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DRIVERS FOR GREEN IT IN ORGANIZATIONS: MULTIPE CASE STUDIES IN CHINA AND SINGAPORE

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Abstract

An important consideration in green IT initiative is to achieve both environmental sustainability (doing good) and business profitability (doing well). This research, which builds on the theoretical lens of corporate ecological responsiveness and multiple case studies with nine companies in China and Singapore, advocates three type of drivers in which organizations could be motivated to push for green IT. The drivers include the alignment of green IT with the primary business objective of achieving profitability by better satisfying the market demand and by reducing operation costs, the institutional pressure exerted by the government, and the corporate social responsibility. Implications for research and practice are discussed.

Keywords: Green IT, case study, environmental sustainability, enterprise operations

1 INTRODUCTION

According to the Climate Group report published in 2008, IT sector accounts for 2% (830 MtCO2e) of the world's greenhouse gas emission and the quantity of emission will increase by almost 40% by 2020 (1.4 GtCO2e). In 2012, data centers consumed approximately 1.3% of electricity use in the world and the Facebook's data centers alone consumed as much energy as 46,000 U.S. households a year[1]. Given the rising carbon emission and energy consumption of IT systems, stakeholders including the government, NGO, industry and business leaders, and consumers start to give green IT movement a serious thought. Green IT is defined as "the design, production, operation, and disposal of information and communication technology (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" (Elliot 2007, pp. 107). An advocate of green IT indicates that innovation and adoption of the green IT practices can contribute to an organization's competitive advantages, and at the same time be able to exercise social responsibility by contributing to a sustainable living and working environment (Williams and Curtis 2008). In other words, the conventional focus of using IT systems to support business operations thereby enhancing performance and yielding economical returns has faced emergent challenges to be replaced by an emphasis on balancing the need to achieve sustainability in environment and business (Tomlinson 2010).

Achieving sustainability in term of environment (doing good) and business (doing well) seems to be paradoxical given that organizations, in general, have become relatively reliant on IT and face increasing demand on the computation power of IT systems (so as to yield greater economic returns) could generate greater emission of carbon, higher consumption of energy and greater electronic waste (Berkhout and Hertin 2001). Furthermore, initial deployment of green IT practices may incur significant investment on new technologies, high cost on changing the products or service production or delivery patterns, or short-term impairment on corporate KPIs (key performance indicators) that may not directly measure the economic benefits of having green IT initiatives. The dilemma between exercising green IT and sustaining consistent corporate performance thus creates a rich yet intertwined set of motivations for organizations to engage in the green IT campaigns as forms of environmental sustainability, ecological responsiveness and corporate performance enhancement (Arora and Cason 1998; Bansal and Roth 2000; Delmas and Montes-Sancho 2010; Reid and Toffel 2009; Rugman and Verbeke 1998).

Several studies have been conducted to gain preliminary understanding of green IT initiatives in organizations. They include those that propose general framework of development stages of corporate capabilities in ICT environmental sustainability (Elliot and Binney 2008) and the green IT readiness model identifying its key measurement dimensions and instruments (Molla et al. 2009). A few studies closely relevant to our current study focused on identifying the antecedents for organizational green IT adoption (Molla 2009), such as the institutional pressures to green IT adoption by organizations (Chen et al. 2008).

This research builds on this field of exploration to examine the paradox of green IT initiatives in organizations, which emphasizes the dilemma to balance sustainability in environment and business, by analyzing multiple case studies. We conducted a series of qualitative studies that induce organizational (IT-based) ecological responsiveness to legislation policies and incentives by industry players in China and Singapore. Our thesis is that an aligned ecological initiative by government and IT-based ecological responsiveness (doing good) by organization could yield business sustainability (doing well), thus address the green IT paradox.

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[1] A Look Inside Facebook's Carbon Footprint, by Benedict Buckley on August 14, 2012
http://insights.wri.org/news/2012/08/look-inside-facebooks-carbon-footprint

2   THEORETICAL BACKGROUND

According to Gartner, "green IT" is a manifestation of keen interest of an organization to sustain both enterprise operations and environment (Gartner 2007). Such ecologically sustainability refers to organizations being able to survive and profit over the long run in both economic and natural environments (Schmidheiny, 1992), where the organizational development can "meet the needs of the present without compromising the ability of future generations to meet their own needs" (WCED, 1987: 43). For example, in the view of Watson et al. (2007), a green IT initiative focuses on addressing seven issues, namely 1) designing energy efficient chips and disk drives, 2) replacing personal computers with energy efficient thin clients, 3) use of virtualization software to run multiple operating systems on one server, 4) reducing the energy consumption of data centers, 5) using renewable energy sources to power data centers, 6) reducing electronic waste from obsolete computing equipment, and 7) promoting telecommuting and remote computer administration to reduce transportation emissions. Though may not be exclusive, these issues represent the current practices of green IT in leading IT companies. In a word, green IT requires an organization to seek an orchestrated effort that spans across people, IT process, and IT products (Watson et al. 2007).

Being green was considered to be a moral issue to a large extent, but it starts to have its practical roots in the digital age. Specifically, green IT has evolved from a marketing hype to a genuine business imperative for many firms. For example, as worldwide IT spending reached US$1.8 trillion in 2012, improving the efficiency of IT increasingly becomes the top priority for enterprises[2]. Among various sectors, IT industry has been leading in the sustainability commitments. Large companies such as IBM, Microsoft, Intel, and Google have been investing heavily in green IT products and services internally and promoting them externally in recent years (Murray 2008a). Even the current economic downturn would not reduce the need for green IT because energy efficient programs such as power management will continue to attract interests as they deliver instant cost saving and associated carbon emission reduction.

Despite the presence of high profile proponents of green IT, significant reluctance to reduce energy consumption or carbon emissions among companies persists. A touted reason is that companies are still in a stage of hesitance about where and when to start. In terms of regional impact, green IT has less traction in Asia Pacific compared to that in U.S. or Europe partially due to lack of exposure to green IT products or practices through IT vendors. The barriers to green IT growth also include such factors as high cost of deploying green IT measures, intangible financial returns, disruption of existing systems, complexity of implementing green IT programs, cost and risks in switching to new systems, lack of expertise in the organization for undertaking green IT projects, and unforeseeable market demand, i.e., whether clients or consumers will like green IT processes or products (GreenBizSite 2008; GreenComputing 2008a, 2008b).

To address these concerns by investigating organizations' motives of involving in green IT initiatives, this study relies on the theoretical basis of motivations for corporate ecological responsiveness, which are defined as "a set of corporate initiatives aimed at mitigating a firm's impact on the natural environment" (Bansal and Roth 2000, pp. 717). These initiatives can include changes to the firm's products, processes, and policies, such as reducing energy consumption and waste generation, using ecologically sustainable resources, and implementing an environmental management system" (Bansal and Roth 2000, p. 717). The motivations include competitiveness, legitimation and ecological responsibility. *Competitiveness* is associated with the potential for ecological responsiveness to improve long-term profitability (Bansal and Roth 2000). A motive of *legitimation* refers to the desire of a firm to improve the appropriateness of its actions within an established set of regulations, norms, values, or beliefs (Bansal and Roth 2000). For example, drawing on the model of social activism and organizational change (den Hond and de Bakker 2007), it is proposed that shareholder actions and regulatory threats are likely to prime firms to adopt practices consistent with the aims of a broader social movement (Reid and Toffel 2009). *Ecological responsibility* stems from the concern that a firm

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has for its social obligations and values, which reflect the thoughts and motivations of organizations to engage in green IT expenditure (Bansal and Roth 2000). Similarly, Watson et al. (2010) proposed three types of Eco-goals of eco-efficiency (about doing things right under economic pressure), eco-equity (about shifting norms) and eco-effectiveness (about doing the right things), which correspond to the competitiveness, legitimation, and environmental responsibility dimensions of the corporate ecological responsiveness. Chen et al. (2009) suggested that mimetic and coercive pressures significantly drive green IT adoption in organizations and outcome-based imitation and imposition-based coercion represent major institutional processes in this process.

Based on the theoretical guidance, previous studies and our initial exploration with informants in the industry, we decided to investigate the drivers for corporate green IT initiatives in both green IT processes (e.g. adopting energy saving servers, etc.) and green IT products (e.g. manufacturing energy saving computers or energy saving base stations) in Asia Pacific where green IT has less traction. And we will group the potential drivers in the following three groups and use them as the guideline (but not limitation) for our case studies. We generally propose the presence of the relevant drivers and their strengths will be positively associated with organizations' green IT initiatives. The three groups are:

- Economic drivers: Cost Reduction (by adopting green IT processes or products) and Market Demand (for green IT processes or products)
- Authority drivers: Government Policy
- Moral drivers: Corporate Social Responsibility

We have selected two countries in this region, namely China and Singapore, to initiate our exploration. Singapore is a more developed country with a long history of IT adoption and more matured IT systems, while China is a developing country with less legacy IT systems and may benefit from the leapfrogging opportunities to adopt the newest IT systems. We thus believe the results from these two countries may yield some interesting contrasts.

3   RESEARCH METHODOLOGY

We adopted a multiple-case study approach in our investigation. This research methodology is considered to be appropriate for this study firstly because green IT is a new phenomenon that needs to be studied in real-life context, that we, as researchers, have no way to control or manipulate the value of the constructs (Yin, 1994). Second, our research question is a "why" question that makes case study a suitable method for investigation (Yin, 1994).

For case selection, we started with companies in the telecommunication industry because we believed the operation of telecommunication services would incur high-energy costs and bear critical environmental responsibilities. Thus, the adoption of Green IT policy should have a significant impact on this industry. Therefore, through our contacts, we approached 5 telecommunication companies located in both China and Singapore to explore opportunities for study. We contacted another 4 companies in IT-related industries which were further referred to us during our interviews with the telecommunication companies: 2 companies in the industry of computer hardware and software, IT services and consulting, 1 company in the industry of telecommunications & networking equipment, and 1 company in the industry of consumer electronics.

The industries in which these companies operate have partially determined the sizes and resources they have. Even the smallest company among these 9 has more than 3,000 employees. We have specifically excluded 2 other companies referred to us since their sizes are much smaller and are therefore not comparable with the 9 companies we have chosen to include in our study. Table 1 gives a more detailed description of the 9 companies selected for the case study.

Case ID.	Industry	Location	Green IT adopted	No. and position of interviewees
Telco1	Telecom	China (Nanjing)	Green data center (new servers, routers, switches, and new methods of cooling)	3 interviewees: Head of data center, Expert responsible for data center, Expert responsible for energy consumption
Telco2	Telecom	China (Shanghai)	Green data center (cloud computing (EMC Storage), blade servers, new design of transformers)	1 interviewee: Operating Manager of the data center
Telco3	Telecom	China (Hangzhou)	Green data center (upgrading servers and cooling facilities, small-scale adoption of cloud computing)	1 interviewee: Head of data center
Telco4	Telecom	Singapore	Green data center	1 interviewee: Senior sales manager for data center
Telco5	Telecom	Singapore	Green data center, Solar-powered mobile base stations, environmental-friendly office building with low power consumption	1 interviewee: Chief information officer (CIO)
Com1	Computer hardware, software, IT services and consulting	China (Beijing) (American MNC)	High efficiency servers, water cooling technology, software to control energy consumption, consulting services in green IT technologies and deployment	1 interviewee: Senior sales manager of Green technologies (responsible for clients in telecommunication industry)
Com2	Telecommunications & Networking equipment	China (Nanjing)	Energy saving base stations, computer centers	1 interviewee: Senior sales manager of Green technology
Com3	Computer Software	Singapore (American MNC)	Hybrid cloud computing	2 interviewees: Senior director of server infrastructure & private cloud, Technology architect of cloud computing
Electro1	Consumer Electronics	China (Qingdao)	Energy-saving electronic appliances, e.g., green computers, refrigerators, air-conditioners, TVs…	1 interviewee: Senior director of process and system innovation

Table 1: Case Description

3.1 INTERVIEW PROCESS

Data was collected from late 2011 to mid 2012 through 11 interviews conducted in the 9 companies. Our interviewees consisting 12 managers at different levels who were responsible for green IT related operation or policies in their companies. All the interviews were conducted in a face-to-face manner except for the one with Electro1, which was carried out through a face-to-face talk first followed by a formal telephone interview. The average duration for each of the interviews was 1.5 hours, resulting in 16.5 hours of interview in total. The semi-structured interviews followed a guideline originally developed in English, which was used in the interviews with Telco 4, Telco 5 and Com3, by the 2nd and 3rd authors of this paper. The English guideline was translated into Chinese following a double-translation process, and was used in the interviews with the remaining 6 companies by the 1st author of this paper.

Table 2 outlined the details of the English version of the guideline for the semi-structured interviews. For each of the interviews, only questions relevant to the company's business were raised from this general guideline. For example, if a company is not manufacturing any IT products, questions related to green IT products would not be posed to the interviewees. At the end of discussion for each question, the interviewees were encouraged to give extra comments openly, which would allow us to capture information that outside the planned research framework.

Dimension	Questions
Green IT initiatives	• Which parts of your company's IT operation consume most of the energy? • Has your company been aware of the approaches to reduce energy consumption by servers and by cooling data centers? • What are the green IT initiatives that have been adopted by your company? Are they effective? How much is their impact on the company's performance? • Does your company produce any green IT products? If yes, what are they?
Cost reduction	• Is it due to cost reduction pressure for IT operation that your company has taken all the green IT initiatives? • How about the return on investment (ROI) for these green IT initiatives? Can the investment on greener IT technologies (e.g. servers, cooling systems, cloud computing, etc.) be covered by the costs saved?
Market forces	• Is it because your clients demand greener IT technologies (e.g. server, data center, etc.) that your company has taken all the green IT initiatives? • Is it because end consumers demand greener IT products (e.g. energy saving computers, etc.) that your company has taken all the green IT initiatives?
Government Pressure	• Is your company under the pressure from government policies to take green IT initiatives, to reduce energy consumption or to reduce carbon emission? If yes, what are such policies? Are they coercive (e.g., government set an upper limit for power consumption) or not? • Will your company receive subsidies from government if you adopt some green IT initiatives? • Will government reward your company if you manufacture green IT products?
Corporate Social Responsibilities	• Is it because of the corporate social responsibilities that your company has taken all these green IT initiatives to make the IT operation a greener process (or to manufacture green IT products, such as energy saving computers…)? • How do you think the green IT initiatives your company has taken will affect your corporate image? • In the long run, if it will incur more costs to maintain the green IT initiatives your company has started in order to keep your corporate social responsibilities, will your company continue doing it?

Table 2: Guideline for Semi-structured Interview

3.2 CASE ANALYSIS

The tape-recorded interviews were transcribed into 108 text pages and the authors examined the transcripts carefully as the basis for the case data analysis. The second author scanned the transcripts and coded all responses to questions directly or indirectly addressing our constructs (green IT initiatives and the drivers for green IT). For example, the following statement in the transcript *"Government put a lot of emphasis on economic KPIs and set up an upper limit for power consumptions for each region. Whenever we exceed this limit, the power supply will simply be cut off. We think this is a quite rude solution that affected the productivity of the enterprises"* was classified as one coding addressing the construct of "government pressure". This scanning activity identified 188 such codings in total that addressed different constructs in our research. The resulting 188 codings were again scanned by the second author in order to rate their presence and salience in the each of the cases on a low-medium-high scale (Yin, 1994; Spohrer, Heinzl and Li, 2011). For example, the presence of the previous statement was in Telco3 and its salience was coded as high. The first and third authors who examined the coded data set independently controlled the validity of the codings and salience ratings. Where the opinions did not match, the authors discussed and resolved the discrepancies. Following this process, we ensured that all evidence was being attended to and the most significant aspects of all the cases were addressed (Yin, 1994). Table 3 shows the examples of coding for different dimensions with the rating of salience for each of them.

Dimension	Example of coding (case) / Rating
Green IT initiatives	"In order to go green, we have promoted the "6R"concept in our enterprise: reasonable design, reduction in material consumption, recyclable, reusable, recoverable, renewable." (Com2)/**H** "We have set up the first solar-powered mobile base station in Singapore to leverage the abundant solar energy resources since we have sunny days most of the time throughout a year. Of course, it is running parallel to our utility power grid so that service will not be interrupted on rainy days or at night. With this new mobile base station, the estimated cut on the power consumption is more than half per year, which means the carbon emission reduction will be more than 2.5 tons per year." (Telco 5) /**H** "We have looked into the three major parts of energy consumption in the data center: the servers, the power source and the cooling facilities. Accordingly, we have come up with strategies to tackle each of these parts to make our data center greener." (Telco 1)/**H**
Cost reduction	"Cost reduction is the most important KPI when we invest in green technologies. Most of the time, we need to carefully examine the ROI to see whether the reduced cost in energy consumption can cover the investment in the green technologies. If the investment can be recovered in 1-2 years, we will go ahead with the deployment of the technology. Otherwise, we need to do further investigation." (Telco1)/**M** "In term of operating cost, power consumption by servers and air conditioning etc. will be an important concern to the telecommunication operator. Therefore, we are actively seeking methods to reduce this cost." (Telco4)/**H**
Market forces	"Our clients sometimes appear to be quite conservative in adopting green technologies. For example, when we tried to promote high voltage direct current (DC) to a big client, they thought it was too risky since it's new and they thought we were experimenting this technology and wanted to use them as a subject." (Telco1)/**L** "Whether our clients will demand green IT products or services, it all depends on how IT influences the ROI of their business. For example, telecommunication operators, whose business operation mainly depends on IT, will pay more attention

	to the reduction of energy consumption by IT. " (Com1)/ **M**
	"The global trend for greener IT is very clear now. In our industry, whether we can follow this trend closely and provide our clients with greener technology will create a barrier for competition." (Com2)/ **H**
	"Since our product strategy is to be custom-centric and market-driven, and we have recognized the trend of green IT products, especially among young educated customers with higher environmental awareness, we are engaged with the development of green IT products, such as the new series of "eye-comforting" computers." (Electro1)/**H**
Government Pressure	"As a state-owned enterprise, we have to obey the rules set by government on reduction of energy consumption." (Telco 1)/**H**
	"Government put a lot of emphasis on economic KPIs and set up an upper limit for power consumptions for each region. Whenever we exceed this limit, the power supply will simply be cut off. We think this is a quite rude solution that affected the productivity of the enterprises. " (Telco3)/**H**
	"Last year, since we used up the quota for energy consumption set by the government, we even could not use air conditioners in offices in winter. Our company simply distributed a thick winter clothes for each staff to wear when working in the office." (Telco3)/ **H**
	"Currently, there is little incentive from the government to drive the data centers to go green." (Telco4)/**L**
	"As for the government, currently, there is no obvious enforcement from them for corporates to go green in Singapore. Of course, they encourage such initiatives, but there are no concrete policies or laws yet. " (Telco5)/**L**
	"Currently there are no coercive government policies that drive us to make green IT products, there are no allowance either for us if we do it. However, we did receive rewards from government for our green IT products, which helped enhance our corporate image" (Electro1)/**M**
Corporate Social Responsibilities	"Of course, corporate social responsibilities are an important reason that we go green. However, be responsible for our society is not in conflict with pursuing profit (by satisfying market demand), which means we do not need to give up profits in order to take our social responsibilities." (Electro1)/**M**
	"We took all these green IT initiatives as a project for the corporate image since going green and taking care of the sustainability of the earth is the social responsibility of our corporate. As I told you before, the color of our logo and website is green. We are determined to be a "green" corporate." (Telco5)/**H**

Table 3: Examples of Coding for each Dimension

After the codings for all the cases were obtained, we aggregated the ratings for salience ratings for each of the constructs on a five-point ordinal scale for each of the case. To support this bottom-up rating of constructs, we performed a simple credibility check: we compared the proportion of interview text the respondents had spent talking about influences, which were related to the single constructs with our salience ratings (Yin, 1994). For nearly all constructs, big proportions matched high ratings. Where they did not match, we double-checked our ratings. Based on the salience ratings, the patterns found in each case were matched against the research framework comparing predictions and evidence. Where they did not match, the codings were searched for hints why there was a mismatch of our model and practice. Table 4 summarized the aggregated salience ratings for the five constructs across the nine cases.

	Telco1	Telco2	Telco3	Telco4	Telco5	Com1	Com2	Com3	Electro1
Green IT initiatives	H	H	H	H	H	H	H	H	H
Cost reduction	M	M	M	M	H	L	M	M	L
Market forces	L	L	L	L	L	M	H	H	H
Government Pressure	H	H	H	L	L	M	H	H	M
Corporate Social Responsibilities	M	M	M	H	M	M	H	H	M

H – high; M – medium; L - low

Table 4. Aggregated salience ratings across 9 cases

4   DISCUSSIONS

The indispensable role of IT in corporate business and management encourages companies and managers to seriously consider green IT as part of their operations, development or strategies. Green IT has been on the agenda of many IT-intensive businesses because of the impacts that IT can potentially make to production, ensure continuous non-disruptive service provision and the facilitation of smooth daily operations within organizations. Despite these business drivers, there are other factors motivating companies to go green. This study thus presents a holistic examination of some leading green IT practitioners in China and Singapore to illustrate the important reasons for going green.

4.1 RESULTS

Through the multi-case analysis method, we derive the key findings of why companies choose to adopt green IT. From the interviews with the nine companies, we found all of them are active in green IT initiatives, either in green IT processes or green IT products, or both, though each of them has emphasized on different set of motivations which fall into the four general categories of cost reduction market drivers, government pressure, and corporate social responsibilities .

The three telecommunication companies in China are highly motivated by government pressures because of the mandated instructions on reducing power consumption or meeting some predefined KPIs of power usage limit. For state-owned enterprises in China, conforming to the government's regulations (including those on green IT) is an important aspect of legitimizing the survival of the telecommunication companies. Such driver corresponds to the legitimation dimension of the corporate ecological responsiveness. It can also help the companies reduce cost and increase the competitiveness of the products or services. In contrast, telecommunication companies in Singapore perform green IT either in order to reduce cost or exercise corporate social responsibilities, because they are mostly profit driven and cost sensitive, which reflect the corporate ecological responsiveness of competitiveness and ecological responsibility.

For computer companies whose main businesses are directly associated with using or building IT, primary business objectives can be achieved by engaging in green IT (e.g., as a way to promote their products). It is reflected in the joint motivations of corporate social responsibilities, market forces and government pressures for two computer companies to be green in their products, services and operations. The consumer electronics companies produce green electronics products because consumers' increasing demands on energy conservative options to reduce the environmental impacts, which can increase the company's competitiveness, too. Meanwhile, each of the companies is also motivated by other dimensions of green IT drivers though they may not be equally important as the main driver(s). It shows the inherent consistency and complementary of the drivers for these companies to exercise green IT though the drivers may be in conflict for other industries where companies may need to invest heavily to meet the strict environmental standards just in order to be functioning, which significantly increases their costs and reduces profits at least in the short run.

4.2 LIMITATIONS

Before we discuss the implications of this research, it is imperative to be aware of several limitations that we hope to address in the future research.

First, for most of the cases (besides Telco1 and Com3), we only had one key contact person from the company, which made the triangulation of different perspectives impossible. Although each of our interviewees was highly cognizant of the green IT initiatives in his/her organization, we believe getting access to more representatives from each company in the future could yield a more informative study. We would also like to acknowledge that the interviewees were not all on the same organizational hierarchical level or were not all from the same functional department. However, most of our interviewees were senior managers in their organizations. In future study, it would be interesting to seek for interviewees with similar position so as to achieve a higher level of comparability among different firms. Moreover, further quantitative data (e.g. survey data) can be collected from the organizations in future study to enable data triangulation in the case studies.

Second, we did not deepen the discussion of the reasons for the different results in China and Singapore. We believe that in order to do so, we have to gather additional data in these two countries respectively. For example, interviews with government officials responsible for green IT initiatives in these two countries are being conducted currently in order to shed light on why the institutional pressures from government seem to play different roles in influencing companies to go green in IT in China and Singapore. Also, if we can obtain access to companies that have not adopted green IT, it might be more interesting since this approach could reveal some important hindering factors for organizational adoption of green IT.

Third, we did not discriminate between the drivers for green IT processes and those for green IT products when we were exploring the nine cases. While the motivations for companies to go green in their IT operation and to manufacturing green IT products could be quite different, our current data set did not provide the richness for us to conduct such a discriminate analysis since we had too few cases of green IT products. In future study, we should strive to balance the cases by locating more companies providing green IT products.

Notwithstanding these limitations and possible improvements in future studies, our current research does have important implications both for research and for practice.

4.3 IMPLICATIONS

Our analysis of the interviews with key representatives from nine companies regarding green IT could inform research and practice in several ways.

In term of research, this study complements the extant empirical findings of the drivers for green IT by exemplifying the paradoxical dilemma of organizations in engaging in green IT initiative. For example, from our analysis of the computer companies, having green IT products could mean a niche way of marketing their products. In this sense, going green IT (doing good) is in-line with the primary objective of doing business (doing well), thus the paradoxical concern over doing good and doing well is adequately alleviated. In other words, organizations are more compelled (self-motivated) to going green for IT when they themselves see the value of doing this. Such an observation complements the extant debate over the paradoxical dilemma of doing well and doing good (Arora and Cason 1996; Bansal and Roth 2000; Delmas and Montes-Sancho 2010; Reid and Toffel 2009; Rugman and Verbeke 1998). The results thus correspond to the theoretical basis of motivations for corporate ecological responsiveness and further enrich its insights on the relative power and influences of each type of specific motives on organizations' green IT practices.

In term of practice, this study highlights two ways in which organizations could be motivated to push for green IT, namely the corporate social responsibility together with institutional pressure exerted by the government, and the alignment of green IT with the primary business objective of achieving profitability by better satisfying the market demand and by reducing operation costs. It is in our view

that the latter (i.e., the alignment) is more sustainable though the former (government intervention) might spearhead the initiative through offering incentives (e.g., in the form of tax-rebate) or punishment (e.g., in the form of high energy consumption cost).

5   CONCLUSION

Being one of the first multi-case studies examining the drivers for green IT initiatives of companies in the Asia Pacific region, our research has presented the initial findings of an on-going project by demonstrating the important roles played by cost reduction, market drivers, government pressure and corporate social responsibilities in this process. We believe the current study is an important first step to achieving a wholesome understanding of the drivers of green IT initiatives of companies in our region.

6   REFERENCES

Arora, S. and Cason, T.N. (1998), "Do Community Characteristics Determine Environmental Outcomes? Evidence from the Toxics Release Inventory," Journal of Applied Economics, 1(2), 413-453.

Bansal, P. and K. Roth (2000), "Why Companies Go Green: A Model of Ecological Responsiveness," The Academy of Management Journal, 43(4), 717-736.

Berkhout, F., and Hertin, J, (2001), "Impacts of Information and Communication Technologies on Environmental Sustainability: Speculations and Evidence," SPRU-Science and Technology Policy Research, University of Sussex, Falmer, Brighton BN1 9RF, United Kindom, 25 May 2001, Report to the OECD.

Chen, A. J., Watson, R. T, Boudreau, M. C., and Karahanna, E., (2009), "Organizational Adoption of Green IS & IT: An Institutional Perspective, " Proceedings of the International Conference on Information Systems 2009.

Delmas, M. A., and Montes-Sancho, M. J. (2010), "Voluntary Agreements To Improve Environmental Quality: Symbolic And Substantive Cooperation," Strategic Management Journal, 31(6), 575-601.

Elliot S. (2007), "Environmentally Sustainable ICT: A Critical Topic for IS Research," Proceedings of the Pacific Asia Conference on Information Systems 2007.

Elliot, S., and Binney, D. (2008), "Environmentally Sustainable ICT: Developing Corporate Capabilities and an Industry-Relevant IS Research Agenda," Proceedings of the Pacific Asia Conference on Information Systems 2008.

Gartner Research (2007), "Green IT: The New Industry Shock Wave," Id Number G00153703.

GreenBiz (2008), "Cynicism, Scarce Data among the Barriers to Eco-Friendly, Responsible Investing: Report," (source: http://www.greenbiz.com/news/2008/08/20/cynicism-scarce-data-among-barriers-eco-friendly-res ponsible-investing-report ; last accessed: 03-February-2013).

GreenComputing (2008a), "Business Slow to Adopt Green IT despite High Demand" (source: http://www.greenbiz.com/news/2008/08/18/businesses-slow-adopt-green-it-despite-high-demand; last accessed: 03-February-2013).

GreenComputing (2008b), "Despite Widespread Interest, Cost Prohibits Many from Greening IT," (source: http://www.greenbiz.com/news/2008/07/24/despite-widespread-interest-cost-prohibits-many-green ing-it; last accessed: 03-February-2013).

Molla A. (2009), "Organizational Motivations for Green IT : Exploring Green IT Matrix and

Motivation Models," Proceedings of the Pacific Asia Conference on Information Systems 2009.

Molla, A., Cooper, V. A., and Pittayachawan, S. (2009), "IT and Eco-sustainability: Developing and Validating a Green IT Readiness Model," Proceedings of the International Conference on Information Systems 2009.

Murray, J. (2008), "Green Cred is Essential to Brand Strength: Report," GreenBizSite (source: http://www.greenbiz.com/news/2008/09/21/green-cred-essential-brand-strength-report; last accessed: 03-February-2013).

Reid, E. M., and Toffel, M. W. (2009), "Responding to Public and Private Politics: Corporate Disclosure of Climate Change Strategies," Strategic Management Journal, 30(11), 1157-1178.

Rugman, A. M., and Verbeke, A. (1998), "Corporate Strategies And Environmental Regulations: An Organizing Framework," Strategic Management Journal, 19(4), 363-375.

Spohrer, A. Heinzl, and Li, Y., "Antecedents of ISD Offshoring Outcomes: Exploring Differences between India and China", Proceedings of 44th Hawaii International Conference on System Sciences (HICSS), Hawaii, USA, January, 2011

The Climate Group (2008), "SMART 2020: Enabling the Low Carbon Economy in the Information Age,"(source:http://www.smart2020.org/_assets/files/Smart2020UnitedStatesReportAddendum.pdf; last accessed: 03-February-2013).

Tomlinson, B. (2010), Greening Through IT, The MIT Press, Cambridge, Massachusetts.

Yin, R.T. (1994), Case Study Research: Design and Methods, 2nd edition. Sage Publications, Thousand Oaks

Watson, R. T., Boudreau, M. C., and Chen, A. J. (2010). "Information Systems And Environmentally Sustainable Development: Energy Informatics and New Directions For The IS Community," MIS Quarterly, 34(1), 23-38.

Watson, R., Boudreau, M.-C., Chen, A., and Huber, M. (2007), Green IS: Building Sustainable Business Practices, In R. Watson (Ed.), Information Systems, Atlanta, Georgia: The Global Text Project.

Williams, J., and Curtis L, (2008), "Green: The New Computing Coat of Arms?" IEEE Computer Society (Jan/Feb), 12-16.