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ENVIRONMENTAL RESPONSIBILITY AND GREEN IT: AN INSTITUTIONAL PERSPECTIVE

Abstract

A recent Gartner Research report found that environmental concerns are increasingly exercising the minds of business and IT executives. This is reflected in the growing interest in the adoption of environmentally responsible approaches to the deployment, operation and use of IT. However, for the majority of firms, issues of cost reduction and energy efficiency appear to predominate. This paper argues that whether it is an interest in Green IT or in cost reduction, the concerns of business and IT managers are modulated by regulative, normative, and cultural-cognitive influences in the institutional environment. The study therefore applies institutional theory to develop a series of theoretical propositions which specify the effect that such influences have in shaping environmental responsibility in organisations. Important as such a theoretical contribution may be, there are, however, the pressing practical imperatives of formulating Green IT strategies, achieving energy efficiencies, and reducing carbon footprints—thus, the study also contributes to a practical understanding of the complex institutional influences at play in shaping such imperatives.

Keywords: Institutional Theory, Environment, Green IT

1 INTRODUCTION

The design, manufacture, deployment, operation, use, and disposal of information technology (IT) has significant implications for the environment (Aberdeen Group 2006). For example, IT (computers, networking, data and telecommunications technologies) consume significant amounts of energy when in use and contribute in no small way to the growth in greenhouse gas (GHG) emissions. Energy issues aside, IT artefacts also contain regulated and hazardous materials. Accordingly, the influence of environmentally-oriented regulatory and social pressures are especially evident in the IT sector (Murugesan 2007), particularly in manufacturing, but also in adoption, operation and use (Murugesan, 2008). IT is increasingly viewed as a significant and growing part of the environmental problem—something that few people take seriously, particularly IT executives (CNET Networks 2007).

This paper has as its focus Green IT. In the past, IT was designed, manufactured, and applied in business enterprises without regard to its environmental impact. In recent years, the term Green IT was coined by practitioners to differentiate between IT artefacts that had been designed with environmental sustainability in mind—that is, to contain the minimum amount of hazardous materials, to be energy efficient during the use period of their lifecycle, and to be disposed or recycled with the minimum effect on the environment and human health (Murugesan 2007). The IT industry has, of late, extended the scope of Green IT to include the manner in which IT is deployed to help reduce GHG emissions, to introduce energy efficiencies, or to reduce energy consumption (Adjugo 2008a,b; Gartner 2007, 2008). Academics such as Boudreau, Watson, and Chen (2008), argue that therefore IT-enabled information systems have a role to play in making business processes environmentally sustainable—they term such information systems Green IS. This study conceptualises Green IT as including all of the above, in order to avoid the possibility of definitional confusion and to maintain congruency with practitioners' use of the term. This paper also introduces the concepts of corporate social responsibility (CSR) and corporate environmental responsibility. The link between Green IT and CSR has been commented upon (cf. Ryan 2008b); as has the relationship between CSR and corporate environmental responsibility (cf. Eisner 2004). For example, it is now common practice for many business enterprises to describe policies or measures aimed at environmental sustainability as part of their statements on corporate social responsibility—Green IT strategies are now included under this heading (cf. Ryan 2008a on Dell and Hewlett Packard).

In its recent Green IT Survey of Belgian executives, Adjugo (2008b) reports that 57% of respondents did not view Green IT as being part of their companies' CSR (corporate social responsibility) initiatives. Nevertheless, Gartner reports that IT needs to become greener as energy is due to become a significant component of IT budgets, rising from 10% to 50%. Add to this the costs of planned carbon taxes and compliance with future environmental regulations. Current estimates suggest that IT accounts for over 2% of global CO₂ emissions (Gartner 2007)—roughly the same amount as generated by air travel. IBM (2008) argues that datacenters account for 2% of CO₂ emissions, implying that the true figure is much higher than this. Whichever figure is most accurate, the true cost to the environment of the design, manufacture, transport, and disposal of IT is much higher than estimated (Murugesan 2008).

Presently, there is little doubt of the impact that CO₂ and other greenhouse gases are having on the climate: consequently, all sectors should be taking responsibility to lower their GHG (Johnston 2008). However, a recent study by IBM argues that a majority of organizations do not possess a green IT strategy, let alone the capabilities to build one (cf. Gartner 2008, Adjugo 2008a). The reasons for this state of affairs are found in recent research by the UK's Corporate IT Forum. This study on 150 large member organisations reported that while 81% of IT executives indicated that Green IT was higher up the corporate agenda than in 2007, it was just in eighth place behind security, legacy software, data quality and server consolidation on their list of priorities (Cooter 2008). Thus, issues of strategy aside, the costs associated with the transition to Green IT architectures are viewed as being problematic for business and IT executives. Both problems are related, however, as Cooter reports on a statement by

Ian Campbell at the European Green IT Summit in London to the effect that “managers often struggled to present a sound business case -- that was the biggest inhibitor” to the adoption of Green IT strategies. Campbell is quoted by Cooter as stating that perhaps the biggest problem faced by organisations is in measuring the impact of green IT policies. He indicated that there was an absence of standards—national and international—with which to evaluate and benchmark green initiatives. It is no doubt, with such issues in mind, that a recent study by Gartner Research (2008) argued that environmental concerns will increasingly impact on organizational decisions to purchase, deploy, operate and dispose of information technology (IT). There is, therefore, a need for business and IT managers to be knowledgeable of, and proficient in, all issues relating to the procurement and use of IT viz. the management of energy and power issues; data centre design and operation; IT server virtualization; regulatory compliance and eco-labelling of IT artifacts (in regard to the use of hazardous substances); green metrics and audits; teleworking and so on (Murugesan 2008).

Given the broad scope of the Green IT problem, this study will focus on the operation and use of IT to achieve green objectives. However, as Green IT is now a relatively mature topic for IT manufacturers, examples of their experiences in addressing regulative, normative, and cultural-cognitive institutional influences on their activities will be employed to illustrate the challenges that may confront end-using business enterprises. The question that arises from this introductory analysis and which guides the conduct of this study is: *What institutional forces act to shape the ‘environmental concerns’ of business and IT managers in making the operation and use of IT green, and how can Green IT objectives be realised?*

Green IT is a new and emerging issue for IS researchers. Webster and Watson (2002, p. xiv) recommend that “authors could tackle an emerging issue that would benefit from exposure to potential theoretical foundations” through the medium of a review paper. This paper follows Webster and Watson in addressing the phenomenon of the operation and use of Green IT. The first section of this paper therefore examines the forces shaping the ‘environmental concerns’ of business and IT managers through the lens of institutional theory.

2 APPLYING INSTITUTIONAL THEORY TO GREEN IT

Richard Scott (2004) argues that institutional theory is concerned with the influences that shape social and organisational structures, schemas, rules, norms, routines and, ultimately, the behaviour of social actors. According to Scott (2001, p. 33), institutions consist of “cognitive, normative, and regulative structures and activities that provide stability and meaning to social behaviour.” Thus, Scott (2001, 2004) argues that regulative, normative and cultural-cognitive institutional forces shape organizational processes and structures—such forces prescribe what is effective performance or efficient operation in organizations (Powell 1991). Focus is brought to this broad theoretical lens by DiMaggio and Powell’s (1983, p. 143) concept of an ‘organisational field’. An organisational field is constituted by a collection of “organizations that, in the aggregate, constitute a recognized area of institutional life”; inter alia, the field consists of “key suppliers, resource and product consumers, regulatory agencies, and other organisations that produce similar services or products.” While environmental ‘concerns’ shape Green IT responses across multiple organisational fields, due to the ubiquity of IT, the concept is nevertheless useful. Thus organisational fields are characterized by regulative and legislative (coercive) influences from government departments, state-sponsored agencies, the judiciary, and so on, in addition to normative and cultural-cognitive (mimetic — DiMaggio & Powell 1983) influences from related organisations (professional and standards bodies, non-government organisations (NGOs), consulting organisations, professional bodies, etc.), and society at large (NGOs and community groups, for examples).

2.1 Regulative Influences on Corporate Environmental Responsibility

It is clear from Scott (2001) that the emphasis of regulative institutional influences is on coercion, indicators of which are rules and laws, which agents such as governments and regulatory agencies legitimize using legal mechanisms or sanctions to ensure Green or environmentally responsible behaviours or initiatives. Regulative institutional carriers, on the other hand, are social structures such as governance and power systems, which institute rules and laws, the organisational response to which is to institutionalize routines such as protocols and procedures (Scott 2001). Drawing on the introduction to this paper, we may now state our first general theoretical proposition:

Proposition 1: Governance and power systems, rules, and laws, will give structure to and shape organisational responses, procedures and protocols around the institution of Green IT initiatives.

Unlike organisational and societal end-users of IT, IT manufacturers are currently confronted with diverse regulations governing the design, production and performance of computers and other IT artefacts (Aberdeen Group 2006, Kellow 2006). Briefly, such regulations include the European Union's (EU) Waste Electrical and Electronic Equipment Directive (WEEE), the Restriction of Hazardous Substances Directive (RoHS), the Registration, Evaluation and Authorisation of Chemicals (REACH) Regulation, and the Eco-Design for Energy Using Products (EuP) Directive (Hristev 2006). All of these place onerous compliance imperatives on IT manufacturers. Indeed, the rest of the world is catching up with the EU. In the US, for example, the Environmental Protection Agency (EPA) has numerous regulations covering environmental issues and hazardous substances across the whole range of manufacturing sectors. However, individual US states such as California are following the EU's lead in introducing exacting WEEE and RoHS-like standards. Other jurisdictions are no less stringent as is the case with Japan, which also has highly demanding laws, while over the last two years, Korea, Australia, China and Canada have introduced legislation similar to the RoHS and WEEE directives.

The total amount of electricity consumed across all sectors in Europe is estimated to be growing at an annualised rate of 2% (Salhofer, Schifflleitner, and Stachura, 2008). Significantly, research by McKinsey (2007) indicates that energy consumption by computers and IT in general is projected to increase at an annual rate of approximately 3% to 2030—much higher than the overall trend. However, that estimate is conservative compared to that of Gartner (2007), who project that the energy portion of IT departments' budgets is due to rise from 10% to 50% in a much shorter time period, with datacentres responsible for the lions share of this. Thus, corporate datacentres are singled out for special attention, as the EPA calculates that they presently account for an unacceptable 1.5% of US energy costs. In a different context, Alain Bandle VP and GM Dell Europe argues that the IT sector is responsible for 5% of total global consumption of electricity (850 terawatt hours) 520 million tones or 1.6% of global CO₂ emissions (Bandle, 2008). These projected increases in consumption needs to be balanced with pressures to reduce consumption.

According to Peter Johnston (2008 p. 19), “[i]n the European Commission, we have identified ICT-enabled improvements in energy efficiency as one of the potentially most cost-effective ways in which Member States can meet their 2020 targets.” He adds that “Energy efficiency is therefore emerging as the cornerstone of energy and climate policies.” Take, for example, the EC Directive 2005 32/EC which focuses on energy efficiency in products: this sets a challenging target for energy savings of up to 9% in the period 2008-2016. Furthermore, the EU Green Book on energy efficiency estimates that energy savings of up to 30% for businesses is possible by 2020. Clearly, much will need to happen if residential and business electricity consumers are to meet EU targets. Failure to do so will, no doubt, result in further regulation in the area as energy generation in EU member states is responsible for over 24 % of the communities greenhouse gas (GHG) emissions. Thus, as EU member states fail to meet the greenhouse gas emissions targets, business organisations will be faced with regulations governing their energy efficiency. The present approach of depending on market forces and the price mechanism to control inefficient energy use by businesses will be replaced by legislation and energy audits. Thus, the option to go ‘green’ may not be left in the hands of business organisations for much

longer (cf. Johnston, 2008). The European Union continues to build a raft of environmental regulations and directives, the outcome of which will be increased carbon taxes and the imposition of further environmental compliance imperatives on GHG emissions (cf. Salnofer, Schiffleitner, & Stachura 2008). Likewise, Stephen Harper (2008) of Intel predicts that the US will adopt similar measures. Indeed, there is evidence that the US congress is already thinking along these lines (King 2007, cf. EPA 2007). Thus, business and IT managers which Cooter (2008) found to be recalcitrant in lowering the energy consumption (and associated GHG emissions) due to the cost of upgrading and replacing IT infrastructures, may have little choice in the matter in the not-too-distant future.

Take, for example, that the Eco-Design for Energy Using Products (EuP) Directive is presently being rolled out across electrical and electronics product groupings, including IT artefacts such as computers and monitors. Although still being formalised, it is being phased in and implemented across EU member states. The EuP Directive will require IT manufacturers (among others) to make voluntary declarations (presently) on the energy used in the design, packaging, delivery, and recycling of products across supply chains, in addition to the energy consumed during use. This new directive significantly extends Energy Star-like standards in EU member states such as Blue Angel in Germany Nordic Swan in Scandinavia. However, current thinking with the European Commission indicates that member states will have to regulate to have widespread efficient use of EuP, if they are to stand any chance of meeting GHG emission targets. The ever-increasing energy consumption of IT concerns the Environmental Protection Authority (EPA), as its recent report to the US Congress indicates (EPA 2007). With electricity cost and consumption rates to increase going forward, and with power shortages already evident in certain parts of the US, the EPA's report makes some strong recommendations involving both carrots (i.e. incentives to conserve energy) and sticks (an energy efficiency tax for inefficient organisations)—all of which has serious implications for business enterprises, if adopted by the US government.

Proposition 2: Business and IT managers are more likely to be environmentally responsible (e.g. implement Green IT) if they are coerced into doing so by rigorous and comprehensive environmental regulations (e.g. aimed at reducing GHG emissions).

Thus, it is clear that in the absence of strong self-governance in relation to energy consumption, regulators in the EU, the US and elsewhere will become increasingly active in demanding compliance with energy efficiency and GHG emissions regulations and adherence to demanding targets (cf. Campbell 2007). It is certain that such measures will favour Green IT strategies that focus on structural power consumption avoidance with its emphasis on reducing the installed power base, as opposed to temporary avoidance strategies, which focus on the optimization of energy utilisation, without reducing the installed power base. Certainly, organisations that have made substantial efforts and costs to become greener will reap the first-mover benefits in terms of compliance, as has already been seen in the electrical and electronics sector (Aberdeen Group 2006).

2.2 Normative Influences on Environmental Responsibility

Scott (2001) argues that the emphasis of normative influences is on social obligation as a basis of environmental responsibility or Green behaviours: the basis of legitimacy for normative forces is moral governance. Scott also emphasises that the institutional carriers of such influences are the values and expectations that develop in cultures and organisational fields. Other carriers include authority systems in social structures and routines that reflect conformance and performance of duty.

In Joel Bakan's *The Corporation*, Peter Drucker argues that executives who are concerned about the environment should be fired "...and fast". Likewise Bakan reports that the economist and Nobel Laureate Milton Friedman holds similar views and observes that the only time that corporate social responsibility can be acceptable is when it is insincere. What Friedman means here is that 'going green' can only be a means to an end—the ends being to enhance brand image and increase market share in order to maximize shareholder wealth. Obviously Friedman's views did not change since his 1970 article in the *New York Times Magazine* titled "The social responsibility of business is to

increase profits.” Indeed as Bakan (2005, p. 35) states “Corporations are created by law and imbued with purpose by law. Law dictates what their directors and managers can do, what they cannot do, and what they must do.” Indeed, this point weakens the argument for self-regulation and supports Proposition 2.

In the four years since Bakan penned his argument, the business environment has changed. William Ford, Jr., Chairman of the Ford Motor Company, argues, for example, that “corporations could be and should be a major force for resolving environmental and social concerns in the twenty-first century” (cited in Bakan, 2005, p. 31). Klaus Schwab, Executive Chair of the World Economic Forum, argues that corporate social responsibility (CSR) focuses on the broader financial, social and environmental effects of all that a company does (Schwab, 2008). Thus, companies who exercise CSR minimize any negative effects of their commercial activities by taking responsibility and being accountable for economic externalities in all spheres of its operations (Bakan 2005). Traditionally, companies attended only to the bottom-line—their financial results, which usually did not account for externalities. Firms practicing CSR, on the other hand, attend to a triple bottom-line, which includes being accountable for what they are doing in terms of environmental and social responsibilities, in addition to their financial obligations of maximising profits (Schwab 2008). Schwab goes on to argue that CSR encompasses the entire value chain to include suppliers and customers. The exercise of CSR by Ford Motor Co. reflects this, as it requires all suppliers to be ISO14001 compliant, thus using the supply chain as a vehicle to drive environmental responsibility. In regard to Green IT, it is clear from Collett (2008) that CSR and other environment-oriented initiatives introduced by industry standards bodies such as the Institute of Electrical and Electronics Engineers, the Global e-Sustainability Initiative (which includes Microsoft, Sun, Ericsson, Bell, BT, Dell, HP, and many others: cf. www.smart2020.com), the US-based Electronic Product Environmental Assessment Tool (EPEAT) organisation, and so on, that self-regulation via normative mechanisms is possible, this leads to the following proposition:

Proposition 3: Organisations are more likely to be environmentally responsible if there are well-defined systems of self-regulation with tangible recognition for rewarding often costly Green IT initiatives.

Normative standards on computer environmental footprints are, as indicated, the Blue Angel in Germany and Nordic Swan in Scandinavia. However, the most influential normative initiative is undoubtedly that of the Environmental Protection Authority in the US which has a major focus on energy-consumption-related GHG emissions. In 1992, the EPA’s instituted its Energy Star programme—which concentrates on the energy use of products in use. Almost all major manufacturers now produce Energy Star compliant products. Notably, only products in the first quartile (25%) of energy efficiency standards set by the EPA and U.S. Department of Energy are awarded an Energy Star rating. In 2006, the Green Electronics Council, which includes the EPA, U.S. Department of Energy, and industry standards bodies introduced the Electronic Product Environmental Assessment Tool (EPEAT). EPEAT is based on the Institute of Electrical and Electronics Engineers (IEEE) 1680 Standard, Section 4 of which governs environmental performance criteria for desktop PCs, notebooks, and PC monitors. In terms of IEEE 1680 Standard Section 4, EPEAT is concerned with the (a) the reduction/elimination of environmentally sensitive materials; (b) materials selection; (c) design for end of life; (d) product longevity/life cycle extension; (e) energy conservation (Section 4.5 covers adherence to the Energy Star standard); (f) end of life management (take-back and recycling); (g) corporate performance (in terms of CSR); and (h) packaging (toxics, labelling). While the US Government did not regulate on the IEEE standard or EPEAT, an Executive Order was issued by President Bush in 2007 requiring all US federal agencies to purchase only EPEAT-certified artefacts (Ryan 2008a). Significantly, in July of 2007, a year after EPEAT’s launch, Energy Star 4 came into force, which is a much more rigorous standard than its predecessor Energy Star 3. Currently, Hewlett Packard (HP), Dell, and Toshiba manufacture computers to reach Gold standard certification (there are also Silver and Bronze certificates). The success of the Energy Star programme is reflected in the fact that in 2007 devices designed to Energy Star specifications resulted in savings of 40 million metric tons of GHG emissions; this is equivalent to taking 27 million vehicles off the road annually (Hojlo

and Jacobson 2008). Yet further evidence of the effectiveness of standards in promoting environmental responsibility is the Leadership in Energy and Environmental Design (LEED) Standard, which is a Green Building Rating System developed by the U.S. Green Building Council. Deloitte is implementing those standards in the construction of its datacentre in Dallas (Desmond, 2008).

It is clear that practitioner publications, on- and off-line, such as Computerworld, NetworkWorld, CNET, the Cutter IT Journal have been raising awareness of late on environmental issues, particularly the issue of energy efficiency as it relates to Green IT. So too have bellwethers like Gartner Group, Forrester Research, the Aberdeen Group, trade and industry conferences such as Electronics Goes Green (EGG2008+), and so on. All this, in addition to normative prescriptions from the ISO and IEEE standards bodies, NGOs like the EPEAT, and so on, influences IT practitioners' decisions. This leads to the following proposition:

Proposition 4: Business and IT executives are more likely to introduce environmentally responsible programmes, if Green IT is promoted by, and institutionalised through, industry standards, business publications, consultancy bodies, and other fora in which executives participate.

2.2.1 Normative Influences of Stakeholders on Cost Reduction Vs. Green IT

Returning to the point made by Milton Friedman, that if the social responsibility of business is to increase profits, then it is logical to assume that business will take steps to reduce costs if this increases profits. Thus, the findings of research by Forrester (2007) indicates that 55% of business and IT executive surveyed saw cost as the chief motive for instituting sustainable IT operations, not Green IT or concerns for environment-related energy efficiencies. It must be remembered, however, that it is only relatively recently that end-user organisations not in the IT sector, e.g., in the services sectors perceived the benefits of adopting 'Green Strategies'. For example, Collett (2008) reports that Wachovia Corp. was ranked 12th in Computerworld's survey of Top 12 Green IT Users in 2008. Likewise Desmond (2008) reports on Deloitte's corporate Green IT initiative. Yet, there is not a widespread recognition by business and IT executives that costs can be reduced and profits increased through Green IT strategies. Significantly, Duffy (2008) reports that "80% of companies recently surveyed by Nemertes [Research] have no corporate green policies; only 13% knew datacenter energy costs; only 3% turn off their servers when not in use; and desktops are left on 50% of the time." Clearly given the opportunity of cost reductions, IT are not serving stakeholders needs or exercising environmental responsibility. Yet as the following examples illustrate, the cost savings can be significant for relatively simple procedures.

Consultants from Adjugo (2008a) argue that "[i]mplementing quick wins like switching off computers after business hours can reduce the energy consumption up to 75% per year." However, such straightforward changes in the management of workstations can have significant implications for an IT function's methods of operation viz. conducting workstation and server software upgrades, patches and backups outside of normal business hours. One might be forgiven for thinking that such simple procedures would be within the ambit of business and IT managers; yet the opposite appears to be the case if stories carried in practitioner publications are to be believed. There are, nevertheless, several powerful examples of significant cost savings.

Proposition 5: Business and IT executives are more likely to introduce environmentally responsible programmes, if they are aware of the costs reductions associated with the implementation of Green IT initiatives and the resulting increase in profits.

2.3 Cultural Cognitive Influences

Cultural-cognitive influences that emphasize environmentally responsible behaviours are 'taken for granted'. Beliefs and attitudes toward compliance are socially constructed and transferred mimetically, while being governed by a logic of orthodoxy. Institutional carriers include, according to Scott (2001),

socially constructed cultural categories and typifications and routines that are reflected in performance programs and scripts. Of interest to the present study are social structures that result in isomorphism of social and organisational practices.

Climate change and environmental concerns has led investors and investment managers to focus on green investments (Mincer 2007). Traditionally, investors have examined risk, liquidity and rate of return as investment criteria; now, however, an increasing number of investors look toward social and environmental factors (Kahlenborn 1999). Kahlenborn (ibid., p. 65) presents two contrasting definitions of 'green investment': in the first, it "can be understood as any form of financial investment whereby the investor pays attention to ecological goals as well as the traditional aims of investment. On the other hand, 'green investment' can be understood as an investment that successfully counteracts negative influences on the environment, or serves to produce goods or offer services that have positive effects on the environment." Over the last ten years there has been a significant increase in individual investment and mutual funds focusing on what is in 2008 an established niche market (Kahlenborn 1999, Mincer 2007). Thus, in highly competitive business environments where 'trust' is an issue, and investor confidence seriously damaged, business enterprises that display CSR and act on environmental concerns may shape customer preferences and investment decisions in opting for 'green strategies' which could tap into an additional source of investment funding (cf. Campbell, 2007). It is clear that such funding is not limitless, so firms will also have to compete on their environmental credentials.

Proposition 6: Business and IT executives are more likely to introduce environmentally responsible programmes such as Green IT if doing so enhances their image and attracts Green Investors.

Thus, is the environmentally responsible behaviour of William Ford out of step with his corporate colleagues as Joel Bakan's thesis would indicate? In an industry whose products are perhaps the most polluting and environmentally unfriendly when in use, presenting an environmentally positive image can only contribute to the bottom-line. So, given the nature of Ford's business, are he and his company genuine in exercising CSR, or is this a form of 'greenwash'? 'Greenwashing' products and brands has become commonplace as companies increasingly use a product's 'greenness' as a basis for competition. Complaints to the UK's Advertising Standards Authority (ASA) regarding 'greenwashing' in product advertising have increased dramatically in the recent past (Charles 2007): for example, complaints to the ASA averaged over 56 per month in the last two quarters of 2007. Likewise, a signal that all is not well in the IT sector comes from James Staten, a principal analyst at Forrester Research. He recently warned IT executives about the level of 'greenwashing' taking place in the industry, as manufacturers imply that whole product lines are green, when in fact only a proportion of products may be. The consequences of 'greenwashing' are significant, as stakeholders tend to lose confidence in a firm's ability to be honest leading not only to potential damage to market share and the bottom line, but also to the withdrawal of valuable sources of investment (Zagenczyk 2004).

Greenpeace is one NGO that is especially significant in shaping public opinion regarding corporate environmental responsibility. They use their website to publish the results of studies and analyses of green and not-so-green products. Whether accurately or not, they also rank manufacturers based on their eco-friendly products and strategies. Take for example their Apple webpage (www.greenpeace.org/apple/itox.html) which states "Apple products – sleek looks, amazing design, and meticulous attention to detail. So what's with the toxic chemicals inside, short life spans and allowing their products to be dumped in Asia?". It must be noted that Apple launched its Greener Apple initiative in 2007, much to Greenpeace's annoyance, as it considered Apple to be greenwashing. Companies like Nokia, on the other hand, are lauded for their efforts at environmental responsibility. This is one of the reasons why the Greenpeace presentation at the Electronics Goes Green 2008+ conference in Berlin was, perhaps, the best attended with standing room only in the aisles. Clearly, NGOs like Greenpeace can shape public perceptions of corporations and products, hence they can exert cultural cognitive as well as normative influences on business activities. The press also shapes public perceptions and various publications are eager to report and rank firms based on their

approaches to corporate social and environmental responsibility. Take for example, McLean's in Canada, whose Technology and Media section reported that Hewlett Packard's efforts at social responsibility received an A+ ranking, while Dell and IBM achieved an A, NOKIA an A-, and Nortel and B+. Thus, the watchful eye of society at large is upon producers, with the media industry being all too ready to highlight issues of concern. Given the forgoing arguments, we now present the following proposition:

Proposition 7: Business and IT executives are more likely to introduce environmentally responsible Green IT programmes if their activities, processes and products are being monitored and reported upon by independent non-government organisations, the press, and society at large.

It is clear from Corporate Annual Reports (e.g. Dell, Intel and HP—Cf. Ryan 2008a,b) that corporate social and environmental responsibility is viewed as being increasingly vital to promote public perceptions and to add to the bottom line (cf. Campbell 2007, Adjugo 2008 a,b, Collett 2008). Thus, institutional theory would predict that mimetic behaviours would have business and IT managers imitate each other in terms of Green IT strategies. This is certainly occurring in large global corporations. Likewise, the increasing evidence of greenwashing has business 'appearing' to imitate. In the event that businesses do actually imitate each other and implement Green IT initiatives, then isomorphism that will benefit society as a whole will occur across firms. We may now present our next and final proposition.

Proposition 8: Business and IT executives will mimic successful Green IT strategies of others leading to industry-wide isomorphism in terms of environmental responsibility practices with regard to the operation and use of IT.

2.4 Directions for Future Research

This paper employs institutional theory to develop applied theoretical propositions; however, these require further elaboration in process-based studies, whether positivist, post-positivist or interpretivist. Such studies might employ the propositions as a theoretical lens in, for examples, exploratory or explanatory case-based research, using analytic generalisation or replication strategies (Yin 2003). The continued use of institutional theory is recommended, of course; however, following Currie (2009), we argue that multiple levels of analysis that encompass the institutional environment, organisational field, organisation and social actors would be of greatest utility. These could, for example, identify the institutional arrangements (i.e. specific Green IT strategies) organisations deploy in response to forces in the institutional environment, or the organisational field (DiMaggio and Powell 1983). In-depth case studies could also be used to inform practice as to why and how business enterprises are adopting and applying Green IT to reduce GHG/CO₂ emissions and introduce energy efficiencies. Such studies might also help identify how software solutions (or Green IS, if you will) can be designed and developed to make business and IT processes more environmentally sustainable across the business (cf. Boudreau et al. 2008).

Following Wheeler (2002), positivist or variance studies could build on process-based case studies to generate hypotheses and identify empirical indicators to subject the theoretical propositions/meso-level applied theory to test in order to attempt to falsify it. Here again, however, Currie's (2009, p. 66) cautionary observation on the use of institutional theory that "Many variance and process studies examine the cause/effect relationships between IT-related constructs, such as adoption intention, assimilation and implementation, without considering the wider environmental and inter-organisational levels. Such an oversight is problematic, both theoretically and empirically, since the mainstay of institutional theory is an emphasis on multi-level and multi-stakeholder analysis." Thus while institutional theory can contribute to a greater understanding of Green IT, Currie's recommendations should be observed if such an understanding and theoretical contribution is to be achieved.

3 CONCLUSIONS

This paper examines a new and emerging research topic for IS researchers. Indeed, with IT literally up there with airline travel as a contributor of greenhouse gas emissions, the greening of IT should be uppermost in the minds of practitioners, as well as being high on the IS field's research agenda. Yet despite the threats to the environment brought on by climate change, it appears from industry-based research that IT practitioners are leading the way only in their ignorance of the impact of energy inefficient practices relating to the deployment, operation, and use of information and communication technologies (ICT). Campbell (2007) argues that corporations behave in a socially responsible way when economies perform well, and are less than interested in exercising this responsibility, or are unable to do so, during economic downturns. It would be reasonable to assume that in the buoyant economic conditions that existed for the majority of firms over the past 10 years that business and IT executives would have exercised corporate environmental responsibility by making IT use more energy efficient and thereby reducing both related costs and greenhouse gas emissions. We conclude that they did not initiate energy conservation measures due to a general ignorance of the consequences and a failure to self-regulate. To be sure, there are many notable exceptions to this, but the facts speak for themselves—the majority did nothing, despite enormous increases in energy costs since 2004. Hence, such executives failed also in their primary objective of maximising shareholder wealth through increasing profits by lowering costs, both in the short term and over the long term.

This paper's application of institutional theory to the phenomenon of Green IT indicates that a small but growing proportion of IT practitioners are responding to normative and cultural-cognitive influences and making their IT infrastructures environmentally responsible. It must be noted that many of these firms produce IT products and services (e.g. participants in Global e-Sustainability Initiative) and have for some time now been subject to regulative influences with regard to their production activities. Hence, they have been sensitive to environmental issues. Their Green IT initiatives have not, we believe, gone unnoticed by others in their organisational fields. Thus, they have shaped the broader institutional environment through cultural-cognitive influences that have engendered environmental responsibility in and across businesses through mimetic responses. At the time of writing, there is a global recession and, with corporate budgets being trimmed, Green IT initiatives are likely to suffer if they require initial investment to obtain energy efficiencies that will reap future cost reductions. Yet, in the face of ever increasing energy costs, there is hope that companies will attempt some of the 'quick wins' described in the literature (cf. Ryan 2008a). Unfortunately, the majority of such 'quick wins' will be in the front office, as improvements in energy efficiency in back-office ICT are not so easy to attain, as reducing power consumption requires structural measures such as reduction in installed power capacity—e.g. reducing the number of servers and using virtualisation to optimise server loads. Significantly, data centres account for much of the growth in IT energy consumption and related greenhouse gas emissions. (Hence, Intel's argument that thin-client architectures are not as energy efficient as energy efficient power managed workstations and notebooks.) Thus, significant investments are required here to reduce both consumption and emissions in the operation of server farms and data centres. At the time of this submission (Dec 1st), government officials across the globe are in Poland to attend the UN Climate Change Conference, which aims to frame a replacement for the Kyoto Agreement. Likewise, the UK government is today talking about decreasing GHG emissions by 20% before 2020. Thus, it is more than likely that, economic downturn or not, governments and regulators will look to the long term and regulate inefficient energy use by business enterprises in order to address overall greenhouse gas emission targets, which are not presently being met. Indeed, many now argue that the targets set out in international agreements such as Kyoto are to be revised upwards, as with the UK—all of this has significant implications for energy efficiency in the deployment, operation, and use of IT infrastructures.

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