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Green IT Motivation: Towards Environment Sustainability

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Abstract: Global warming is a major concern to all. The ICT is without doubt plays a significant role to the global economy. However, the ICT has been found to be one of the reasons for global footprints. The total electrical energy consumption by data centers, servers and computers is steadily increasing. Thus, firms are urged to address the environmental and commercial goals simultaneously rather than as a trade-off as the sustainability of economic, social and environment capitals must be satisfied for long run success. However, the fundamental role of green IT for sustainability is often not given an adequate attention. Hence, in this study, we seek to explore issues and challenges related to green IT implementation. We provide an intensive review of green IT and how it relates to sustainability. Then based on an in-depth discussion with two organizations, we discuss our findings as the related aspects of implementation issues. Finally we offer a model for promoting and motivating green IT in organizations. Such effort is significance as it will become a point of reference for adopting and implementing green IT for greener world.

Key words: Green IT, green IT motivation, green IT adoption, sustainability, ICT

INTRODUCTION

With the growing awareness of environmental issues such as global climate change, organizations increasingly realize the importance of sustainability. Therefore, sustainability is a complex phenomenon that includes environmental, economic and social dimensions (Kleindorfer *et al*., 2005; Porter and Kramer, 2006). According to Molla (2009) the impact of Information Technology (IT) on the natural environment can be classified into two broad categories of first and second order effects (Kohler and Erdmann, 2004). The first-order effect refers to the environmental impact of IT production, use and disposal.

This is related to green IT. The second-order effect refers to the positive impact of using IT on environmental sustainability of business and economic processes. This effect relates to green Information Systems (IS). Organizational motive for IT adoption is a suitable, albeit largely under-used, theoretical lens in IT research (Rahim *et al*., 2010). Compared to technological, organizational and environmental contextual factors, organization motivation theory offers an explanation into the strong order drivers why IT implementation processes vary among organizations (Rahim *et al*., 2007). Further, a motivational perspective helps to understand the motives for organization's environmental initiatives and predict environmentally based behaviors. A motivational perspective to green IT adoption therefore provides useful insights as to what extent eco-sustainability considerations are influencing the IT decision making process. It helps to discern if organizational concern for the natural environment, even if economic benefits are not tangible in the immediate short term, influence the adoption of IT.

GREEN IT

Concept of green ICT can be referred to conserving energy, using computing resources efficiently, reducing carbon emissions, appropriate handling of hazardous waste and driven by the desire to reduce cost, benefit the environment and be a good corporate citizen (Hamid *et al*., 2011). Olson (2008) refers to these and similar initiatives as enterprise level green strategy and believe that such an approach has a possible positive impact on the environment. The business case for green strategy should also identify benefits to an enterprise's revenue and/or cost (Molla, 2008). Strategic use of IT in smart motor systems, buildings, logistics and grids is estimated to reduce approximately 7.8 bln. ton (Gt) Carbon dioxide equivalent (CO_2e) which can be translated into an approximately-600 billion ($US 946.5 billion) of cost savings.

Green IT seems to be the right component to connect both corporate innovation and environmental integration.

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As specified through the National IT and Telecom Agency in the "Green IT guidelines for public authorities", Green IT can be included in four phases of the product lifecycle:

The development phase includes the design of environmentally friendly systems and computers by consuming green material and pursuing energy efficiency consumption. The production phase focuses on energy saving and the decrease of carbon emissions. The first deals with cost saving while the second deals with an environmental approach. On one hand, producing at lower costs targets to use less energy on the other hand reducing the CO_2 emission with use subsidized energy sources such as solar panels.

The usage phase mentions to the organization itself, employee behavior, equipment and infrastructure. To implement a green IT strategy, the management requirements to draw up a new process and implement new standards not only in terms of IT infrastructure but also in terms of individual usage such as printing work, employee green behavior, recycling study and electricity custom. The disposal phase is the critical phase as it mostly depends on the government's participation to implement regulations and motivate companies to invest in product which can have a second life

ISSUES AND CHALLENGES OF GREEN IT

In this exploration we conducted two sets of interviews with top management officers of different organizations. They were selected based on the relatedness of the issue and the organizations they represented. Similar characteristics or homogeneity traits are essential for reducing bias in qualitative research. Considering green IT is a new technology in their context, we generally defined green IT as an innovation in organization. Data gathered was analysed by using constant comparison method. This was highlighted by Boeije (2002) that the aim of constant comparison method is to discover the concepts. There are four phases involved namely exploration, specification, reduction and integration. Following Corbin and Strauss (2014), three coding processes of open, axial and selective were adhered in the exploration phase. Validation was achieved by getting the respondents to approve the narrative summary. Based on the analysis, major issues of green IT were summarised. First, the awareness of the importance of green IT is substantially low. The issue is not limited to the employees of the lower hierarchy but it involves everyone at all levels. Though employees were observed having an understanding of what green IT is, translating its deep meaning into actions seem to be lacking. In many studies, lack of awareness has been reported as a barrier to new technology adoption, including green IT. It results in failure to seek opportunities of reducing environmental impacts that can be achieved with its adoption and implementation. The low awareness level is also coherently referred as the attitude issue.

Although top management commitment is important, the aspect seems to be disintegrated in the organizations. Developing and maintaining the green IT competitiveness require a strong commitment from the corporate leadership, namely senior IT management in working out the policy that relates with green IT. This commitment is not only driven by government regulations and alerts from legitimate environment watchdogs but also the attitudes of the top management towards environmental issues. Unclear identification of IT manager's role in organizational practice will influence the greening agenda of information technology in organizations. It is believed that the role of top management support is very important in implementing and conducting green IT projects. Finally, the analysis concludes motivation has also become the challenge to the green IT adoption. In achieving successful green IT adoption, motivation is essential in meeting organization's goal and objective. Without strong motivation, the understanding of benefits of green IT will not achieved.

Application of the organizational motivation theory on IT and eco-sustainability implies that an organization's belief and value system related with eco-sustainability as well as the influence of external institutions can drive organizational actions to green IT. Reviews of related issues from the literature yield majority of the early studies on green IT invention focused mostly on the definitional issues and theoretical explanations (Chen *et al*., 2008). Even though studies linking the green IT practices to environmental sustainability are emerging, there is still a lack of implementation and action dimensions in measuring green IT. Looking at the green IT measurement, attitude, policy, practice, governance and technology have been studied as the indicators of green IT maturity (Molla, 2008) but the examinations on the organizational factors on awareness and top management support in the relationship still requires further understanding. In addition, the role of motivation though significance, is given less emphasize as the determinant of green IT intention adoption. Given the issue of slow green IT uptake, it is necessary to give a greater attention to the adoption intention as suggested by Roger on the sequence of innovation diffusion.

GREEN IT PROMOTIONAL MODEL

Grounded on the qualitative approach findings and reviews of related studies we offer a model for promoting green IT implementation, specifically relating the factors to intention adoption. They are the role played by motivation and the importance of awareness and top management support in relating the motivation to the intention.

Motivation: Motivation is the driving force of action towards targets and desired goals. It is the desire that initiates the activities of an organization. Motivation can be measured through variables that consisted of economic motives (Molla, 2009). The adoption of green IT could be different from other IT 2adoption because of the importance of ethical and eco-sustainability motivation considerations in the decision making process. A motivational perspective to green IT adoption therefore provides beneficial insights as to what extent eco-sustainability considerations are influencing the IT managerial process. It helps to discern if organizational concern for the natural environment, even if economic profits are not tangible in the immediate short term, influence the adoption of green IT.

The development of the organization's initiatives and efforts toward green IT adoption may be influenced by the motivational and institutional forces. Institution's 1 coercive, normative and mimetic pressure of the institutional forces can impact or control the behaviour of organizations. Developing from the forces, there are three eco-motivations identified by Chen *et al.* (2008) which are eco-effectiveness, eco-efficiency and eco-equity. Eco-effectiveness on the other hand, "means to stop pollution and exhaustion by guiding individual and organizational thoughtfulness regarding the underlying and central elements of environmental issues through a central redesign of the system". Eco-efficiency denotes to a business's capacity to deliver "competitively priced goods and services while logically diminishing ecological effects" (De Simone and Popoff, in Chen *et al.*, 2008). Eco-equity emphases on "equivalent right of individuals to environmental assets" and a business's "social requirement regarding the future generations". Building on Chen *et al.* (2008) and Molla (2009), the motivation factor is categorized as economic motiveand socio-political motive. For the economic motive, green IT c an be measured through eco-efficiency and eco effectiveness. Socio-political motive can be measured through eco-responsiveness and eco-legitimacy.

Eco-efficiency motive has internal locus and economic focus. It refers to the desire to implement practices and technologies to expand the eco-sustainability of IT but at the same time pursuing economic objectives such as cost reduction. Equally corporate demand for more data processing and storage capability remains to grow, energy costs are becoming a significant part of the total cost of running IT infrastructure. The need for reducing the power, cooling and real estate costs and growing data centre efficiency might drive some organizations to turn to green IT. Therefore, most IT managers and professionals are focused on reducing the direct environmental impacts of IT by making data centres and end user medium more energy efficient (Dedrick, 2010). Eco-effectiveness motive has internal locus and socio-political focus. It occurs when organizations initiate green IT initiatives due to their beliefs and value system associated with eco-sustainability and for reasons other than instant economic gains. It refers to the desire to implement practices and technologies to increase the eco-sustainability of IT out of a sense of concern for the natural environment or in order to set a norm and become a thought leader. Managers and organizations that are ecologically embedded and that have deep relationship with the natural environment and the ability to learn from it show commitment to the adoption of sustainable practices (Cabinet Office, 2007). An organization's relationship with the environment and the beliefs and value systems it has cultivated about the environment among its IT employees can motivate the adoption of green IT. Overall, organizations that are environmentally involved are more likely to consider green IT as an important undertaking and plan its implementation (Moore *et al.*, 2010).

Eco-responsiveness motives occur at the meeting of external locus and economic focus. The importance is on green IT initiatives that are induced to meet certain needs from the market environment such as green market opportunities. Green IT can lead to profitability through superior access to markets that reward the greenness of companies. It can also lead to introduction new products and services to the market (Sayeed and Gill, 2010). As businesses increasingly use green strategies as a basis for competition (Porter and Kramer, 2006), they set the green norms of competition and motivate their competitor's adoption of green IT. Therefore, eco-responsiveness motives can lead to green IT preferences that associate a business to market recognized norms of reducing emission, recycling, reuse and electronic waste management. Eco-legitimacy motives can be occurring because of political and social pressures facing an organization. The political pressure comes from government burdens in the form of regulations, standards and taxes (Tyteca, 1996) whereas the social pressure come out from the maturity of the institutional environment

within which an organization operates. The central thesis of this motive is that companies engage in green IT projects when they face regulatory and social pressures on their legitimacy. Regulatory requirements and legislative actions play significant roles in the adoption of green technologies and can strength some businesses to accept a technology or practice even if they do not have a strong intention to do so (Olson, 2008). In particular, governments can encourage the adoption of green IT by legislations that generate the framework for the law carbon economy (Chen *et al*., 2008). National, professional and inter-governmental organizations often apply a great deal of influential power in relation to professional practice in turn it can have implications for the adoption of green IT. These organizations are producingguidelines related to green IT. Therefore, the search of legitimacy within the wider social context could be one of the motivating factors in affecting the adoption of green IT.

Awareness: According to Hamid *et al*. (2012), a gradual increase in people's awareness in the developed world has created a fairly cleaner environment in comparison to the developing countries. Lack of awareness has been reported to hinder application of technology (Wabwoba *et al*., 2013). Lack of technology awareness often results in organizations failure to pursue opportunities that can be achieved with its adoption and implementation (Ogunyemi and Johnston, 2012). By implementing green IT practices in organizations it could help in the environment, economic and socio political sustainability. Each organization need to understand and realize about the importance of green IT practices is not only about activities that reduce environmental impacts, it also will motivate organization in becoming more concern in their economics and socio-political sustainability. The decision to invest in adopt and implement green IT will be difficult to reach at when organizations are unconscious of the potential benefits they can derive from such an a undertaking (Wabwoba *et al*., 2013).

Top management support: Studies have indicated one of the primary factors of green IT adoption success is the champion support which is referred as the top management importance. It is essential for achieving the objective and as the driver of change. Top management can encourage change by communicating and stressing values over an articulated vision for the organization.

Support from top management seems important in areas where existing attitudes, beliefs and values can prohibit change. Other than that, top management commitment will help the organization to defeat prejudice, stereotypes and destructive feelings by legitimizing the diversity cause to the organizational society

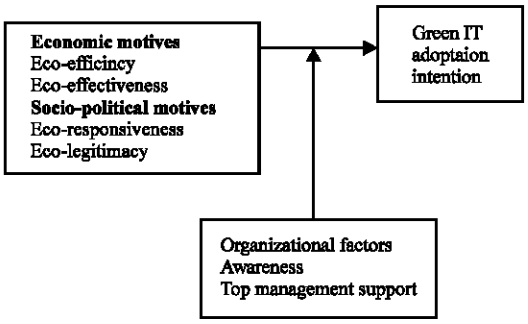

Fig. 1: The promotional model

(Guffey and Nienhaus, 2002; Hart, 1997). In addition, it is essential for top management to have a clear direction such as goals, objectives, mission as well ability to clarify roles and direction. By developing a clear picture of which the change effort is designed to achieve, the process of implementing and adopting in greening IT will be much easier. It is happened when people understand the nature of the implementation, they are able to calibrate their implementation efforts more effectively, so that, desired outcome will be achieved. According to Moore *et al*. (2010), the combination of both support from top management and clear vision is necessary for any change at enhancing diversity and inclusiveness. The process of adopting and implementing of green IT needs extensive resources that are available only with the active support from top management. Additionally, support from top management for adoption of green IT would also send a solid indicator to encourage line management to actively participate in recommending and emerging of green IT (Thong, 1999). Based on the discussion we have suggest a model as described in Fig. 1 that reflects the responsibility of the green IT initiatives in making the operation become reality. We then suggest for the factors that will have influence to the use of the green IT initiatives for both government agencies. With efficiency of green IT practices it would succeed the environmental sustainability. The green IT promotional model is illustrated in Fig. 1.

CONCLUSION

Greening the government ICT requires basic and easy practices like to turn off computers overnight, defaulting printer to duplex mode and an efficient cooler for data center. Luckily with this simple of practice will bring a significant implication to our earth as by turning off just one computer overnight is like to save 235 kg of CO_2 in a year and turning off 500,000 computers at night would have same effect as taking 40,000 cars in the road (Cabinet Office, 2007). Green IT initiative is important because it

will give the benefits to the staff and government agencies in their financial and performance. However, the implementation of green IT initiative is a complex and a costly process as it involves more skilled personnel to handle it issues. The model is developed based on a set of interviews we recommend validating the model via survey. This investigation will produce statistical evidences that can be generalized across.

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