Applying Green IT with a strategic focus on Business Sustainability: A study of businesses in St Lucia

Abstract

There is increasing concern about the negative impact of extensive IT use on the environment and society. Some businesses have developed green IT strategies to address the issue. Research has revealed that most of these strategies are geared towards economic value and are less concerned about the environmental impact. Much of the research has also been focused on developed nations where stakeholder involvement helps form regulations, while little research has examined business organisations in developing regions. Despite developing countries accounting for 41% of global IT investment (Ark et al 2008), limited research has been undertaken on ICT within the business environment of developing countries (Kowal and Roztocki, 2013) and on green IT (Ongondo et al 2011). This paper intends to begin filling that gap and is based on a review of relevant literature and interviews with selected businesses in St. Lucia, a Caribbean island where the use of IT has increased significantly over the last ten years. A case study approach has been adopted. The findings of the research highlight the fact that there are issues concerning the concept of sustainability and green IT. Green IT efforts are a series of uncoordinated initiatives aimed at economic gains through cost reductions, with less emphasis on other aspects of business. The main conclusion drawn from this research is the limited awareness of the benefits of developing and implementing green IT initiatives with a strategic focus on sustainability. Green IT strategies require a more sustainable and holistic approach which is aligned with business strategy. Such an approach would better provide sustainable advantages to the business community in St. Lucia.

Keywords: Green IT, Sustainability, Triple bottom line, Developing countries, e-Waste management

Introduction

Information technologies (IT) and information systems (IS) have been used as essential tools to aid business performance and to create competitive advantages. IT/IS are now fully integrated into business and, as Lamb (2009) argues, modern business success cannot be achieved without the use of IT/IS. There are increasing IT investments and projects to be considered in any organisation in both developed and developing nations. Ark et al (2011) indicate that IT investment in developed countries has more or less stabilised while annual IT spending in the developing world is rapidly increasing. Nnorom and Osibanjo (2008) explain that this increasing investment can be attributed in part to developing countries attempting to bridge the digital divide in IT use.

While IT/IS provide many benefits for the business community, they have negative impacts on the environment. The negative effects of IT include IT-related emissions, energy inefficiency and electronic waste (Murugesan, 2008; Molla et al, 2014). Most IT products consist components such as micro-chips, semiconductors, liquid crystal displays and batteries and manufacturing many of these components has hazardous effects on environment (Rizvi et al, 2012). Scientists also believe that technologies cause adverse effects leading to global warming, acid rain and pollution (Denson, 2008). An awareness of this encourages businesses to adopt more sustainable business practices (Jenkin et al, 2011). The push for addressing environmental issues has led business organisations to adopt and change many aspects of their business operations (Wati and Koo, 2010).

Business sustainability: definition, triple bottom line, IT and business sustainability

The Brudtland Commission defines sustainable development as meeting "*... the needs of the present without compromising the ability of future generations to meet their needs*" (Brundtland, 1987). Petrini and Pozzebon (2009) build on this definition to describe corporate sustainability as being concerned with developing strategies to meet the needs of stakeholders without compromising the firm's ability to meet the needs of future stakeholders. The Financial Times (2013) describes business sustainability as a process by which "*organisations manage their financial, social and environmental risks*".

Much of the emphasis concerning business sustainability has been on environmental conservation (Sharma et al, 2010). The need for adequate strategies by businesses comes from pressures of stakeholder groups (Dunphy, 2011), and in return, organisations respond by addressing social and environmental concerns as economic constraints on the business (Sharma et al, 2010). Organisations, unsurprisingly, have placed a greater emphasis on regulatory compliance when dealing with sustainability issues. Hart (2011) states that businesses looking to attain long term profitability could seek such gains by creating a balance between the economic, environmental and social spheres of conducting business.

The triple bottom line

The triple bottom line is often cited when it comes to business sustainability. The concept refers to a balanced emphasis of economic, social and environmental developments (Elkington, 1998). In a practical sense, there is a general awareness of the social and environmental risks associated with economic development. Dunphy (2011) suggests that while pursuing economic growth it is critical to reduce such risks in order for the world to be sustainable. Accordingly, businesses should consider and take on social and environmental responsibilities along with aspects of their business activities when pursuing economic gains (Adams et al, 2011; Nidumolu et al, 2009). These three realms - economic, social and environmental are intertwined (Elkington, 2004), meaning that business would not survive if focused on one area only. This view is augmented by Hitchcok and Willard (2009) who,

through their framework of benefits accruing from sustainable strategies, argue that there are risks associated with *not* addressing sustainability.

Business sustainability and IT

Although IT/IS have transformed the modern life and society they have also increased environmentally unfriendly practices such as excessive printing (Molla et al, 2014). Computers have supposedly brought about the 'paperless society'. However, they not only have failed to reduce the amount of paper consumed but increased paper consumption on printing emails, memos, letters and reports (Saini, 2005; York, 2006). The use of IT/IS consumes a considerable amount of energy, whilst devices such as computer-based systems become obsolete over a relatively short period of time (Houghton, 2010). IT use accounts for 2% of world carbon emission (Gartner, 2007). Improper disposal of obsolete devices can cause both environmental and social damage (Kiddee et al, 2013), including the release of Green House Gases (GHG) into the atmosphere (Vereecken et al, 2012). Reusing, recycling and extending the life of IT equipment to reduce e-waste, conserve energy and reduce paper consumption are some pro-environmental IT practices (Thongmak, 2012). Sustainable IT/IS practice, as Erek (2011) argues, should not only focus on the economic gains for the business, but also address issues concerning the environment and society. Several authors criticise green IT initiatives that place more emphasis on financial advantages than environmental and social aspects, and as a result, have unsustainable implementation measures (Schmidt et al., 2011; Harmon et al., 2010; Erek, 2011; Demirkan & Harmon, 2011).

Green IT: definition, focus areas, various initiatives, sustainable green IT, influencing factors

Whilst there is increasing awareness that green IT has become a critical factor in achieving business sustainability (Dedrick, 2010; Su & Al-Hakim, 2010; Molla, 2009) researchers use the terms 'green IS', 'green computing' and 'green IT' interchangeably (Dedrick, 2010) and there is no universally agreed definition of green IT. Murugesan (2008), for example, defines green IT as *"... 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".* Bose and Luo's work (2011) shows that organisations are developing and implementing green IT solutions for various reasons: reducing power consumption, reducing costs, improving systems performance and space savings. Molla et al (2009) emphasise that green IT solutions should be developed in a systematic approach with environmentally sustainable measures to address the design, production, sourcing, use and IT infrastructure.

Initiatives
Legislation such as the Climate Change Act 2008 and Energy Act 2013 in the UK place some pressure on organisations to better manage their use of information and communication technologies (ICT) from a green perspective. Businesses are faced with rising energy costs (BBC, 2012) and the majority of green IT practice is primarily focused on reducing business energy costs (Vereecken et al, 2012; Joumaa and Kadry, 2012).

Initiatives that aim for cost and energy reduction include elements of virtualisation, grid computing, thin clients, cloud computing, renewable energy use and compliance with standards and laws (Murugesan, 2008). Murugesan and Gangadharan's green IT life cycle framework advocates a business culture which addresses the three R's of green IT; reuse, refurbishment and recycling of IT hardware (Murugesan and Gangadharan, 2012).

Towards sustainable green IT

Harmon et al (2010) and Erek (2011) propose that in order for organisations to take full advantage of green IT, they need to move towards a more outward focus on IT/IS strategies. That is, an organisation must take a holistic approach to corporate sustainability (Murugesan, 2008; Demirkan & Harmon, 2011). Galliers (2006) argues, though, that green IT itself does not provide organisations with competitive advantages or competitive value.

Legislation and international conventions continue to influence organisations to adopt relevant measures that have positive impacts on the environment and society. There are factors which will influence the adoption of green IT and an understanding of these factors will help provide insights into how business practices are developed and how green IT is implemented.

Influencing factors
Nazari and Karim (2012) categorise the reasons why organisations consider green IT strategies as economic, regulatory and attaining legitimacy. Eastwood (2009) sees influencing factors from two strands: voluntary and enforced. Within the voluntary category a push for sustainability stresses cost savings, carbon footprint reductions, recycling and the disposal of electronic waste (e-waste). The enforced drivers stem from rising energy prices, space/capacity limits and customer/political pressure via legislation and regulations. Further, factors can be classified as internal and external. Jenkin *et al* (2011) define internal factors as "organisational forces" relating to leadership, internal stakeholders, capabilities, structures, policies and financial considerations. Developing an enterprise-level 'green' strategy/policy helps cultivate an environmentally sound culture, part of the core business strategy to encourage 'green' considerations in every decision that is made (Olson, 2008). The green strategy is then embedded into business, operating and IT strategies and product development projects. These organisations are more likely to identify strategic differentiation and open up new channels for product/service development due to their 'green' contribution. For example, IBM have partnered with both business and educational institutions in creating energy efficient green data centres (IBM, 2007). A green strategy may influence a firm's decision in selecting an IT vendor from those with environmentally friendly sourcing, manufacturing, delivery and disposal operations.

External factors
The external factors are identified generally following the PEST framework.
- Political/legal – industrial standards, international and national regulations concerning the use of technology which either place restrictions in line with green IT principles or provide guidance for implementation.
- Economic – generally focused on the increased costs of energy consumption. Rising world fuel prices have a direct impact on the generation of electricity and a high percentage of the IT budget is used to pay IT infrastructure energy bills (Forrest et al, 2008).
- Social/environmental – mainly concerned with the consumers' awareness of green IT and people's attitude towards green computing within an organisation which put pressure on decision makers to adopt better practice in the use of IT (Galliers, 2006).
- Technological – the availability of technology and new ways of acquiring IT which can result in better efficiency and cost-efficient IS infrastructure.

Green IT strategies

Although political/legal factors have been influential most organisations develop their green IT strategies as part of their business low-cost strategies (Erek, 2011). Nevo and Wade (2010) encourage firms to identify the potential benefits and not see green IT strategies merely as cost-

cutting measures. Dubey and Hefley (2011) provide more detailed guidance on implementation based on the role and actions of the Chief Information Officer (CIO). Esty and Winston (2009) argue that to create lasting value businesses should apply environmental thinking into strategy formation. Schmidt et al (2011) stress that implementation of green IT strategies can support low-cost strategies or facilitate competitive differentiation driven from environmental initiatives. Dubey and Hefley (2011) note that the core objectives for most green IT strategies deployed by organisations should include minimising energy consumption, purchasing green energy, making use of green suppliers, reducing paper consumption, minimising equipment disposal and reducing travel requirements for employees and customers.

Research Questions

According to Ark et al (2001), developing countries have a 41% share in global ICT investment, which has grown from 13% in the 1990's. The Latin American and Caribbean (LAC) region has been identified as one of the areas with high ICT investment (Heinz et al, 2008). Yet limited research has been undertaken on ICT within the business environment of developing countries (Kowal and Roztocki, 2013). In particular, research on green IT of the LAC region is limited to the ecological effects of e-waste management and its environmental impacts (Ongondo et al, 2011; Sinha-Khetriwal et al, 2006).

The review of the literature has led the researchers to investigate the perception of businesses with regards to green IT in order to gain an understanding of the current practice and initiatives of sustainable green IT. St. Lucia has been chosen as the case country. The research is therefore aimed at answering the following questions pertaining business sustainability and green IT in St. Lucia:
- What are St. Lucian business organisations' perception on sustainability and green IT?
- How do St. Lucian businesses develop and implement their own green IT strategies?
- What are the implications for developing and implementing green IT strategies as part of business organisations' strategic IT planning process?

Research Methodology

A case study approach has been adopted because the research questions require an in-depth investigation in a relatively novel area. It provides a better understanding of complex issues (Yin, 2009). Initially twenty St Lucian business organisations were identified and contacted based on the level of IT use. Out of the twenty only four were selected for the research. Organisations were de-selected on the following criterion: the organisations' refusal to provide information; the unavailability of IT or senior managers and organisations who have never considered green IT in their business practice. The four selected companies operate in the finance, energy and IT sectors. Data was collected through semi-structured interviews for qualitative analysis.

St Lucia
St. Lucia, a Caribbean island with a population of just over 170,000, has had considerable increase in the use of IT over the last 10 years. Preliminary figures suggest a 317% increase in internet usage, 210% increase in computer ownership and 555% increase in mobile device ownership in that period (St. Lucia, 2010). St. Lucian businesses, generally small in size, tend to be flexible and adaptive. They adopt new technologies faster than larger firms. There is a level of emphasis on innovation which is less hindered by bureaucracy. St. Lucian businesses have mostly remained unregulated with their use of IT (JnBaptist, 2009).

IT investment within developing nations plays an important role in gaining and maintaining competitive advantages within the business environment. Businesses within the developing

countries generally have fewer long-term strategic planning processes in comparison with developed world businesses (Roztocki and Weistroffer, 2013). As a result, the business models used usually are more flexible.

Research on ICT for business strategy in St Lucia is rather limited. There has been some recognition of increased ICT use in small and medium enterprises (SMEs) as they compete within the ever expanding international market (JnBaptiste, 2009).

The business sector of the island is diverse, characterised mainly by SMEs that operate in the manufacturing, tourism, financial, agricultural and IT sectors (InvestStLucia, 2013). There is an absence of standards and legislation governing the use of IT (Roztocki and Weistroffer, 2009). Thus, the responsibility to initiate strategy for green IT is very much at the discretion of individual business owners.

Company Profiles

Company A
Business Sector: Financial
Type: Development Bank
Respondent: Chief Technology Officer (CTO)
Organisation Size: 52 Employees

The bank's major areas of interest lie in the development of agriculture, industry, manufacturing, tourism, service, housing and manpower of the country. The bank has a general philosophy about sustainability and only funds projects which provide sustainable growth for the island. As a result, projects that are considered to increase employment coupled with the capacity for sustainability are funded. The general perception of green IT of Company A is that there should be practical measures that reduce the reliance of electricity and improve efficiencies internally while reducing costs.

Company B
Business Sector: Financial
Type: Commercial Bank
Respondent: Senior IT Officer
Organisation Size: 112

In 1999 the bank strategically positioned itself to compete in local, regional and international markets. Some of the strategies used were renaming of the institution and the establishment of a new vision and mission. There was an integration of an IT system to facilitate increased efficiency and productivity within the bank and the use of the system was extended to the company's customers. Green IT is seen as initiatives which should reduce internal energy costs and help customers gain access to banking services with reduced costs to them.

Company C
Business Sector: Energy
Type: Power Company
Respondent: Deputy IS Manager
Organisation Size: 275 Employees

Company C had an exclusive licence for the generation of electricity in St. Lucia. Following the government's efforts to change the company's monopolistic position the company went public in 1999. The vision of the company has been driven to meet the public demand in providing a reliable

electricity source and the shareholders operate as an efficient and cost effective entity. The general perception of green IT of the company is to embark on activities that will increase internal efficiencies and in the meantime contribute to reduced hardware costs and smaller office infrastructure.

Company D
Business Sector: Information Technology
Type: IT Service Provider
Respondent: Managing Director
Organisation Size: 20

The company specialises in providing ICT-based solutions for small to large organisations across the entire Caribbean. The company offers multiple services for its clients ranging from basic IT support, procurement of equipment, web design, e-commence, customer relations management solutions and application design and deployment. Green IT is viewed as measures implemented for clients to reduce travel costs and help with increased efficiencies.

Findings

Business sustainability

During the interviews, respondents were asked to describe what their respective organisation's perception of sustainability. It is not surprising to find that the case companies consider, among the social, economic and environmental factors, the economic aspects of conducting business to be the most important; the common theme being the business survival of the company. There was less emphasis on environmental and social aspects. Respondents were asked to comment on the lack of awareness on social and environmental sustainability. It was felt that this may be as a result of case companies' lack of established social and environmental policies. Only companies A and C mentioned the existence of environmental policies giving very general guidance on both the company's internal and external operations. The results confirm the economic constraints to organisations as far as business sustainability issues are concerned, as identified by Sharma *et al* (2010). The Deputy IS Manager at Company C explains that the development and implementation of environmental strategies are driven mostly from the pressures imposed by the government and certain consumer groups.

Green IT perspectives

Although case companies gave various reasons for the development of green IT strategies, most of the initiatives were considered following external influences on the companies. Of the influences cited, economic and political/legal factors play the major role. Consistent with Molla's (2009) work, respondents indicated cost reductions as the primary purpose for the implementation of green IT. The combinations of different external factors driving green IT adoption determined how and why green IT was initiated for each case. For example, in Company A the factors were primarily economic and environmental influences. By comparison Company B, also a financial institution, is primarily driven by legal requirements and market pressure. New legislation, i.e. the Electronic Transactions Act, has forced the bank to launch projects to facilitate image document exchanges between competing banks. The adoption of the mobile extension of their "MoBanking" platform was driven by other financial institutions offering similar services as indicated by the Senior IT Officer "*When other institutions began offering online services, we further extended that idea by offering mobile banking...*"

Snedaker (2011) considers climatic factor as an influence on IS planning, particularly with rising global temperature. Case organisations expressed the constant threat of storms as an influence in adopting virtualisation in the server environment. The Deputy IS Manager of Company C stated "*We have had issues in the past when it comes to storms and virtualisation offers the quickest recovery options...*" and the CTO of Company A also said that virtualisation *"... offered better disaster recovery especially after the rains*". The use of virtualisation for disaster recovery leads to a question on the use of cloud computing, as Adeshiyan (2009) suggests the use of cloud computing as an option for disaster recovery. This may not be an option for the case companies. Two reasons are given. First, there are legal obligations on security when it comes to the use of cloud computing, which is in line with issues addressed by Poston (2008). Companies A, B and C indicated that they would not use cloud-based services because there are risks about customer information privacy if data is stored on the cloud. Secondly, it was felt that technology itself is a hindrance. There is lack of reliable internet infrastructure and services on the island to support continuous access to cloud services. As expressed by Company C," *We have an issue with ISP reliability and internet speeds...*" Perspectives of business sustainability and the factors influencing green IT have led the case companies to focus on different areas of green IT implementation. The findings with respect to green IT initiatives will now be discussed below.

Financial perspectives

Green IT from the financial perspective is internal and generally geared towards initiatives which reduce costs for the organisation. The case companies who have considered the green IT concept focus their green IT efforts primarily on the reduction of energy cost. The most common IT projects being implemented were virtualisation within the server environment and equipment redeployment, which was practiced by all case organisations.

Companies A and C have power management policies in the workplace. For firms who have no such policies or guidance, instructions or employee training is given to minimise the use of electricity. Both companies A and D indicated the use of solar energy to power air condition units. Additionally they reduce energy usage by taking relevant steps to transform the lighting system of the workplace. These practices are mostly consistent with the literature. While Molla (2009) proposes reducing costs in network servers, case companies A, C and D not only endeavour to reduce server energy consumption but make changes in the offices and provide training to staff to address green IT issues.

Customer perspectives

Green IT from the customers' perspective is usually external with initiatives developed and implemented by organisations to reduce costs incurred by customers and provide better customer service. Research has suggested the use of "green marketing" as a means of attracting eco-aware customers (O'Neill, 2010). In response to questions pertaining to the use of green IT initiatives to enhance customer value, none of the organisations was aware of any sort of green marketing or green advertising approach. An investigation into the advertising promotions on each case company's website revealed no indication of any green campaigns to address environmental issues. Companies pointed out that there is no need and they have yet to consider the use of such strategies to attract more customers.

Dubey and Hefley (2011) assert that reducing travel costs for customers to visit a store physically should be a main focus for organisations who are engaged in the e-business concept. Company A is able to deliver an improved customer service by offering their customers an online banking system for loan applications which can be easily made at home. This, in turn, has improved the efficiency of the loan application process. Similarly, the CTO of Company A states, "*It saves time and money,*

especially for those customers from the south of the island... Travelling from the south is very costly ..." Company B has taken a step further allowing their customers to bank online through their mobile devices. This offers a number of banking operations at a customer's finger tips and reduces the need for a customer to travel to a local branch.

Following the same concept, Company D, being an IT service provider, offers a combination of various technically-oriented green IT initiatives to its clients. First its "ticketing system" reduces clients' travel costs and provides a means for real-time communication between clients and the office. Second, their implementation of teleconference services for clients removes the need for regional travel. As the Managing Director comments, "*we have facilitated the ease of travel for CXC consultants who over the years have had to travel annually to Barbados...*" Third, the organisation has employed solutions for its clients with the use of solar power to drive down energy costs and finally, there is a general trend of the organisation to redeploy legacy hardware of its customers in an effort of reducing procurement costs.

Harmon and Auseklis (2009) emphasise that for organisations to be sustainable, green IT initiatives should be developed using a "co-creation" process, working together with customers and relevant stakeholders. When asked about consultation with customers during the development of green IT projects, none of the organisations, unfortunately, included customers in the process with the exception of Company D who operates as a consultancy and are therefore closer to and understand the requirements of their clients better. Understandably this fosters a mutually beneficial relationship in the development of green IT solutions which are in both the firm and consumers' interests.

Internal operations

Green IT with respects to a firm's internal operations is generally considered as internally driven towards improving work and operational efficiency. Considering green IT from such a perspective means that the consideration at times tends to cross the boundaries of customer perspectives and financial/economic perspectives, as there is no clean-cut separation between these intertwined aspects. Green IT initiatives which are developed for improving internal operational efficiency are evident within all four case organisations. It should be noted, however, the scope of the initiatives, cited by the respondents, was limited to three areas: paperless systems, disaster recovery management and resource monitoring. The concept of virtualisation is applied to the disaster recovery management which is the most popular initiative undertaken by all four case organisations. The development and installation of paperless systems resulted in significant time reduction of days for Company B in processing cheques from other banks while Company A was expecting a 40% increase in efficiency from the online loan application facility once the full implementation of its system had been realised. Monitoring resource usage is a popular strategy that case companies develop and implement to assist with consistent monitoring of resource use. For example, Company C regularly monitors the office electricity usage and set target and policy to address power consumption issues.

Environmental and social sustainability perspectives

Green IT initiatives in the perspective of environmental and social sustainability deal directly with the reduction of foot prints and using IT to support social programmes. Although the reduction of energy consumption and its associated CO_2 emissions would also fall under this category, initiatives addressing such these have already been highlighted within other aspects of green IT.

Eastwood (2009) states that regulations and standards are the main driver in the environmental considerations of green IT. All case companies are unaware of any specific standards or regulations relating to green IT, although some of the initiatives undertaken have been to address similar requirements. The most commonly cited practice is the reuse of IT equipment. Every case company acknowledges that there is a culture in their workplace of recycling parts of computer and equipment. It can be argued that the motive behind the practice is, perhaps, purely financial, as firms would avoid IT and other expenditures by prolonging the life of the machines. As Senior IT Officer of Company B indicates, *"... we don't have regular turnover on equipment.... many computer systems are very often extended their life cycle thus reducing burdens on the environment"*. Companies A and C, on the other hand, donate used equipment to community groups as part of their green IT initiative. In a similar practice, Company C gives used devices and parts to staff members or donates them to small repair shops. A reason cited by the interviewee is that such action of the organisation may assist to build employee morale and loyalty.

Companies C and D have implemented a policy of a "Take Back System" which allows them to return IT equipment to their vendors, even though there are no legal requirements for them to do so. This is in line with good practice in countries such as UK and Japan where legislation has mandated manufacturers and suppliers to provide facilities for customers to return used IT products (Bo and Yomamoto, 2010; Kiddee et al, 2013). The practice of returning used IT goods may not be an easy solution. Company D has no problem allowing their customers to return equipment thanks to their vendors who have implemented a 'point system' for the purpose. Company B, however, found that the "Take Back" strategy was impractical due to compliance with the local Customs Department, which has made the process tedious. Having given much thought, they now use a local exporter/recycler in getting rid of e-waste, a method that is also being considered by Company C.

Relevant initiatives with respect to the social aspect of green IT is demonstrated by Company C. Since 2011 Company C has started a project with a number of local secondary schools for the implementation of virtualisation of network servers in computer labs. The project was initiated when the schools needed sponsorship for the supply of new computers. Company C supplied both thin-client computers and the corresponding servers for these schools. Prior to that in 2009 the company had been involved in the use of renewable energy to supply power, sponsoring the installation and maintenance of photovoltaic solar systems to help power secondary schools in the south of the island and the National Trust Museum in the north.

Innovation and learning

Green IT initiatives which fall under the heading of innovation and learning deal with the development of innovative practices and approaches, as new technologies are being developed to measure CO_2 emissions, energy usage or paper usage as well as essential information which could assist in monitoring the efficiency and effectiveness of green IT strategies. Unfortunately there is a general lack of green IT initiatives within this sphere of the framework. The only initiative which sparked innovation or change was Company A's use of its IT system to monitor customer behaviour. This led to the design of new products and services, but not a change in employee behaviour or business processes. None of the case companies indicated any innovative green IT solutions which gather information that may be used to analyse the results of green IT practices. Manual processes are used to gather such information, which shows a general lack of innovation in the case companies.

Conclusions

The overall aim of this research is to obtain an understanding of the current state of green IT practices in a developing country and what green IT initiatives have been developed and

implemented to address this important issue for business sustainability. A case study based on St. Lucian businesses was conducted to gauge the general perception of sustainability and green IT, how green IT strategies are developed and implemented and the implications of these strategies for long-term business and environmental impacts.

Dunphy (2011) advocates a need for business to reduce social and environmental risks in order to attain sustainability. Although the case companies have differing perspectives about business sustainability, much of their focus has been on the creation of economic gains and the reduction of operating costs. This means that companies are generally concerned less about the environmental and social aspects of conducting business. This is reflected in the adoption of and views on green IT, which is primarily driven internally by the need to save costs. This is consistent with Schmidt et al (2011) who views green IT as uncoordinated practices geared towards addressing the economic sphere of business sustainability. Case organisations do not see green IT as an important practice for long-term business sustainability. Green IT initiatives are mostly seen by case companies as IT projects which are implemented to reduce energy cost and to improve the efficiency of existing business processes. In terms of the triple bottom line, it can be concluded that most business organisations in St. Lucia focus primarily on the economic benefits, and less on environmental impact and social responsibility.

The development and implementation of green IT strategies, in terms of time, motive and process, vary among the case organisations. The findings show that the key driving forces to trigger the consideration of green IT are mostly external. The research analyses various factors from different perspectives, such as customers, financial considerations, internal operations and environmental and social responsibilities. The rising energy costs have led case companies to develop strategies to use renewable energies and measures to reduce the reliance of electricity in the computing and work environments. The need for business continuity pushes organisations to develop practices that enable disaster recovery after hurricane damage. Whereas research points to an increase in regulations and more stakeholder's involvement in green IT adoption (Eastwood, 2009), St. Lucian businesses have remained unregulated. Case companies have expressed, despite growing concerns from the public, the absence of relevant legislation and standards concerning IT use and e-waste. Firms appear to develop their own strategies and approaches to address green IT issues.

An evaluation of the case organisations' green IT strategies, purposes, scope of work and methods used reveals that each firm has its strengths and weaknesses in their planning and implementation processes. It is clear that companies have not fully addressed the business sustainability concept, not mention taking a holistic approach in their green IT initiatives involving key stakeholders with longer-term objectives in the process. Although some companies have started developing strategies to address environmental and social responsibilities and impact, the main focus of their green IT initiatives have been on the reduction of costs with the objective of increased operational efficiency. As Harmon et al (2010) argue, a sustainable IT approach will need to address customer and societal values first before long-term economic benefits can be realised. This will require some strategic thinking in the development of green IT strategies and the scope of work should not be limited to equipment life cycle management, with which many organisations have already demonstrated good practice, but taking account the entire IT value chain considering the relationships between the organisation, its customers and how they impact with the broader environment, the society and the country. The firms need a systematic approach in identifying, evaluating and prioritising sustainable issues. In the meantime, the government should set standards and relevant legislation for organisations to comply with.

The case study of St Lucia demonstrated much good practice, such as the use of renewable energy, e-waste solutions and e-business strategies, which reduce costs to both the companies and their

clients. Sustainability will undoubtedly continue to receive a lot of attention from business practitioners and their stakeholders, and green IT strategies should be part of a firm's long-term competitive planning process. Sustainability through green IT can improve corporate reputation, raise awareness of green issues and in return attract customers and investors because, by addressing green issues, the organisation is seen as a reliable and responsible business entity interested in the long-term welfare of the society and future prospect.

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