

ORGANIZATIONAL ADOPTION OF GREEN IT IN THAILAND

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Abstract

This study examines major influencing factors that affect the adoption of green information technology (IT) in Thai organization. Organizations will be grouped based on their sizes: small, medium, and large. The proposed influencing factors include organizational factors, environmental factors, and technological factors. All data will be gathered from email questionnaire and interviews. Email questionnaire will be distributed to five-hundred Thai organizations. Ten large-sized organizations that are believed to have the highest impact on environment regarding IT will be selected for an interview.

Keywords: Green IT, Technology Adoption, Green Practice, Environmental Performance, Sustainable Environment

1. INTRODUCTION

Information technology (IT) has transformed our daily life and contributed significantly to economic and social wealth. IT is one of many tools firms use to cope with change. IT is currently moving at an incredible pace. However, there is also a downside to IT expansion. The increasing use of IT device, such as laptop, mobile phone, etc. and their short life span have caused two significant problems: high energy consumption for IT power usage and generated waste of IT device called e-waste when it discarded. The mounting of e-waste poses serious health and environmental hazard because electrical and electronic products contain some toxic materials.

In view of the above concern, IT professionals are now turning to Green IT in order to develop IT activities in a sustainable manner. In fact, Green IT include all practices that aim to reduce the environmental impact of IT use. Their approaches concern mainly on energy efficiency, environmentally friendly products and proper disposal of IT end of life.

This study aims to investigate the factors influencing Green IT adoption among Thai organization. An understanding of the determinant factors is essential for practitioners to best implement green practices and for researchers to best understand the issues that need to be addressed. Many researchers have proposed various explanations as to what factors influence firm's adoption of Green IT (e.g., Aragon-Correa et al. 2004; Gadenne et al. 2009). The study will be carried out mainly to identify influencing factors toward 3 different sizes of organizations, small, medium, and large.

In this paper, we first describe the definition of Green IT and green IT adoption in our literature review. We then develop a research framework based on previous green IT research. After that, we describe each of the proposed factors in details and explain the methodology that we will be using throughout our research.

2. LITERATURE REVIEW

Green IT

Green technology is the concept of environmental monitoring, electronic devices monitoring and the use of technology regardless to environmental sustainability, in order to reduce environment impact and conserve the natural resources. As green technology is becoming more concerned among organizations and societies, green IT&IS become more commonly discussed in the IS research realm. The term of “Green IT” and “Green IS” are two main aspects of green technology that play a major role in driving the shift to a sustainable society (Watson et al. 2009). Green IT refers to the use of technological solutions to the business, products, and the practices of using computing resources efficiently. The goal of Green IT is to achieve pollution prevention, energy consumption, and sustainable development (Murugesan 2008; Boudreau et al. 2008; Molla et al. 2009). Some possible activities of green IT practices are datacenter efficiency, green procurement, and e-waste management. Green IT is not only about the use of technology to reducing environment impact, but also the collection of strategic and tactical that a firm can learn to reduce carbon footprint of the organization (Eastwood 2009). As mentioned above, most of Green IT definitions mainly focus on hardware side and other tangible aspects of IT. On the other hand, green IS can be defined as organizational practices and processes that aim to improve environmental sustainability in the conduct of information process tasks such as environmental information systems (Sayeed and Gill 2008).

Green IT Adoption

Firm cannot gain a positive outcome from green IT development if its adoption rate from business side is still low. Most common reasons for an adoption in business are to enhance growth and increase the innovation capability. Although the adoption of Green IT is similar to other types of adoption, the Green IT practices take longer time. The adoption will provide more on softer benefits such as employee morale and good corporate citizenship rather than heavily money returns. Not only adopting green practices involves profoundly with the implementation of new or modified processes, techniques, and systems in order to reduce pollution emissions and energy consumptions, it also involves with environment technical innovation such as clean production technologies (Henriques and Sadorsky 2007). There are a number of both internal and external factors that can motivate the adoption of green IT such as technological, organizational, and environmental factors. These factors will be discussed later in this study.

Research Framework

In order to understand an organization’s adoption behavior, we first need to distinguish between different types of innovation. One of the most popular is the concept of administrative and technical innovation in which we will use as our main indicator here in this study (Damanpour 1991). Administrative innovation is regarded as an organizational structure and administrative processes, while technical innovation relates to basic activities involving with products, services, and production process technology (Damanpour 1991; Kimberly and Evanisko 1981). As green IT adoption involves with the modification of previous process into being less polluting and energy consuming, the adoption itself can be regarded as a part of technical innovation process. The study of Rathenberg and Zyglidopoulos (2007) supported this statement. They stated that new resource combination

process is required when applying green criteria into the business operation. As a result, green IT adoption can be referred to as a form of technical innovation process.

As technical innovation process has been widely studied, few studies put an attention on influencing factors upon an adoption of new innovations. Three influential factors including environmental factors, organizational factors, and technological factors are proposed to be the major factors that supported an adoption of new innovations (Lin and Ho 2010). Furthermore, other previous literature also suggested that three general factors including external environment, the capabilities of the organization, and the nature of technology are affecting the adoption of technical innovations (Chau and Tam1997; Frambach and Schillewaert 2002; Tornatzky and Fleischer 1990). One study on printing industry found that company’s task environment has positive effect on the adoption of green innovations (Rothenberg and Zyglidopoulos 2007). Another study on Canadian manufacturing companies found a positive effect between external stakeholder pressure and adoption of cleaner technical innovation. The study of Del Brio and Junquera (2003) mentioned that technological approach and innovative capacity have high influence on green innovation management. Table 1 shows numerous studies that supports these three factors: technological factors, organization factors, and environmental factors.

Table1: Previous empirical studies on an adoption of green IT and IS.

Factors	Sub-Factors	Dependent Variable	References
Technological	Complexity Compatibility Relative Advantage	Technology Perceptive Level Organization Technology Technology Development	Frambach and Schillewaert 2002; Rogers 2003; Sia et al. 2004; Tornatzky and Klein 1982)
Organizational	Organizational Encouragement Quality of human resources Company Size	Leadership Education & Training Company Size	Amabile 1988; Tornatzky and Fleischer 1990; Kimberly and Evanisko 1981
Environmental	Environmental Report Government Regulation Market Pressure	Business Performance Regional Government Customer Demand, Supplier Demand, Competitor	Elliot 2009; Wagner 2005; Jenkin 2011

Most of the studies on these factors took place in highly developed countries while none of them were conducted on Thai organization. Therefore, this paper will explore the influence of technological, organizational, environmental factors on the intention to adopt green IT in Thai organization. Figure 1 illustrates the research framework of this study. The technological factors include complexity, compatibility, and relative advantage. The organizational factors include organizational encouragement, quality of human resources, and company size. The environmental factors include environmental report, government regulation, and market pressure.

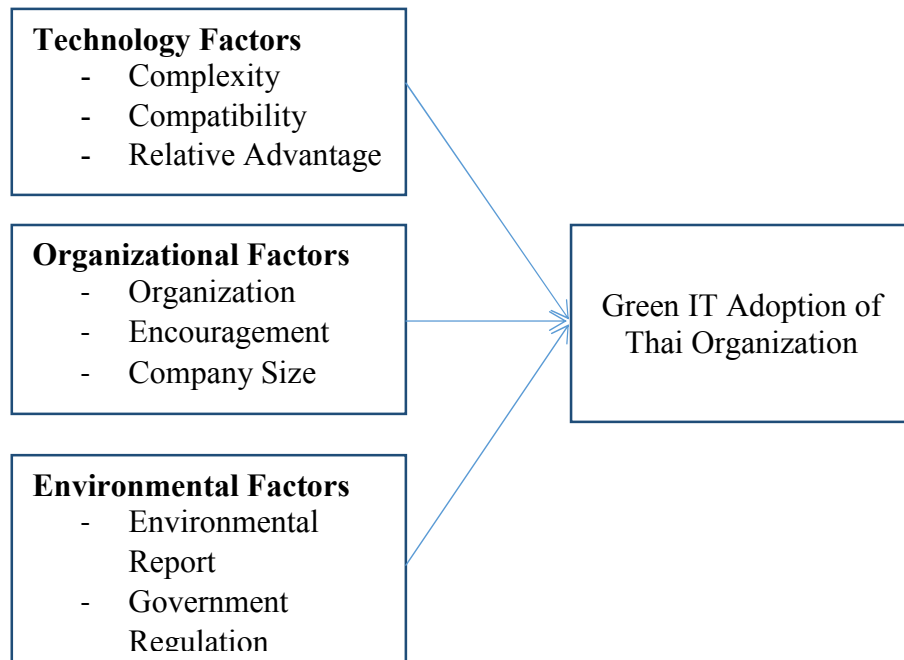


Figure 1: Research framework

Technological Factors

Although, several technological characteristics can affect the adoption of technological innovation including complexity, compatibility, ease of use, information intensity, observability, perceive usefulness, relative advantage, triability, and uncertainty (Tomatzky and Klein 1982), only three factors including complexity, compatibility, and relative advantage stands out to be more significant than the others (Frambach and Schillewaert 2002; Rogers 2003; Sia et al. 2004; Tornatzky and Klein 1982). According to Lin and Ho's model(2011), these three characteristics were also proved consistently that they have more important influencing adoption behavior than the other factors (Lin and Ho 2011; Rogers 2013; Sia et al. 2004; Tomatzky and Klein 1982).

Proposition 1:*Technological factors have a positive effect on green IT adoption among Thai organization.*

Complexity

Technology is the knowledge that human resources within the organization have to learn in order to adopt green IT (Grant, 1996). Complexity is the degree to show how hard it is to learn a particular technology. The less understandable each technology is, the less knowledge transfer and diffusion among the organization will likely to occur (Rogers 2003). Furthermore, complexity is also hypothesized in the previous research by Tornatzky and Fleiser (1990) to have a negative effect on innovation adoption. As complexity increases, human resources are required with more attention to learn and diffuse the technology. As a result, complexity can lower the possibility of successful adoption (Tornatzky and Fleiser 1990). Hence, we propose:

Proposition 1a:*Technological Complexity has a negative effect on green IT adoption among Thai organization.*

Compatibility

Compatibility is a degree of an innovation which is perceived as being consistent with the existing values, experiences, and needs in the organization (Roger, 2003). The fit between the new technology and knowledge from company processes is also an important factor that can influence technical innovation (Chau and Tam 1997; Torantzky and Fleischer 1990). When the knowledge about the adoption can be easily understood and shared, the technology tends to have a higher successive rate of being adopted. Thus, an organization will be more likely to adopt the new technology that is more compatible with the current knowledge to lessen possible objective (Torantzky and Klein 1982). Compatibility is also relevant to green innovation adoption, because several green technology innovations are adoption from organization's current technologies. Green adoptions are more compatible and can describe a process of knowledge accumulation and integration (Dupuy 1997). Therefore, the adoption of green innovations can be affected by the compatibility of the innovations. Hence, we propose:

Proposition 1b: *Technological Compatibility has a positive effect on green IT adoption among Thai organization.*

Relative Advantage

The perception of an innovation that is more advantageous than its substitute idea is a relative advantage. We may be able to measure the perceived benefit in economic and social terms like facilitation and satisfaction. Organizations may probably adopt green technologies which is able to provide them with better performance and economic gain than the other technologies. Therefore, relative advantage is positively related to the adoption of green innovation (Rogers 2003; Tornatzky and Klein 1982). The organizational benefits of green innovations include reduced energy and natural resource consumption, improved environmental and financial performance, reduced waste and pollutant emission and greater responsiveness to social environmental expectation (Etzion 2007; Hart 1995). The perceived benefits green innovation that will be motivations organizes to adopt the technology. Therefore, the adoption of green innovations is expected to be positively affected by relative advantage. Hence, we hypothesize:

Proposition 1c: *Relative advantage has a positive effect on green IT adoption among Thai organization.*

Organizational Factors

Several articles have discussed the influences of organization characteristics variables such as quality of human resources, stakeholder, top management's leadership skills, organization support, organization culture, organization size, capabilities, structures, policies, and financial consideration on technical innovation (Kimberly and Evanisko 1981; Tornatzky and Fleischer 1990; Jenkin et al. 2011) and environment strategy (Etzion 2007; Gonzales-Benito and Gonzales-Benito 2006) on adoption. In general, the availability of resource, organizational learning capability, human resources and management support would influence the green adoption (Lee 2008; Lin and Ho 2011; Zhu et al. 2008). This study focuses mainly on the quality of human resources, organizational support, and financial consideration because these variables are considered as organizational resource-related variables in research on technical innovation (Lin and Ho 2011).

Proposition 2: *Organizational factors have a positive effect on green IT adoption among Thai organization.*

The Quality of Human Resources

Green IT adoption required qualified employees with competent learning and innovation capabilities (Tornatzky and Fleischer 1990). Management skills, organizational encouragement, and supportive resources for innovation are found to support the improvement of an innovation (Amabile 1988). The lack of knowledge and its absorption on green IT is a major barrier interrupting adoption within a firm (Szulanski 1996). At the same time, the development in educational and training of tactic skill would be encouraging employees' involvement. Competent employees would be easily involved in training programs that can advance their work practice. Also, companies would have higher advance capabilities which could lead to a success of the firm (Christmann 2000). Therefore, organizations that have qualified human resources will benefit adoption green technology. Hence, we propose:

Proposition 2a: *Quality of human resources has a positive effect on Green IT adoption among Thai organization.*

Organization Support

Organizational support is an extent to which an organization supports employees by providing a special system or technology. For the development, organizational support is essential because the resources required for adoption will be available. The employees will be encouraged to implement green behavior. In addition, the top management will play a major role in organization support. To ensure the successful adoption, several green innovation processes require the collaboration and coordination of different departments and division. The top management are usually endorsed and encouraged in initiative stage (Gonzales-Benito and Gonzales-Benito 2006). Therefore, the organization support will be benefit adoption green technology.

Proposition 2b: *Organization Support has a positive effect on Green IT adoption among Thai organization.*

Company Size

According to prior research (e.g., Frambach and Schillewaert 2002; Del Brio and Junquera 2003; Etzion 2007; Gonzalez-Benito and Gonzalez-Benito 2006a), company size has been commonly mentioned as a factor influencing on technical innovation and environmental activities. Most of the time, many organizations do not see the benefit of adopting green IT and considered green IT adoption as a cost generating activities (Gadenne et al. 2009). In general, large size companies tend to be more easily to adopt green innovation than small size companies because they have better infrastructures and sufficient resources (Gonzalez-Benito and Gonzalez-Benito 2006a). Since more resources are available from within the organization, company size can reduce the concern of financial issues. Hence, we propose:

Proposition 2c: *Company Size has a positive effect on Green IT adoption among Thai organization.*

Environmental Factors

The external environment in which company conducts its business is another important factor affecting green innovation adoption (Frambach and Schillewaert 2002; Tornatzky and Fleischer 1990). Numerous environmental variables have been discussed in the literature of technical innovation (e.g., Frambach and Schillewaert 2002; Tornatzky and

Fleischer 1990; Jeyarai et al. 2006). Among various variables mentioned in prior studies, environmental reports, Government regulation, and market pressure are consistently considered as initial environmental factors influencing technical innovation (Elliot 2009; Haveman 1993; Selznick 1996; Tomatzky and Fleischer 1990; Wagner 2005). Thus, this study focuses mainly on the environmental reports, Government regulation, and market pressure. We propose:

Proposition 3:*Organizational factors have a positive effect on green IT adoption among Thai organization.*

Environmental Reports

Environmental report is a public disclosure by a firm of its environmental performance information. Most firms are not released their environmental reporting as it is seen as another voluntarily requirement and its operation cost is very high (Parker et al. 2011). However, it has been recently stated that environmental reporting could create competitive advantage for a firm. As a result, an organization that promote and implement environmental reporting seems to gain more benefits from the publicity and more universally acceptable as they voluntarily perform the actions. These actions lead to business innovation including offering reporting services to other organizations (Elliot 2009), establishing and promoting some measurement such as carbon footprint measurement, green advertising such as provide a slogan or display the contents that protect the environment. Although there are many organizations attempt to implement environmental reporting, there are still less engage in their businesses. Hence, we propose:

Proposition 3a:*Environmental reporting has a positive effect on Green IT adoption among Thai organization.*

Government Regulation

Government Regulation is another fact that many countries should concern. The regulations are used to force and control organization to initiate green IT. It can be used to guide organization into efficiently adopting green IT by setting requirements on their business operation. It also affects all type of organization including SMEs (Clemens 2006). Positive influences can occur toward an initiation of green IT. Heavy regulations with heavy penalty can further improve and boost the adoption rate of green IT (Wagner 2005) as most organizations tends to avoid an additional cost, especially when it is very high. Hence, we propose:

Proposition 3b:*Government Regulation has a positive effect on green IT adoption among Thai organization.*

Market Pressure

Green IT and IS will certainly be spread and practiced. Most of the time, company observes and decides to imitate activities conducted by some of the successful organization (Haveman 1993; Selznick 1996), especially when conditions are uncertain (DiMaggio and Powell 1983). Being acceptance in the society is another reason for imitation of practices. Dominant actors such as customer, supplier, and Parent Corporation can also have influence on green IT adoption. As they have some control over specific resources required by the organization, the firm has no other choice but to comply with their demand (Pfeffer and Salancik 1978). All these pressures from dominant actor and imitation of practices can be

gathered into a group called market pressure (Jenkin, 2011). Market pressure, in other word, acts as a driving force the organization to adopt green IT. Hence, we propose:

Proposition 3c: *Market Pressure has a positive effect on green IT adoption among Thai organization.*

3. RESEARCH METHODOLOGY

Data Collection

To examine the nine possible factors influencing the adoption of green IT in Thai organization, data will be collected by means of a survey and an interview. Five hundred samples will randomly draw for a list of each company's size in Thailand. A companies' size, including large, medium, and small, will be segmented based on a number of employees and company's annual turnover rate. The questionnaire will be emailed to the sample companies' owner, IT managers, or senior managers who are familiar with the company's environmental activities. Furthermore, the interview will be conducted on large organizations that contain large computer network. Those interviewed organizations will most likely play an important role in environmental sustainability regarding IT. Two week after we distribute our questionnaires, we will start conducting a follow-up process to the sample companies in order to remind of the important of their responses and thank them for their cooperation.

Measurement

The data will be measured using 5-point Likert scales which range from 'strongly agree' to 'strongly disagree' except the company's basic information. The willingness to adopt green IT practices will be used as a measurement of green IT adoption.

Technology complexity will be measured according to the degrees that technology can be understood, learn, and transfer throughout the organization (Grant 1996; Teece 1996; Tsai and Ghosal 1998). Technology compatibility will be measured according to the degree in which the firm's previous technology fits with that of the new innovation (Chau and Tam 1997; Simonin 1999). Relative Advantage will be measured according to degree in which the innovation itself is better than other technology in the aspects of economic and performance (Rogers 2003; Tornatzky and Klein 1982). Organizational encouragement will be measured according to the company's resources and top leader's support (Amabile 1988; Tornatzky and Fleischer 1990). Quality of human resources will be measured according to employees' skill, knowledge, and commitment (Tornatzky and Fleischer 1990). Company size will be measured according to the company resources relative to its size such as financial resources (Gonzalez-Benito and Gonzalez Benito 2006). Environmental Report will be measured according to the degree to which the report can be used as a marketing tool (Elliot 2009). Government regulation will be measured according to the degree to which regulation affect business decision toward green IT (Wagner 2005). Market pressure will be measured according to the degree to which dominant factors and imitation of practice pressure the firm to adopt green IT (Jenkin 2011).

4. CONCLUSION

As of now, all influencing factors including technological factors, organizational factors, and environmental factors have been proposed based on previous research and literature (Amabile 1988; Elliot 2009; Frambach and Schillewaert 2002; Jenkin 2011; Kimberly and Evanisko 1981; Rogers 2003; Sia et al. 2004; Tornatzky and Klein 1982; Wagner 2005). Technological factors that might affect the current green technology development

include complexity, compatibility, and relative advantage (Rogers 2003; Tornatzky and Klein, 1982). Organizational factors are the internal factors within the organization that include organizational encouragement, quality of human resources, and company size (Amabile 1988; Tornatzky and Fleischer 1990). Environmental factors are the uncontrolled variables outside the company that includes environmental report, government regulation, and market pressure (Elliot 2009; Jenkin 2011; Wagner 2005). Research questions will be developed relating to each of the sub-factors. Research methodology is also defined. Questionnaires will be distributed to 500 different organizations in Thailand corresponding to their company size while 10 large organizations will be interviewed personally. All results will then be analyzed to find whether each influencing factors have positive effects toward an adoption of green IT in Thailand.

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