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The Value of Green IT: a Theoretical Framework and Exploratory Assessment of Cloud Computing

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Abstract

The phenomenon of climate change and the resulting focus on energy consumption has created a consensus among businesses about the need for a collective reduction in carbon emissions. A range of new Green technologies, such as Cloud computing, provide unprecedented opportunities to improve the efficiency of business operations and represent a realistic opportunity to reduce energy costs and combat global warming. Enterprises are equally concerned with optimising the business value derived from investments in Green IT. However, evidence from the literature shows that the measurement of IT value is a complex, challenge involving multiple stakeholders. Green IT, such as Cloud computing, adds further complexity to the understanding of IT value as the expected operational and business benefits should also be complemented by environmental and societal concerns.

This paper contributes to the area of Cloud computing and Green IT research through the development of a framework that measures the value of Green IT. The framework expands on the work of Corbett (2010) and is developed as a result of a comprehensive literature review of both seminal works in the IT value field and also the most recent studies in Green IT. This paper demonstrates the efficacy of the value framework by reporting from a series of case studies involving Cloud computing. Using exploratory case studies, this study highlights the utility of the model and its applicability to multiple contexts. Although the framework can be applied in multiple settings, the findings highlight a number of areas that are prominent in SMEs and those in need of further attention.

Keywords: Cloud Computing; Green IT; IT Value; SME

1 Introduction

The challenge of identifying and quantifying the contribution and value of IT investments has been present since the early days of MIS (Keen, 1981) and still represents a core question for the IS discipline (Kohli and Grover, 2008). More recently, with interest in the environmental impact of IT growing as a result of scientific research and widespread media reporting on global warming, the IT value challenge for Green IT has become more prominent. In contrast to traditional IT valuation, Green IT presents an extra challenge in that not only must Green IT investments meet operational and business requirements, but they must also respond to complex environmental objectives all while meeting the expectations of a growing and diverse group of stakeholders (Connection_Research, 2010). Given the limits of traditional IT value frameworks in relation to Green IT, and the increasing urgency to use IT to support environmental sustainability (Melville, 2010), a more tailored approach on the value of Green IT is required. This paper provides such an approach by developing for the first time a comprehensive Green IT value framework and presenting results from an exploratory analysis of Cloud computing in the SME sector.

2 Theoretical Background

Accurately identifying the value contribution of IT is vital for justifying future investments in technology and understanding success in information systems (Epstein and Rejc, 2005, Keen, 1981). An initial catalyst for research in this area was the IT productivity paradox (Brynjolfsson, 1993), which suggested that large investments in IT do not have a corresponding positive impact on productivity. Further investigation resulted in the general agreement that while IT does have positive economic impacts, difficulties with measurement (Brynjolfsson, 1993, Chan, 2000), ambiguity regarding both the dependent and independent variables (DeLone and McLean, 1992, Larsen, 2003), inability to capture intangible effects (Brynjolfsson and Hitt, 2000, Mittal and Nault, 2009) and varying levels of analysis, result in conflicting outcomes (Brynjolfsson and Hitt, 1996, Thatcher and Pingry, 2004).

Agarwal and Lucas (2005) suggest that demonstrating the value of investing in IT is fundamental to the contribution of the IS discipline. However, IT value can manifest itself in many ways and the specific types of value have not been definitively identified or clearly demonstrated (Kohli and Grover, 2008). Several studies have made the case that IT valuation is a complex issue involving social action that can extend over a period of time (Farbey et al., 1993) and hence should be studied in a more comprehensive fashion (House, 1980).

A seminal contribution to the field of IT value was the DeLone and McLean IS Success Model (1992, 2003), which provided a comprehensive taxonomy of the dimensions of IS success. In 2003, DeLone and McLean published a re-specification of the model, adding the dimension of service quality and collapsing individual and organizational impacts into a single construct called net benefits (DeLone and McLean, 2003). These changes recognised the fact that IT may have both positive and negative impacts that can be felt at multiple levels from individuals, groups, organizations and society at large (Seddon, 1997, DeLone and McLean, 2003). This research recognised the multi-dimensional nature of success and multiple perspectives of stakeholders who perceive the impact of IT.

Many of the initial benefits of Green IT occur at individual and organizational levels, making traditional IS success and IT value models useful in helping to assess the traditional impacts (i.e. use, satisfaction, performance, economic value) associated with Green IT investments. However, these approaches are limited because they fail to capture the full complexity and reach of Green IT. Furthermore, although numerous authors such as Bingi (2006), DeLone and McLean (2003) and Seddon (1997) have recognized the societal value of IT, the literature to date focuses mainly on individual and organizational level impacts of IT. It is a possibility that in the long run, the societal benefits of Green IT will outstrip the initial firm-level cost savings or efficiencies. Therefore, it is important to ensure that models for identifying and measuring the value of Green IT take into account the full range of impacts, from the direct financial impacts to the broader societal level benefits.

From a review of the literature it is clear that there are many diverse definitions of Green IT, each conveying a plethora of different meanings and perspectives of value. Gartner (2007), Walsh (2007) and Murugesan (2008, p25) offer varied perspectives and definitions on Green IT. This study preferred Bachour and Chasteen's (2010) definition: Green IT involves using technology efficiently, while taking into account the triple bottom line: "economic viability, social responsibility and environmental impact" (Bachour and Chasteen, 2010, p1). Similarly the Cloud offers a variety of definitions for example, Armbrust et al. (2010) who define Cloud computing as the applications delivered as services over the Internet and the hardware and systems software in the data centres that provide those services. It leverages shared infrastructure to deploy and balance IT resources to cater to the computing needs in real-time (Armbrust et al., 2010). Cloud computing can help organizations improve their Green credentials by providing a shared and on-demand infrastructure with virtualization capabilities (Durkee, 2010, Vouk, 2008). Thus, organizations can access services and infrastructure on an as-needed basis and promote the ability to maintain distributed workforces.

3 Green IT Value Framework

This study proposes a framework developed to identify and measure the value derived from Green IT. From a review of the existing knowledge on IT Value, it is critical to capture not only a wide range of value dimensions but also account for the important impact levels of Green IT. The proposed framework was stimulated by a similar review by Corbett (2010) but significantly extends this work through a comprehensive literature review that defines the theoretical basis for each impact level and value dimension, thus making an important theoretical contribution to the IS research field. The diagram below displays the layout of the framework. The impact levels consist of societal, organisational, customer and supply-chain. The value dimensions consist of economic, environmental, ethical and competitive position. The table also provides definitions for each impact level and value dimension along with the relevant references.

	Definition	**Reference**
Impact Levels		
Society – Shared Value	Identifies and expands the connections between societal and economic progress.	Porter and Kramer (2011)
Organisational	It is rare for any change to occur in	Leavitt (1964)

	isolation. Leavitt identifies technology, tasks, people, and the organizational structure in which they function as four interdependent variables, visualized as the four points of a diamond. Change at any one point of the diamond will impact some or all of the others.	
Customer	Customer Relationship Management is essential for creating value for both the firm and its customers through the appropriate use of technology, data and customer knowledge	(Payne and Frow, 2005)
Supply-Chain	Integrating environmental criteria, or concerns, into organizational purchasing decision and long term relationships with suppliers	(Gilbert, 2000, p. 6)
Value Dimensions		
Economic	A large subset of empirical studies apply econometric approaches by analyzing the relationship between IT investments and economic variables, such as productivity Return on Sales (ROS), Net Present Value (NPV), Cost Benefit Analysis (CBA), Economic Value Added (EVA), and Return on Asset (ROA)	(Hitt and Brynjolfsson, 1996), (Bharadwaj, 2000), (Graeser et al., 1998, Strassmann, 1990, Strassmann, 1997, Van Heck and Van Bon, 1997).
Environmental	Green IT benefits the environment by improving energy efficiency, lowering greenhouse gas emissions, using less harmful materials, and encouraging reuse and recycling	(Murugesan, 2008).
Ethical	Firms seem to concern themselves with what is good and evil or right and wrong, and involve an inquiry into what ought and ought not to be done in the business practices and operations	(Aurifeille and Quester, 2003).
Competitive Position	How firms leverage their investments to create unique IT resources and skills that determine overall effectiveness in an industry sector	(Clemons and Row, 1991, Carr, 2003).

Table 1 –Green IT Value Framework

The application and use of this high-level framework is intended to be comprehensive and adaptable to different types of Green IT and also to different company and industry sectors. This paper presents evidence of the adaptability of the framework by developing exploratory case studies that provide an initial application of the framework to the SME sector using Cloud computing as an increasingly common example of Green IT.

4 Research Methodology

This study was structured around two main objectives: to develop a comprehensive theoretical framework that represents the value dimensions and impact levels of Green

IT; and to empirically test the framework in order to evaluate its usefulness for academics and practitioners. Exploratory case studies were therefore used to evaluate the Green IT value framework. Saunders et al (2000) define an interpretive case study as the development of detailed, intensive knowledge about a single case, or a small number of related cases. Three exploratory case studies are presented in the following section. Given the importance of including multiple perspectives in value identification, the case study participants represent both supplier and customer perspectives. In order to identify suitable case study participants, exploratory interviews were held with a number of leading professionals and academics in the Green IT industry. These included a sustainability leader with a telecommunications multi-national company, the head of Cloud computing at a leading IT MNC, a senior manager for a sustainability program at a large IT MNC and a leading academic in the area of Green IT. This small sample also provided advice and feedback in relation to the Green IT Value Framework prior to data collection. Interviews with these participants lasted between 1 and 3 hours. In order to build the case studies, both primary and secondary data was used. In-depth interviews were conducted with senior management and/or the CEO of the companies. Additional employees were also contacted to provide more information where necessary. Interviews were structured according to each of the value dimensions and impact levels. In total, ten interviews were conducted. In addition, secondary data was also used to support and corroborate findings; extensive use was made of government reports, company websites, industry reports, relevant third party studies and company case studies.

The case studies comprise SMEs, within the ICT industry, recognised as being particularly successful in using and supplying forms of Cloud computing services. SMEs were chosen for the following reasons. Firstly, there is significant focus on the ICT industry in the Green IT sector, given their expert technical knowledge. Secondly, emissions from the ICT industry are expected to significantly increase, in a business as usual (BAU) scenario, from 0.53 billion tonnes (Gt) carbon dioxide equivalent (CO2e) in 2002 to 1.43 GtCO2e in 2020. However, there is minimal focus on SMEs in efforts to reduce this figure. SMEs however, play a hugely important role in many economies, representing about 95% of all private sector firms in most modern nations (Schaper 2002). They further contribute to economic development by creating employment and by providing desirable sustainability and innovation in the economy as a whole (Ganzi et al. 2004).

5 Cloud Computing Case Studies

This section presents three exploratory case studies of SMEs who supply or extensively use Green IT, specifically Cloud-based technologies. In each case, findings are presented in the Green IT value framework. The dual role of supplier and user of Cloud services provides a balanced perspective on value identification.

5.1 Case A

Case A are regarded as a supplier and user of Green IT in that they develop and supply Cloud services to their customers and extensively use Cloud services in their own business operations. Case A use virtualisation for example, to provide consultancy services on the SQL Server platform to optimise customers' performance. Case A were established in 1994, part of the ICT sector in Ireland, providing software solutions for

businesses. The business consists of about forty full time workers and about twenty five contract workers. Case A are a Microsoft Gold Certified Partner for both information worker and custom software development solutions. They work with a diverse range of companies, both Irish and international, large and small and across many sectors. Their business is the delivery of appropriate and cost effective software solutions, tailored to the requirements of their customers. The following represents an application of the proposed Green IT value framework to Case A:

Dimensions of Green IT/Cloud Value by Impact Level				
	Economic	**Environmental**	**Ethical**	**Competitive Position**
Impact on Society	N/A	Reduced Co2 emissions	N/A	N/A
Impact on Organisation	Cost savings Increased flexibility	Reduced power consumption Reduced burning of fossil fuels Reduced Co2 output	N/A	Increased productivity Improved Strategic Position More efficient processes Cross Functional integration
Impact on Customer	Cost savings from more efficient operations as a result of Cloud	Reduced travel due to more online communication technologies	Makes them think more about optimising Green investments in the data centre.	Increased communication and collaboration options Quicker response times
Impact on Supply Chain	Reduction in server purchasing	Purchase recycled ink cartridges and batteries. Focus on more Green suppliers of laptops and desktops.	More cost and efficiency focused than ethical	Strong relationship with Microsoft who supply them with the latest technologies.

Table 2 - Application of Framework to Case A

5.2 Case B

Case B are an organization of approximately fifty employees dedicated to providing education and developing research on environmental projects. The organization exemplifies that mission through its own actions. Case B has won many international awards for their adoption of Green initiatives. The company headquarters for example, has been certified under the Canada Green Building Council's Leadership in Energy and Environmental Design (LEED) Gold standard for new construction. This study focused on Case B's adoption of Cloud computing and in particular on the adoption of Avaya Intelligent Communications Manager, a converged voice solution for small and medium-sized organizations. It provides Case B with comprehensive applications for telephony and unified messaging on a reliable, secure platform. The following represents an application of the proposed Green IT value framework to Case B:

Dimensions of Green IT Value by Impact Level

	Economic	**Environmental**	**Ethical**	**Competitive Position**
Impact on Society	Potential for cost savings from reduced travel.	Teleworking has reduced commuters' carbon emissions by 30% and eliminated over 23 metric tons of ghg emissions per year from commuting.	Educates society to make positive lifestyle changes Exemplifying through their own actions.	Reputation as a Green company. Green IT enables them to exemplify their Green mission
Impact on Organisation	Green IT in the data centre is saving $3500 a year. IP infrastructure has reduced wiring costs by $44,400. IP telephony has cut tolls by $2,400 per year. Estimated savings of $200 on long distance calls every month.	Teleworking has reduced commuters' carbon emissions by 30%. Energy-efficient Avaya Data Solutions have saved them more than 35,000 kilowatt-hours annually. Avaya switches use 50% less energy, compared to rival products. Case B are now using just 2.4 kilowatts per hour in the data centre.	Case B has empowered each employee to make individual and personal changes by encouraging them to carpool to work and telecommute. Have a philosophy to keep improving in the Green space	Avaya Softphones and VPN connection has improved flexibility as work can be accessed anywhere, any time. Avaya Intelligent Communications has aided a culture of innovation and creativity.
Impact on Customer	Internet and communication technologies have reduced the need for customers to travel A plan to use Avaya web.alive would allow customers to interact with shows online, reducing the need for air travel	Provide education for customers to learn how to protect the environment and increase sustainability. Incentives offered to reduce IT waste e.g. Green4Good Program. Plan to use Avaya web.alive to create a club where people interact in a virtual environment, reducing the need for air travel and related carbon emissions.	Focus on communicating to kids the importance of protecting biodiversity and adopting more sustainable behaviours. Equip kids with the knowledge, skills and tools necessary to make an impact on the natural world.	Downtime problems have been reduced now that the Avaya system is in place meaning customers experience less inefficiency. Provide increased communication options to educate customers.
Impact on Supply Chain	Making monetary savings on a reduction in electricity supply. Saving on transport costs from sourcing from as many local vendors as possible.	86 kilowatts of solar panels off-set the amount of electricity their data centre uses. Source from as many local vendors and like-minded organizations as possible and seeking out the most energy-efficient products.	Strive to apply sustainable practices to their overall behaviour including the supply chain	Strong vendor relationships have been built by the strategy to source from as many local vendors and like-minded organizations as possible.

Table 3 - Application of Framework to Case B

5.3 Case C

Case C is an IP and technology law firm located in the USA who specialise in issues such as software, technology transactions, Internet law, privacy issues and software audit defence. Case C have about 10 employees and this study focused on the company's experience of moving from an office based operating environment in a congested city to a fully mobile/cloud-based enterprise communication system using Avaya IP office. The following represents an application of the proposed Green IT value framework to Case C:

Dimensions of Green IT Value by Impact Level				
	Economic	**Environmental**	**Ethical**	**Competitive Position**
Impact on Society	N/A	Reduction of Co2 emissions due to less commuting.	N/A	Green Committee
Impact on Organisation	$60,000 cost savings. Saved about 33% in total operating expenses.	Reduction of nearly 40 tonnes of pollutants	Employees are now working smarter, more effectively and more environmentally friendly.	Quicker task completion/decision-making. Increased flexibility – employees can work from anywhere, any time Cross-functional integration.
Impact on Customer	No cost for meetings with customers	Less required travel means less co2 emissions	N/A	Can contact Case C employees more easily. E.g. the biweekly conference call.
Impact on Supply Chain	Cost savings due to a reduction in electricity supply, paper and waste disposal costs	Small initiatives to reduce the environmental impact of technology	Thinking more green in a technology supply sense	Closer vendor relationships due to better communication.

Table 4 - Application of Framework to Case C

6 Key Findings

This section considers the key findings from the case studies, examining both the value dimensions and the impact levels for these implementations of Cloud computing.

6.1 Green IT Value Dimensions

The findings show that in all cases significant financial value has been derived from Green IT investments. Case B has measured several areas where they have gained financial value such as the data centre, wiring costs, tolls and calls. Case C have achieved financial gains from Green IT with operating costs now significantly less as a result of reduced building requirements. Case A has also achieved financial value through cost savings but has not measured it in such a way to produce a precise figure of the saving. This finding correlates with Nidumolu (2009), similarly showing that

becoming environmentally friendly lowers costs because companies end up reducing the inputs they use.

Both Case B and Case C have achieved and measured the environmental value of their Green IT investments. For example, Green IT has helped both to reduce energy consumption and costs by increasing utilization and decreasing the number of servers and physical floor space in the data centre. Not surprisingly, given the company's core focus on the Green area, Case B has developed many metrics to measure environmental value. However, Case C also measured the environmental impact of their initiatives aided by a free website recommended by their Green IT supplier.

Case B had developed the strongest ethical philosophy, to strive to apply sustainable practices to overall corporate behaviour. They also set an example by backing up their mission with Green implementations for instance their building is certified under the Canada Green Building Council‘s Leadership in Energy and Environmental Design (LEED) Gold standard for new construction. Case C has also created strong ethics regarding the environment. Although this was initially unintended, it is now a strong focus of the company. Their strategy now prioritises behaving in a more environmentally friendly manor with the results of greater efficiency and reduced expense. The effects of Green IT encouraged these companies to change their ethical value perspective to reflect a more environmentally sensitive approach. This has resulted in environmental impacts as now a major part of future IT decision making in these companies.

Cloud computing has had a significant effect on the competitive position in each of the cases. All three organisations have increased productivity in different ways. Similar to other research (Irani, 2002), the strategic position for both Case A and C has been strengthened by the Cloud as employees can now do their jobs more effectively. Flexibility has been increased in all organisations as employees can work remotely (Kohli and Grover, 2008), highlighting that intangible assets can be affected by IT investments, such as organizational capabilities. Additionally, cross-functional integration has been made easier in all cases as a result of unified communications (Perez et al., 2007). Processes have also been affected in all cases with improvements in efficiency for example, the communication process in all organisations has been made easier with collaborative tools, live meeting or conference calls. This correlates with Street and Meister (2004) who similarly argue that ICT can help increase the organisational transparency of SMEs to internal and external stakeholders by facilitating communication within and between firms. Cases B and C believed that they have strengthened their reputation as a result of implementing leading edge Green IT. Additionally, Case B and C specifically pointed to the potential of enhancing innovation and creativity through the use of Green IT.

6.2 Impact Levels

Cloud computing has had many effects on each of the cases. A common organisational impact was increased employee effectiveness as a result of increased technical efficiency from using the Cloud. Almost all organisational benefits from Green IT can be interlinked. For example, Case A achieved increased productivity as a result of time saved on project set-up from virtualisation. Unified communications also aided them in being more efficient due to easier communication and collaboration mechanisms.

Additionally at Case A, virtualisation enabled quicker customer environment deployment and replication. This allowed tasks to be completed more quickly. Communication tools like Live Meeting and unified communications have also increased efficiency with less travel required and quicker communication available. Similarly at Case B and Case C, task completion has been made easier by real time, anywhere communication options from Avaya. Benefits such as employee empowerment, innovation and flexibility have been strengthened at Case B as a result of a more mobile, remote workforce. Furthermore, at Case C the culture within the organisation has evolved as a result of Cloud-based communication options. Employees have been empowered to be a more mobile, remote workforce that is more cognisant of the impacts of resource usage. These findings correlate with Dendrick et al. (2003) who regard IT as an enabler of organizational changes, such as communication and coordination that can lead to improved firm performance and employee effectiveness.

The two most common impacts of Cloud computing on customers across all the cases were a reduction in the need to travel and quicker completion of work. For example, at Case A project set-up times were reduced from two days to two hours. Additionally, the replication of the customer environment was made much quicker due to virtualisation. At Case B, Green IT meant downtime for systems was reduced. Cloud-based technologies improved communication options for customers in each organisation. For example, unified communications were used in all of the organisations allowing customers to contact employees in several different ways. This resulted in a more efficient communication process and enabled the development of stronger relationships with customers. Additionally, Case B used the Cloud to educate their customers with various online initiatives and plan to use a virtual environment to save customers travelling to view their product demonstrations. This evidence confirms that these firms are now investing heavily in Green IT assets to better manage their interactions with customers before, during and after purchase (Bohling et al., 2006).

The impact on supply-chain operations was minimal in all three organisations. The main impact was a reduction in the supply of electricity and a small reduction in supply-chain logistics at Case C. Additionally, at these three organisations, the supply of servers required was reduced by virtualisation. Case B sourced their supplies from local and like-minded organisations to get the most energy efficient products. This was mainly due to their primary business focus on environmental impact however, this approach was not a major priority in the other cases. It would be expected that larger organisations with more complex supply chain operations would yield more examples of how Cloud computing may provide value in this level.

Both Case B and Case C have realised significant societal impacts as a result of adopting Cloud technologies. Green IT has offered Case B a greater opportunity to offer environmental education to their customers online. Their plan to host live shows in a virtual environment on their own servers could have a significant impact on society with less travel required. Case C has also had a positive impact on society as a result of adopting Green IT. Avaya‘s IP office system has allowed their employees to be more remote and mobile meaning for society there is less traffic and less pollutants. Additionally, they have created a better work life balance for employees. All three organisations have had a positive impact on society in terms of reducing carbon emissions, although Case A have not specifically measured this. Case B have developed business partnerships with various local businesses and communities who share their

Green agenda and are possibly the best example of contributing value to society. Case C also intend developing their green strategy to contribute further to this area. The development of partnerships with local businesses or other community partners is an important aspect of creating shared value in society (Porter and Kramer, 2011). It is argued that by creating benefit for society as a whole, companies will in the longer term reap important economic gains. These cases provide good examples of how enhancing the competitiveness of the company can simultaneously advance economic and social conditions in the community in which they operate.

7 Discussion

This study developed the work of Corbett (2010) to produce a theoretical model consisting of value dimensions of Green IT and the relevant impact levels. By examining the case studies through each element of the framework, it is apparent that this approach provides significant utility in identifying and categorising value dimensions at specific impact levels in a structured manner. Although exploratory in nature, the cases provide evidence of the explanatory power of the theoretically proposed value dimensions. As expected, the findings show that certain elements of the framework proved more applicable than others in the specific context of SMEs. In particular, the economic and competitive position value dimensions were most prominent and represent two important areas in the early stages of Green IT adoption. Although some examples of environmental value and ethical value were apparent, these areas could be developed further. In addition, the framework highlights that the levels of organisation and customer might represent a more relevant starting point for SMEs at the early stages of Green IT maturity. Although it is not surprising that companies place higher importance on economic and competitive value dimensions, it is nevertheless important that ethical and environmental aspects are included. The challenge for companies is to recognise and place importance on these less tangible dimensions (Remeni and Bannister, 2003). This framework is useful therefore in that it provides a structured approach to identify less tangible aspects of value and also the potential to conceptualise how differing value dimensions may complement each other. Clearly, the value dimensions and indeed the impact levels do not exist in isolation but rather work in synergy. This framework thus develops an integrative, interdependent view on value and specifically encourages companies to approach social issues from a value perspective and focus on connecting societal and economic progress (Porter and Kramer, 2011).

However, the cases demonstrate that leadership and change in organisational culture are critical in order for social value and impact to be realised from investments in Green IT. The results highlight that these SMEs are using types of Green IT and Cloud services however, they also convey that there is not enough effort being made to measure the value of these investments. This results in the real value of the investment not being sought and consequently not fully realised. The findings demonstrate that it is possible for small companies to measure the investment, as demonstrated by Cases B and C in particular, however it requires significant change in organisational culture and mind-set to shift behaviours from the norm to a more effective, efficient, environmentally friendly ethos.

8 Conclusions and Further Research

This study proposed a Green IT value framework and evaluated it using exploratory case studies of Cloud computing. The results highlight the utility and applicability of the model to multiple contexts. Initial evidence from the case studies suggests that the proposed Green IT value framework is a parsimonious and comprehensive attempt to capture the primary value categories of Green IT. Further research is required to test the explanatory power of the framework however, this study provides an invaluable first attempt at proposing value dimensions and impact levels. The framework also encapsulates an important contemporary challenge for businesses, outlined by Porter and Kramer (2011), in which economic value is created in a manner that also creates value for society. In order to respond to current social, environmental and economic problems, companies must reconceive the intersection between society and their own corporate performance. The proposed framework provides a structured alternative to the myopic view on economic value by identifying a range of dimensions relevant to investments in Green IT that address the needs and challenges of society.

It is important for future research to test the framework with different company types and industry sectors in order to evaluate the explanatory power in various idiosyncratic settings. The framework could also be usefully implemented along with an evolutionary model in order to identify how value dimensions are developed and achieved at different stages of maturity and sophistication.

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