

DIGITALES ARCHIV

ZBW – Leibniz-Informationszentrum Wirtschaft
ZBW – Leibniz Information Centre for Economics

Tan, Mei-Chee; Tuan Hock Ng; Ying San Lim et al.

Article

Modeling the Impacts of corporate environmental responsibility on information and communication technology -waste management

Provided in Cooperation with:

International Journal of Energy Economics and Policy (IJEPP)

Reference: Tan, Mei-Chee/Tuan Hock Ng et. al. (2018). Modeling the Impacts of corporate environmental responsibility on information and communication technology -waste management. In: International Journal of Energy Economics and Policy 8 (4), S. 347 - 355.

This Version is available at:

<http://hdl.handle.net/11159/2173>

Kontakt/Contact

ZBW – Leibniz-Informationszentrum Wirtschaft/Leibniz Information Centre for Economics
Düsternbrooker Weg 120
24105 Kiel (Germany)
E-Mail: [rights\[at\]zbw.eu](mailto:rights[at]zbw.eu)
<https://www.zbw.eu/econis-archiv/>

Standard-Nutzungsbedingungen:

Dieses Dokument darf zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden. Sie dürfen dieses Dokument nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, aufführen, vertreiben oder anderweitig nutzen. Sofern für das Dokument eine Open-Content-Lizenz verwendet wurde, so gelten abweichend von diesen Nutzungsbedingungen die in der Lizenz gewährten Nutzungsrechte.

<https://zbw.eu/econis-archiv/termsfuse>

Terms of use:

This document may be saved and copied for your personal and scholarly purposes. You are not to copy it for public or commercial purposes, to exhibit the document in public, to perform, distribute or otherwise use the document in public. If the document is made available under a Creative Commons Licence you may exercise further usage rights as specified in the licence.



Modeling the Impacts of Corporate Environmental Responsibility on Information and Communication Technology -waste Management

Mei-Chee Tan¹, Tuan-Hock Ng^{2*}, Ying-San Lim³, Chun-Teck Lye⁴, Hishamuddin Ismail⁵

¹Faculty of Business, Multimedia University, Jalan Ayer Keroh Lama, 75450 Bukit Beruang, Melaka, Malaysia, ²Faculty of Business, Multimedia University, Jalan Ayer Keroh Lama, 75450 Bukit Beruang, Melaka, Malaysia, ³Faculty of Business, Multimedia University, Jalan Ayer Keroh Lama, 75450 Bukit Beruang, Melaka, Malaysia, ⁴Faculty of Business, Multimedia University, Jalan Ayer Keroh Lama, 75450 Bukit Beruang, Melaka, Malaysia, ⁵Faculty of Business, Multimedia University, Jalan Ayer Keroh Lama, 75450 Bukit Beruang, Melaka, Malaysia. *Email: thng@mmu.edu.my

ABSTRACT

The global growth of consumption and disposal of information and communication technology (ICT) appears to be one of the main factors that fuels the increased level of ICT-waste. With ICT-waste causing environmental degradation, there is urgency in the public interest to achieve more sustainable development. This study develops a conceptual framework for reduce behavior at workplace premised on the classic theory of planned behavior. The theoretical contribution of this study is primarily upon expanding existing knowledge on factors influencing pro-environmental behaviors, by firstly conceptualizing reduce behavior and secondly emphasizing the mediating effect of corporate environmental responsibility on the relationships between attitude, subjective norms and perceived benefits, and reduce behavior. In short, a well-communicated environmental policy within organizations is urgently required, being a strong signal that encourages employees to engage in pro-environmental actions.

Keywords: Reduce, Corporate Environmental Responsibility, Information And Communication Technology -Waste, Theory of Planned Behavior
JEL Classification: P28

1. INTRODUCTION

The importance of electronic gadgets in shaping our life style has increased drastically over time with greater dependency on technological products and services for efficiency and convenience. These appliances, however are contributing to the alarmingly increase in electronic waste (e-waste) worldwide, when they reach their end of life. The 2014 United Nations University report 'The Global E-waste Monitor' shows that the volume of disposed electrical and electronic equipment (EEE) accounted for approximately 41.8 metric tons in 2014, up by 24% in a 4-year period (Baldé et al., 2015). Of this total, their study claims that the share of screens and small information and communication technology (ICT) products (e.g. laptops, printers, tablets, mobile phones, personal computers and scanners) reached 23%.

Local councils in many countries have been working under a program called "take-back and treatment" for end-of-life electronics. This system, which collects discarded EEE from users and recycles it in an environmentally sound way holds great potential as a means to address issues related to managing e-waste. Despite the potential outcomes that this method offers, the evidence for its benefits was in most cases limited due mainly to lack of good governance and weak enforcement (Baldé et al., 2015). Moreover, this process is plagued with another challenge - many developing nations do not give it significant importance and weight in the overall policy framework as it is usually perceived considerably new with no clearly-defined procedures and rules (Nnorom and Osibanjo, 2008). This case can be subsequently seen through how alarmingly EEE ends up neglected in landfill, leading to changes in environmental conditions, including increased levels of chemicals and heavy metals in the soil, air and water (Hong et

al., 2015; Zhang et al., 2017). These toxins are threats to human, having adverse impacts on public health such as respiratory infections, premature mortality and cardiovascular diseases (Environmental Protection Agency [EPA], 2017).

Managing e-waste is not without its challenges, especially with continuous expansion and development in the electronic industry. A major hurdle, according to Oh et al. (2003), is the rapid advances in scientific discovery which they believed that the introduction of new products will spur demand. Compounding this, the widespread of ICT-based solutions throughout the world likely generates a tremendous volume of e-waste after they are discarded. Recent industry surveys by Gartner Incorporation on the latest global trends and developments in ICT show that worldwide budgets for ICT products and services are expected to hit US\$3.7 trillion in 2018, compared to US\$3.38 trillion in 2016 (Darrow, 2017; Meulen and Bamiduro, 2018). Realizing that higher consumption levels of ICT products and shorter product life expectancy generally correlate with the average increase in e-waste (Baldé et al., 2015; Dwivedy and Mittal, 2013; Organization for Economic Co-operation and Development [OECD], 2017; Osibanjo and Nnorom, 2007; Pariatamy and Victor, 2013), it is hence more urgent than ever to address this specific matter.

The next question that arises is the system by how to halt this environmental injustice effectively. For this study, proposing a research model of reduce decision at workplace draws important policy implications for environmental benefits linked to e-waste prevention. As stated in a report by Madden and Weißbrod (2008), reducing demand for ICT hardware and software is a clear example of how companies can integrate sustainable development goals into their business agenda. To put things in perspective, if companies are to avoid making unnecessary purchase of new ICT products by doubling the functional lifespan of a personal computer, this should mean that the new computer production can be reduced by 50%. It is worth noting that this initiative secures not only economic savings but also environmental benefits. In this case, they must be well-prepared to take on the responsibility of implementing green purchasing. But the irony is that – in actual fact, discussions centre on reduce seems to be limited¹, making this study an important one after all.

The present study approaches this matter from the employee (manager or supervisor) perspective not from the household. Prior studies on household environmental behavior (e.g. Iyer and Kashyap, 2007; Liobikienė et al., 2016; Moser, 2015; Nguyen et al., 2016; Park and Ha, 2014; Ramayah, et al., 2010; Saphores et al., 2012) have undeniably enriched the understanding on environmental protection, providing insightful analysis of factors motivating pro-environmental behaviors. It is as yet unclear whether those reported determinants are similarly valid in predicting pro-environmental behaviors in the organizational context, especially given the relative scanty in extant study on corporate environmentalism. Additionally, the need for a focus

on reduce behavior at workplace becomes more imperative as organizational activities are related to environmental sustainability issues (Darby and Obara, 2005; Stern, 2000). It is for this reason that this study must be conducted at the firm level.

Studies with focus on pro-environmental behavior and environmental sustainability have been developed in the past. Since the seminal work of Ajzen and Fishbein (1980), the theory of planned behavior (TPB) has become one of the most extensive considerations within the attitude-behavior approach in behavioral environmental studies. This model which links attitude, social norms and perceived behavioral control (PBC) to individual's intention and behavior often has the degree of flexibility that permits the inclusion of other external factors that could possibly be relevant to the explanation of human behavior (Ajzen, 1991; Ajzen and Fishbein, 1980). Related to this study, the proposed framework sheds more light on how corporate environmental responsibility (CER), defined as voluntary corporate activities that aim to reduce carbon footprints (Hilson, 2017) affects reduce intention and behavior at workplace. CER seems to have been excluded from the processes leading to pro-environmental behavior in majority of ecological research. Few notable studies that have specifically been conducted in this field include the studies of Arnaud and Sekerka (2010) who explained that employees may reciprocate sustainability initiatives undertaken by their firms through the socialization process and Gkorezis and Patridou (2017) who claimed that the role of CER provides the basis for pro-environmental behavioral development. Quite different from the approach adopted in previous works where CER is exogenous, this model is among the first studies, to the best of authors' knowledge, that explicitly considers CER as the primary mechanism that translates attitude, subjective norms and perceived benefits into reduce behavior (Figure 1). This idea is closely linked to a study by Ramus and Steger (2000) who used the organizational behavior literature to explain that the corporate environmental policy signals organizational and supervisory encouragement in regard to sustainability and natural environment protection. They found that employees, in turn will be more willing to create environmental initiatives. In the absence of a high degree of organizational attention and commitment to the prevention of environmental degradation, this study argues that the implementation of various environmental solutions from employees would be more difficult, if not impossible. Moreover, environmental actions at workplace differ from those at home, due largely to different work processes and requirements playing roles in the organization (Ruepert et al., 2016), acting as motivators or inhibitors of employees' participation in environmental activities. As a result, attitude, subjective norms and PBC may not directly affect reduce behavior; rather, their influence in this context is indirect through CER.

In sum, this study proposes a model in which CER plays a mediating role in predicting reduce behavior at workplace. The remainder of this study is organized as follows. The conceptual framework is presented in section 2, followed by section 3 which concludes this study.

¹ Evidence suggests that extant studies mostly underscore the importance of recycling (e.g., Iyer and Kashyap, 2007; Park and Ha, 2014; Saphores et al., 2012) and reuse behavior (e.g., Mosler et al., 2008; Tonglet et al., 2004).

2. THE CONCEPTUAL FRAMEWORK

2.1. ICT, Waste and Management

ICT is defined as products and services that are utilized to capture, transmit or display data or information in the form of electronic (Madden and Weißbrod, 2008). They are for example, printers, personal computers, laptops, fax machines and telephones. The application of ICT solutions worldwide holds enormous potentials for economy and delivery of products and services, which include more effective management of resources, growth in productivity, rapid innovation, technological progress, and strengthened human interaction and communication (Nnorom and Osibanjo, 2008; World Bank, 2017). Although the development of ICT today is encouraging in many areas, the backside of this advancement is the negative impact to the environment, due mainly to increased production, consumption and disposal of ICT products. Like any piece of equipment, ICT products, may wear down over time. A personal computer, for example should last for 2-3 years before it needs replacing (Boon et al., 2000). Apart from non-functionality, owners may choose to throw away EEE because of business policy, age and cosmetic conditions, according to Solving the E-waste Problem [STEP] (2014). These EEE once discarded is considered as e-waste, which is created from any forms of electronic products, including all electronic sub-components that have become obsolete and reached the stage of the end-of-life (Dwivedy and Mittal, 2013; EPA, 2017; Hong et al., 2015; STEP, 2014; Wang et al., 2011).

Electronic products, including ICT contain both precious and hazardous materials, such as lead, nickel, cadmium and mercury (Pariatamby and Victor, 2013) that if treated in a wrong manner at end-of-life (e.g. acid leaching process and open burning), can impair human health and the environment (EPA, 2017; Giusti, 2009; Zeng et al., 2016). In fact, solving the e-waste issue can start with business. As stated by Brewer and Stern (2005), business decisions can have profound implications for environment and with efforts, environmental conditions will change. There are a whole range of opportunities for companies to protect environment without exorbitant expenses, such as using energy-efficient products, buying products that are durable, purchasing recycled-content products with minimal packaging, and meet recycling targets (Cantor et al., 2012; Carter and Dresner, 2001; Corbett and Klassen, 2006; Department of Environment and Heritage Protection, 2017; Environment Protection Department, 2005). Indeed, dealing with e-waste could be linked to waste prevention and recycling, according to the United Nations Centre for Regional Development (2011). Recycling is an option that gives priority on the process of recovering material from waste and converting it into reusable materials whereas waste prevention (also known as source reduction) is closely linked to reducing the quantity of waste in the first place (Bortoleto et al., 2012). The emphasis of these methods is completely different but should complement each other (Tonglet et al., 2004). Recognizing the possible health effects of toxic exposures from managing end-of-life of EEE, waste avoidance is a must-do agenda (Li and Geiser, 2005).

OECD (2000) divides waste prevention into 3 classifications – strict avoidance, source reduction and product reuse. With this reference, strict avoidance is defined as an act that completely avoids waste

generation. Concerning source reduction, OECD (2000) stresses the importance of minimization of the use of toxic materials, while product reuse can be achieved by a multiple use of the products. Waste prevention initiatives are highly justifiable, according to Tonglet et al. (2004) who strongly advocated avoidance at the point of purchase (e.g. select products with minimal packaging) and waste prevention technique that values repair and reuse over disposal (e.g. multiple use of plastic containers). Tucker and Douglas (2007) concurred with this classification and included additional category, namely new purchases minimization and use of long life products.

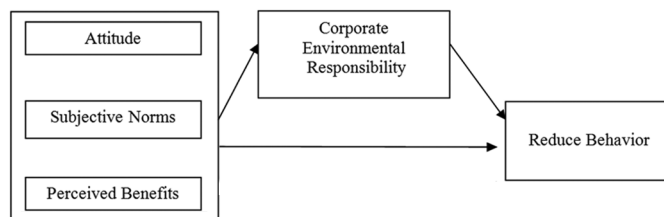
2.2. The Reduce Framework

Growing public awareness of the importance of environmental health has spurred a host of empirical studies on waste management. One such theory that has gained recognition in understanding pro-environmental behavior is the theory of reasoned action (TRA) (Ajzen and Fishbein, 1980) and its extension - TPB (Ajzen, 1991). Research using TPB has been undertaken in various settings and at different units of analysis. For example, there are studies related to recycling in Scotland (Knussen et al., 2004), the United Kingdom (Tonglet et al., 2004), Greek (Botetzagias et al., 2015), Hong Kong (Wan et al., 2012) and Malaysia (Ramayah et al., 2012). Likewise, evidence from empirical studies indicates that TPB is similarly valid in explaining eco-friendly products purchase (e.g. Liobikienė et al., 2016; Nguyen et al., 2016; Tan et al., 2017; Yadav and Pathak, 2016), reuse behavior (e.g. Ertz et al., 2017; Mosler et al., 2008) and energy saving behavior (Chen, 2016; Gadenne et al., 2011), to name a few.

Although there are overwhelmingly large scale of works pertaining to pro-environmental behavior in household and some in organizations, many of their aspects at workplace specifically are still poorly understood and incomplete. This means that no attempt has been made to study reduce behavior at workplace, using TPB or other theories, to the best knowledge of authors. It is, hence deemed relevant to delve deeper into this matter. In the absence of a more appropriate theoretical framework in elucidating reduce behavior, this study first conceptualizes reduce behavior, followed by a proposal of a waste prevention model – reduce, by extending TPB, as depicted in Figure 1. The use of TPB in this study seems relevant for its high predictive power to explain various pro-environmental behaviors aforementioned.

TPB has its foundations in seeking to understand individual's behavior. This theory consists of two building blocks: People's intention, which argues that whether or not to perform a particular act is determined by intention; and a set of other factors (attitude,

Figure 1: A conceptual framework for reduce behavior



subjective norms and PBC), which in turn, is expected to impact individual's intention (Ajzen, 1991; Ajzen and Fishbein, 1977). Using this view as a basis, this paper outlines how reduce behavior is motivated at workplace.

2.2.1. Reduce

It is broadly acknowledged that reduce behavior, referred to actions of a person that consumes the product only when it is necessary serves as a means of creating a green environment (National Environment Agency, 2017). It can be described as one of the most suitable techniques that addresses waste challenge facing the international community. According to Yano and Sakai (2016), reduce is the waste prevention action that has the highest priority in the waste management hierarchy. Through the decision on not creating it in the first place (United States Environmental Protection Agency [US EPA], 2017), it is clear that reduce behavior provides an opportunity to deal with sustainability issues more effectively. The basis for this study is the idea that a commitment to greener purchases with responsible procurement playing central roles, reduce, in this context is a key factor in achieving environmental sustainability and that, correspondingly, companies are willing to share this responsibility. The need to minimize new ICT products purchase has been expressed in several policy documents. The procurement standards by the Queensland Government Chief Procurement Office (2010) which require governmental sectors to reconsider the need for a new purchase of ICT products can be seen as a public intervention. Following these definitions, this study expresses reduce behavior as an act that minimizes the procurement ICT products after conducting a careful demand analysis. It is important to acknowledge that not all users require advanced computer technology as older machines might still work well and capable of performing basic functions that suit the business needs (Osibanjo and Nnorom, 2007).

The main thrust of this study using TPB is the notion that CER plays a significant role in understanding reduce behavior at workplace. Attitude, subjective norms and perceived benefits included in TPB are general considerations that explain various pro-environmental behaviors but based on literature review, CER is similarly relevant for its role that sends out a clear signal of encouragement for employees to be committed towards protection of the natural environment (Ramus and Steger, 2000, Ruepert et al., 2016; Ruiz-Quintanilla et al., 1996). For the purpose of this study, CER is postulated as the key route through which the factors identified in TPB promote the reduce initiative. Each of these relationships is briefly discussed.

2.2.2. Corporate environmental responsibility

International trends indicate that companies broadly place CER on their agenda not only as a solution to pollutions, but also an important strategic factor that enhances corporate performance - firm reputation and financial performance (e.g. Epstein and Roy, 1998; Fombrun and Shanley, 1990; Testa and D'Amato, 2017). CER, as defined by Hilson (2017) is corporate voluntary activities that assess and minimize the ecological footprints in their business model. As part of the corporate social responsibility (CSR) activities, Mazurkiewicz (2004) expressed CER as "the duty to cover the environmental implications of the company's

operations, products and facilities; eliminate waste and emissions; maximize the efficiency and productivity of its resources; and minimize practices that might adversely affect the enjoyment of the country's resources by future generations." It requires firms to proactively and voluntarily adopt business practices that go beyond regulations in fulfilling economic and environmental sustainability (Torugsa et al., 2013).

It is argued that adopting reduce behavior is, to some extent, a challenge requiring not only the external forces such as regulations and social pressure, but also a similarly crucial supportive environment within the organization. This refers to CER that aims to achieve ecological sustainability. The role of sustainable pledges of corporations to environment is a central constituent in the company, helping to instill pertinent value in employees, who in turn support social and environmental initiatives proposed and undertaken by the companies (Gkorezis and Petridou, 2017). Indeed, Rupp et al. (2006) recognized that devotion of firms to more socially responsible practices would consequently encourage emotional, attitudinal and behavioral outcomes. Ramus and Steger (2000) likewise stated that the organizational policy on environment serves as a strong signal to employees, encouraging them to promote environmental initiatives. As a result, such voluntary environmental commitment can be identified relating to pro-environmental behaviors of employees for whose perceptions are shaped by environmental values through the socialization process (Arnaud and Sekerka, 2010). It means that employees become interested in taking environmentally friendly measures at workplace as a way of corresponding with various programs conducted within firms that redress consequences of environmental degradation. In the light of these discussions, it is therefore vital for firms wishing to implement environmentalism to firstly formalize well-communicated environmental practices (Banerjee et al., 2003). Environmental policies embedded across its administrations often instill and inculcate environmental friendly habits in employees, such that the adoption of CER promotes reduce behavior at workplace.

Consistent with the earlier discussion, this study seeks to shed light on the mediating role played by CER in motivating reduce behavior. Prior studies yielded important insights into attitude and subjective norms, among others predict a wide range of pro-environmental behaviors at home. It is however, more importantly to answer if these factors are translated into actual action at work, given that there are different processes involved in workplace and these organizational situations can seriously inhibit such behaviors (Ruepert et al., 2016). As review of past literature suggests, the absence of a comprehensive CER framework reflects a situational constraint whereas firms committed to environmentalism make essential resources more easily available (Lee et al., 2016). CER, consequently, is sufficient enough to explain how it changes behavior of employees in firms. For example, the procurement policy characterized by low carbon footprints undertakes purchase requests and approval of ICT equipment on the basis of job functions and requirements, not the rate of technological advancement. This is because many basic applications are still functional and compatible with existing processing capacity (Dedrick, 2010; Osibanjo and Nnorom, 2007). In deciding on a

purchase of ICT hardware, employees who have equally positive attitudes toward environment, coupled with CER would lead to purchases of ICT product being less frequent in the organization. On the contrary, an employee may find it impossible to carry out pro-environmental behaviors in the absence of CER, especially when conflicts arise between their feeling of moral obligation and the work process. As reported by Tudor et al. (2008), managers who on a personal level have motivation to be more sustainable, are unable to take more environmentally friendly actions as they are limited with their powers to effect change in the organization. Clearly, in such cases, a formal procedure exists within companies to which individuals are expected to conform, namely CER likely mediates the effects of attitude, subjective norms and perceived benefits on reduce behavior.

2.2.3. Attitude

Attitude of a person plays a very important role in understanding behaviors of people in TPB. It is defined as the favorite of a person to certain behavior (Ajzen, 1991; 2001). Schwartz (1992) concluded that attitude refers to a set of beliefs that an individual has cultivated over many years about an object or act (e.g., likes or dislikes). Along with this theoretical account, Stern (2000) stressed the importance of attitude and how an individual with a good attitude will be more responsive to environmentally responsible initiatives.

The adoption of CER and reduce behavior, to some extent are affected by attitude. In discussing the link between attitude and CSR, Hemingway and Maclagan (2004) strongly support the view that individual managers have autonomy with their responsibility in the organization, and hence have choice among alternative courses of action. Their decision in the organization is strongly influenced by personal interests and values, in addition to corporate objectives, such that being ethical and environmentally friendly are factors motivating them to champion social responsibility (Wood, 1991). Similarly, Tudor et al. (2008), through their case study of the health service, reported that employee interests, belief and the level of awareness of environmental issues determine their sustainable waste management behavior at workplace. As noted by Manika et al. (2013), individual attitude is the key motivational factor of workplace environmentally friendly behaviors. Also, a study by Bansal and Roth (2000) largely confirmed this relationship and concluded that a sense of responsibility and duty contributes to CSR adoption. Karassin and Bar-Haim (2016) likewise showed a consistency of findings, both the theoretical postulations and empirical results. Overall, personal beliefs are the important factor in environmental actions of organization (Stern, 2000) and it is believed that employee perception towards the natural environment influences CER and reduce behavior.

2.2.4. Subjective norms

As regards subjective norms in TPB, it is highly likely that multi-stakeholder pressure promotes pro-environmental behavior (Flannery and May, 2000), the idea being that others' perception influences a given behavior (Ajzen, 1991). It is a function of beliefs that specific individuals approve or disapprove when the action is performed (Ajzen and Fishbein, 1977). For a person to perform a particular behavior, that individual needs to know the customary

codes of behavior, namely the expectation of reference groups of whom he/she perceives important.

Through the lens of institutions, Meyer and Rowan (1977) viewed an organization as an open system which subjects to pressures arise from the external environment. The components of external environment are diverse, including individual and group functioning as society, local community, suppliers, employees, management and shareholders (Chen et al., In Press; Lee et al., 2016). Each of them shows varied interests in the company and hence their expectations will be different in extent accordingly. Any given pressure is complex and could be a trigger for change. Linking subjective norms and CER, stakeholders have a role to play in organizational decision-making processes and such influences may result in managers proactively using CER to meet their requirements, especially when environmental protection becomes a worldwide issue nowadays (Buysse and Verbeke; 2003; Gössling, 2011). Lee et al. (2016) concurred with this idea and concluded that social expectations account for how companies perceive their environmental obligation and hence determine the degree to which they conduct CER initiatives. Social pressure is hence quite naturally suited for demonstrating why companies commit to pro-environmental decisions (Keogh and Polonsky, 1998; Papagiannakis and Lioukas, 2012). Within this context, an organization needs to be responsive to the constantly changing conditions and continuously fine-tune its approach to meet the needs of a vast array of stakeholders (Selznick, 1949); being more in line with social rules and norms to alleviate threats stemming from key stakeholders (Haveman and Rao, 1997; Stern, 2000).

2.2.5. Perceived benefits

Human activities are to some extent determined by PBC, which is generally expressed as constraints on action in certain circumstances (Armitage and Conner, 2001). In this study, perceived benefit is considered as a dimension of PBC. It is explicitly and traditionally derived from TPB, defined as a form of extrinsic motivation that determines whether or not an activity achieves valued outcomes (Davis et al., 1992; Park and Kwon, 2017). In a broad sense, there are two types of perceived benefits, namely quantifiable and unquantifiable measures. They obviously have substantial relevance in explanation of a person's intention and behavior based on prior findings. In this context, the measurable benefits are in connection with monetary benefits, for instance, cost savings or sales increase; whilst immeasurable benefits comprise recognition (Iyer and Kashyap, 2007), customer attraction and corporate reputation (King and Lenox, 2002). Azzone and Manzini (1994), on the other hand divided benefits of corporate environmentalism into two categories: (1) Internal advantages refer to benefits obtained from factors within the organization such as higher efficiency, reduction of fines associated with pollutions and savings in production costs, and (2) external advantages consist of a variety of benefits gained from factors outside the company such as improved image, larger market share and better reputation.

Drawing from the natural-resource based view, companies which develop specific capabilities with existing resources can potentially transform these capabilities into their competitive edge (Barney

and Zajac, 1994). Hart (1995) concurred that companies embedded environmental strategies in their operations would be having more valuable organizational capabilities, being a source of competitive advantage. Likewise, the benefits of cost, revenue and reputation accrued from environmentalism will lead the corporations toward continuous fulfillment of sustainability (Sindhi and Kumar, 2012). Banerjee (2001) through his interview with managers in the United States (U.S.) revealed that economic benefits to their firms, such as cost savings and quality improvement are the main reasons underpin the adoption of CER initiatives among companies. Besides, better corporate image and increased market value are other potential benefits which likely serve as motivations for firms to adopt CER (Chen et al., In Press; Dummett, 2006; Lee et al., 2016).

Since perceived benefits are largely thought to be associated with human behavior (see for example Dummett, 2006; Hartmann and Apaolaza-Ibanez, 2012; Huijts et al., 2012; Sindhi and Kumar, 2012), this study takes a step forward to understand how perceived benefits account for variance in CER and reduce behavior at workplace. It is important to note that, however the effectiveness of perceived benefits is dependent on whether the benefits with environmental practices are easily quantifiable. As argued by Papagiannakis and Lioukas (2012), it is possible that managers who place great emphasis on the assessment of monetary criteria would most likely be less active in environmental management as benefits with environmental practices are not easily measurable.

Taking in consideration all the factors potentially motivating CER and reduce behavior, this study develops a conceptual model to understand how the reduce decision at workplace are affected. It is expected with strong belief that CER is the key factor for reduce behavior among companies thereby making a difference in affecting companies' decision in reducing the purchase of ICT equipment. Such proposition however represents an area that needs further examination, emphasizing how CER mediates the relationship between the explanatory variables - attitude, subjective norms, and perceived benefits, and reduce behavior.

3. CONCLUSION

Companies must be motivated by a desire not to see that their business activities cause environmental degradation. Working towards this vision, it seems conceivable that waste prevention through reduce behavior at workplace will not only save costs but also offers health and environmental benefits. This paper demonstrates that study taking into account of reduce behavior has been scanty and efforts to fill this gap has faltered. These limitations have made ICT-waste a growing concern - a problem compounded by the absence of adequate ICT procurement policy in a large extent. Perhaps, the study of reduce behavior has been hindered by a lack of conceptualization of reduce behavior at the corporate level, as well as the insufficient statistics on it. For example, the authorities do not yet disaggregate data on reduce, reuse and recycle. The conceptual framework presented here, with an emphasis on CER tackles the lingering question about rising ICT-waste, beginning with the most basis, that is reduce behavior.

Building on TPB, reduce behavior at workplace is viewed as the result of complex interaction among attitude, subjective norms, perceived benefits and CER. The incorporation of CER in this model specifically is seen as not only new but also crucial to the understanding of reduce behavior. The proposed framework offers fresh insights into mechanisms leading up to reduce behavior in organizations. As pointed out in literature, the right conditions created by firms, especially management supports in socially responsible practices shape the perceptions of employees towards the organization. A well-communicated environmental policy within organizations for example, is perceived by workers as a strong signal that encourages them to engage in pro-environmental actions. As a result, CER is the most appropriate means to achieve the goal of environmental sustainability. In other words, it potentially mediates the effects of general factors identified in TPB on reduce behavior at workplace. In conclusion, the proposed model in this study is seen as a vital step towards a comprehensive understanding of the role of CER on reduce behavior at workplace.

4. ACKNOWLEDGMENTS

We would like to thank Prof. Dr. Jay Janney and other anonymous reviewers for their insightful comments. We also acknowledge Malaysia's Ministry of Higher Education via Fundamental Research Grant Scheme for its financial support.

REFERENCES

- Ajzen, I. (1991), The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, 50(2), 179-211.
- Ajzen, I. (2001), Nature and operation of attitudes. *Annual Review of Psychology*, 52(1), 27-58.
- Ajzen, I., Fishbein, M. (1977), Attitude-behavior relations: A theoretical analysis review of empirical research. *Psychological Bulletin*, 84(5), 888-918.
- Ajzen, I., Fishbein, M. (1980), *Understanding Attitudes Predicting Social Behavior*. Englewood Cliffs: Prentice Hall.
- Armitage, C.J., Conner, M. (2001), Efficacy of the theory of planned behavior: A meta-analytic review. *British Journal of Social Psychology*, 40(4), 471-499.
- Arnaud, A., Sekerka, L.E. (2010), Positively ethical: The establishment of innovation in support of sustainability. *International Journal of Sustainable Strategic Management*, 2(2), 121-137.
- Azzone, G., Manzini, R. (1994), Measuring strategic environmental performance. *Business Strategy and the Environment*, 3(1), 1-14.
- Baldé, C.P., Wang, F., Kuehr, R., Huisman, J. (2015), *The Global E-waste Monitor-2014*. Bonn, Germany: United Nations University.
- Banerjee, S.B. (2001), Managerial perceptions of corporate environmentalism: Interpretations from industry and strategic implications for organizations. *Journal of Management Studies*, 38(4), 489-513.
- Banerjee, S.B., Iyer, E.S., Kashyap, R.K. (2003), Corporate environmentalism: Antecedents and influence of industry type. *Journal of Marketing*, 67(2), 106-122.
- Bansal, P., Roth, K. (2000), Why companies go green: A model of ecological responsiveness. *Academy of Management Journal*, 43(4), 717-736.
- Barney, J.B., Zajac, E.J. (1994), Competitive organizational behavior: Toward an organizationally-based theory of competitive advantage. *Strategic Management Journal*, 15(S1), 5-9.

- Boon, J.E., Isaacs, J.A., Gupta, S.M. (2000), Economics of PC recycling. *Proceedings of the SPIE International Conference on Environmentally Conscious Manufacturing*, 4193, 29-35.
- Bortoloto, A.P., Kurisu, K.H., Hanaki, K. (2012), Model development for household waste prevention behavior. *Waste Management*, 32(12), 2195-2207.
- Botetzagias, I., Dima, A.F., Malesios, C. (2015), Extending the theory of planned behavior in the context of recycling: The role of moral norms and demographic predictors. *Resources, Conservation and Recycling*, 95, 58-67.
- Brewer, G.D., Stern, P.C. (2005), *Decision Making for the Environment: Social and Behavioral Science Research Priorities*. Washington, DC: The National Academies Press.
- Buyse, K., Verbeke, A. (2003), Proactive environmental strategies: A stakeholder management perspective. *Strategic Management Journal*, 24(5), 453-470.
- Cantor, D.E., Morrow, P.C., Montabon, F. (2012), Engagement in environmental behaviors among supply chain management employees: An organizational support theoretical perspective. *Journal of Supply Chain Management*, 48(3), 33-51.
- Carter, C.R., Dresner, M. (2001), Purchasing's role in environmental management: Cross-functional development of grounded theory. *Journal of Supply Chain Management*, 37(2), 12-27.
- Chen, C.S., Yu, C.C., Hu, J.S. (In Press), Constructing performance measurement indicators to suggested corporate environmental responsibility framework. *Technological Forecasting and Social Change*, 75(8), 1091-1108.
- Chen, M.F. (2016), Extending the theory of planned behavior model to explain people's energy savings and carbon reduction behavioral intentions to mitigate climate change in Taiwan—moral obligation matters. *Journal of Cleaner Production*, 112, 1746-1753.
- Corbett, C.J., Klassen, R.D. (2006), Extending the horizons: Environmental excellence as key to improving operations. *Manufacturing Service Operations Management*, 8(1), 5-22.
- Darby, L., Obara, L. (2005), Household recycling behavior attitudes towards the disposal of small electrical electronic equipment. *Resources, Conservation and Recycling*, 44(1), 17-35.
- Darrow, B. (2017), Here's Why Gartner Cut its IT Spending Estimates. *Fortune*. Available from: <http://www.fortune.com/2017/01/12/gartner-it-spending/>. [Last accessed on 2017 Sep 05].
- Davis, F.D., Bagozzi, R.P., Warshaw, P.R. (1992), Extrinsic and intrinsic motivation to use computers in the workplace. *Journal of Applied Social Psychology*, 22(14), 1111-1132.
- Dedrick, J.L. (2010), Green IS: Concepts and issues for information systems research. *Communications of the Association for Information Systems*, 27(1), Article 11.
- Department of Environment Heritage Protection. (2017), Reduce, Reuse, Recycle. Available from: https://www.ehp.qld.gov.au/waste/minimisation/reduce_reuse_recycle.html.
- Dummet, K. (2006), Drivers for corporate environmental responsibility (CER). *Environment, Development and Sustainability*, 8(3), 375-389.
- Dwivedy, M., Mittal, R.K. (2013), Willingness of residents to participate in e-waste recycling in India. *Environmental Development*, 6, 48-68.
- Environmental Protection Agency. (2017), Reducing and Reusing Basics. Available from: <https://www.epa.gov/recycle/reducing--reusing-basics>.
- Environmental Protection Department. (2005), Throw Less, Pay Less. Available from: http://www.epd.gov.hk/epd/mw/htm_en/ch03/main.htm.
- Epstein, M., Roy, M.J. (1998), Managing corporate environmental performance: A multinational perspective. *European Management Journal*, 16(3), 284-296.
- Ertz, M., Huang, R., Jo, M.S., Karakas, F., Sarigöllü, E. (2017), From single-use to multi-use: Study of consumers' behavior toward consumption of reusable containers. *Journal of Environmental Management*, 193, 334-344.
- Flannery, B.L., May, D.R. (2000), Environmental ethical decision making in the US metal-finishing industry. *Academy of Management Journal*, 43(4), 642-662.
- Fombrun, C., Shanley, M. (1990), What's in a name? Reputation building corporate strategy. *Academy of Management Journal*, 33(2), 233-258.
- Gadenne, D., Sharma, B., Kerr, D., Smith, T. (2011), The influence of consumers' environmental beliefs and attitudes on energy saving behaviors. *Energy Policy*, 39(12), 7684-7694.
- Giusti, L. (2009), A review of waste management practices and their impact on human health. *Waste Management*, 29(8), 2227-2239.
- Gkorezis, P., Petridou, E. (2017), Corporate social responsibility and pro-environmental behavior: Organizational identification as a mediator. *European Journal of International Management*, 11(1), 1-18.
- Gössling, T. (2011), *Corporate Social Responsibility and Business Performance: Theories and Evidence about Organizational Responsibility*. Cheltenham: Edward Elgar Publishing.
- Hart, S.L. (1995), A natural-resource-based view of the firm. *Academy of Management Review*, 20(4), 986-1014.
- Hartmann, P., Apaolaza-Ibáñez, V. (2012), Consumer attitude and purchase intention toward green energy brands: The roles of psychological benefits and environmental concern. *Journal of Business Research*, 65(9), 1254-1263.
- Haveman, H.A., Rao, H. (1997), Structuring a theory of moral sentiments: Institutional and organizational co-evolution in the early thrift industry. *American Journal of Sociology*, 102(6), 1606-1651.
- Hemingway, C.A., MacLagan, P.W. (2004), Managers' personal values as drivers of corporate social responsibility. *Journal of Business Ethics*, 50(1), 33-44.
- Hilson, A.E. (2017), Corporate environmental responsibility. *The International Encyclopedia of Geography*, ???, 1-7.
- Hong, J., Shi, W., Wang, Y., Chen, W., Li, X. (2015), Life cycle assessment of electronic waste treatment. *Waste Management*, 38, 357-365.
- Huijts, N.M., Molin, E.J., Steg, L. (2012), Psychological factors influencing sustainable energy technology acceptance: A review-based comprehensive framework. *Renewable and Sustainable Energy Reviews*, 16(1), 525-531.
- Iyer, E.S., Kashyap, R.K. (2007), Consumer recycling: Role of incentives, information, and social class. *Journal of Consumer Behavior*, 6(1), 32-47.
- Karassin, O., Bar-Haim, A. (2016), Multilevel corporate environmental responsibility. *Journal of Environmental Management*, 183, 110-120.
- Keogh, P.D., Polonsky, M.J. (1998), Environmental commitment: A basis for environmental entrepreneurship? *Journal of Organizational Change Management*, 11(1), 38-49.
- King, A., Lenox, M. (2002), Exploring the locus of profitable pollution reduction. *Management Science*, 48(2), 289-299.
- Knussen, C., Yule, F., MacKenzie, J., Wells, M. (2004), An analysis of intentions to recycle household waste: The roles of past behavior, perceived habit, and perceived lack of facilities. *Journal of Environmental Psychology*, 24(2), 237-246.
- Lee, J.W., Kim, Y.M., Kim, Y.E. (2016), Antecedents of adopting corporate environmental responsibility and green practices. *Journal of Business Ethics*, 15(1), 1-13.
- Li, L., Geiser, K. (2005), Environmentally responsible public procurement (ERPP) and its implications for integrated product policy (IPP). *Journal of Cleaner Production*, 13(7), 705-715.
- Liobikienė, G., Mravickaitė, J., Bernatienė, J. (2016), Theory of planned behavior approach to understand the green purchasing behavior in the EU: A cross-cultural study. *Ecological Economics*, 125, 38-46.

- Madden, P., Weißbrod, I. (2008), ICT and Sustainable Development. Forum for the Future. Available from: <https://www.forumforthefuture.org/sites/default/files/project/downloads/connected.pdf>.
- Manika, D., Wells, V.K., Gregory-Smith, D., Gentry, M. (2015), The impact of individual attitudinal and organizational variables on workplace environmentally friendly behaviours. *Journal of Business Ethics*, 126(4), 663-684.
- Mazurkiewicz, P. (2004), Corporate Environmental Responsibility: Is a Common CSR Framework Possible? Available from: <http://www.documents.worldbank.org/curated/en/577051468339093024/pdf/421830csrframework01PUBLIC1.pdf>.
- Meulen, R.V.D., Bamiduro, W. (2018), Gartner Says Global IT Spending to Grow 6.2 Percent in 2018. Available from: <https://www.gartner.com/newsroom/id/3871063>.
- Meyer, J.W., Rowan, B. (1977), Institutionalized organizations: Formal structure as myth ceremony. *American Journal of Sociology*, 83(2), 340-363.
- Moser, A.K. (2015), Thinking green, buying green? Drivers of pro-environmental purchasing behavior. *Journal of Consumer Marketing*, 32(3), 167-175.
- Mosler, H.J., Tamas, A., Tobias, R., Rodríguez, T.C., Mira, O.G. (2008), Deriving interventions on the basis of factors influencing behavioral intentions for waste recycling, composting, and reuse in Cuba. *Environment and Behavior*, 40(4), 522-544.
- National Environment Agency. (2017), Waste Minimization and Recycling. Available from: <http://www.nea.gov.sg/energy-waste/3rs>.
- Nguyen, T.N., Lobo, A., Greenl, S. (2016), Pro-environmental purchase behavior: The role of consumers' biospheric values. *Journal of Retailing and Consumer Services*, 33, 98-108.
- Nnorom, I.C., Osibanjo, O. (2008), Electronic waste (e-waste): Material flows and management practices in Nigeria. *Waste Management*, 28(8), 1472-1479.
- Oh, C.J., Lee, S.O., Yang, H.S., Ha, T.J., Kim, M.J. (2003), Selective leaching of valuable metals from waste printed circuit boards. *Journal of the Air and Waste Management Association*, 53(7), 897-902.
- Organization for Economic Co-operation Development. (2000), Strategic Waste Prevention. OECD Reference Manual. Available from: [http://www.oecd.org/officialdocuments/publicdisplaydocumentpdf/?doclanguage=en&encote=env/epoc/ppc\(2000\)5/final](http://www.oecd.org/officialdocuments/publicdisplaydocumentpdf/?doclanguage=en&encote=env/epoc/ppc(2000)5/final).
- Organization for Economic Co-operation Development. (2017), Waste Prevention. Available from: <http://www.oecd.org/env/waste/wasteprevention.htm>.
- Osibanjo, O., Nnorom, I.C. (2007), The challenge of electronic waste (e-waste) management in developing countries. *Waste Management and Research*, 25(6), 489-501.
- Papagiannakis, G., Lioukas, S. (2012), Values, attitudes and perceptions of managers as predictors of corporate environmental responsiveness. *Journal of Environmental Management*, 100, 41-51.
- Pariatamby, A., Victor, D. (2013), Policy trends of e-waste management in Asia. *Journal of Material Cycles and Waste Management*, 15(4), 411-419.
- Park, E., Kwon, S.J. (2017), What motivations drive sustainable energy-saving behavior? An examination in South Korea. *Renewable and Sustainable Energy Reviews*, 79, 494-502.
- Park, J., Ha, S. (2014), Understanding consumer recycling behavior: Combining the theory of planned behavior and the norm activation model. *Family and Consumer Sciences Research Journal*, 42(3), 278-291.
- Queensland Government Chief Procurement Office. (2010), Procurement Guidance: Selling to the Queensland Government. Available from: <http://www.hpw.qld.gov.au/sitecollectiondocuments/procurementguidesellingtoqldgov.pdf>.
- Ramayah, T., Lee, J.W.C., Lim, S. (2012), Sustaining the environment through recycling: An empirical study. *Journal of Environmental Management*, 102, 141-147.
- Ramayah, T., Lee, J.W.C., Mohamad, O. (2010), Green product purchase intention: Some insights from a developing country. *Resources, Conservation and Recycling*, 54(12), 1419-1427.
- Ramus, C.A., Steger, U. (2000), The roles of supervisory support behaviors and environmental policy in employee ecoinitiatives at leading-edge European companies. *Academy of Management Journal*, 43(4), 605-626.
- Ruepert, A., Keizer, K., Steg, L., Maricchiolo, F., Carrus, G., Dumitru, A., Mira, R.G., Stancu, A., Moza, D. (2016), Environmental considerations in the organizational context: A pathway to pro-environmental behaviour at work. *Energy Research and Social Science*, 17, 59-70.
- Ruiz-Quintanilla, S.A., Bunge, J., Freeman-Gallant, A., Cohen-Rosenthal, E. (1996), Employee participation in pollution reduction: A socio-technical perspective. *Business Strategy and the Environment*, 5(3), 137-144.
- Rupp, D.E., Ganapathi, J., Aguilera, R.V., Williams, C.A. (2006), Employee reactions to corporate social responsibility: An organizational justice framework. *Journal of Organizational Behavior*, 27(4), 537-543.
- Saphores, J.D.M., Ogunseitani, O.A., Shapiro, A.A. (2012), Willingness to engage in a pro-environmental behavior: An analysis of e-waste recycling based on a national survey of US households. *Resources, Conservation and Recycling*, 60, 49-63.
- Schwartz, S.H. (1992), Universals in the content and structure of values: Theoretical advances and empirical tests in 20 countries. *Advances in Experimental Social Psychology*, 25, 1-65.
- Selznick, P. (1949), *TVA and the Grass Roots*. Berkeley: University of California Press.
- Sindhi, S., Kumar, N. (2012), Corporate environmental responsibility—transitional and evolving. *Management of Environmental Quality: An International Journal*, 23(6), 640-657.
- Solving the E-waste Problem. (2014), What is E-waste? Available from: <http://www.step-initiative.org/what-is-ewaste.html>.
- Stern, P.C. (2000), New environmental theories: Toward a coherent theory of environmentally significant behavior. *Journal of Social Issues*, 56(3), 407-424.
- Tan, C.S., Ooi, H.Y., Goh, Y.N. (2017), A moral extension of the theory of planned behavior to predict consumers' purchase intention for energy-efficient household appliances in Malaysia. *Energy Policy*, 107, 459-471.
- Testa, M., D'Amato, A. (2017), Corporate environmental responsibility and financial performance: Does bidirectional causality work? Empirical evidence from the manufacturing industry. *Social Responsibility Journal*, 13(2), 221-234.
- Tonglet, M., Phillips, P.S., Bates, M.P. (2004), Determining the drivers for household pro-environmental behavior: Waste minimisation compared to recycling. *Resources, Conservation and Recycling*, 42(1), 27-48.
- Torugsa, N.A., O'Donohue, W., Hecker, R. (2013), Proactive CSR: An empirical analysis of the role of its economic, social and environmental dimensions on the association between capabilities and performance. *Journal of Business Ethics*, 115(2), 383-402.
- Tucker, P., Douglas, P. (2007), Understanding Household Waste Prevention Behavior, Working Paper (WR0112). Paisley: University of Paisley Environmental Technology Group.
- Tudor, T.L., Barr, S.W., Gilg, A.W. (2008), A novel conceptual framework for examining environmental behavior in large organizations: A case study of the Cornwall national health service (NHS) in the United Kingdom. *Environment and Behavior*, 40(3), 426-450.
- United Nations Centre for Regional Development. (2011), Reduce,

- Reuse, Recycle (the 3Rs) and Resource Efficiency as the Basis for Sustainable Waste Management. Available from: http://www.un.org/esa/dsd/csd/csd_pdfs/csd-19/learningcentre/presentations/May%209%20am/1%20-%20Learning_Centre_9May_ppt_Mohanty.pdf.
- United States Environmental Protection Agency. (2017), Reduce, Reuse, Recycle. Available from: <https://www.epa.gov/recycle>.
- Wan, C., Cheung, R., Shen, Q. (2012), Recycling attitude and behavior in university campus: A case study in Hong Kong. *Facilities*, 30(13/14), 630-646.
- Wang, Z., Zhang, B., Yin, J., Zhang, X. (2011), Willingness and behavior towards e-waste recycling for residents in Beijing city, China. *Journal of Cleaner Production*, 19(9), 977-984.
- Wood, D.J. (1991), Corporate social performance revisited. *Academy of Management Review*, 16(4), 691-718.
- World Bank. (2017), Overview. Available from: <http://www.worldbank.org/en/topic/ict/overview#1>.
- Yadav, R., Pathak, G.S. (2016), Intention to purchase organic food among young consumers: Evidences from a developing nation. *Appetite*, 96, 122-128.
- Yano, J., Sakai, S.I. (2016), Waste prevention indicators their implications from a life cycle perspective: A review. *Journal of Material Cycles and Waste Management*, 18(1), 38-56.
- Zeng, X., Gong, R., Chen, W.Q., Li, J. (2016), Uncovering the recycling potential of New WEEE in China. *Environmental Science and Technology*, 50(3), 1347-1358.
- Zhang, S., Ding, Y., Liu, B., Chang, C.C. (2017), Supply and demand of some critical metals and present status of their recycling in WEEE. *Waste Management*, 65, 113-127.