibility of their corporation to the society and the nature invest millions of dollars to implement and practice environmentally friendly Green IT initiatives. However, such investment would be wasted if the managers cannot influence the organizational users to use and adopt such initiatives for their daily work. Influence processes would assist IT managers to identify what motivates users to practice the target Green IT initiative and under what circumstances these processes would succeed or fail. Drawing upon ELM, IT managers can benefit from two alternative processes to motivate their users, namely central and peripheral routes. The former technique involves providing high quality information for users regarding the benefits of

target Green IT and how it can sustain the natural environment and their work processes. The latter technique would involve providing peripheral cues such as endorsement from reputable or preferred sources about the benefits and contributions of the target Green IT to the organization and the environment. Furthermore, IT managers can understand that "one size fits all" approach influence cannot lead to the desired outcome, because of the various motivation and ability of organizational users to elaborate the issue-relevant argument. In our research model we demonstrated that the users who see more relevancy of the target Green IT to their job and have more expertise in their work are more tend to follow the central route and more influenced by argument quality, while those with low job relevancy and expertise more rely on peripheral cues to adopt the target Green IT.

Theoretically, this study represents one of the first studies focusing on the role of influence processes on the adoption of Green IT. Prior studies investigated the influence factors such as ease of use and usefulness on the adoption behavior and intention, but did not specifically examined how those beliefs and attitudes shaped at the first place. In that sense, our research addressed a gap in Green IT literature by highlighting the role of influence processes in shaping individuals' beliefs and attitudes towards Green IT and eventually its adoption. Another theoretical contribution of this study is the detailed exposition of ELM in the context of Green IT. Although prior studies applied ELM in different disciplines and contexts, but this is the first study that applies ELM to the Green IT paradigm. The advantages of this theory compared to prior applied theories in Green IT acceptance context such as TPB and TAM are (1) its focus on the influence processes by which the user's belief and attitude shape, and (2) the contextualized nature of this theory, in which it investigates not only the variations of influence processes among individuals to adopt Green IT, but also considers the influence of their motivation and ability on their influence processes to shape their beliefs and attitudes.

CONCLUSION

In this study we tried to fill a gap in the Green IT adoption literature by proposing a model based on the ELM. In the previous studies on Green IT adoption they investigated how positively or negatively beliefs and attitudes of individuals influence their intention or behavior to practice Green IT, while in this paper we explored how their beliefs and attitudes are shaped from the first place towards Green IT. Two influence processes have been investigated namely central and peripheral cues which the former includes the technique of knowledge argument and the latter included the technique of source credibility. Further, the moderating impacts of users' motivation and ability on the influence processes to shape belief and attitude have been discussed. For the future, the researchers tend to develop a measurement instrument and apply the proposed framework to explore how influence processes are varied among the potential users to shape their beliefs and attitudes toward the adoption of Green IT, and further, how their job relevancy and expertise moderate their influence processes.

ACKNOWLEDGMENT

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