Green It Strategies: A Case Study-Based Framework For Aligning Green It With Competitive Environmental Strategies

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GREEN IT STRATEGIES:
A CASE STUDY-BASED FRAMEWORK FOR ALIGNING GREEN IT WITH COMPETITIVE ENVIRONMENTAL STRATEGIES

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Abstract

Green Information Technology (IT) has become an important topic in IT management research and practice in the last years due to economic opportunities and increasing pressure from stakeholders. However, many IT organisations fail to manage their environmental efforts in an adequate manner since they neglect the strategic aspects of this topic. This paper reveals the strategic relevance of Green IT on the basis of a literature review that refers to fundamental approaches of Strategic Management and Information Systems research and emphasizes the necessity of aligning business, sustainability, and IT domain. The argumentation is accentuated by a multiple-case study that analyses the Green IT implementation practices of four companies on the basis of semi-structured interviews. The findings of the cross-case analysis indicate that there is no consistent approach for aligning Green IT with corporate sustainability goals and business objectives so far. To close this research gap, we conceptualise a Strategic Green IT Alignment Framework and identify four distinct Green IT strategies. The suggested framework is supposed to provide guidance for decision-makers in selecting an appropriate Green IT strategy that contributes to the achievement of corporate sustainability targets and leverages competitiveness.

Keywords: Green IT, Strategic Alignment, Sustainability, Strategy, Environmental Strategies, Competitive Advantage.

1   INTRODUCTION

Sustainability has emerged as a relevant topic of strategic management during the last years – and it is supposed to become a game-changing megatrend (Lubin & Esty 2010). However, business executives are struggling to identify sustainability-based sources of competitive advantage and to integrate environmental aspects into their corporate strategy. In addition, the strategic role of information technology (IT) still challenges executives due to the fact that the IT strategy must be aligned with the business strategy to enhance firm competitiveness (Henderson & Venkatraman 1993). Anyhow, IT/business alignment remains a major concern of Chief Information Officers (CIOs) and the necessity to consider and manage environmental aspects of IT further increases the complexity of this strategic challenge (Chan et al. 1997; Avison et al. 2004; Luftman 2004).

The operation of IT systems comes along with considerable carbon dioxide (CO_2) emissions that drive climate change while the demand for data processing and storage capacities is continuously rising. Thus the implementation of Green IT practices that enhance energy efficiency and the consequent application of environmental technologies that substantially decrease IT-related CO_2 emissions are urgently needed (GeSI 2008). Green IT is acknowledged as a strategic technology that will play a fundamental role in reengineering of business and production processes to reduce the environmental footprint of organisations (Watson et al. 2010). Besides, Green IT practices can induce cost savings and the utilisation of environmentally-friendly technologies often has a positive return on investment (Harmon et al. 2010).

Green IT can support low-cost strategies or facilitate competitive differentiation on the basis of environmental initiatives. As a consequence, Green IT has the potential to create competitive advantage in the business and sustainability domain and should be addressed as a strategic issue (Zarrella 2008). The interrelation of business strategy, sustainability goals, and IT constitutes a complex challenge which simultaneously implies great opportunities for environmental protection and economic progress. However, Green IT initiatives are recently limited to operational cost reductions whereas holistic Green IT strategies that can create competitive advantage and sustainable, profitable growth can hardly be found (Hart 1997; Hart & Milstein 2003). To leverage the full potential of environmentally-friendly IT systems, it is necessary to align the Green IT measures with the competitive environmental strategy. Even so, little research about Green IT alignment has been conducted so far. To contribute to the research concerning the strategic relevance of Green IT, we address the following research questions:

- Why and how do IT organisations implement Green IT measures (state-of-the-art)?
- How can Green IT optimally support competitive environmental strategies?

To answer these research questions, the paper is structured as follows. First, the relevant research topics are introduced in the scope of an extensive literature review. In section 2 we define the term Green IT, illustrate major drivers of Green IT adoption, explain crucial approaches of strategic management, analyse the strategic relevance of sustainability, and illustrate the necessity of IT/business alignment. Next, we present the results of our multiple-case study analysis in section 3, describing current Green IT implementation practices of four organisations. Based on the insights of the literature review and the results of the cross-case analysis, we discuss our findings in section 4 and emphasize the need for the strategic alignment of Green IT. In section 5 we conceptualise the Strategic Green IT Alignment Framework (SGITAF), which facilitates the consideration of strategic aspects of Green IT and identifies four distinct Green IT strategies. In section 6 we draw our conclusions and outline the contributions this research does make. The SGITAF is supposed to assist practitioners in identifying an adequate Green IT strategy that supports the environmental goals of the firm, and the paper contributes to the fields of Strategic Management and IS research by giving new insights concerning the strategic relevance of sustainability and the potential of Green IT for enhancing value creation and firm competitiveness.

2   LITERATURE REVIEW AND THEORETICAL BACKGROUND

2.1   Definition and drivers of Green IT

Green IT has become the latest buzzword in IT management although a common understanding of the coverage and scope is still missing in research and practice (Velte et al. 2008). Some researchers also prefer the term "Green IS" (Boudreau et al. 2008). Watson et al. (2010) emphasize that the term Green IS incorporates the concept of Green IT and comprises a greater variety of possible initiatives to support sustainable business processes. A comprehensive overview of current research on Green IT is provided by Molla (2009). The author argues that amongst researchers the terms *green*, *eco-efficiency* and *sustainability* are widely used. In this paper we apply the term *green* to specify the analysis and minimization of environmental impacts. This specification of *green* differs from the term *sustainability*, which is more far-reaching (see section 2.2) and refers to the balanced consideration of economic, environmental and social aspects (Erek et al. 2009). Hence, the process of corporate *greening* can be understood as a first step towards the superior goal of sustainability (Molla 2009). Harmon and Auseklis (2009) refer to Green IT as "the practice of maximising the efficient use of computing resources to minimise environmental impact." The Info-Tech Research Group (2009) conceptualises Green IT as "initiatives and strategies that reduce the environmental footprint of technology" by increasing efficiency and reducing the demand for resources. In line with Elliot (2011) we define *Green IT* as follows:

Green IT is the systematic application of practices that enable the minimization of the environmental impact of IT, maximise efficiency and allow for company-wide emission reductions based on technology innovations.

Green IT is supposed to significantly decrease the environmental footprint of the IT industry and to foster environmental innovations in other industry sectors (Dutta & Mia, 2010). Nonetheless, one of the current key challenges of Green IT is to advance from uncoordinated cost-cutting investments to consistent Green IT strategies that leverage the full potential of innovative environmental technologies (Harmon et al. 2010; Olson 2008).

Motivation	Driver	Source
Economic opportunities	a) Cost savings b) Revenue growth c) Prevent resource restrictions d) Risk reduction e) Innovation f) Repositioning	Accenture (2009); Bansal & Roth (2000); e-Server-Consortium (2009); Harmon & Auseklis (2009); Hart & Milstein (2003); Info-Tech (2009); Skinner (2009); Zarnekow et al. (2009); Zarrella (2008)
Stakeholder pressure	g) Emission and waste reduction h) Reputation i) Media attention	Accenture (2009); Bansal & Roth (2000); e-Server-Consortium (2009); Esty & Winston (2009); Hart & Milstein (2003); Info-Tech (2009); Nunn (2007); Zarnekow et al. (2009); Zarrella (2008)
Legislation	j) Regulatory compliance k) Legitimacy	Esty & Winston (2009); Harmon & Auseklis (2009); Hart & Milstein (2003); Info-Tech (2009); Zarrella (2008)
Ethical motives	l) Corporate citizenship m) Top management n) Company values	Bansal & Roth (2000); Nunn (2007); Zarrella (2008)

Table 1.   Overview of drivers of Green IT initiatives.

The major drivers for Green IT adaptation at firm level are presented in table 1. Bansal and Roth (2000) identify four major drivers of environmental initiatives: economic opportunities, stakeholder

pressure, legislation and ethical motives. This classification scheme is applied to structure the list of drivers of Green IT initiatives that were identified in the prevailing literature.

Today, the most important driver for the implementation of Green IT measures is the reduction of operational costs. The improvement of IT efficiency is vital since the demand for computational and storage capacities is ever-increasing while energy prices are rising and stakeholders are demanding for responsible business practices. A positive return on investment is still crucial for Green IT initiatives since the strategic potential is not recognized so far (Olson 2008). This highlights the need for a holistic Green IT strategy approach that aims at the creation of competitive advantage on a more profound basis.

2.2   Sustainability as a new dimension of corporate strategy

The most common definition (Bansal 2005) of the term sustainability originates from the WCSD (1987): "Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs." Sustainable management considers the effects of business activity under consideration of the triple bottom line. It refers to a long-term process of simultaneously optimizing economic, environmental and social goals to ensure the enduring activity of business practices. Sustainability "is in the process of becoming a competitive and strategic issue" (Elkington 1997) and it is supposed to cause fundamental shifts in the competitive landscape and create game-changing opportunities (Dutta & Mia 2010). That is why organisations must advance from unfocused investments to consistent sustainability strategies being aligned with core business activities (Lubin & Esty 2010). There is empirical evidence for a positive relationship between corporate responsibility and firm performance (Funk 2003; Hart & Milstein 2003; Klassen & McLaughlin 1996). Porter and Linde (1995) even claim that the efficient use of resources is a new paradigm, uniting environmentalism and competitiveness.

The fundamental objective of strategic management research is to identify how competitive advantage can be created and sustained (Teece et al. 1997). Strategies determine the firm's market position and identify necessary key resources being required to assure long-term competitiveness. Porter (1996) emphasizes that strategy is always a question of choice, coming along with trade-off decisions. Different complementary approaches which identify the sources of competitive advantage have evolved during the last decades (Orsato 2009).

Porter's competitive positioning approach focuses on the company's external context and argues that business success depends on the attractiveness of the industry and the firm's relative position in that industry. To achieve competitive advantage, a firm must pursue a clear and focused strategy (Porter 1980). Porter proposes three distinct generic positioning strategies: the low-cost strategy, which aims at low prices and high sales volumes, the differentiation strategy, which targets unique products and premium pricing, and the focus strategy, which seeks for small but profitable market segments. The disregard of the structure and internal competencies of the firm in the scope of Porter's strategic positioning approach resulted in the development of the Resource-Based View (RBV), which can be seen as the dominant approach of strategic management today (Eisenhardt & Martin 2000). The RBV analyses the significance of firm-specific resources and capabilities for the creation of competitive advantage. Grant (1991) distinguishes between tangible, intangible, and personnel-based resources while capabilities are organisational competencies, such as processes and business routines. Resources and capabilities should be the basis for the formulation of corporate strategy because they are the sources of competitive advantage and shape the firm's permanent identity.

Porter's strategic positioning approach is directed towards the external competitive environment whereas the RBV elucidates internal firm-specific sources of competitive advantage. Wade and Hulland (2004) emphasize that the consolidation of these complementary strategic approaches is appropriate and applied by numerous IS researchers.

Economic and environmental value can be created in the internal domain by enhancing the efficiency of processes and material utilization, both resulting in cost savings and emission reductions. In the external domain, sustainability can constitute a unique value proposition the customers are willing to pay for. Sustainability-related innovations can create new markets and enable differentiation while an improved firm reputation can increase the demand for products and services. Olson (2008) states that a "green strategy has the potential to significantly impact both top line revenue growth and bottom line cost savings." He emphasizes the crucial significance of aligning the sustainability strategy with the business, IT, and technology strategy. However, the value creation potential of sustainable business practices depends on the firm-specific context. Competitiveness and returns will only increase if the eco-investments are appreciated by internal or external stakeholders (Bieker 2005).

Orsato (2009) proposes four generic, choice-based environmental competitive strategies which distinguish between the internal and the external domain of value creation and competitive advantage, which refers to the consolidation of the two leading strategic management approaches as explained above. He underlines that "strategy implies choice, priority, and focus" (Orsato 2009) and comes along with trade-off decisions. The environmental strategies are subdivided into two dimensions: in the "competitive advantage" dimension, firms can either pursuit a low-cost strategy by reducing their operational costs through environmental initiatives, or they can strive for competitive differentiation based on a superior, sustainability-related value proposition. The "competitive focus" dimension determines whether the environmental investments are targeted at internal organisational processes or at market-oriented products and services. On the basis of this classification, four different environmental strategies are defined, as illustrated in Table 2.

		Competitive focus	
		Organisational processes	Products and services
Competitive advantage	Low-cost	*Eco-efficiency*	*Environmental cost leadership*
	Differentiation	*Beyond compliance leadership*	*Eco-branding*

Table 2.   Generic competitive environmental strategies (Orsato 2009).

The *eco-efficiency* strategy aims at the minimization of waste, by-products and emissions. In this way, the production efficiency can be enhanced and costs can be reduced. Although initiatives that allow for a reduction of the environmental footprint and simultaneously come along with cost savings are attractive for virtually every firm, this strategy proves to be particularly appropriate for mass volume producers with intense industrial processing. The *beyond compliance leadership* strategy concentrates on organisational processes as well, but the competitive advantage is rooted in differentiation rather than in cost reductions. Firms pursuing this strategy even approve unprofitable environmental initiatives to reduce their environmental footprint. The positive corporate image helps to attract new customers and to intensify the relationships with established ones. In contrast, the *eco-branding* strategy refers to a competitive focus on products and services. This strategy strives for competitive differentiation based on environmental product characteristics. The customer must be willing to pay for this environmental differentiation. Hence, reputation and credibility are important intangible assets associated with this strategy. In highly price-sensitive markets, the *environmental cost leadership* strategy can be a suitable approach. This strategy targets radical product innovations instead of incremental process enhancements. Substitution of decisive input materials or new business practices can significantly change markets and competitive conditions.

2.3   Strategic IT/business alignment

For many years already, IT/business alignment is a major concern of business executives and the number one topic of CIOs (Luftman 2004). Many firms are not able to leverage the full potential of their IT due to a lack of alignment between the IT and their business goals. Firms that have a high

degree of alignment achieve to apply IT for strategic purposes, to position themselves strategically in the market, and to leverage their core competencies with the help of the latest technologies (Ravichandran & Lengworsatien 2005). Strategic alignment can result in superior strategies due to the fact that the "alignment process and its outcomes constitute a unique firm asset capable of producing IT-based competitive advantage" (Kearns & Lederer 2003). Avison et al. (2004) underline that "firms cannot be competitive if their business and information technology strategies are not aligned."

Henderson and Venkatraman (1993) develop the Strategic Alignment Model (SAM), which is the most widely applied alignment concept in academic research and practice (Tarafdar & Qrunfleh 2009). The SAM differentiates between four domains of alignment: business strategy, IT strategy, organisational infrastructure and processes, and IT infrastructure and processes. The alignment of these four domains is achieved by the utilization of two established concepts of strategic management: strategic fit, which describes the interrelation between the external environment and the internal structure of the organisation, and functional integration, which addresses the harmonization of the business and the functional domains respectively. The externally-oriented strategies are determined by their scope, specific competencies and governance principles while the internally-oriented domains specify the provisioning of infrastructure and processes and the development of required functional architectures and skills. The four domains of the SAM must be balanced to achieve strategic IT/business alignment. To do so, Henderson & Venkatraman (1993) develop a system of cross-domain relationships, which are denominated alignment perspectives. Within the SAM, four dominant alignment perspectives are explained: strategy execution, technology transformation, competitive potential, and service level.

2.4 Summary

As revealed by theoretical and empirical research, Green IT practices can indeed have the capability to leverage firm competitiveness. By implementing consistent Green IT initiatives, competitive advantage can be created and thus Green IT should be understood as an integral part of IT strategy. IT-based environmental initiatives can support low-cost strategies or facilitate competitive differentiation. However, the interrelation of business strategy, sustainability goals and IT constitutes a complex challenge. Even so, linking and aligning these strategic domains promises great opportunities for environmental protection and economic progress. Regardless, Green IT initiatives are considered recently as a means to reduce costs and risks whereas technology-based overall strategies aimed at the creation of competitive advantage and sustainable, profitable growth can hardly be found.

3   CASE STUDY ANALYSIS

Dealing with the research question of why and how IT organisations implement Green IT measures, the qualitative case study method (Yin 2009) allows us to get an in-depth view on Green IT implementation practices. The selection of four cases facilitates data for a cross-sectional analysis for studying various organisational types and their strategic direction. This research approach provides insights into diverse strategy types, thus illustrating the challenges of Green IT adoption. The methods of data collection were document analysis (e.g. presentations, catalogue of measures) and face-to-face interviews with subject matter experts (SME), such as CIOs, IS and environmental managers. The interviews were based on a structured interview guideline, were conducted by two researchers to ensure the reliability of findings by convergence of observations (Eisenhardt 1989) and were recorded. The transliterated interviews were analysed using content analysis. Because of the small sample of four cases, the findings (section 4) and the generalisability are limited. Nevertheless the results indicate possible relations and give empirical information about the topic of this research.

Case 1 – Green IT at a Public Institution (called PubInst)

PubInst is a public institution and offers IT and telecommunication services to the public administration. For the provisioning of IT services it operates a highly secure data centre. PubInst began early to implement Green IT measures, prior to regulatory requirements. Currently, the topic of Green IT plays a strategic role within the organisation. Especially for this purpose, PubInst pursues a holistic approach by having established a "task force Green IT" with eight members, each responsible for a particular working area (e.g. procurement, data centre, product management, office environment, sales etc.). This interdisciplinary team develops measures and recommendations, ensuring a cross-divisional adoption and implementation of Green IT practices and encouraging company-wide energy efficiency improvements as well as environmental awareness.

Case 2 – Sustainability commitment at an internationally operating bank (called Ibank)

Case 2 deals with a global financial institution located in Germany. Ibank offers financial services throughout the world. As a globally acting investment bank, Ibank committed itself to sustainable business principles. The corporate sustainability strategy is focused on environmental protection, social equality and responsible corporate management. With the goal of operating all business processes in a climate neutral way, Ibank set up a company-wide strategy to promote climate and environmental responsibility internally and externally towards its stakeholders. For this purpose, Ibank has defined specific targets, areas of action, and measures for the environmental operations teams striving for an environment-conscious use of resources, to increase the purchase of renewable energies and to improve the energy efficiency of the technological infrastructure. As a contribution to the climate neutral operations strategy of the company, the IT department initialised the Green IT program. The key elements of the program are to ensure that the used IT applications and the infrastructure are resource-efficient during their whole life cycle, to improve the IT energy efficiency in the data centres and to reduce the energy consumed by IT activities in the office environment.

Case 3 – Green IT at an internal IT service provider of a large corporate group (called ISP)

ISP is an internal service provider and part of a large corporate group. The company's core activities are the provision and support of IT infrastructure solutions. The corporate group is committed to the concept of sustainable development and pursues a sustainability strategy with special regard to the principles of the United Nations Global Compact. This commitment is carried out through the entire value chain towards all the stakeholders, especially the employees, customers, suppliers and stockholders. A detailed report on the basis of defined objectives and performance indicators is presented in an annually published sustainability report. All subsidiaries and service companies – and hence, ISP as well – have also been integrated into the sustainability program. To support the sustainability targets of the corporate group, ISP initialised the "Green IT project". The scope of this project is to develop measures designed to optimize processes and software and to roll out energy-efficient server installation concepts. Furthermore, resource-friendly configuration of IT workstations and adopting a more restrained approach to the use of printers are additional objectives.

Case 4 – The sustainability strategy of an IT service provider (called ITSP)

ITSP is part of a corporate group and provides IT solutions and outsourcing services. ITSP does not only deliver its products and services to the corporate group (like ISP in case 3) – a large share of its revenues comes from external customers. ITSP's solutions are consistently aligned to the customers' business goals and its portfolio ranges from system integration to the comprehensive management of IT infrastructure. ITSP holds the opinion that environmental sustainability goes far beyond Green IT and develops a specific "IT sustainability program". Decision-makers are starting to go one step further and declare sustainability to be a primary strategic goal. The sustainability strategy of ITSP already plays a role in the design of products and services. In addition, ITSP offers solutions and services that encompass sustainable, IT-based resource management. The program coordinator affirms that "the development of sustainable IT strategies and solutions will play an important role in environmental protection."

The results of the cross-case analysis are summarized in table 3 to illustrate the strategic direction of the Green IT/sustainability practices of the four different companies. To draw conclusions from the results of the case studies, we structure the data that was gathered through semi-formal interviews according to the relevant aspects that were identified in the literature review of section 2. As displayed in table 3, the conducted interviews initially focused on the strategic integration of sustainability aspects throughout the organisation, thus referring to the argumentation of section 2.2, which revealed the strategic relevance of environmentalism. The Green IT strategy section of table 3 illustrates the characteristics of the alignment of Green IT measures in the companies that were analysed in the scope of the multiple-case study. The interviews revealed whether the Green IT initiatives of the companies support the sustainability goals of the corporation. The drivers of Green IT implementation are identified and classified on the basis of the literature review of section 2.1. Furthermore we analysed how Green IT is supposed to enhance competitiveness along the dimensions of Orsato's competitive environmental strategies that were explained in section 2.2.

	Case 1	Case 2	Case 3	Case 4
Sustainability and environmental strategies				
Sustainability is an integral part of corporate strategy	Yes	Yes	Yes	Yes
Environmental goals defined	Yes	Yes	Yes	Yes
Environmental competitive strategy formulated	Yes	No	No	Yes
Type of environmental competitive strategy (according to Orsato 2009)	Eco-efficiency, eco-branding	Not defined; focusing cost savings	Not defined; focusing cost savings	Environmental cost leadership
Green IT strategy				
IT strategy defined	Yes	Yes	Yes	Yes
Green IT is part of the IT strategy	Yes	No	No	No
Green IT strategy is aligned with sustainability goals	Yes	No	Yes	Yes
Drivers of Green IT measures	Cost savings	Cost savings	Cost savings	Strategic repositioning
	Reputation	Media attention	Corporate citizenship	Innovation
	Regulatory compliance	Stakeholder pressure	Top management	Revenue growth
	Company values	Corporate citizenship	Corporate values	Economic opportunities
Green IT investments follow a clear logic to enhance competitive advantage	Yes	No	No	Yes
Competitive advantage of implemented Green IT measures	Low-cost & differentiation	No focus	No focus	Differentiation
Competitive focus of implemented Green IT measures	Internal processes, products and services	Internal processes	Internal processes	Products and services

Table 3.   Results of cross-sectoral case study research.

4   FINDINGS

In the four analysed organisations Green IT was implemented on the basis of a variety of different measures. Each organisation defined environmental goals to reduce its overall environmental footprint

to contribute to the attenuation of the possible impacts of climate change. However, Green IT initiatives primarily aim at reducing operational costs by decreasing resource consumption. Besides, the companies strive for a positive reputation of the enterprise and want to prevent restrictive regulation by legislation, for instance strict laws for IT-related CO_2 emissions. Through Green IT implementation and cooperation with stakeholder groups, the companies hope to minimize the risk of restrictive governmental regulations, which would come along with higher production costs. Through Green IT initiatives, companies expect to influence and direct policy and regulation.

Due to the substantial electricity consumption of servers, the data centre is in the focus of numerous Green IT practices. Most companies are not unconditionally concerned with environmental aspects and motivated to protect the environment. They are rather carefully balancing benefits based on operational cost decreases, product differentiation and improvements of firm reputation against required investment expenses. But rising energy and resource costs are continuously enhancing the business case of Green IT.

The interviews indicated also that almost all IT organisations are in some kind of dialogue with stakeholders about Green IT. More and more sustainability reports feature Green IT related aspects to communicate the organisations' activities to stakeholders. Moreover, some companies favour environmental initiatives to advance their innovation competencies or to reposition their products in the market. Another driver is the revenue growth potential of Green IT. In combination with appropriate marketing strategies, environmentally-friendly products and services are becoming increasingly favoured by consumers – corporate sustainability can contribute to differentiate from competitors.

However, Green IT initiatives solely target cost and risk reductions while neglecting the significance of an overall sustainability/Green IT strategy in IT management (see table 3). Although IT strategies are defined in most cases, Green IT is not always reasonably integrated into these strategies. Regardless, companies are trying to decrease their environmental impact by applying uncoordinated environmental measures and the analysed IT service providers still lack a consistent environmental strategy being complementary to the business activities. As revealed by the literature review (section 2), Green IT practices can indeed have the capability to leverage firm competitiveness, but the case study results indicate that this strategic potential is largely disregarded. By implementing consistent Green IT initiatives, competitive advantage could be created – if Green IT is addressed as a strategic issue and integrated into the concept of IT strategy. However, the interview partners emphasized that the interrelation of business strategy, sustainability goals and IT constitutes a complex challenge.

Based on these findings it becomes obvious that there is a need for consistent Green IT strategies. For this reason, the next section proposes a conceptual framework for the identification of an adequate Green IT strategy that leverages sustainability and firm competitiveness.

5   CONCEPTUALISING THE STRATEGIC GREEN IT ALIGNMENT FRAMEWORK

As argued in section 2, aligned Green IT strategies are essential because they can contribute to the achievement of sustainability targets of corporations. Firm competitiveness can be improved through environmental commitment that differentiates from competitors and enhanced efficiency that comes along with higher productivity. To leverage Green IT's full potential, a company requires a clear strategic orientation and consistency of its sustainability and Green IT strategy. The multiple-case study (section 3) indicates that executives need a sound rationale that conducts their sustainability initiatives for setting priorities in line with the company's core business. Non-aligned environmental activities do neither lead to increased competitiveness nor to the optimal reduction of the firm's environmental footprint. The development of aligned Green IT strategies requires the appreciation of the impact that IT and corporate sustainability can have on firm competitiveness. As argued in section

4, referring to the findings of our case study analysis, a framework for the alignment of business, sustainability and IT strategies is strongly needed.

To conceptualise such a framework, we firstly integrate the concept of Green IT into the theoretical concept of IT strategy. This integration facilitates the linkage of Green IT practices to the strategic context of the firm. As displayed in figure 1, the IT has a strategic impact on the internal organisation (supporting and designing business processes), on competitive advantage (efficiency/differentiation), and on the product portfolio (technological innovations) of the firm (Bakos & Treacy 1986; Earl 1989). We argue that the IT has an impact on the environmental footprint of the corporation as well and according to this, the Green IT strategy should be an integral part of the IT strategy. As a consequence, the IT strategy is linked to the business strategy and the sustainability strategy of the firm. Hence the Green IT strategy should be aligned with the corporate sustainability goals to support environmentalism optimally. This can be achieved on the basis of decreasing emissions and waste in two areas: on the one hand, in the scope of the IT organisation (purchase, operation, and recycling of IT systems); on the other hand throughout the whole organisation (reengineering of production and business processes). The Green IT measures can either focus on efficiency enhancement, which comes along with decreasing operational costs, or they can aim at ecological differentiation, which distinguishes from competition and creates additional value. By developing innovative environmental technologies, the company can differentiate from competitors as well (Harmon et al. 2010).
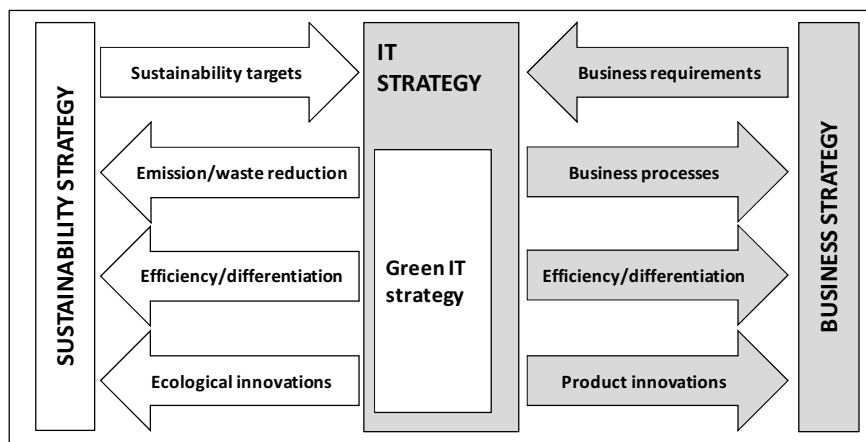

Figure 1.   Conceptualisation of IT strategy.

As discussed above, competitive advantage should be regarded from two dimensions: the internal dimension, where IT can enable cost-efficient business processes, and the external dimension, where IT can be utilized to provide unique customer value (Henderson & Venkatraman 1993). The IT organisation should be effective and efficient in the provisioning of internal, standardized technology solutions while developing externally-focused distinctive solutions considering the strategic business context (Gartner 2008).

At this point we conceptualise the Strategic Green IT Alignment Framework (SGITAF). It was emphasized above that Green IT mainly consists of cost-saving measures while the strategic relevance is largely disregarded. The exploitation of the full competitive potential requires the strategic alignment of Green IT strategy and competitive environmental strategy. We refer to the generic competitive environmental strategies of Orsato (2009) that were introduced in section 2.2. This generic, choice-based conceptual typology of environmental strategies corresponds closely to our understanding of business strategy, value creation, and competitive advantage based on environmental initiatives. Furthermore, the SGITAF is based on the fundamental logic and procedures of the SAM (Henderson & Venkatraman 1993), which proved to be useful for executives and investigators, and which is in line with our distinction between internal and external sources of competitive advantage.

The SAM has the purpose of aligning the IT and business domain whereas the proposed SGITAF is aimed at aligning the IT and sustainability domain.

The SGITAF should help practitioners and academics in identifying Green IT-related sources of competitive advantage and aligns the externally-oriented Green IT strategy with the competitive environmental strategy. In analogy to the SAM, the SGITAF refers to the achievement of strategic fit and functional integration as displayed in Figure 2. Strategic fit describes the interrelation between externally-oriented strategies at business level and the internal structure of the organisation. The SGITAF links uncoordinated Green IT measures at functional level to the strategies at competitive level. The achievement of strategic fit removes the prevalent constraints of the strictly internal perspective of Green IT practices and connects Green IT with the strategic external perspective, thus integrating customer and stakeholder aspects and revealing sources of competitive advantage for product differentiation or low-cost strategies. Sustainability goals can only be achieved if the strategies are implemented on the basis of an appropriate IT and organisational infrastructure, which constitutes the basis for low-impact business processes. The process of functional integration between the Green IT and the environmental sustainability dimension considers the impact of Green IT concerning the sustainability strategy and vice versa, thus indicating how Green IT can leverage the competitive sustainability strategy and how a sustainability-oriented infrastructure in conjunction with environmentally-friendly processes can increase the sustainability of business operations.
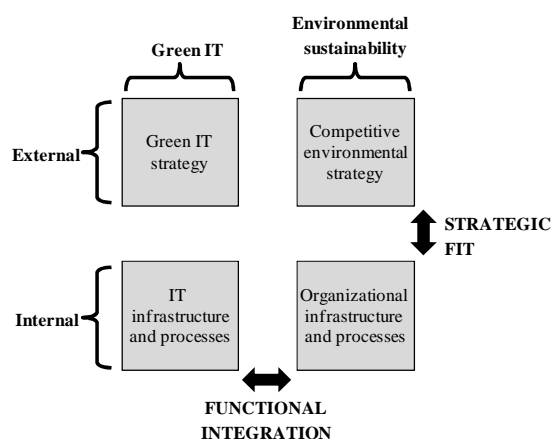

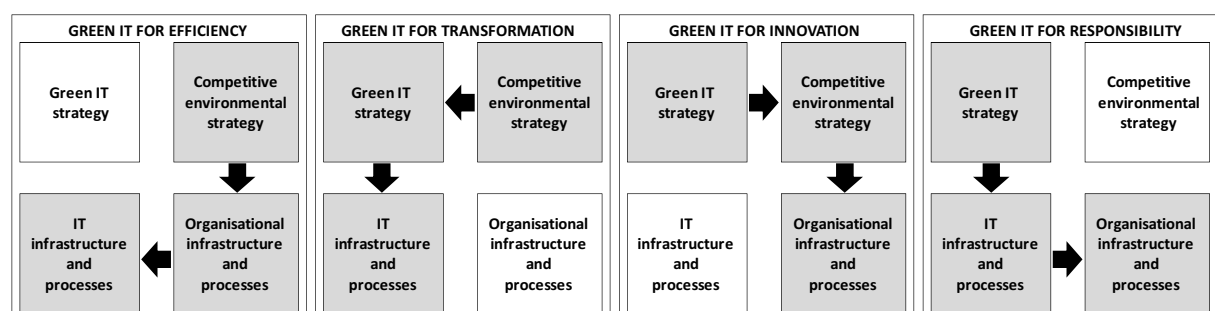Figure 2.   Components of the Strategic Green IT Alignment Framework.

Figure 3.   The four alignment perspectives of the Strategic Green IT Alignment Framework.

Referring to the SAM, we argue that the four domains displayed in Figure 2 must be balanced to achieve strategic Green IT alignment. In analogy to the SAM, we identify four dominant alignment perspectives, which determine the cross-domain relationships and the specific characteristics of each domain. Each of these alignment perspectives corresponds to one of the previously introduced

environmental strategies. The alignment logic of the four alignment perspectives is illustrated in Figure 3 and their main characteristics are summarized in Table 4.

The *Green IT for efficiency* alignment perspective corresponds to the eco-efficiency environmental strategy. The business strategy is the driving force and promotes superior resource productivity. This strategy aims at achieving competitive advantage on the basis of a low-cost approach and focuses on the internal infrastructure and processes. As a consequence, the environmental strategy has a firm-wide scope and the efficiency of business operations is a major goal. Sustainability is regarded from a cost perspective and Green IT measures are implemented if they allow for superior efficiency, coming along with operational cost decreases. The environmental strategy corresponds to business requirements and the IT is guided by this strategy. The alignment logic reveals that environmental practices targeting the organisational infrastructure are determined by the competitive environmental strategy, which demands for efficient business processes. This efficiency focus sets the terms for the implementation of Green IT practices.

The second alignment perspective, denominated *Green IT for transformation*, is driven by the eco-branding competitive environmental strategy, which aims at product and service differentiation based on environmental attributes. These environmental products usually target niche markets and customers that are willing to pay for the costs of environmental differentiation. Green IT serves as crucial strategy enabler. Green IT-related opportunities are thoroughly considered by the top management. The sustainability management strives for environmental technology leadership and exploits the full environmental potential of the latest technologies. The IT management is responsible for the development of environmental technologies that facilitate a state-of-the-art Green IT infrastructure. Innovative IT solutions are an integral part of the product or service and the environmental characteristics are appreciated by the customers (e.g. provisioning of a CO2-neutral e-mail service). The alignment logic reveals that the Green IT strategy enables the competitive strategy on the basis of a specific Green IT infrastructure, which is not constrained by the organisational infrastructure.

The alignment perspective *Green IT for innovation* fits the environmental cost leadership strategy, which refers to a product focus while following a low-cost strategy. This strategy is associated with radical product innovations instead of incremental process improvements and it is appropriate if the firm strives simultaneously for the lowest environmental impact and the lowest production costs within its competitive environment. This can only be accomplished through radical technological innovations, which are anticipated by a visionary top management that is committed to environmentalism and targets business leadership at the same time. As a result, the Green IT strategy should leverage innovations and drives the competitive environmental strategy. The top management seeks for business and sustainability opportunities which are based on innovative technologies. The IT management regards environmental technology trends and analyses their impact for the business in close cooperation with the top management. IT influences the business and sustainability strategy as well as product characteristics while the environmental practices change the organisational processes fundamentally.

The fourth alignment perspective is called *Green IT for responsibility*. It is associated with the beyond compliance leadership environmental strategy, which has an extended scope covering the entire range of internal processes with the goal of sustainability-based competitive differentiation. The key performance criteria are oriented towards stakeholder satisfaction while the IT management plays an important role for executive leadership. The top management and the sustainability management facilitate direction, analyse stakeholder claims and prioritize investments. The Green IT strategy strives for a high quality, low-impact IT infrastructure that enhances the process efficiency of the whole organisation. Green IT promotes the extraordinary environmental dedication and even unprofitable investments that allow for further emission reductions are realized. This gives the firm a first mover advantage in the field of sustainability, shaping the shopping behaviour of customers and resulting in an outstanding firm reputation.

Competitive environmental strategy	Competitive advantage	Competitive focus	Objective of sustainability management	Objective of IT management	Performance criteria
Perspective 1: Green IT for efficiency					
Eco-efficiency	Low-cost	Internal processes	Support business strategy	Implement business strategy	Cost/service centre
Perspective 2: Green IT for transformation					
Eco-branding	Differentiation	Products and services	Differentiate from competition	Develop green technologies	Environmental technology leadership
Perspective 3: Green IT for innovation					
Environmental cost leadership	Low-cost	Products and services	Become industry leader	Drive ecological innovations	Business leadership
Perspective 4: Green IT for responsibility					
Beyond compliance leadership	Differentiation	Internal processes	Fulfil stakeholder claims	Minimize environmental impact	Stakeholder satisfaction

Table 4.   Characteristics of the Green IT alignment perspectives.

6   CONCLUSION AND FURTHER RESEARCH

In this paper we analysed the strategic impact as well as the underlying dimensions of Green IT on the basis of an extensive literature review. We pointed out that competitive advantage can be achieved by either lowering costs or providing differentiation. Practitioners must acknowledge that strategy is always a question of choice, coming along with trade-off decisions. A consistent Green IT strategy that creates sustainable competitive advantage necessitates the consideration of technological and environmental aspects.

As revealed by the multiple-case analysis, the topic of strategic Green IT alignment is highly relevant, especially because Green IT still consists of the implementation of uncoordinated measures while the strategic potential of environmental technologies is neglected. The presented framework for strategic Green IT alignment can help to develop a consistent Green IT strategy. It distinguishes between the internal and external perspective, which are aligned by the concept of strategic fit, while the Green IT and environmental sustainability domain are aligned through functional integration. The suggested Green IT alignment perspectives, *Green IT for efficiency*, *Green IT for transformation*, *Green IT for innovation*, or *Green IT for transformation*, are selected according to the firm's sustainability goals and competitive orientation.

However, this research is only a first step towards a stringent approach of Green IT alignment. Our small sample of four cases provides only a limited overview of company practices. In order to get a representative sample and to advance the applicability and validity of the suggested alignment procedure, an extension of the sample size is strongly needed. In particular, more IT organisations – especially internal IT service providers and/or IT departments and their strategic alignment logic – should be studied in order to verify, to refine, and, where appropriate, to extend this research.

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