Organizational Green IT Adoption: Concept and Evidence

Full Paper

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Abstract

Green IT has emerged as a popular and an important research area in information system field over past decade or so. Some progresses have been made in our understandings of Green IT in a wide area of research topics ranging from Green IT definition to motivation of adopting Green IT by organizations. The paper presents a research model on organizational adoption of Green IT based on an extensive review of literature and a broad theoretical foundation. The model is tested, using content analysis, with data of 39 cases collected from Green IT vendors.

Keywords

Green IT adoption, sustainable competitive advantage, content analysis.

Introduction

With sustainability gradually becoming an important issue in most countries (Dao, Langella & Carbo, 2011), business enterprises are under increasing social, legal and economic pressures to adopt environmentally sustainable strategies for their products and services (Butler, 2011; Melville, 2010). For instance, as one of the *triple bottom line* (Elkington, 1994), environmental sustainability has been identified as one of CEO's major issues of concern in global surveys (IBM 2008; McKinsey 2009). Green IT, because of its important role in energy consumptions and savings and environmental issues, has become an emerging topic and received wide attention from both practitioners and scholars (Elliot, 2007).

According to a report surveying 426 companies in North America and a total of 1052 worldwide, 86 percent of companies stated that it is important for them to implement Green IT initiatives (Symantec, 2009). Organizations are currently actively pursuing Green IT for a number of reasons, including reducing power consumption, carbon emissions and environmental impact, improved systems performance and use, increased collaboration and interaction amid constituents, space savings and an agile workforce (Bose & Luo, 2011). However, given above mentioned benefits of Green IT, main determinants for Green IT adoption are still uncertain. Based on a review of Green IT literatures, Brooks et al. (2010) proposed three most prudent research questions for future study, among which the first one is: What motivates a company to adopt Green IT initiatives?

This paper has two objectives: 1) to identify the extant predictors of organizational Green IT adoption (OGITA) in research area; 2) to propose a research model of OGITA and test it through data collected from a number of cases. The rest of this paper is organized as follows. Section two examines definitions of Green IT and related terminologies and summarizes the extant predictors of organizational Green IT adoption. Section three introduces several theories and discusses their roles in explaining OGITA. A research model of OGITA is proposed in section four. Several propositions are formalized as well. Section five presents the preliminary test results of the proposed model. Conclusions, limitations of the study and potential directions for future study are presented in section six.

Overview of Green IT

The impacts of IT can be seen as twofold. On the one hand, IT is viewed as a source of environmental problem. In addition to direct negative effects the IT manufacturing has on the natural environment (Hilty et al., 2006; Köhler & Erdmann, 2004; Mishra, Akman & Mishra, 2014), the global IT industry alone was estimated to account for approximately 2 percent of the global carbon dioxide (CO_2) emissions (Gartner, 2008). On the other hand, IT is viewed as a solution to environmental problem. Numerous applications of IT (such as E-Commerce, smart grid, smart building, digital media, virtual goods/mobility, intelligent transport system) are believed to have potential power to reduce the environmental degradations caused by human activities and turn our society to a more sustainable one (Fuchs, 2008). As Elliot (2011) suggested, one challenge for the IT sector is to directly address the 2 percent of emissions by improving energy efficiency in products; a second challenge is to directly and indirectly address the remaining 98 percent through innovative IT applications.

The Definitions of Green IT

Green IT has been conceptualized in many ways, with wider or narrower scope, and with a variety of terminologies and concepts (Dedrick, 2010), such as Green IS (Dedrick, 2010; Jenkin, Webster & McShane, 2011; Lei & Ngai, 2012; Watson, Boudreau & Chen, 2010), IT for Green (Cai, Chen & Bose, 2013; Faucheux & Nicolaï, 2011), Green IS & IT (Chen et al., 2009), environmentally sustainable ICT (Elliot, 2007; Elliot, 2011). A summary of related terminologies and their definitions is presented in Appendix 1.

To illustrate what Green IT is, two related terminologies need to be clarified first: Green IS and IT for Green. For researchers studying Green IT, there is no consensus on whether Green IT and Green IS are same. Some regard them as the same object and use them interchangeably while others don't. The difference between Green IS and Green IT can trace back to the difference between IT and IS (Brooks et al., 2010). In-depth discussion of such difference is beyond the scope of this paper. Consistent with Watson, Boudreau & Chen (2010), in this paper, we differentiate Green IT from Green IS. Another confusable term is IT for Green. Some differentiate between Green IT and IT for Green because they are defined based on the different notions, "IT as a problem" and "IT as a solution", respectively (Cai, Chen & Bose, 2013; Faucheux & Nicolaï, 2011). Though these definitions vary in many aspects, there seems to be some consensus on what is green and environmentally sustainable (Cai et al., 2013; Hart, 1995). Green is associated with firms, systems, products and production processes that (1) use less energy, (2) recycle and reuse materials, (3) reduce waste, water use, and pollution and (4) preserve natural resources. Since IT for Green and Green IT share common goals for environmental sustainability, we treat IT for Green as part of Green IT. Therefore, in this paper, we define Green IT through combining definitions of Green IT and IT for Green proposed by Cai, Chen & Bose (2013):

> *Green IT is the practice of designing, manufacturing, using and disposing of computer, servers and associated subsystems efficiently and effectively with minimal or no impact on the environment, and with a strong focus on using information systems to enhance sustainability across the economy.*

Extant Predictors of Green IT Adoption

Many studies, both conceptual and empirical, have addressed Green IT adoption from different perspectives. In these studies, different dependent variables have been used, such as Green IT adoption (Chen et al., 2009; Lei & Ngai, 2013; Molla, 2008; Molla & Abareshi, 2011), Green IS adoption (Gholami et al., 2013; Lei & Ngai, 2012), Green IT initiative/initialization (Bose & Luo, 2011; Simmonds & Bhattacherjee, 2014), extent of Green IT (Kuo, 2010; Schmidt et al., 2010), intention to Green IT adoption (Lei & Ngai, 2014; Molla, 2008). Some studies employed the process view and differentiated between Green IT initiation and Green IT adoption; while, in practice, some researches distinguished between intention to Green IT adoption and actual Green IT adoption. Broadly speaking, although different terminologies have been used in different studies, the predictors (i.e., independent variables) identified in these studies can be viewed as antecedents of Green IT adoption. Since the objective of this paper is to take a holistic review of why Green IT is adopted at the organization level, we do treat all predictors identified in these studies equally and examine them thoroughly based on their research contexts.

Appendix 2 presents a review of extant predictors of Green IT adoption identified in previous studies. For each of the studies, the theoretical basis, type, core construct, components/definitions are examined.

Theoretical Background

Explaining Organizational Green IT Adoption

Diffusion of Innovation (DOI) Theory

Diffusion of innovation (DOI) theory (Rogers, 1995) is a theory on how, why and at what rate new ideas and technology spread through cultures, operating at the individual and firm level (Oliveira & Martins, 2011). DOI theory has been applied and adapted in various ways, especially in technology adoption studies (e.g., Cooper & Zmud, 1990; Thong, 1999; Eder & Igbaria, 2001; Beatty, Shim, & Jones, 2001; Bradford & Florin, 2003; Li, 2008; Zhu et al., 2006; Hsu et al., 2006). It offers rich explanations of how new innovations are adopted and how adoption decisions are affected by perceptions of the technology itself as well as the characteristics of the adopting organization and its environment (Bose & Luo, 2011). The characteristics of an innovation, as perceived by the members of a social system, determine its rate of adoption. Five attributes of innovations are: 1) relative advantage; 2) compatibility; 3) complexity; 4) trialability and 5) observability. Although Rogers mostly focused on the studies of individual innovation adoption, Van de Ven (1993) has argued that innovation attributes also play important roles in organizational adoptions.

Institutional Theory

First introduced in sociology field, institutional theory provides a rich and comprehensive view on how organizations become homogeneous under social pressures (Chen et al., 2009). The concept that best captures the process of homogenization is isomorphism. DiMaggio and Powell (1983) "moved" the focus on isomorphism from the society level to the organizational field level (Svejvig, 2013) and categorized three mechanisms through which institutional isomorphic change occurs: 1) coercive isomorphism; 2) mimetic isomorphism; and 3) normative isomorphism.

Institutional theory has been applied to study IS adoption in many researches (e.g., Liang et al., 2007; Gosain, 2004; Svejvig, 2013; Jensen, Kjærgaard & Svejvig, 2009; Tsamenyi, Cullen & González, 2006). The theoretical viewpoint of institutional theory also shows promise for understanding how organizations may embrace sustainability (Boudreau, Chen & Watson, 2008). Several studies have addressed corporate social and environmental sustainability through the lens of institutional theory (Butler, 2011; Campbell, 2007). Green IT adoption, as one step towards to corporate sustainability, has been studied using institutional theory as well (Butler, 2011; Chen et al., 2009; Gholami et al., 2013; Lei & Ngai, 2012). Although institutional theory could be used in multi-level, in this paper, we use institutional theory to primarily capture the external pressures motivating organizations to adopt Green IT.

Organizational Culture Theory

In IS field, researchers have studied the impact of culture (at multi levels, such as national, organizational and subunit) on IT issues for a long time. One stream of such studies focused on the relationship between organizational culture and IT adoption and diffusion (Cabrera, Cabrera & Barajas, 2001; EI Sawy, 1985; Hoffman & Klepper, 2000; Kitchell, 1995; Ruppel & Harrington, 2001; Von Meier, 1999). For example, Hoffman and Klepper (2000) found that organizations with mercenary cultures (i.e., low in sociability and high in solidarity) experienced more favorable outcomes with technology assimilation than did organizations with more networked cultures (high sociability and low solidarity). Information technology is not values neutral but inherently symbolic and values lade (Coombs et al., 1992; Feldman & March, 1981; Gobbin, 1998; Freeman, 1974; Robey & Boudreau, 1999; Scholz, 1990). Leidner and Kayworth (2006) labeled the values attributed to IT by a group as IT culture. They also proposed that the degree of fit between social groups' values and values embedded in the IT has emerged as an important construct for studying the relationship between values and IT adoption and diffusion. Therefore, in this paper, organizational culture would be proposed to have impacts on Green IT adoption.

Exploring the Role of Green IT in Sustainable Competitive Advantage Creation

Resource-Based View (RBV)

Resources-based view (RBV) was firstly proposed by Wernerfelt (1984) to explain the competitive advantage of firm in strategic management field. It suggests studying firm's competitiveness in terms of their resources rather than their products. Barney (1991) extended RBV by proposing that, to have potential of sustained competitive advantages, a firm resource must have four attributes: 1) it must be valuable, in the sense that it exploits opportunities and/or neutralizes threats in a firm's environment; 2) it must be rare among a firm's current and potential competitions; 3) it must be imperfectly imitable; and 4) there cannot be strategically equivalent substitutes for this resource that are valuable but neither rare or imperfectly imitable.

The application of the RBV to IS contexts has the potential to identify key drivers of superior business performance. It provides a way for IS researchers to understand the role of the information system within the firm (Wade & Hulland, 2004). By viewing IT as one kind of resources, RBV becomes to a useful tool to explain the potential of IT as a source of sustainable competitive advantage.

Natural-Resource-Based View (NRBV)

While RBV takes the perspective that valuable, costly-to-copy firm resources and capabilities provide the key sources of sustainable competitive advantage, it systematically ignores the constraints imposed by the natural environment (Hart, 1995). Recognizing how environmentally oriented resources and capabilities can yield sustainable sources of competitive advantage, Hart (1995) proposed the Natural-resource-based view (NRBV) by incorporating the natural environment into RBV. According to Hart (1995), there are three strategic capabilities: pollution prevention, product stewardship and sustainable development. A pollution prevention strategy seeks to reduce emissions using continuous-improvement methods focused on well-defined environmental objectives, whereas a product stewardship strategy guides the selection of raw materials and disciplines product design with the objective of minimizing the environmental impact of product systems. A sustainable-development strategy is fostered by a strong sense of social-environmental purpose. It aims at reducing environmental impacts of a firm's economic activities across the world.

Inherently, the Green IT adoption is consistent with underlying assumption of NRBV. Through adopting Green IT, organizations can acquire the "environmental resource", which, in turn, is the potential source of competitive advantage.

Research Model and Propositions

Generally, the Green IT adoption studies involved causal chains that begin with motivations and end with Green IT adoption. In this paper, we follow Simmonds & Bhattacherjee's (2014) suggestion and view Green IT adoption as the mean to create sustainable competitive advantage. Synthesizing the theories discussed above and the literatures examined, a research model is proposed (shown in Figure 1).

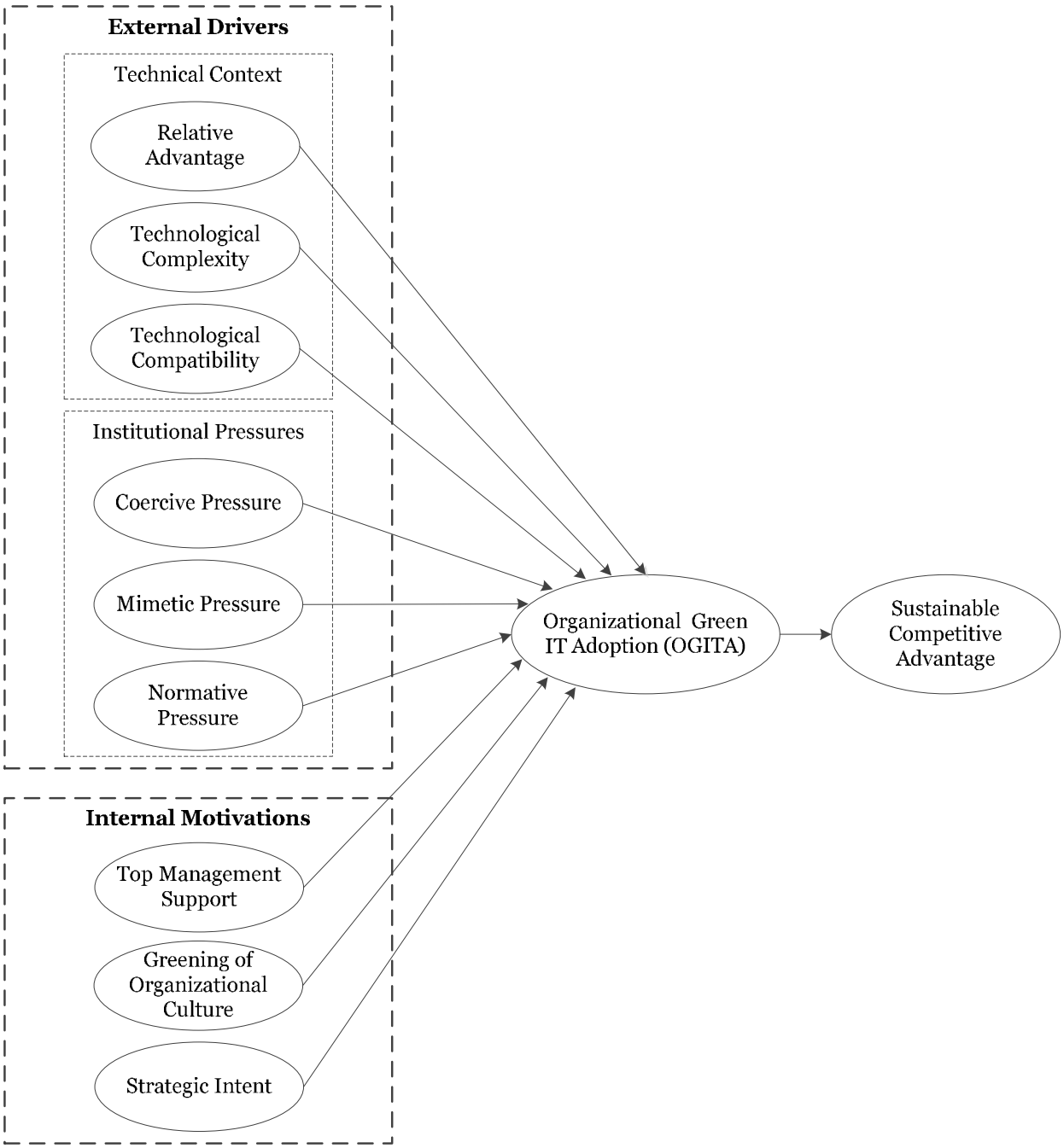

Figure 1. Research Model on Organizational Green IT Adoption

External Drivers

Technological Context

Within the technological context, three innovation attributes were examined: relative advantage, technological complexity and technological compatibility. Several studies addressing IS adoption have included these attributes (Chong et al., 2009; Li, 2008; Thong, 1999; Wang et al., 2010; Zhu et al., 2006).

Relative advantage refers to that the innovation is technically superior (in terms of cost, functionality, "image", etc.) than the technology it supersedes. Studies found relative advantage to be positively related to the adoption of IS innovations (e.g., Grandon & Pearson, 2004; Lee et al., 2004; Ramdani & Kawalek, 2007). For organizations, several relative advantages come along with adoption of Green IT, such as cost reduction, emission reduction, transparency. In a highly competitive marketplace, these benefits play important motivations for adopting Green IT.

Technological complexity refers to that the innovation is relatively difficult to understand and use. Green IT includes technologies desiring human-technology interaction, such as virtualization, teleworking, teleconferencing, etc. Technological complexity could be viewed as the opposite of ease of use or the degree to which a particular system is perceived to be relatively free from physical and mental effort (Bradford & Florin, 2003; Davis, 1989).

Technological compatibility refers to an innovation's compatibility with existing systems (in this case, retained IT), including hardware and software (Bradford & Florin, 2003; Schultz & Slevin, 1975). It has been identified as an important determinant of IS innovation adoption. The adoption of Green IT can bring significant changes to extant technologies used in organization. With such significance, resistance to change is a normal organizational reaction (Premkumar & Roberts, 1999). Therefore, it is important for the change to be compatible with organization's extant technological infrastructure.

Proposition 1a. Relative advantages will positively impact organizational Green IT adoption.
Proposition 1b. Technological complexity will negatively impact organizational Green IT adoption.
Proposition 1c. Technological compatibility will positively impact organizational Green IT adoption.

Institutional Pressures

To avoid the potential confounding of normative pressure with mimetic and coercive pressures, some researchers focus only on mimetic and coercive pressures in Green IT adoption study (Bose & Luo, 2011; Chen et al., 2009). In this study, we covered all three kinds of institutional pressures to capture the holistic picture of institutional pressure.

Coercive pressure stems from political influence and the problem of legitimacy. Several studies have proposed coercive pressure to be an important predictor of Green IT adoption (Cai et al., 2013; Chen et al., 2009; Gholami et al., 2013; Kuo, 2010; Lei & Ngai, 2012). In the context of Green IT adoption, the coercive pressures come from environmental regulations/laws and important stakeholders' requirements. On the one hand, regulations (national, regional and international) and environmental laws require organizations to operate in an environment-friendly way. On the other hand, the pro-environment requirements from important stakeholders (such as consumers, vendors, suppliers, etc.) also drive organization towards a more eco-style.

Mimetic pressure results from standard responses to uncertainty. Undoubtedly, adoption of Green IT involves uncertainty. Meanwhile, organizations also face the difficulties of measuring their environmental performances. Mimetic isomorphism suggests that organizations will follow leading organizations which have realized benefits from being the first movers in the industry (Gholami et al., 2013). In the context of Green IT adoption, those indecisive organizations would be impacted by other organizations' adoption of green IT.

Normative pressure is associated with professionalization and is shaping organizational responses. This is clearly seen when most large corporations are now addressing the triple-bottom-line and giving greater focus on improving their environmental performance (Butler, 2011). Several previous studies have identified normative pressure as a predictor of Green IT adoption (Ijab, Molla & Cooper, 2012; Kuo, 2010; Lei & Ngai, 2012). Now, more and more normative signals are emerging, such as the compliance of ISO 14001 Environmental Management Systems (EMS) and Electronic Product Environmental Assessment Tool (EPEAT), the establishment of some environment-oriented associations, such as the Climate Savers Computing Initiative, Global eSustainability Initiative (GeSI) and The Climate Group (Ijab, Molla & Cooper, 2012). When environmental operation becomes norm, Green IT, as one big step towards an environmental way, would be adopted by corporates facing big normative pressures.

Proposition 2a. Coercive pressure will positively impact organizational Green IT adoption.
Proposition 2b. Mimetic pressure will positively impact organizational Green IT adoption.

Proposition 2c. Normative pressure will positively impact organizational Green IT adoption.

Internal Motivations

Within the organization, many factors have impacts on Green IT adoption. This paper addressed three of them, top management support, greening of organization culture, and strategy intent.

Top Management Support

Top management support refers to support from the organization's top management or a champion (e.g., CEO) who recognizes the usefulness of an idea and leads authority and resources for innovation throughout its development and implementation (Meyer, 2000). It has been labeled in many similar terminologies, such as champion support (Bose & Luo, 2011), management influence (Kuo, 2010), attitude (Gholami et al., 2013), managerial attitudes (Sarkar & Young, 2009), managerial interpretation (Lei & Ngai, 2014). Although there is no consensus on which terminology should be used, there is significant consensus that top management support plays a crucial role in IT adoption.

Top management support has been found to be one effective predictor of IS adoption (Jeyaraj et al., 2006; Zhu et al., 2006; Beath, 1991). At the organizational level, prior studies have found that champion support was a significant discriminating factor between adopters and non-adopters for emerging business and/or technological processes (Grover & Goslar, 1993; Teo & Ranganathan, 2004). In the context of Green IT adoption, top management can stimulate change by communicating and reinforcing values through an articulated vision for the organization (Thong, 1999), as well as create a supportive climate for the adoption of new technologies (Premkumar & Roberts, 1999).

Proposition 3. Top management support will positively impact organizational Green IT adoption.

Greening of Organizational Culture

Recently organizational culture concept has been enlisted frequently within the green business literature (Newton & Harte, 1997). One stream of literature has sought to show how the greening of organizational culture can have economic as well as environmental benefits (Harris & Crane, 2002). On the one hand, adopting the resource-based view, some has argued that the incorporation of environmental concerns into organizational culture may deliver environmental capabilities that competitors would find hard to imitate (Russo & Fouts, 1997). On the other hand, utilizing the strategic-fit perspective, some has argued that failing to deliver the level of environmental performance demanded by green stakeholders could lead to undesirable performance outcomes (Gray, 1992). It was consistently found that extant cultures tend to shape the greening process, with the presence of certain cultural values either supporting of constraining the institutionalization of green values (Post and Altman, 1994; Fineman, 1996). Based on the theory of IT-culture conflict (Leidner & Kayworth, 2006), the higher the vision conflict a group has with respect to a system, the lower the adoption rate of the system by the group. Inherently, Green IT, which also pursues the economic and environmental value, is highly consistent with green organization culture.

Proposition 4. The greening of organizational culture will positively impact organizational Green IT adoption.

Strategic Intent

Another important organizational factor in IT adoption is the alignment between IT and organizational objectives (Cline & Guynes, 2001; Gefen & Ragowsky, 2005). The impact of such alignment on IT adoption has been examined in several previous studies, for example, the fit between ERP systems and business strategies is often considered critical to achieving gains in organizational performance (Zahir Irani, 2001; Kotha & Swamidass, 2000). Strategic intent has been studied in many areas, such as IT outsourcing (DiRomauldo & Gurbaxani, 1998), E-Business adoption (Levy, Powell & Worrall, 2005), ERP adoption (Law & Ngai, 2007). Thus the strategic intent of organization to adopt Green IT deserves further investigation. In this paper, we use strategic intent to examine the relationship between such alignment and Green IT adoption.

Proposition 5. The alignment between strategic intent and Green IT adoption will positively impact organizational Green IT adoption.

From Green IT Adoption to Sustainable Competitive Advantage

Resource-based view started to appear in IS research in the mid-1990s. Since then, the link between IS resources and firm performance has been investigated by numerous researchers. According to RBV, the valuable, costly-to-copy firm resources and capabilities could provide the key sources of sustainable competitive advantage. In IS field, IT has been viewed as both resources and capabilities, both of which have been proposed as potential sources of competitive advantage (Mata et al., 1995; Ross, Beath & Goodhue, 1996). While NRBV extended RBV by incorporate environment as resource, it proposed that strategy and competitive advantage will be rooted in the capabilities that facilitate environmentally sustainable economic activity. The adoption of Green IT could be viewed both as acquisition of IT resource and as improvement of IT capability.

Proposition 6. Organizational Green IT adoption will positively impact the sustainable competitive advantage.

Preliminary Test

IT vendors, such as IBM, Oracle and SAP, post customer stories/cases on their websites to demonstrate the usefulness of latest technologies they provide, aiming to attract more clients. Each short case consists, in general, of background and introduction information, challenges faced by their client, solutions and benefits. Although lacking the details, those short cases can provide summaries of why specific technologies are adopted and what benefits can be gained from such adoption. It seems appropriate for us to examine those short cases to test our model, given the study is at its early stage and it's exploratory in nature.

Data Collection

To preliminarily test of the proposed model, cases of Green IT adoption were collected from two well-known Green IT vendors, Oracle and SAP, at their official websites. We excluded cases from IBM for two reasons. First, unlike Oracle and SAP, IBM doesn't provide a tag (for Oracle, the tag is "Green"; for SAP, it is "Sustainability") exclusively for Green IT cases so it's difficult to select the cases. Second, many cases provided by IBM are too short to be analyzed, which also makes the selection work harder. In total, 39 cases were collected, of which 26 were from Oracle and 13 were from SAP. The organizations covered range from with 12 employees to more than 60,000, from revenue of several millions to several billions, from location of developing countries to developed countries across many different industries. A detailed list of cases is shown in Appendix 3. Among these cases, 31 were text files with lengths of around 700 words and 8 were videos with around 3 minutes in length.

Data Analysis

To accomplish our research objectives we conducted a content analysis. Content analysis has been described as "*a scientific, objective, systematic, quantitative and generalizable description of communications content*" (Kassarjian, 1977, *pp.10*). It has been proved to be a valuable technique for IS studies (see Gottschalk, 2001; Davies, 1993; Davies, 2012; Todd, McKeen & Gallupe, 1995). Although content analysis is used to provide statistical information for multi-method studies, it is useful, even though our goal is neither extracting categorizations nor gaining frequencies.

The initial coding of cases was conducted separately by two authors of this paper. In total, 91 percent agreement was reached. One major disagreement comes from how to categorize "the commitment to sustainability/is committed to sustainability": whether classify it as greening of organizational culture or as strategy intent. Through discussion, the authors decided to categorize it as greening of organizational culture unless the case mentioned the strategy of the organization. Similarly, all consensuses were reached through discussions and deliberations.

Results

The analysis results are presented in Table 1. As Table 1 has shown, most organizations (32 of 39) adopted Green IT to pursue relative advantages (RA). The advantages include cost reduction, GHG emissions tracking and reduction, improving transparency, as well as enhancing customer satisfaction. Although we cannot rule out the possibility that such significance of relative advantage is due to the marketing effort by IT vendors, we can conclude with certainty that relative advantage play an important role in organizational Green IT adoption considering the nature of organizations.

	External Drivers[1]						Internal Motivations		
	Technical Context			Institutional Pressure					
	RA	TC_1	TC_2	CP	MP	NP	TMS	GOC	SI
Trex	X			X		X		X	
Abu Dhabi Education Council	X			X		X			
Centennial Coal	X			X					X
Safe Water Kenya	X			X					
Kansai Nerolac Paints	X			X					
Varian Medical Systems	X			X					
AIRes	X					X			
University of Salzburg	X					X			
Walmart	X					X			
Acorn Paper	X							X	
Indaver N.V.	X							X	
Oregon Health Sciences University	X							X	
Ricoh Europe	X							X	
SAP AG	X							X	
SThree	X								X
MMG Limited	X								X
Abigroup Limited				X					X
Woongjin Holdings				X					X
Colorado State University	X								
IDA Foundation	X								
INPS	X								
Kabel Deutschland	X								
Korea Enterprise Data	X								
Korean Air	X								
Mobily	X								
Modesto Irrigation District	X								
NEDIS	X								
North County Transit District	X								
Terracap	X								
University of Massachusetts	X								
Ind-Aussie Solar	X								
Etex	X								
ArcelorMittal	X								
Fraport	X								
Perstorp Group				X					
The Max Planck Society				X					
Bang & Olufsen				X					
Air Products				X					
DONG Energy							X		

Table 1. Drivers & Motivations of Organizational Green IT Adoption

[1] Abbreviation: Relative Advantage (RA); Technological Complexity (TC_1); Technological Compatibility (TC_2); Coercive Pressure (CP); Mimetic Pressure (MP); Normative Pressure (NP); Top Management Support (TMS); Greening of Organizational Culture (GOC); Strategic Intent (SI)

Notably, technological complexity and technological compatibility are not considered as motivations of Green IT adoption in all cases. Although technological compatibility is mentioned in some cases, it is viewed as the reason why choosing one IT vendor over other IT vendors at best. Three reasons may be accountable for this. First, our data were collected from the success cases provided by IT vendors so the technological complexity and technological compatibility should not be the barriers of adopt Green IT. Second, it might be that technological complexity and technological compatibility should be viewed as necessary conditions, not drivers of Green IT adoption. Third, in this paper we did not focus on any specific green information technologies; instead, we focus only on the motivations at organizational level. It therefore would be possible that technological complexity and technological compatibility becoming motivations in future studies when the focus is on a specific information technology in a detailed technological context.

Different from Chen et al.'s (2009) study, in which the normative pressure was excluded, our results demonstrate that normative pressure is a motivation factor for organizations to adopt Green IT. Of the 39 cases, 5 viewed normative pressure as important motivation. We did not find any cases considering mimetic pressure as motivation to adopt Green IT (as shown in the table above). This is probably because that mimetic pressure is not the concern of IT vendors.

As to the sustainable competitive advantage, with all the benefits gained from adopting Green IT, there is no reason that we cannot expect that organizations will obtain the competitive advantage.

Discussion

Due to the scope limitation and the early stage of this study, the internal motivations and external drivers have been treated separately and the interrelationships among them have not been discussed. Future studies can examine the relationship between them, especially the impacts of external drivers on internal motivations. For example, top management support could be negatively impacted by technological constraint and be positively impacted by coercive and mimetic pressure (Gholami et al., 2013).

Although, in this paper, we focus only on the predictors at organizational level, it does not mean that theories at individual level, such as Technology Acceptance Model (TAM), Theory of Planned Behavior (TPB) and Unified Theory of Acceptance and Use of Technology (UTAUT), cannot be used to explain organizational Green IT adoption. After all, whether to adopt Green IT is a decision to make by individuals. As previous studies identified, top management support is one of the important predictors of Green IT adoption. In the decision making context, top management support could be viewed as decision maker's acceptance of Green IT. Furthermore, "technological complexity" may be viewed as "ease of use" and "relative advantage" of Green IT may be viewed as "usefulness" in the context of TAM. As shown in Appendix 2, previous studies tended to employ theories at organizational level. In future research, researchers can make use of theories at individual level to explain the Green IT adoption.

Conclusion

Green IT is becoming one popular research area in IS field. Among the questions related to Green IT, understanding why organizations adopt Green IT is critical. Several studies have addressed this topic. Based on a review of predictors of Green IT adoption proposed in previous studies and broad theoretical foundations, we proposed a research model for studying OGITA. To examine the model, we conducted a content analysis on the Green IT adoption cases provided by IT vendors. The current study contributes to existing literatures in Green IT research in two ways. First, through summarizing the previous studies of Green IT adoption, this paper indicates areas where significant work has already been accomplished, which could be helpful for researchers interested in Green IT adoption in future. Second, the model helps to provide and contribute the cumulative knowledge of Green IT adoption.

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Appendix 1. Definitions of Green IT and Related Terminologies

Citation	Definition	Terminology
Bose & Luo (2011)	"**Green IT** refers to the using of IT resources in an energy-efficient and cost-effective manner." *(p. 38)*	Green IT
Cai et al. (2013)	"**Green IT** is the practice of designing, manufacturing, using and disposing of computer, servers and associated subsystems efficiently and effectively with minimal or no impact on the environment, with a strong focus on improving energy efficiency and equipment utilization through steps such as designing energy efficient chips, virtualization, reducing data center energy consumption, using renewable energy to power data centers, and reducing electronic waste. **IT for green** is the use of information systems to enhance sustainability across the economy, with a focus on IT as a solution." *(p. 3)*	Green IT IT for Green
Chen et al. (2009)	"**Green IS & IT** refers to IS & IT products (e.g., software that manages an organization's overall emissions) and practices (e.g., disposal of IT equipment in an environmentally friendly way) that aims to achieve pollution prevention, product stewardship, or sustainable development." *(p. 4)*	Green IS & IT
Dedrick (2010)	"**Green IS** refers to the use of information systems to achieve environmental objectives, while **Green IT** emphasizes reducing the environmental impacts of IT production and use." *(p. 173)*	Green IS Green IT
Elliot (2007)	"The design, production, operation and disposal of ICT and ICT-enabled products and services in a manner that is not harmful and may be positively beneficial to the environment during the course of its whole-of-life." *(p. 107)*	Environmentally sustainable ICT
Elliot (2011)	"Activities to minimize the negative impacts and maximize the positive impacts of human behavior on the environment through the design, production, application, operation, and disposal of IT and IT-enabled products and services throughout their life cycle." *(p. 208)*	Environmental sustainability of IT
Erek et al. (2011)	"**Green IT** is the systematic application of practices that enable the minimization of the environmental impact of IT, maximise efficiency and allow for company-wide emission reductions based on technology innovations." *(p. 3)*	Green IT
Faucheux & Nicolaï (2011)	"**Green IT** defined as IT sector's own activity and its impact on environmental efficiency. Green applications of IT or **IT for green** defined as the impact of IT on other sectors' environmental productivity, particularly in terms of energy efficiency and carbon footprint." *(p. 2021)*	Green IT IT for Green
Jenkin et al. (2011);	"**Green IT** is mainly focused on energy efficiency and equipment utilization." *(p. 2)* "**Green IS**, in contrast, refers to the design and implementation of information systems that contribute to sustainable business processes." *(p. 2)*	Green IT/S
Lei & Ngai (2012)	"**Green IS** is defined as the IS or IT used to achieve environmental sustainability." *(p. 3)*	Green IS
Lei & Ngai (2013)	"**Green IT** refers to the practices and process enabled by information systems (IS) that can enhance the economic and environmental performance of an organization." *(p. 96)*	Green IT
Murugesan (2008)	"**Green IT** refers to environmentally sound IT. It's the study and practice of designing, manufacturing, using, and disposing of computers, servers, and associated subsystems… efficiently and effectively with minimal or no impact on the environment." *(p. 25-26)*	Green IT
Molla (2009)	"**Green IT** is an organization's ability to systematically apply environmental sustainability criteria (such as pollution prevention, product stewardship, use of clean technologies) to the design, production, sourcing, use and disposal of the IT technical infrastructure as well as within the human and managerial components of the IT infrastructure." *(p. 3)*	Green IT

Molla & Abareshi (2011)	"Therefore, both IT hardware manufacturers and firms using IT need to apply principles of environmental sustainability, which include pollution prevention, product stewardship and sustainable development in managing IT. **Green IT** refers to such practices." *(p. 3)*	Green IT
Molla, Cooper & Pittayachawan (2011)	"**Green IT** is a systematic application of ecological-sustainability criteria (such as pollution prevention, product stewardship, use of clean technologies) to the creation, sourcing, use, and disposal of the IT technical infrastructure as well as within the IT human and managerial practices." *(p. 73)*	Green IT
Watson et al. (2010)	"In the practitioner literature, much of the current attention is devoted to '**Green IT**.' We argue that this exclusive focus on information technologies is too narrow and should be extended to information systems, which we define as an integrated and cooperating set of people, processes, software, and information technologies to support individual, organizational, or societal goals. To the commonly used Green IT expression, we thus prefer the more encompassing **Green IS** one, as it incorporates a greater variety of possible initiatives to support sustainable business processes. Clearly, Green IS is inclusive of Green IT." *(p.24)*	Green IT Green IS

Appendix 2. Extant Studies of Organizational Green IT Adoption

Citations	Theoretical Foundations	Type[2]	Core Constructs	Components and Definitions[3]
Cai, Chen & Bose (2013)	Porter's concept of competitive advantage; Diffusion of Innovation (DOI) Theory	E	Political	**Public concerns (+, NS)**: "interests of the community stakeholders and the public." *(p. 4)* **Regulatory Forces (+, NS)**: "influences from government and laws/regulations." *(p. 4)*
			Economic	**Cost reduction (+, S)**: "a firm can obtain competitive advantage by selling products or services with the lowest cost in its industry." *(p. 5)* **Differentiation (+, S)**: "a firm can use differentiation strategies to create unique features for its products or its services." *(p. 5)*
			Perceived Complexity	Or **perceived innovation complexity (-, NS)**, "refers to the degree to which as innovation is perceived as relatively difficult to understand and use." *(p. 5)*
Chen et al. (2009)	Institutional Theory; Natural Resource Based View (NRBV)	E	Mimetic Pressures **(+)**	**Frequency-based imitation (+, NS)**: "mimetic pressure arises from the number of other organizations that have adopted a certain practice." *(p. 5)* **Outcome-based imitation (+, S)**: "organizations are motivated to adopt a given practice because of the favorable results achieved by other adopters." *(p. 5)*
			Coercive Pressures **(+)**	**Imposition-Based Coercion (+, PS)**: regulations (e.g., public policy, industrial regulation). **Inducement-Based Coercion (+, PS)**: "important supply chain partners often possess the power to create strong inducements for a focal organization to comply with their demands." *(p. 7)*

[2] For type of study, "E" means empirical study and "C" means conceptual study.

[3] "+/-": (in the column of "Components and Definitions") the component is hypothesized to be positively/negatively related to the construct it belongs; (in the column of "Core Construct") the construct is hypothesized to be positively/negatively related to Green IT adoption; "S": The hypothesis is supported; "NS": The hypothesis is not Supported; "PS": The hypothesis is partially Supported.

			Mimetic × Coercive **(+, PS)**	"Between coercive and mimetic pressures, the presence of one is very likely to add to the institutional legitimacy suggested by the other. … Therefore, the presence of one pressure reinforces the effect of the other." *(p. 7-8)*
Gholami et al. (2013)	Belief-Action-Outcome Framework; Institutional Theory	E	Macro Factors (antecedents of Attitude)	**Coercive pressure (+, S)**: "pressure from regulatory bodies, suppliers, and customers." *(p. 432)* **Mimetic pressure (+, NS)**: "mimetic isomorphism suggests that firms will follow leading firms who have realized benefits from being the first movers in the industry." *(p. 433)*
			Micro (Belief Factors)	**Attitude (+, S)**: "an affective characteristic of senior managers; it measures the extent to which they are aware of and interested in Green IS." *(p. 432)* **Consideration of Future Consequences (CFC) (+, S)**: "Individuals low in CFC, attach a high degree of importance to the immediate consequences of behavior; whereas those high in CFC attach a high degree of importance to the future consequences of behavior." *(p.432)*
Kuo (2010)		E	Motivational Factors	**Competitive pressures**: "initiatives that reduce costs, generate revenues or improve efficiencies." *(p. 2)* • External competitive pressures **(NS)**: "arise from external market forces in the form of mimetic institutional pressures." *(p. 2)* • Bottom line considerations **(S)**: "comprised solely of economic drivers such as tangible cost savings from IT operations." *(p. 2)* **Legitimation pressures**: "initiatives are based on satisfying government, local community and stakeholders and complying with norms and regulations in order to avoid penalties and lessen risks." *(p. 2)* • Normative legitimation pressures **(S)**: "when cultural expectations press organizations to act in a legitimate way." *(p. 2)* • Coercive legitimation pressures **(NS)**: "when organizations are driven to act alike because of governmental laws and regulations." *(p. 2)* **Social responsibility pressures (NS)**: "organizations act from 'a sense of obligation, responsibility or philanthropy rather than out of self-interest'." *(p. 2)*
			Organizational Factors	**Organizational capabilities (NS)**: "such as ongoing operational costs, the complexity of processes, the availability of resources and the capability of the organization to adapt." *(p. 3)* **Management influences (S)**: support from senior management champion. *(p. 3)*
			Technological Constraints **(NS)**	Including technological context, technology facilitation, the complexity of initiatives and the limitations posed by software, hardware and technological infrastructure.
Molla (2009); Molla & Abareshi (2011)	Theories of organizational motivation; Eco-sustainability	E; E	Eco-efficiency **(+, S)**	"Desire to improve eco-sustainability while at the same time pursuing economic objectives." *(p. 8)*
			Eco-effectiveness **(+, S)**	"Eco-sustainability motives associated with beliefs and value system of the organization out of deep concern for the natural environment and to achieve sociopolitical outcomes." *(p. 8)*
			Eco-responsive **(+, NS)**	"Desire to improve eco-sustainability either due to green opportunities or in response to actions and/or demands of competitors, customers, suppliers and market forces." *(p. 8)*
			Eco-legitimacy **(+, PS)**	"Desire to improve eco-sustainability due to political and social pressures facing a company." *(p. 8)*

Sarkar & Young (2009)	Institutional Theory; Theory of Reasoned Action (TRA)	E	Managerial Attitudes	**Effective cost model (+, S)**: "cost reduction… need for such a comprehensive model establishing an explicit link between green IT initiatives and resultant cost savings." *(p. 8)* **Awareness programs (+, S)**: "educate their colleagues in the organisation about the benefits of Green IT, and de-mystify misconceptions surrounding the issue." *(p. 8)*
			External Influences	**Customer requirements (+, S)**: "customers were keen on Green-enabled IT services as this allowed them to report on their carbon footprint in accordance with the government regulations." *(p. 8)* **Government regulations (+, S)**: "Australian environmental regulatory agencies were close to mandating carbon footprint reporting schemes." *(p. 7)*
Schmidt et al. (2010)	Technology Acceptance Model (TAM); DOI	E	Importance (+)	**Corporate management (+, S)**: The IT department is approached frequently by the corporate management with the topic of Green IT. **Environmental engagement (+, S)**: How would you rate the environmental engagement of your enterprise? **Experience (+, S)**: Our enterprise possesses a lot of experience with Green IT.
			Uncertainty (-)	**Experience (-, S)**: Our enterprise possesses a lot of experience with Green IT. **Measurement (-, S)**: The success of Green IT is difficult/easy to measure. **Standards (-, S)**: There are defined and generally accepted standards for Green IT. **Hype (+, S)**: Green IT is a hyped topic and is overrated. **Initiative from IT staff (-, S)**: Did IT staff instigates the Green IT initiative?
Bose & Luo (2011)	TOE Framework; DOI; Process Virtualization Theory (PVT)	C	Technological Context	**Sensory readiness**: "the degree to which virtualization process participants are able to enjoy a full sensory experience of the process." *(p.47)* **Relationship readiness**: "the need for process participants to interact with one another in a professional context." *(p.47)* **Synchronism readiness**: "the degree to which the activities that make up a process need to occur quickly with minimum delay." *(p.47)* **Identification and control readiness**: "the degree to which the process requires unique identification of process participants and the ability to exert control over/influence their behavior." *(p.47)*
			Organizational Context	**Champion Support**: "a management-level person (e.g., CEO) who recognizes the usefulness of an idea to the organization and leads authority and resources for innovation throughout its development and implementation." *(p.48)* **Resource Commitment**: "the commitment of financial resources to Green IT as a proportion of total organizational resources." *(p.48)* **Firm Size**: "the number of employees in the organization." *(p.48)*
			Environmental Context	**Regulatory support**: "supportive government or state policies and/or legislation on the state-wide or national level can help organizations achieve their Green IT aims." *(p. 49)* **Competition intensity**: "the degree that the company is affected by competitors in the market." *(p.49)*
Lei & Ngai (2012)	Institutional Theory; Organizatio	C	Institutional Perspective	"**Mimetic pressure** refers to pressure that drives an organization to imitate the actions and practices of others perceived to be similar to the organization." *(p. 3)*

	nal Information Processing Theory;			"**Coercive pressure** is the force that subjects an organization to comply with law and regulations." *(p .3)* "**Normative pressure** refers to the expectations from the stakeholders in the same social network forcing the organization to take legitimate actions." *(p. 4)*
			Information Processing Theory	**Environmental Uncertainty**: "information shortage on the environment that surrounds an organization, resulting in difficulties in predicting external changes and evaluating organizational actions." *(p. 2)*
			Organizational Resources	"**Operational slack** refers to the operational resources of an organization that are unused or under-utilized." *(p. 3)* "**Human resource slack** refers to human resources that are skilled and specialized." (p. 3) "**Financial slack** refers to excess financial resources for the maintenance of the operations of an organization." *(p. 3)*
Lei & Ngai (2014)	Norm Activation Model	C	Personal Norm	"Refers to an organizational decision maker's self-set standard on the relationship between business and natural environment." *(p. 4)*
			Competitive Advantage	"The expected level of economic and environmental benefits of Green IT adoption." *(p. 5)*
			Managerial Interpretation (moderator)	"Managerial interpretation may serve as norm activator/de-activator. Decision makers' managerial interpretation on environmental preservation can either be interpreted as a threat or an opportunity." *(p. 5)*
Molla (2008)	TOE Framework; Perceived E-readiness Model (PERM)	C	Green IT Context	**Technological context**: "Green IT is likely to flourish in organisations that have large installed IT assets." *(p. 663)* **Organisational context**: "refers to the descriptive properties of a business such as sector, size and corporate citizenship." *(p. 663)* **Environmental context**: "the regulatory environment is a critical factor in creating the conducive and permissive environment for encouraging the use of some Green IT technologies." *(p. 664)*
			Green IT Drivers	"**Economic driver** refers to the need for greater IT efficiency and the pursuit of tangible cost savings from IT operations." *(p. 662)* "**Regulatory driver** refers to the pursuit of legitimacy within the wider social context." *(p. 663)* "**Ethical driver** refers to the pursuit of socially responsible business practices and good corporate citizenship." *(p. 663)*
			Green IT Readiness	**Perceived organisational Green IT readiness**: describes the awareness, commitment and resources of a firm relevant to Green IT. **Perceived value network Green IT readiness**: refers to the readiness of a firm's suppliers, competitors, investors, partners and customers for Green IT. **Perceived Institutional Green IT Readiness**: refers to business's assessment of the readiness of these institutional forces, which refer to both formal entities such as government and professional associations and informal norms and practices.
Nedbal, Wetzlinger, Auinger & Wagner	TOE Framework; DOI; Process Virtualization Theory (PVT)	C	Technological Context	**Technical compatibility**: "an innovation's compatibility with existing systems [...], including hardware and software". *(p. 5)* **Perceived complexity**: perceived difficult to use outsourcing solution. *(p. 5)*
			Organizational Context	**Top management support**: same as *champion support* in Bose & Luo (2011). **Transaction costs**: "organizations weigh the internal transaction costs against the external transaction costs before they decide whether or not to

(2011)			keep certain business processes in-house, or to outsource the processes." *(p. 6)* **Size**: same as *firm size* in Bose & Luo (2011).
		Environmental Context	**Regulatory support**: same as *regulatory support* in Bose & Luo (2011). **Competition intensity**: same as *competition intensity* in Bose & Luo (2011).
Simmonds & Bhattacherje (2014)	RBV; Advanced Model of Corporate Ecological Responsiveness	C	Environmental	"The concern that a firm has for its social obligations and values" *(p. 7),* such as Green IT properties (energy usage; material toxicity and recyclability), social responsibility pressures (from employees), eco-effectiveness, eco-efficiency.
			Economic/ Competitiveness	"Potential for ecological responsiveness to improve long-term profitability" *(p. 7),* such as cost reduction, differentiation, adaptability to changing contexts, eco-efficiency.
			Legitimation	"The desire of a firm to improve the appropriateness of its actions within an established set of regulations, norms, values, or beliefs" *(p. 7)*

Appendix 3. The List of Samples

Organization	Location	Industry	Annual Revenue/Employee
Abigroup Limited	Australia	Construction Services	Over 1500
Centennial Coal	Australia	Natural Resources	$500 Million to $1 Billion/1,800
MMG Limited	Australia	Mining – base metals	Approximately 10,000
University of Salzburg	Austria	Higher education	2,700
Etex	Belgium	Building Products Manufacturing	About 17,500
Indaver N.V.	Belgium	Natural Resources	$500 Million to $1 Billion
Terracap	Brazil	Public Sector	
Bang & Olufsen	Denmark	Electronics	2.8 Billion kr/2,036 (2013)
DONG Energy	Denmark	Natural Resources/Energy	Around 54 Billion DKK/Approximately 7,000 (2010)
Fraport	Germany	Transportation	€2.195 Billion/19,790 (2010)
Kabel Deutschland	Germany	Media and Entertainment	$1 to $5 Billion/3,700
SAP AG	Germany	High tech	€16.3 Billion/64,000
The Max Planck Society	Germany	Higher education and research	More than 17,000
Ind-Aussie Solar	India	Industrial machinery and components	36
Kansai Nerolac Paints	India	Chemicals	$467 Million/2,200
Safe Water Kenya	Kenya	Utilities	12
ArcelorMittal	Luxembourg	Steel	$79.44 Billion (2013)
IDA Foundation	Netherlands	Healthcare	170
NEDIS	Netherlands	Wholesale Distribution	$100 to $500 Million/350
Korea Enterprise Data	Republic of Korea	Professional Services	Under $100 Million/260
Korean Air	Republic of Korea	Travel and Transportation	Over $5 Billion/20,966
Woongjin Holdings	Republic of Korea	Chemicals and consumer products	€3.56 Billion/1,060 (2010)
Mobily	Saudi Arabia	Communications	Over $5 Billion/3,500
Perstorp Group	Sweden	Chemicals	€1.6 Billion/2,200
Abu Dhabi Education Council	United Arab Emirates	Education and Research	14,000
INPS	United Kingdom	Healthcare	350
Ricoh Europe	United Kingdom	High Technology	17,000
SThree	United Kingdom	Professional Services	2,000
Acorn Paper	United States	Industrial Manufacturing	250
Air Products	United States	Chemicals	$10.180 Million/21,300
AIRes	United States	Professional Services	$100 to $500 Million
Colorado State University	United States	Higher education	Academic Staff 1,468; Administrative Staff 4,379

Modesto Irrigation District	United States	Multi-service utility	
North County Transit District	United States	Public Transportation	
Oregon Health Sciences University	United States	Higher education	Postgraduates 3,900
Trex	United States	Industrial Manufacturing	$342 Million/423 (2013)
University of Massachusetts	United States	Higher education	16,000 faculty and staff, and more than 60,000 students
Varian Medical Systems	United States	Medical Technology	$2,942 Million (2013)/6,350
Walmart	United States	Retail	Over $5 Billion/2.2 Million

Appendix 4. The Sample of Coding

Organization	Coding
Abigroup Limited	"Abigroup needed to find a way to measure and monitor emissions more efficiently and effectively—both to support its internally driven sustainability strategy and to comply with government mandates for detailed GHG data collection and reporting."
Abu Dhabi Education Council	"Save employee time and cut IT costs…by… enterprise resource planning system; Enforce environmental practices that meet international standards for a greener environment…; Comply with regulatory requirements to meet …ISO 14001"
Acorn Paper	"… enable us to streamline operations and reduce waste, paper use, and energy use, while improving overall operating efficiency. It's a winning proposition for the company, our customers, and the environment."
Air Products	"… is committed to sustainability and maintaining our license operated around world…being compliance with environmental regulations is right for our business, for our shareholders, for the company, for our neighbors…"
AIRes	"AIReS also focuses on driving the most environmentally-friendly, secure, and efficient business practices possible, achieving International Organization for Standardization (ISO) quality certification for all its locations and services beginning in 1994, and ISO environmental certification in 2007… AIReS wanted to further streamline the ASSIST system to continue to reduce the company's environmental impact, automate internal processes, and reduce costs."
ArcelorMittal	"…uses SAP solutions for sustainability solutions to manage safety and maintenance processes."
Bang & Olufsen	"Bang & Olufsen is required to constantly monitor the change in … we need to ensure compliance… be able to apply upcoming changes … we need to protect revenue and brand by actually being compliant."
Centennial Coal	"Faced with major environmental and bottom-line challenges, Centennial Coal needed to ensure accurate emissions reporting … It also wanted to streamline compliance auditing, minimize its carbon footprint, and increase energy efficiency to offset carbon liability."
Colorado State University	"…to enhance learning and create an IT infrastructure that is eco-friendly."
DONG Energy	"Its leaders have committed to becoming part of the solution with aggressive sustainability goals…"
Etex	"we were looking to replace our systems we using to record sustainability and accident data…"
Fraport	"…needed a system that was flexible and scalable – one that enabled it to make structure updates on its own."
IDA Foundation	"Cut the cost of administering 130 workstations… reducing hardware overhead and minimizing power consumption… Improve staff productivity… Enhance user convenience…"
Ind-Aussie Solar	"Integrate process, improve visibility, and increase control for a more agile business; Improve project monitoring; Increase capacity to meet future supply chain, logistics, and growth needs."
Indaver N.V.	"At Indaver, e-service plays a critical role in customer service and the company's commitment to sustainability."
INPS	"Reduce power and cooling requirements for servers, storage units, and switches and cut data center footprint."
Kabel Deutschland	"Lower the company's CO2 footprint and reduce operational costs…; Deliver high-quality, high-performance business intelligence (BI) reporting…; Ensure business continuity…"
Kansai Nerolac Paints	Improve operational efficiency for environment, health, and safety (EHS). Ensure continued regulatory compliance to meet legal, safety, and sustainability requirements; Protect employee health and safety as key to maintaining a sustainable and profitable business.
Korea Enterprise	"Improve data processing speed to enable fast execution of credit inquiries, evaluation requests,

Data	and financial data, increasing customer satisfaction."
Korean Air	"Korean Air is deeply committed to green operations and constantly looks for ways to improve its product and service designs, so they are based on green business processes."
MMG Limited	"Support growth strategy with global, standardized incident management." "Proactively reduce safety, health, environment, and community (SHEC) risks based on valid data and reports." "Continuously improve the SHEC process and outcomes by analyzing hazards, incidents, near misses, and safety observations."
Mobily	"Reduce paper use and overall invoice volume, and minimize invoice rejections due to errors."
Modesto Irrigation District	"Smart Meters allow utility trucks to drive 200,000 fewer miles annually to reduce carbon emissions."
NEDIS	"…Cut infrastructure support costs, reduce power consumption, and shrink hardware footprint"
North County Transit District	"… was a daunting effort and we really couldn't face it year after year so we needed a different solution."
Oregon Health Sciences University	"Oregon Health Sciences University is dedicated to sustainability as a pillar within our community… we are constantly looking at ways to streamline our organization and be a much more sustainable environmentally friendly company…"
Perstorp Group	"Comply with the regulations for Registration, Evaluation, Authorization, and Restriction of Chemicals (REACH) for substance tracking and reporting…"
Ricoh Europe	"Ricoh set out to streamline and digitize business processes… It also aimed to reduce CO2 emissions and the cost of transporting goods through global supply-chain-management optimization…"
Safe Water Kenya	"…enabling staff to obtain installation survey data, required for carbon credit funding, without the need to carry cumbersome equipment."
SAP AG	"Enable continuous improvement in sustainability of operations success; reduce carbon footprint and operational costs; improve transparency and reporting of corporate sustainability initiatives; drive greater customer satisfaction through a commitment to customer."
SThree	"Part of SThree's strategy for corporate social responsibility has been to significantly reduce its carbon footprint."
Terracap	"Oracle's technology helped Terracap to ensure compliance with environmental guidelines and monitor environmental metrics efficiently… to replace a paper-based viability analysis process—accelerating management decision-making."
The Max Planck Society	"Increasing occupational safety and allowing more time for research."
Trex	"We are a pioneer and green leader in our industry and are driven by a commitment to set the standard to create eco-friendly outdoor-living products. Our culture fosters respect for the environment and manufacturing processes that help preserve the outdoors, and we can directly attribute a portion of our growth over the last five years to our implementation and use of Oracle solutions." "Use applications and technology to continually improve green practices while meeting all environmental, health, and safety guidelines, as well as industry regulations."
University of Massachusetts	"But thanks to cost avoidance, we're moving forward with a lot of our other projects. It's nice to know that hardware costs won't be holding us up when the next hot item comes down the pipeline."
University of Salzburg	"Demonstrate commitment to a carbon neutral environment by reducing energy and paper consumption, carbon emissions, and operational costs." "Implement standards that encourage green computing to reduce the environmental impact of the university's IT operations"
Varian Medical Systems	"…to achieve REACH and RoHS compliance as well as faster engineering changes."
Walmart	"In the retail industry, environmental sustainability has become a critical component of running a responsible and successful business. Oracle Service Cloud is a scalable platform that helps us engage partners across our supply chains and sell sustainable products that minimize our environmental footprint. We are also on track to meet our goal of eliminating 20 million metric tons of greenhouse gas by 2015."
Woongjin Holdings	"To realize its corporate vision for environmental management…companies' compliance with both domestic and global regulatory requirements is more robust…"