

Developing Ecological Sustainability A Green IS Response Model

Hedman, Jonas; Henningsson, Stefan

Document Version

Accepted author manuscript

Published in:

Information Systems Journal

DOI:

[10.1111/isj.12095](https://doi.org/10.1111/isj.12095)

Publication date:

2016

License

Other

Citation for published version (APA):

Hedman, J., & Henningsson, S. (2016). Developing Ecological Sustainability: A Green IS Response Model. *Information Systems Journal*, 26(3), 259–287. <https://doi.org/10.1111/isj.12095>

[Link to publication in CBS Research Portal](#)

General rights

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

Take down policy

If you believe that this document breaches copyright please contact us (research.lib@cbs.dk) providing details, and we will remove access to the work immediately and investigate your claim.

Download date: 20. Apr. 2024



Developing Ecological Sustainability: A Green IS Response Model

Jonas Hedman and Stefan Henningsson

Journal article (Post print version)

This is the peer reviewed version of the following article: Hedman, J., and Henningsson, S. (2016) Developing ecological sustainability: a green IS response model. Info Systems J, which has been published in final form at [10.1111/isyj.12095](https://doi.org/10.1111/isyj.12095).

This article may be used for non-commercial purposes in accordance with [Wiley Terms and Conditions for Self-Archiving](#).

First published online: 20 January 2016.

Uploaded to [Research@CBS](#): Januar 2016

Developing Ecological Sustainability: A Green IS Response Model

Jonas Hedman & Stefan Henningsson

Copenhagen Business School, Department of IT Management, Howitzvej 60, 2000 Frederiksberg, Denmark.

Accepted for publication in Information Systems Journal

Abstract

Growing private and public concern with the environment is pushing businesses to increase their awareness and action. Using the Nordic bank Nordea as a case study and a Green IS organizational response model developed on the basis of extant literature, we investigate how Green IS initiatives become part of a firm's overall strategy and part of the organizational sustainability process. We find that Green IS initiatives are initiated through a bottom up process where environmentally concerned individuals identify issues and become Green IS champions. They use their authority and edification skills to promote Green IS to the organizational agenda. If the issue is aligned with the organizational agenda, it receives management's endorsement. The empirical case also shows two types of systemic feedback that can fuel a self-reinforcing sustainability process. The first type of feedback increases the champion's ability to promote Green IS in the future through authority and edification. The second type leads to transformation of organizational value through reinforcement and extension. Finally, we identify interrelationships between organizational response processes, where higher order response processes, e.g. change of corporate values, function as gatekeepers or pre-conditions for when and which issues are promoted to the organizational agenda.

Keywords: Green IS, Green IS champion, case study, organizational response, sustainability process, Nordea

“This is not about being perfect, it’s about striving to become better.” Head of Wealth Management at Nordea

INTRODUCTION

In response to increased public awareness of environmental issues, organizations are developing, implementing, and using *Green information systems* (IS) organizational activities and processes to reduce their ecological footprint. For instance, Google and Facebook are locating new data centers in Scandinavia to take advantage of the climate in cooling servers. Aviva, a global insurance company, has installed video conferencing systems and reduced their carbon footprint by 25%.

In parallel, an emergent literature is investigating the antecedents of adopting Green IS (Butler, 2011; Chen et al., 2008; Kim & Ko, 2010; Schmidt et al., 2010) and the implementation process of Green IS initiatives (Bengtsson & Ågerfalk, 2011). Collectively, this research increases understanding of the opportunities and the challenges of using IS in striving for sustainability goals.

However, extant research is typically limited to the study and theorization of Green IS as isolated projects, analytically decoupled from firms’ overall strategy and organizational sustainability processes (Melville, 2010; Watson et al., 2011). Little consideration is given to how and why some organizations decide to go down the road of Green IS while others do not. Furthermore, failure to understand how Green IS projects relate to the overall sustainability process may in practice lead to Green IS projects becoming one-off actions, without real impact on organizational sustainability. Recognizing these limitations of extant research, a number of authors have called for research that aims at understanding the role of Green IS in the organizational sustainability process (Elliot, 2011; Jenkin et al., 2011; Melville, 2010). Therefore, in our research, we reframe the unit of analysis from the individual Green IS initiative to the relationship between the Green IS and the overall sustainability process to explore the following question:

How do Green IS initiatives and organizational sustainability process influence each other?

Theoretically, we approach this question by adopting Seidel et al.’s (2013) conceptualization of Green IS and view *Green IS initiatives* as a form of organizational response (Dutton & Duncan, 1987; Dutton & Jackson, 1987; Walsh & Ungson, 1991) to sustainability issues (Bansal, 2003; Bansal & Roth, 2000; Tsoukas, 1989). The organizational response literature, as an extension of the behavioral (Cyert & March, 1963) and attention-based views of the firm (Ocasio, 1997), specifically investigates the organizational processes leading up to

organizational actions, and how the organizational inclination toward certain actions evolves over time. It is therefore an appropriate framework to analyze how Green IS initiatives influence and is influenced by the organizational sustainability process.

Empirically, we ground our analysis in a case study of Nordea, a large northern European bank that transformed itself from giving minimal attention to sustainability issues to an organization recognizing ecological sustainability as an important constituent of organizational identity. In this transformation process, appropriation of Green IS formed a key role in the pursuit of ecological sustainability. Nordea's transformation thus provides ample empirical evidence to analyze how Green IS unfolds in a real world setting.

Analyzing Nordea's use of Green IS and the organizational sustainability process within an organizational response framework, we develop a Green IS organizational response model. This model explains organizational responses in the form of Green IS as an interaction between Green IS champion's concerns for ecological sustainability and the prevailing organizational value. The model also shows that if the Green IS initiatives are perceived as successful, they lead to positive feedback, and identification of mechanisms that lead to value transformation (reinforcement and extension) and increases in champion's promotion abilities (authority and edification skills). Over time, contingent on the transformative effects of the Green IS responses, these effects create a self-reinforcing process driving the organization's inclination to attend to sustainability issues through Green IS.

The remainder of this paper is organized as follows: In the next section, we review the literature on Green IS and organizational response and develop an initial conceptual framework. The third section outlines our case study methodology and its justification. In the fourth section we present our empirical material from Nordea and two Green IS projects. Following this we present our findings and discuss its implications. Finally, we conclude the paper.

RELATED LITERATURE AND RESEARCH FRAMEWORK

The significance of sustainability is now widely accepted (Accenture, 2010, p. 12). Today, organizations recognize the desire to create an ecologically sustainable business not only as a one-off defense mechanism, but also as a core strategy and lifelong task (Chen et al., 2008; Marcus & Fremeth, 2009). Paralleling the increasing interest in environmental sustainability from practitioners, the IS discipline has experienced a surge in research on sustainability aspects of IT and IS (Watson et al., 2010).

In section 2.1, we review the literature on Green IS and identify two focuses of attention. The first is the process of selling Green IS to upper management and introducing it into the organization. The second is related to the outcome of Green IS use, namely its feedback on the sustainability process. In section 2.2, we develop an initial research framework based on organizational response literature that explains the relationship between Green IS and sustainability processes.

Green IS

Practice and research related to Green IS and sustainability projects are on the rise. Much of the literatures on Green IS has focused on antecedents to Green IS initiatives (Kuo & Dick, 2010; Molla et al., 2009). For example, Sarkar and Young (2009) found that the existence of an effective cost model and awareness programs surrounding Green IT initiatives would influence managerial attitudes towards Green IS. Kim and Ko (2010) used financial and environmental indicators to identify Green IS leaders versus followers; they examined the influence of management, bottom line considerations, and normative legitimation pressures on the extent of Green IS initiatives in organizations. Similarly, Schmidt et al. (2010) studied the predictors of Green IT adoption, such as corporate management, environmental engagement, and initiatives from IT staff. Butler (2011) studied how institutional imperatives influence the adoption of Green IS initiatives.

Research on Green IS use has shown that the role IS plays in sustainable processes varies between organization. In some organizations, Green IS is used to reduce energy consumption (Bose & Luo, 2011; Corbett, 2010) and is often driven by institutional pressures (Chen et al., 2008) to retain legitimacy. This approach, where the organization is tuned to using minimal resources and which results in a positive impact on both the ecological footprint and the balance sheet (Hedman & Henningsson, 2010) is often referred to as *ecological efficiency* (Chen et al., 2008; Marcus & Fremeth, 2009).

Other organizations adopt an *ecological effectiveness* approach, which involves a redesign of the economy to embrace sustainability, restoration, and regeneration as part of the organizational values. Ecological effectiveness implies attention to acts of sustainability, but also recognition of the reasons for those acts. Thus, ecological effectiveness "...aims beyond merely reducing negative environmental impact by ending ecological degradation. Seeking an ultimate solution for ecological problems, ecological effectiveness oftentimes requires a shift of mindset and transformation of business models" (Chen et al., 2008 p. 188). In such cases, IS is a tool not only applied to reduce the ecological footprint, but also deployed so as to transform or move the organization towards sustainability (Bengtsson & Ågerfalk, 2011;

Butler, 2011; Hedman et al., 2012). Organizational sustainability transformation utilizes two inherent properties of Green IS: support of organizational sensemaking and sustainable work practices (Seidel et al., 2013).

However, examples of organizations embracing an ecological effectiveness strategy are rare. Some current research presents high-level frameworks (Elliot, 2011; Melville, 2010) for the role of Green IS, while others provide theoretically informed empirical studies focusing on single Green IS projects that tend to downplay the embeddedness of IS as an integrated part of a broad-based organizational greening process (e.g. Bengtsson & Ågerfalk, 2011; Butler, 2011). Green IS can assume two broadly defined roles. In the first role – which resembles what Seidel et al. (2013) define as sustainable work practices – Green IS is a consequence of the sustainability process, since a firm's adoption of Green IS is contingent on organizational values (Melville, 2010). An organization that tries to enact its organizational recognition of sustainability can turn to Green IS as a means of streamlining business processes and enabling resource optimization, by, for example, better planning of production processes, scheduling of operations and administrative processes, planning of transportation routes, and monitoring of energy consumption (Chen et al., 2008; Hedman & Henningsson, 2010).

In the second role, which relates to organizational sensemaking, Green IS can be a catalyst for the sustainability process (Elliot, 2011; Seidel et al., 2013). For an organization on a path toward ecological effectiveness, Green IS can provide information on consumption patterns and resource waste, thus reinforcing “good” behavior (Melville, 2010). This role of Green IS rests on its transformational potential; IS can be so deeply embedded into business processes and practices that it is sometimes difficult to distinguish between the IS and its environment. Elliot (2011) provides a conceptual model to understand the relationship between environmental sustainability and human action. It is based on general system theory and consists of six interrelated categories: environment; society; government; industry and alliances; organizations; and individuals and groups within organizations. The role of IS in this model is to support communication among stakeholders, facilitate changing human behavior, and monitor and evaluate behavioral and environmental impact. Similarly, Melville (2010, p. 1) “demonstrates the critical role that IS can play in shaping beliefs about the environment, in enabling and transforming sustainable processes and practices in organizations, and in improving environmental and economic performance.”

Essential in both these roles is that Green IS influences both individual and organizational behavior. Thus, following the identification of these two roles of Green IS vis-à-vis the organizational sustainability process, we make two assumptions about the relationship of Green IS and the sustainability process. First, we regard Green IS initiatives as outcomes of

the sustainability process. Second, Green IS initiatives enable the sustainability process through feedback about behavior and outcomes of environmental work. Together, these two assumptions form a recursive system wherein Green IS is both the consequence and the enabler of the sustainability process. Next, we model such a recursive system and develop a Green IS model, where sustainability and Green IS are part of the organizational agenda.

Green IS Response Model

Organizations face numerous issues (including sustainability) but respond to only a few (Daft & Weick, 1984). The literature on organizational response investigates why some issues are associated with organizational responses, while others are not. In table 1, we summarize key concepts used in the article.

Table 1. Key concepts used

Construct	Description	Indicative reference
Organizational sustainability process	Is the process in which the organization re-invents itself to ensure long-term ecological viability by using Green IS Green IS as providing functional affordances for sense-making and sustainable work practice.	Chen et al., 2008; Seidel et al., 2013
Green IS	The use of IS in organizational activities and processes to reduce the ecological footprint. IS provides support of organizational sensemaking and sustainable work practices.	Elliot 2011; Melville 2010; Butler 2011; Seidel et al., 2013
Issue	Sustainability problems that can be addressed with Green IS and opportunities for Green IS to make a positive impact.	Bansal, 2003
Identification	Recognition of an issue by an individual with matching personal agenda.	Bansal, 2003; Bansal and Roth, 2000
Champion	Individual who identifies and seeks to promote Green IS issues to the organizational agenda.	Schon, 1963; Tushman and Nadler, 1986
Promotion	Action that the Green IS champion undertakes to place the Green IS on the organizational agenda.	Dutton et al., 2001; Peppard, 2001; Schon, 1963
Organizational agenda	Set of green issues that the organization gives collective attention to.	Dutton and Duncan, 1987; Dutton and Jackson, 1987
Endorsement	Organizational-level effectuation of a Green IS response.	Bansal and Roth, 2000
Response	Green IS as an organizational response that goes beyond the individual's resources and discretion.	Bansal, 2003; Melville, 2010
Congruence	Organizations respond only to sustainability issues that are congruent with the organizational agenda.	Tsoukas, 1989

Promotion abilities (Authorization, Edification)	Dynamic impact on the Green IS champion's ability to promote Green IS issues through authorization and edification.	Dutton et al., 2001; Peppard, 2001; Schon, 1963 Howard-Grenville, 2007; Peppard, 2001; Peppard, 2007
Value transformation (Reinforcement and Extension)	Dynamic impact on organizational values by a Green IS response through mechanisms of reinforcement and extension.	DeSanctis and Poole, 1994; Orlikowski, 1992; Orlikowski and Barley, 2001

An *issue* is a development, event, or trend perceived as potentially having an impact on an organization (Dutton & Ashford, 1993). Issues can be perceived as threats, for example a rival's competitive move, or as opportunities, including the opportunity to apply technological innovation to improve the organization. *Organizational response*, on the other hand, is an action, for instance a decision to do something that is formally or informally endorsed at the organizational level to counter the identified issue (Dutton & Jackson, 1987). In this study, we focus on issues for which Green IS is a response. Such issues are identified by concerned individuals, who become *Green IS champions*. Green IS champions *promote* the issues to the organizational agenda to obtain organizational approval. If successful, the organization endorses a *Green IS response*.

The organizational response (or lack thereof) to an issue is contingent on the organizational and individual agendas (Dutton & Duncan, 1987; Dutton & Jackson, 1987). The *individual agenda* is the set of issues that an individual perceives as important and for which the individual pursues actions to counter. The individual agenda is a reflection of personal values held by the individual (Dutton and Jackson 1987). The *organizational agenda* is the set of issues that receive collective, coordinated attention, and are made legitimate by senior managers through the commitment of resources beyond the individual's discretion (Bansal, 2003). The organizational agenda as a concept is closely linked to theories of organizational schemas (Howard-Grenville, 2007) and organizational values (Bansal, 2003). *Organizational values* are "socially shared cognitive representations of institutional goals and demands" (Rokeach, 1979 p. 50). They provide the decision rules for interpreting the complex and numerous signals within the organizational environment and influence the organizational structure and culture (Ranson et al., 1980). As such, organizational values influence the way issues are interpreted, affecting an issue's inclusion in the organizational agenda (Dutton et al., 1997).

Concerned individuals play key roles in driving the sustainability response process (Bansal, 2003). These salient individuals drive the response process for sustainability issues, in

addition to other types of issues. Bansal (2003) describes issue identification as the activity of recognizing and labeling issues in the issue pool. These issues fit with what the individual sees as important in their personal life. For example, if the individual recycles at home, they will identify recycling at work as an issue. Individuals, often referred to as champions or issue sellers, attempt to shape the organizational agenda by promoting issues to the organizational agenda. *Promotion*, also referred to as *issue selling*, is defined as “the process by which individuals affect others’ attention to and understanding of the events, developments, and trends that have implications for organizational performance” (Dutton et al., 2001 p. 716). A champion’s authority, argumentative abilities/normative knowledge, expertise, and relationships affect the champion’s ability to promote an issue (Howard-Grenville, 2007). *Authority* refers to a mix of formal authority given by a hierarchical position. Argumentative ability (*edification*) refers to how the champions articulate arguments of relevance and feasibility. Expertise refers to how knowledgeable the champion is. Relationships refer to the different ties the champion has within the organization.

Ultimately, organizations respond only to sustainability issues that are *congruent* with the organizational agenda (Tsoukas, 1989). The congruence refers to the fit and the interdependency between organizational agenda and responses. The organization’s resources and the cognitive capabilities of its decision makers limit the size of the organizational response (Dutton, 1997). As sustainability issues are relatively new to many organizations, they may lack routines to manage responses to them (Feldman, 2000). Therefore, their endorsement implies an exploratory search for and innovation of an appropriate response to the issue (Bansal, 2003; Bansal & Roth, 2000; Tsoukas, 1989). Depicting the relationship and the self-reinforcing system between Green IS and the sustainability process, we develop a conceptual research model in Figure 1.

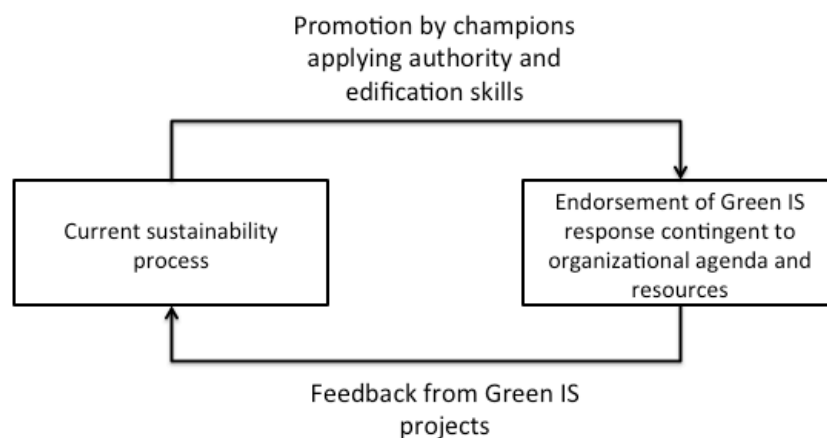


Figure 1. The relationship between Green IS initiatives and sustainability process

METHOD

This article is based on a case research study of Nordea, with the goal of developing an explanatory theory (Gregor, 2006) covering the relationship between Green IS initiatives and the organizational sustainability process.

Case Study Design and Case Selection

To achieve our objective, we base our theoretical development on the organizational response literature. Applying the assumptions used by researchers in this area, organizations are systems that identify, understand, and interpret issues (Daft & Weick, 1984). The ontological assumption, then, is that issues exist separate from organizations and the epistemological assumption is that organizations interpret those issues. Nevertheless, we accept that organizational change can ultimately be seen as socially constructed. This study frames the sustainability process from a simplified, modest foundationalist view (Feldman, 2002), meaning respondents' descriptions of the process are assumed to be reasonable while the research collects evidence to contradict or support the description.

Nordea attracted our attention during a related study where we had investigated the state-of-art of Green IS in the 50 largest companies in Denmark. In this investigation, Nordea emerged as the company with the most elaborated view of Green IS and an articulated ambition to include Green IS in its transformation towards a more sustainable company. In addition, three main conditions made Nordea a suitable focal organization for a study of the relationship between Green IS and the organizational sustainability process. First, when we began interacting with Nordea, the organization was going through a profound organizational transformation toward improved ecological effectiveness. Second, our initial interaction also revealed that Green IS initiatives had assumed an important position in this development process. Third, Nordea, as a multi-national Fortune 500 company, represents a type of large organization that has an extensive impact on society and ecology.

Data Collection and Analysis

The data collection and analysis of our Nordea study followed an iterative cycle. This means that our theory generation was not linear from data to conceptual model, but rather it emerged through multiple iterations between empirical data and emergent theoretical understanding. We used several preliminary theoretical frameworks and model designs in parallel to guide the process. Therefore, several measures were taken to ensure research quality; Table 2 gives a summary.

Table 2. Measures to ensure research reliability and validity

Reliability	Validity
<p><u>Case study protocols</u></p> <ul style="list-style-type: none"> • List of sustainability initiatives (internal paper, external paper, internal logistics, waste management, water usage, energy consumption, buildings, and Green IT) • List of Green IS/IT initiatives (credit risk management system, Click-to-Power, virtual collaboration tools, virtualization and consolidation of server halls, Power-off, facility management systems). • Organizational charts with potential informants (CRS report and internal documents) • Interview guide with areas of interest • Strategy to allow for new information (dialogue with key informants) • Strategies for different informant competences (broad coverage of employees) <p><u>Case study database</u></p> <ul style="list-style-type: none"> • Audio recording (one for each interview), transcriptions (90 pages) • Project documentation (32 documents of varying length) • Field notes with potential alternatives (1-2 pages for each interview) 	<p><u>Multiple sources of evidence</u></p> <ul style="list-style-type: none"> • Interviews (19 in total) • Internal documentation (annual reports, CSR reports, projects plans, workshop documentation, project proposals, and return on investments-analyzes) <p><u>Establishing chain of evidence</u></p> <ul style="list-style-type: none"> • Extended case stories with extensive use of quotes (see illustrations in section 4) • Key findings of Green IS and sustainability development (see table 5) <p><u>Review of case drafts</u></p> <ul style="list-style-type: none"> • Employees at Nordea received draft case stories (40 pages). Feedback corrected minor misconceptions, but supported our general conception of the role Green IS played in Nordea's sustainability process.

Data Collection

We used two main sources of data to trace Nordea's transformation into a more sustainable organization: (1) documents, such as annual reports, CSR reports, Green IS project plans, workshop documentation, project proposals, and return on investments-analyzes; and (2) interviews with key personnel.

Prior to physically entering Nordea in 2010, we began to collect documents, such as its annual reports from 2005–2010 and its CSR reports from 2008–2010. We continued to collect these documents for the years 2011–2014. We also collected internal documents describing ecological issues and responses, for instance project descriptions of Green IS projects, workshop documentation, and return-on-investment analyses. The documents provided

background information to the company, key historical events, input in narrative case writing, and to triangulate interview findings.

For the interviews, we used strategic, organizational, managerial, and technological theoretical frameworks related to Green IS. The objective was to identify relevant initial conditions, states, events, and transformations necessary to capture Nordea's Green IS development process. Starting in March 2010 with the manager of Green IS projects to get an overview of the process and to identify key informants, a total of 18 interviews were conducted. The interviews lasted on average 60 minutes and, as illustrated in Table 3, the respondents included top and middle management from IT and the business organization, as well as individual employees who were involved or affected by the transformation. We recorded and transcribed the interviews. Interviews with respondents marked with an * were conducted in Swedish whereas the others in English. The final transcriptions were in English. The interviews were wide-ranging and conversational to facilitate the collection of information. Nordea had two requests of us. One was that its name should appear on the paper. The other was that the interviews not contribute to CO₂ emissions. Consequently, we conducted most interviews over the phone.

*Table 3. Interviews**

Interviewee	Relation to Green IS/Sustainability	Interview date	Interaction
Green IT manager*	Responsible for Green IS and project manager for video conference system	2010-03-19	Face-to-face
		2010-05-19	Face-to-face
		2010-08-09	Phone
		2010-10-08	Face-to-face
		2012-04-20	Face-to-face
		2014-03-12	Face-to-face
Video conference project worker*	Employed by Green IT department, working with video conferencing	2010-07-01	Face-to-face
Customer support manager	Active Green IS use and idea creator	2010-07-01	Phone
IS developer*	Project co-worker, conferencing	2010-07-14	Face-to-face
Communication Responsible group IT	Responsible for internal communication from Group IT	2010-07-22	Phone
CSR manager	CSR manager	2010-09-07	Video conference
Premises manager	Premises manager and ecological footprint manager	2010-09-07	Phone
		2010-10-25	
Project leader Power-off*	Responsible for the Power-off project	2010-09-14	Phone
IT developer Power-off*	Involved in the Power-off project	2010-09-14	Phone

IT operations manager	Chairman Green IT committee	2010-09-14	Phone
Communication partner*	Responsible for Nordea's external communication related to Group IT	2010-09-20	Phone
CIO	CIO	2011-02-25	Phone
Eco-footprint manager	Orchestrating ecological initiatives at Nordea	2012-04-20	Face-to-face

Data Analysis

We coded the data in two broad (partly overlapping) phases, with distinct objectives: the first phase involved just coding; the second phase involved both coding and data collection. In both phases, the two entities of organizational sustainability process and Green IS initiatives guided our attention. The first phase of coding of interviews aimed to capture the event-time series of the organizational sustainability transformation, including the position of Green IS initiatives. Coding categories were generic process codes (Van de Ven & Poole, 1995), including events, actions, decisions, outcomes, and states. To determine concepts (such as tension, acceptance, recognition, promotion, hero, etc.) and their properties (e.g., success/failure) in events, actions, decisions, outcomes and states, we applied an open coding procedure. The authors jointly conducted the interviews and coded the data, resolving any disagreements through discussion. The outcome of this coding phase was an event-sequence outlining Nordea's transformation with an unstructured list of concepts that seemed to be relevant in the story of Nordea's use of Green IS and the organization's sustainability process.

The initial findings, for example that Green IS was mainly driven from the bottom up, not top-down, triggered a second phase of more coding as well as continuous data collection. In the second phase, we approached the sustainability process as a theoretical issue extending and challenging our findings. We evaluated the relevance continuously in terms of explanatory potential (Gregor, 2006).

Stimulated by the emerging event-sequences highlighting a salient individual drive and the role of "sustainability heroes" (respondents' wording), we turned to the organizational response literature for a focal category of coding in the sustainability response process. This focal category allowed us to systematically relate the various concepts of Green IS produced in the open coding phase (e.g., "sustainability hero" became "issue champion" and "management acceptance" became "endorsement"). These emerging themes spurred a new literature search for theoretical arguments supporting empirical findings of dynamic effects following Green IS initiatives. Green IS concepts were clustered using a constant comparison method (Corbin & Strauss, 1990); we identified the phenomenon (Green IS) and its process at Nordea before collecting additional data. The subsequent sampling of interviews occurred in

dialogue with the case company, where we sought to find individuals that could have opposite opinions. This eventually rendered two mechanisms for value transformation (reinforcement and extension) and two mechanisms for champion transformation (authorization and edification).

Finally, we used our empirically-induced findings and supportive theoretical arguments to create an initial 40-page case narrative, and a timeline for the development process by tracing the order of events and underlying mechanisms (see figure 3). Employees assessed the representativeness of the findings in our narratives. Largely, the perception of Nordea concurred with our emergent explanation, revealing the need for only marginal adjustments to the narrative.

SUSTAINABILITY PROCESS AT NORDEA

Before presenting the role of Green IS in Nordea's sustainability process, it is important to understand some of the history of Nordea and how sustainability became part of the corporate values. Nordea is now one of the largest financial institutions in the Northern Europe, with over 10 million customers, 32,000 employees and more than 900 branch offices in 2014. The bank is in good financial condition, with an operating profit of €4.324 million during 2013. In 2012, the bank won the title "Bank of the Year" in Western Europe from the industry journal *The Banker*. However, only two decades ago, the banks that today make up Nordea were bleeding financially and fighting for their survival. In the early 1990s, the Nordic countries experienced a profound financial crisis, which challenged the existence of many of their financial institutions. For instance, the Swedish state took over the Swedish part of Nordea (formerly Nordbanken). And in the wake of the financial crisis, four Nordic banks merged under the label Nordea in the year 2000.

In the first few years of its life, Nordea had a strong focus on leveraging economies of scale from the merger. The objective was to reduce costs and secure profitability. The organizational values at the time were "*focus*", "*speed*", and "*performance*". These values were core and influenced all actions and decisions made by bank. By 2006, the bank had reached a stable financial position.

Nordea's Sustainability Process

In 2006, Nordea initiated a strategic repositioning that emphasized customer focus and hired a new CEO. The new CEO changed the management style to involve more discussions with shareholders, employees, and customers. The CEO also initiated a revision of the corporate values. This process started by interviewing thousands of employees and customers, along

with long discussions at the executive management level. The new corporate values that emerged were *“It’s all about people”*, *“One Nordea team”*, and *“Excellence of customer experiences”*.

In this process, Corporate Social Responsibility (CSR) emerged as a key issue among Nordea’s customers and employees. This was at a time when CO₂ emission and global warming were on many politicians’ agendas, competing banks had begun to publish Green reports, and the Swedish state (at that time Nordea’s biggest shareholder) was putting pressure on the bank to become more sustainable. Nordea also noticed that when hiring new employees, candidates were increasingly asking questions about its environmental program and CSR.

“[...] we tried to see what kind of issues people found important and motivating for them. In addition, we were also following the rest of the world and noted that the leading banks were taking care of their CSR.” (CIO)

In response to increasing external and internal pressure, Nordea established a CSR function and hired a CSR manager in the summer of 2008. The role of the CSR manager was to take a holistic grip of all sustainability activities, including producing green annual reports (2008-2013), participating in external committees, and planning future CSR-related activities. The CSR manager explained the link between CSR and the new corporate values:

“The ambition was never to introduce CSR from top-down... it has to be a natural part of all the activities the bank does.... we think that doing responsible business is a prerequisite for staying in business. That’s why these values [corporate—our note] ... ties the story together, we need to have all Nordea employees understand what needs to be done and what responsibility is.” (CSR Manager)

To support and coordinate the different sustainability activities, an umbrella initiative, labeled the Eco-footprint, was established. The initiative organized eight workgroups, each focusing on eight different issues: internal paper, external paper, internal logistics, waste management, water usage, energy consumption, buildings, and Green IT. The Eco-footprint had some ambitious 2016 environmental goals: reduction of energy usage by 50% per employee, customer paper by 50%, and internal printing by 50%. While in 2012 Nordea was behind its targets, in 2013 it reached most of them, except for internal paper and travel. Figure 2 summarizes the total CO₂ emissions spilt into travel and energy.

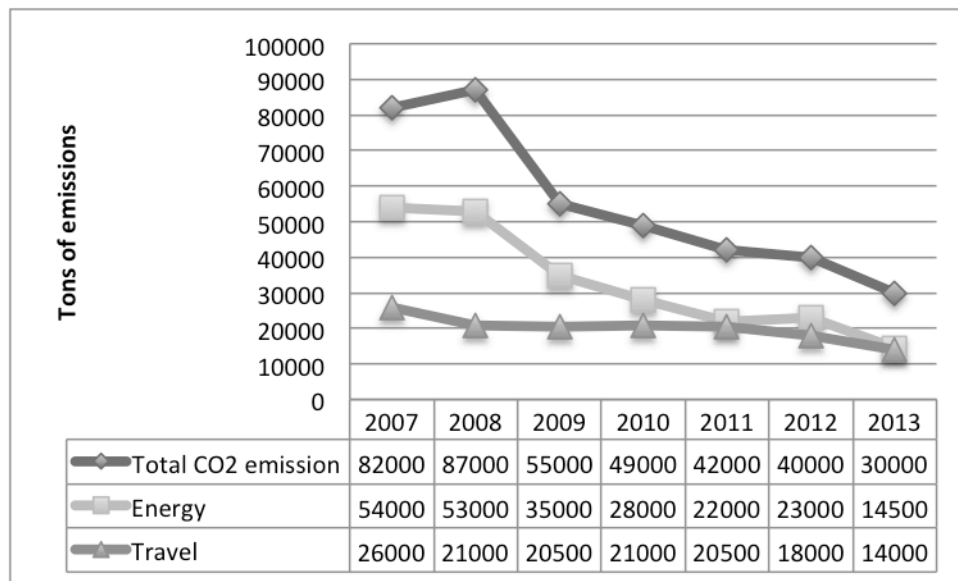


Figure 2. Summary of CO₂ emissions from 2007-2013* in tons (based upon Nordea Green Annual reports from 2008-2013)

*There are some inconsistencies in the Green Annual reports due to changing reporting principles. The large decrease in CO₂ between 2008 and 2009 is the result of Nordea beginning to buy Green electricity and the reduction in 2013 is due to the sale of the Polish subsidiary.

Even though Nordea had not met all its goals by 2013, CSR played an important part in its long-term agenda and influenced most of its business activities.

“...we continued to integrate sustainability into our business, shifting the focus even more towards our everyday banking business.” (Nordea CSR Report, 20013)

The sustainability work follows a strategic plan with the long-term goal of reducing the bank’s environmental impact and integrating CSR into its business activities, for instance, including environmental, social, political, and governance (ESG) analyses in the credit process. The ESG analyses were built upon a model of an Environmental Risk Assessment Tool (ERAT) and a Social and Political Risk Assessment Tool (SPRAT). Nordea has enforced sustainability clauses with all its suppliers to prevent child labor and other misuse. Nordea has also signed the United Nations Process for Responsible Investments. Nordea is also engaged in the “Carbon disclosure project” to influence the business society at large. In Figure 3, we summarize the key events in Nordea’s sustainability process.

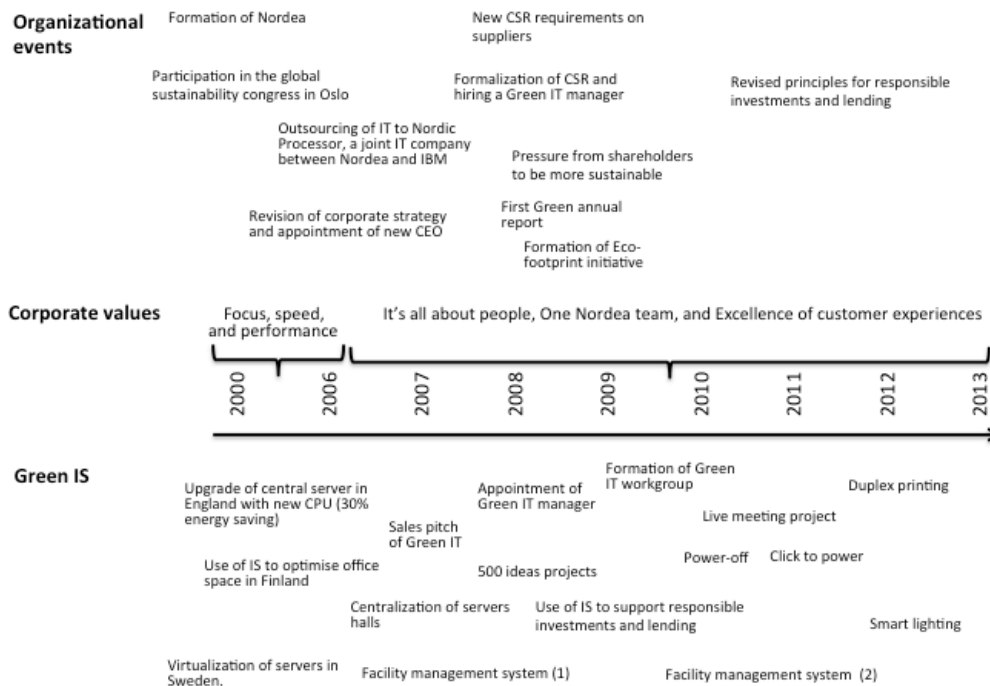


Figure 3. Key events in Nordea's sustainability process, including Green IS

Green IS in Nordea's Sustainability process

Green IS emerged as an issue during the fall of 2007. One employee, at that time working with Nordea's infrastructure operations, was reading the latest reports on global warming while waiting for a flight that would take him to Nordea's headquarters in Stockholm. He thought that someone should to do something about global warming. Then it struck him that he and his fellow co-workers at Nordea were part of the problem.

"I had reflected on these things before. But now the timing was right. ... I got great support from my manager. A couple of months later I was called up to Helsinki to give a presentation on 'Nordea and Global Warming,' focusing on actions Nordea could do." (Green IT Manager)

The topic of the presentation was how Nordea could use IT more effectively to save costs and reduce environmental impact at the same time. The feedback on the presentation was positive.

"The presentation was very convincing. It was obvious that this was something that fitted very well into the emerging strategy." (CIO)

The following year, the project manager became the Green IT manager, responsible for the different Green IT/IS initiatives within Nordea. The Green IT manager was part of a newly formed steering committee, consisting of the Green IT manager, the CSR manager, and the

Premises manager. One of their first actions was the 500 Ideas project, aimed at engaging employees by requesting them to identify issues and green solutions. It was supported by a web-based system, where employees could pose green ideas. The Green IT manager reflected upon the project:

“We were at first discussing to suggest a Green IT campaign... but the issue with that would have been that people aren’t too interested in many of the Green IT issues. Server virtualization, who really cares about that except the IT people ourselves...? So, the campaign was broadened. This was essential to reach out to and to engage a broader audience. After all the Green IT issues have to be seen in a wider context to be really interesting.” (Green IT Manager)

Top management sanctioned the 500 Ideas project, which legitimized sustainability work in the organization. The changing attitude towards ecological work was also noticeable.

“What is [...] very clear is the whole mindset of the employees has changed during 2009. They have realized that there is this green activity and sending proposals so there is also a pressure from non-IT employees, employees not specifically working in any IT department.” (Premises manager)

Nordea initiated a number of Green IS initiatives: e.g., two systems to support credit risk management in responsible investment and lending (ERAT and SPRAT); one system (Click-to-Power) to put computers in standby mode in order to reduce power consumption; policies to reuse and recycle old IT equipment and mobile phones; implementation of virtual collaboration tools; and virtualization and consolidation of server halls to save energy.

In the reminder, we will focus on two organizational responses of Green IS. The first is the Power-off, which aimed to find a solution to control energy waste from computers running at night. The second is the Facility Management systems, which focused on monitoring and reducing energy consumption in buildings.

Power-off

Employees around the bank had noted that computers were still running after people had gone home for the day. This issue also surfaced during the 500 Ideas project. The issue identification was not formal or governed by top-management, but driven by concerned employees’ personal beliefs that this was a waste of energy which had a negative affect on the organization’s ecological footprint. The Green IT manager included the issue to his own agenda and became its champion. First, he launched a feasibility study, which explored

different solutions, including commercially available products and internal options. Eventually, the analyst in charge of the feasibility study recommended modifying the current platform management system to turn off computers at night.

“There is a management system for the entire platform that we use when we send out updates.... The management system is the foundation for our installed IT base. It contains basic functionality. The wake-up-function we needed existed in Denmark already... and install it in the rest of the world together with a shut-down function. We also needed to measure its use. It was very important to have statistics to really see that it has an effect, and based on the first numbers I saw that it seemed so.” (Project leader Power-off)

In selling the project to the corporate IT steering committee, the Green IT manager relied partly on his formal authority as manager but more so on his argumentative abilities (see Table 5). He made the presentation as simple as possible and highlighted the economic benefits, rather than the ecological benefits. He also used his edification skills and normative knowledge. Furthermore, he aligned his presentation strategy to the tool generally used to sell IS – i.e., a business case. The endorsement of this Green IS response shows the link between the new organizational values and the issue at hand.

Table 5. Issue summary and suggested solution for the Power-off initiative

Current state	Target state
<ul style="list-style-type: none"> • There is no uniform Nordea standard on how to handle PCs at night. • Some countries are instructed to turn off their PC and some to leave it on. • Many software installations and patching are installed during the daytime. • No power management software is used on CLIP2-machines. • A severe amount of electricity is wasted every year. 	<ul style="list-style-type: none"> • PCs should be switched off every weekday at 19:00. (PCs should be completely switched off on weekends). • Users logged in at 19:00 should be warned and have the opportunity to abort the shut down process. (Alternatives will be investigated, such as sleep mode, etc.). • Installation updates should be sent out during nighttime. The computer should be woken up, have the installation done, and then be switched off again. • Users should turn their computer on manually in the morning. • Users or departments that need an exception from computer shut down should apply for this in a defined approval process.

“You could explain it in terms of CO₂ too, but that isn’t as concrete. Money is more concrete. You can translate CO₂ into how many trees or how many miles in a car ... but it is still less concrete ...” (Project leader Power-off)

The business case suggested that the total cost would be roughly €80,000 for the first year, and then €36,000 annual running cost from the second year onwards. Expected cost savings would be in the area of €500,000 over the initiative's lifetime. The IT steering committee endorsed the proposal.

The Green IT manager took responsibility for the project and implemented it as an organizational response. A guiding principle during the implementation was that the Power-off project should not interfere with employees' everyday activities. Once finished, some 46,000 computers were shut down every night, resulting in an estimated annual cost savings of 4,000 tons of CO₂ or €360,000.

“Energy consumption has gone down by about 10%. We think that much of this can be attributed to switching off computers at night.” (Green IT manager)

Facility Management Systems

The issue identification process that led to the Facility Management systems was very different than for the Power-off. In this case, there were two issues and the Premises manager identified them both, ultimately leading to the implementation of two facility management systems.

The Premises manager had driven a sustainability agenda for a long time. For example, all Nordea's buildings are certified for low energy consumption and Nordea is taking active part in the North-European green building council. Also, in 2004 Nordea initiated the “17 square meter project”, aimed at reducing the average square meter office space per employee from 24 m² to 17 m².

In his quest to make Nordea more energy efficient, the Premises manager had encountered an issue. Nordea's corporate energy provider, from Norway, could not provide detailed figures of power consumption, only aggregated measures. The Premises manager viewed this as a major issue, since he could not monitor the power consumption at business unit level.

“I think the biggest challenge is to collect the data we need... But when we have the data collected, we can of course think about how to utilize and take benefits from this.”
(Premises manager)

The Premises manager was not only the identifier of the issue; he also became its champion. Convincing the Premises Management team and putting the issue on the organizational agenda was a relatively easy task given Premises manager's personal concern and authority,

but the decisive argument was one of cost savings. This shows how the individual agenda and the organizational agenda must be in line with each other.

The first Facility Management system provided the Premises department with energy consumption data from the individual locations and over time.

“I think one of our eye-openers has been when we were able to monitor our electricity consumption. We noticed that our buildings consume equal amounts of energy when people are not there as when they are there. It’s great when IT systems can provide us with this information. So I think information is the key; we have to measure and compare the trends, and act thereafter.” (Premises manager)

The monitoring data from the first Facility Management system was essential for the second Facility Management system, since it provided Nordea with data to identify the second issue. The first system made it possible to monitor energy consumption at location and over time. This was more of an exploratory finding not directly governed by top-management. The Premises manager took charge of the second issue as well and became its champion and executor again.

Trying to promote the issue to the organizational agenda, the Premises manager used his executive power (authority as Premises manager) and his argumentative ability – in this case, referring to the data from the first system. The management team endorsed the second Facility Management system,

This would be not just a monitoring system but a control system whereby Nordea could control resource use in every building and every work place. By combining energy consumption data and workplace data, it allowed Nordea to calculate the specific unit’s eco-footprint. In addition, the system also has a travel monitor module, collecting data on all travel made by Nordea employees. The system distributes information to business managers. For instance, the CSR manager used data from the system in the CSR report.

DISCUSSION

We find that organizations respond to issues that are congruent with their organizational agenda. Individuals identify issues and then become champions when trying to promote the issue to the organizational agenda. Organizations endorse Green IS as an organizational response under the following two conditions: 1) congruence with the organizational agenda and 2) within existing resource and cognitive limitations. This is consistent with the organizational response literature. In this section, we focus our attention first on how Green

IS champions promote Green IS response towards the organizational agenda through authorization and edification. Then we demonstrate how Green IS responses lead to transformation of the organizational agenda by value extension and value reinforcement. Finally, we look at how organizational, sustainability, and Green IS response processes are interrelated.

Before doing so we present an integrated model of how Green IS becomes part of the sustainability process and relates to overall firm strategy in Figure 4. The Green IS response process begins at the bottom with the *identification* of Green IS related issues, which are picked up by a champion who *promotes* the issue towards the organizational agenda. Top management *endorses* Green IS *responses* if they are congruent with the organizational agenda. Depending on the result, a response will influence the ability of champions to promote new issues and transform organizational values. Over time, successful Green IS will create a self-reinforcing system and *interdependency* between organizational response processes. Table 5 provides a summary of the two Green IS initiatives and their relationship to the organizational sustainability process presented in Figure 4.

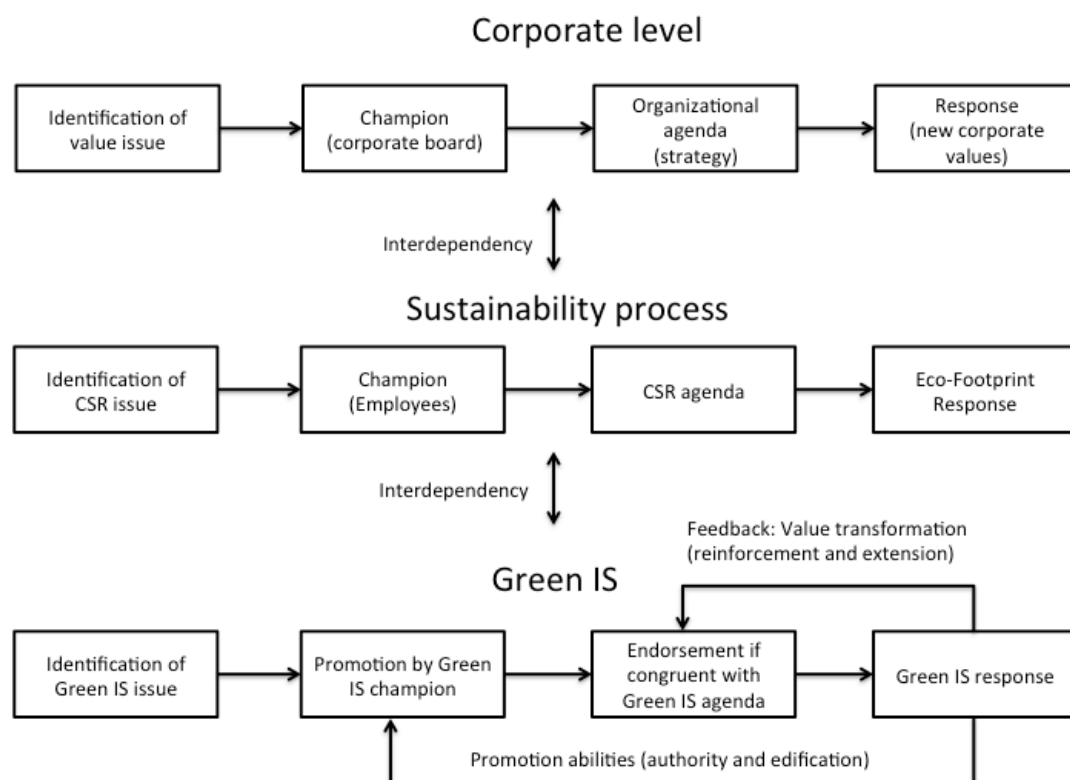


Figure 4. Integrated Organizational Response Process Model

Table 5. Concept illustration in organizational response logic

Constructs	Example initiatives	
	Power-off	Facility Management 1 & 2
Green IS issue	Computers throughout the bank were still turned on after employees had gone home for the day.	Nordea's corporate power provider could not provide detailed data on business unit power consumption, only aggregated measures. The first Facility Management system could not calculate eco-footprint for the business units or provide data for the green annual reports.
Identification	The identification was not formal or driven by top-management; instead, employees' personal agenda and beliefs drove the identification.	The lack of detailed data was a key issue for the Premises manager. The first Facility Management system helped the Premises Department to understand the potential of detailed data in making Nordea more sustainable. This was more of an exploratory finding not directly governed by top management.
Green IS champion	The Green IT manager picked up the issue of computers running 24/7 on his personal agenda and became its champion.	The need for data on energy consumption was in line with the Premises manager's personal agenda and his area of responsibility. In his role as Eco-footprint manager, the Premises manager needed detailed data and the ability to control the eco-footprint in the organization.
Promotion (Authorization and Edification)	The Green IT manager relied in part on formal authority, but foremost on his argumentative abilities in selling the initiative by making the outset as simple as possible, and by focusing on the economic benefits, rather than the ecological benefits. The ability to promote Green IS led to the creation of the role of Green IT manager. Then the success of the Power-off project was used by the Green IT manager in selling future projects, for instance of Click-to-Power. Clearly his ability (edification) to understand how to sell Green IS increased over time.	The Premises manager used his formal authority to promote the need for the Facility Management system in order to get more data. In the case of the second Facility Management system, the Premises manager used his formal authority and his argumentative abilities from the experience of the first Facility Management system. Energy consumption data are now part of the organizational agenda—"Data is key." This has reinforced previous work on trying to reduce energy consumption in buildings. It has also extended the organizational agenda to put focus on energy consumption in buildings.
Green IS agenda	There was a fit between the aim of the Power-off project and Nordea's CSR aim to reduce its environmental impact.	The key to reach Nordea's goal was that energy consumption data came onto the organizational agenda. The focus on energy consumption became

		evident when Nordea realized (from the first Facility Management system) that the company consumed as much energy during nighttime or weekends as during office hours.
Endorsement	The Green IT committee endorsed the Power-off project based on its appealing business case of expected savings of €500,000.	The Premises manager together with his management team decided to develop and install both Facility Management systems, based on their need for detailed data on energy consumption.
Green IS response	After a feasibility study, it was decided by the Green IT committee to include turn-off functionality in the platform management system.	It was decided to design a system that could monitor energy consumption 24/7. The second Facility Management system included functionality to calculate eco-footprint impact by integrating data from other systems.
Value transformation (Reinforcement and Extension)	Green IS is now part of the organizational agenda and has extended the organizational values to be more inclusive of sustainability initiatives. The CIO stated: <i>“Today it’s obvious to us that economic and sustainability objectives are not in opposition. Most often they are directly linked, like in the Power-off project.” (CIO)</i>	Energy consumption data are now part of the organizational agenda—“Data is key.” This has reinforced previous work on trying to reduce energy consumption in buildings. It also extended the organizational agenda to put focus on energy consumption in buildings.
Self-reinforcing system	The success of the Power-off project reinforced the work done by the Green IT manager and, for instance, helped him to get the Click-to-Power project going.	The first Facility Management system provided data that eliminated the lack of business unit energy consumption, leading to the second Facility Management system
Interdependency (interrelationship between organizational response processes)	A key enabler of all sustainability initiatives and Green IS is the change of corporate values. This enabled CSR to become part of the organizational agenda and such work became “part of normal work” (CSR manager).	The Eco-footprint manager describes this as a new atmosphere emerging at Nordea, where initiatives that were not previously endorsed could now get acceptance.

Promotion capabilities

We found that the champions are essential in the identification of Green IS issues. They promote Green on the organizational agenda and are motivated by their personal engagement and strong belief that the firm should act ecological. This resonates with the literature on technology champion (Leonard-Barton, 1988). According to Schon (1963 p, 50), “the new idea either finds a champion or dies”. A champion is an individual who informally emerges in an organization (Schon, 1963; Tushman & Nadler, 1986) and makes “a decisive contribution

to the innovation by actively and enthusiastically promoting its progress through the critical [organizational] stages” (Achilladelis et al., 1971 p. 14).

Over time, the champions become better in selling Green IS. We find Green IS response increases champions’ abilities to promote issues to the organizational agenda by strengthening their authority (Peppard, 2001) and improving their edification skills (Peppard, 2007; Ward & Peppard, 1996). As noted, both authority and edification skill exists against a backdrop of historical events (Harison & Boonstra, 2009), including the success and failures of previous initiatives (Day, 2007; Sabherwal, 1999). In the reminder of this section, we discuss in depth the mechanisms of authority and edification.

Authority

Authority includes formal and informal conditions that create credibility (Preston et al., 2008). The formal authority for the Premises manager came with his positions as senior manager, member of the Finnish Green Council, and later head of the Eco-footprint initiative. With budget responsibility, he could promote issues to the organizational agenda and endorse responses. The formal authority, based upon assigned responsibilities and hierarchies (Astley & Sachdeva, 1984; Daily & Johnson, 1997), is perhaps the most commonly cited type of power in literature (Finkelstein, 1992).

The authority of the Green IT manager was different. The position gave him authority to promote Green IS initiatives. However, the position did not come with budget control and the discretion to endorse organizational responses. More important was his informal authority that came from his success in running the 500 Ideas project and the Power-off. This echoes previous research showing that individuals may undertake various IT initiatives based on their prior level of success within the organization (Broadbent & Kitzis, 2005) and that success can lead to increased authority (Schmidt et al., 2010). The success gave the Green IT manager credibility to promote Green IS initiatives to the agenda and made him a recognized change agent in the organization. Informal authority refers to the personal credibility of the champion to promote an issue to the organizational agenda (Preston et al., 2008). As Peppard (2001, p. 259) points out “Credibility must be earned [...] and is derived from achievements and actual results. [...] Building trust and establishing mutual respect is a central aspect of the route towards a strong relationship”.

Edification

Edification refers to the learning process affecting a champion’s ability to read, understand, and interpret the organizational agenda and thereby articulate the need for Green IS issues on

the agenda. Effective champions astutely analyze key stakeholders' interests and tailor their selling strategies to be maximally persuasive. Based on these experiences, the champion can "*adjust the pattern of moves*" (Howard-Grenville, 2007, p. 650). In the Nordea case, the Green IT manager showed a high level of articulation ability, recognized by the success of his initial presentation to the Nordea management team that eventually led to his position as Green IT manager. Learning from each presentation and promotion attempt, the Green IT manager developed a set of tools to pre-evaluate a suggestion with regard to how feasible it would be to promote it to the organizational agenda.

Successful champions are better at arguing for how the innovation ties into positive organizational outcomes. Argumentative ability is partly a function of understanding the organizational values, and what motivates the key influencers of the organizational agenda (Peppard, 2007). Motivations can change and the champion needs to be up to date with organizational drivers, as a Green IS initiative will not be promoted to the organizational agenda unless it fits with prevailing organizational values. Here the champion's interaction skills are essential. This includes ability regarding relationship management and the ability to use language that the business understands and is comfortable with (Peppard, 2001; Ward & Peppard, 1996). The Green IT manager's use of common management tools was critical. For instance, he used Power Point to present his idea and included a financial cost benefit analysis as well as a description of how the idea was aligned to the corporate values. The presentation was very timely, with the new corporate values in place and the general acknowledgement of sustainability issues. His success supports the point that champions presenting sustainability issues with formal, rational arguments were more likely to succeed than those who used dramatic, emotional language (Anderson & Bateman, 2000).

Value Transformation

The feedback or the outcome from Green IS, which relates to its functional affordances for sense-making and sustainable work practice, influences the organization and its agenda (Bingham & Kahl, 2012). Based on Weick's (1979) definition of technology as an 'enacted environment,' Orlikowski (1992) argued that interaction with technology influences the institutional properties of an organization, either by reinforcing them (more typically) or by transforming them (less frequently). We find that Green IS led to value reinforcement and extension, and this furthered the sustainability process creating a self-reinforcing system. These two mechanisms theoretically can result in negative effects on the organizational endorsement of Green IS in the case that Green IS initiatives do not live up to expectations. One illustration of this comes from the CIO:

“Today it’s obvious to us that economic and sustainability objectives are not in opposition. Most often they are directly linked, like in the Power-off project. Sometimes there is no direct, short-term economic benefit, but that does not mean that there is an economic downside to it.”

Value Reinforcement

The enforcement of sustainability work practice influenced the organizational agenda and led to *value reinforcement*, by making the organizational agenda more acceptable and inclusive to Green IS initiatives. Recall that top management can only attend to a limited number of issues due to cognitive and resource limitations. The success of the Power-off initiative, with its high return on investment, large reductions in energy consumption, and relative ease of deployment, showed that Green IS was a possible avenue for combining economic and ecological agendas. After the success of the Power-off initiative, there was a more general acceptance that these objectives did not have to be mutually exclusive and, given past successes, the organization showed an increased willingness to investigate possibilities for ‘more of the same.’ For instance, just after the Power-off initiative, the Click-to-Power initiative was endorsed by top-management, for very similar reasons as the Power-off initiative.

The process of how IS can transform values resonates well with other IS-induced organizational changes, which can reinforce existing organizational values (DeSanctis & Poole, 1994) or lead to a change in values (Orlikowski, 1992). When IS are used by an organization in a way that is consistent with the values (or “institutional structures” in the terminology of Orlikowski, 1992) that motivated the appropriation, users “unwittingly sustain the institutional structures in which the technology is deployed” (Orlikowski, 1992, p. 19). This is consistent with the Green IS use at Nordea. It had a direct effect on the issue that the technology addressed, i.e. reducing ecological footprint, but it also had an indirect effect (often unintended) on the institutional environment (Orlikowski, 1992), such as changed employees awareness and engagement in sustainability issues.

Value Extension

The sense-making affordance of the Facility Management system also influenced the organizational agenda. Similarly, direct benefits increased the willingness for more-of-the-same initiatives, e.g., they started initiatives addressing turning off lights at night. It also enabled the Premises manager to put more resources into the Facility Management system and implement the controlling function and emission reports based on business units. The success of these projects led to *value extension*. This emergent property of technology use is

expressed through the concept of interpretative flexibility (Davern & Kauffman, 2000), and also resonates with how organizations have been described to extract value through double loops of learning when using technology (Sher & Lee, 2004), and positive feedback in system dynamics (Von Bertalanffy, 1956). However, unexpected advantages after the implementation of the first system also broadened the view of how Green IS initiatives could be beneficial for the company. When it was discovered that energy consumption was as high during weekends and nights as during office hours, that issue became a key concern for the Eco-footprint initiative and the organization at large. Following this, the idea to monitor the company's resource utilization with Green IS gained general appreciation. These processes may lead to a situation in which the organization obtains a greater general appreciation of IS initiatives, or identifies new roles of IS in the organization (Peppard, 2001). This resonates with Bingham and Kahl's (2012) three-stage model of organizational value transformation. In the first stage, the recognition stage, a new object (in this case, sustainability/Green IS) is acknowledged. This stage involves the incorporation of a new situation into an existing value (linking of Green IS to the CSR strategy). The next stage is the deconstructions stage, where values become conceptually distinct from previous values (Green IS exists by itself). In the third stage, the unitization stage is when new values become persistent (Green IS is part of the organizational agenda).

Interrelationship Between Organizational Response Processes

In the Nordea case, we find one key change to the organizational agenda. The change of the corporate values from "focus," "speed," and "performance" to "It's all about people," "One Nordea team," and "Excellence of customer experiences" shows interdependency between organizational response processes. This change was a key enabler for the sustainability process and introduction of Green IS, since CSR became part of organizational agenda. The new values legitimized CSR and became a "part of normal work" (CSR manager). The Eco-footprint manager describes this as a new atmosphere emerging at Nordea, where initiatives that could not be previously endorsed could now get acceptance. The CIO gives an example:

"... the Power-off project would probably not have been started before these structures came into place. I don't believe that those would have been so high on the execution list without having clear linkage to the new values." (CIO)

A key aspect of the interrelationship between organizational response processes and self-reinforcing system was that the successes of the Green IS projects were communicated both internally through intranet articles and externally through annual reports and external presentations. For this Nordea created a team called 'Communication and Behavior'

within the Eco-footprint initiative to ensure the results of sustainability projects were communicated throughout the organization.

“We are trying now to make our environmental initiatives part of the communication planning. In our external articles, we are also trying to get the key messages relating to Green IT. When someone from IT is interviewed we think ahead of what we would like to bring up... Green IT is something that obviously is very important, so of course the message needs to go through.” (Communication partner)

Implications

This paper contributes to the extant literature in several ways. First, it provides an empirical example and integrated model of how Green IS becomes a part of organizational sustainability processes (Bengtsson & Ågerfalk, 2011; Elliot, 2011) and what role Green IS plays (Seidel et al., 2013). The model reveals that Green IS becomes part of the sustainability process, through champions promoting Green IS to the organizational agenda and the feedback from successful Green IS. This finding complements previous work, such as that by e.g. Elliot (2011) and Melville (2010), by providing a detailed account of how this occurs. For instance, by putting the Green IS promotion into context, this paper shows that endorsement is contingent on a Green IS champion's promotional abilities in combination with the organizational agenda. Promotional abilities can be decomposed into authorization and edification abilities. Both are partly a function of historical events. The organization agenda is framed by prevailing organizational values, including the recognition of sustainability. Organizational values are also partly a function of perceived effectiveness of past events. It shows that Green IS and creates dynamic effects on the unfolding of the ecological sustainability process over time. It should, however, be noted that positive incremental development is conditional on the outcome of the Green IS initiatives. Realizing this, Nordea's Green IS champions learned to master the art of aligning their requests with organizational values, never in opposition to them. The criticality of this delicate stance was learnt and mastered over a series of attempts to promote Green IS.

Second, whereas the large part of Green IS literature focuses on external factors, such as compliance (Butler, 2011) and value chain pressure (Seidel et al., 2013), this paper focuses on internally initiated Green IS responses. This contributes to the Green IS literature by showing how Green IS are initiated by individual personal concern for the environment. In addition it also reveals that individuals, not top management, are of utmost importance in the sustainability process.

Third, besides contributing to the Green IS field, our results also contribute to organizational response literature by proposing interrelationships between organizational response processes. We show that research needs to take a holistic perspective to understand the relationship between responses. The Green IS initiative seems to be a unique form of organizational response because of its far-reaching transformational potential, here showcased by the effects on organizational values and Green IS champions' promotional abilities. The consequence of these effects is a recursively developing sustainability process. This view of organizational sustainability processes as slow, incremental processes deviates from the radical transformation process that has been proposed in extant literature.

Fourth, organizational response literature contributes to information systems literature, for example IS development life cycle and IS mediated organizational change models, by providing an alternative lens. In particular, the organizational response literature contributes to the understanding of the events and actions that proceed an IS project: e.g., how IS becomes part of the organizational agenda and the critical role of individuals. This contrast with the assumption of the importance of top-management decisions that dominates much IS research (Nandhakumar et al., 2005; Wixom & Watson, 2001). Furthermore, the organizational response literature provides constructs and associations, including identification of issues that can be solved through IS, selling of the idea to the organizational agenda, and the endorsement of an IS project, leading to the development, implementation and use of IS. We can find traces of research that addresses identification and promotion in IT prioritization and IS evaluation literature (Murphy & Simon, 2002; Remenyi et al., 2007). One recent event that organizational response literature could explain is the case of how Volkswagen used IT to produce a false picture of car emissions¹. In this case, the organization endorsed an IS project as a response to the issue of too high emissions. This is, however, misuse of Green IS.

Besides the theoretical implications, there are practical implications as well. We believe one of the success factors for Nordea's continuous progression toward increasing sustainability was a careful strategy of avoiding negative impact on day-to-day activities. This might partly be a consequence of the conservative banking industry context in which Nordea operates. Nevertheless, we suggest that any individual with interest in promoting Green IS initiatives should assess the promotion beyond the specific initiative, and carefully consider how the promoted initiative will influence subsequent sustainability response processes. In practice,

¹On 18 September 2015 it was revealed that Volkswagen Group had equipped vehicles with a that hide the real emission levels, see e.g. Financial Times series on the Volkswagen scandal (<http://www.ft.com/intl/vw-emissions-scandal>).

this could mean disregarding issues with great immediate impact in favor of other issues that may have lesser immediate impact, but greater transformational effect.

Limitations

As with any research, ours is subject to limitations. First, it should be clear that historical data do not provide first-hand accounts of the research situation and may be biased and lack details (Van de Ven, 1992). Respondents tend to forget details of past events and cast themselves in a flattering light (Golden, 1992). While our research design offers longitudinal coverage of the evolution at the case site, primary data collection on Green IS and the sustainability processes were collected toward the end of the process. Therefore, it would be useful in the future to include real-time data collection – based on ethnography and other such rich data collection approaches – since it potentially enriches construct and association conceptualization as it allows for close-up study of emerging practices and sense-making of stakeholders involved.

Second, our analysis of the sustainability process has been limited to the role of Green IS. In the case of Nordea, Green IS on its own can by no means explain the transformation. Other internal and external events, pressurizing and enabling the sustainability process, were clearly present. It could thus be suggested that the increasing endorsement of Green IS initiatives was merely a consequence of contextual factors re-shaping the organizational agenda. This would, however, be an unjust marginalization of the fueling impact of the successful Green IS initiatives. As shown in our data and analysis, Green IS influenced the organizational agenda through mechanisms of reinforcement and extension, and it influenced the Green IS champions' promotional abilities through mechanisms of authority and edification. The relative effect is, however, difficult to isolate in this kind of study. Hence, we recommend that future studies seek to gauge the impact of Green IS initiatives relative to other triggers of sustainability transformation.

Third, the Nordea case provides ample basis for analyzing the relationship between Green IS initiatives and the sustainability process. However, the case does have some limitations. Most importantly, it is not a case of a company re-inventing itself as an ecologically effective organization in its purest sense. That is, by the end of our study, the company's ecological sustainability had not achieved a position fully in balance with economic sustainability and not all their environmental goals were met. However, the case is a story of a company that takes ecological issues seriously and is moving toward sustainability. Therefore, the case meets our requirements on organizational transformation, as defined in the literature review above, thereby enabling us to study how IS becomes part of the sustainability process and the role of IS in this transformation. Future research could seek organizations that put equal

emphasis on ecological sustainability and economic profitability in order to gain a deeper understanding of the role of Green IS in such sustainability processes.

CONCLUSION

In this paper, we show how the use of Green IS leads to sense-making and sustainable work practice. Besides reducing CO₂ omissions, it affects the champions' abilities to promote Green IS and transform organizational values. Over time, an organization that pursues a series of Green IS initiatives can incrementally move towards improved ecological sustainability, both in the sense of reduced ecological impact and in the sense of sustainability being integrated into the organizational agenda.

The paper offers an explanatory model of how Green IS becomes part of the sustainability process and what role IS plays in this process. We draw upon the Green IS literature, organizational response literature, and a case study of Nordea. The Green IS response model explains how the use of Green IS leads to sense-making and sustainable work practices and affects the champions' abilities to promote Green IS and transform organizational values. Over time, an organization that pursues a series of Green IS initiatives can incrementally move towards improved ecological sustainability, both in the sense of reduced ecological impact and in the sense of sustainability being integrated into the organizational agenda, creating a self-reinforcing system fueling the organizational sustainability process.

From a managerial perspective, we suggest that management of an organizational sustainability process benefits from being regarded as a cultivation metaphor, rather than a design or construction metaphor. Following the argument that promotional ability is partly a function of historical events, the normative implication of how to build promotional abilities is to start simple and move toward activities that are more complex. In the Nordea case, this was enacted in the Green IS workshops with ease of implementation being one of two main evaluation criteria for new initiatives. As the Green IS group gained credibility, they could approach more complex initiatives. To catalyze the credibility process, the Green IS group benefited from collaborating with the internal communication department, constantly building the group members' authority to promote Green IS issues to the organizational agenda.

Where is Nordea on Green IS today? By 2015, Green IS and Corporate Social Responsibility is part over everyday business. Nordea is maturing in how they engage and report on these matters, for instance they have recently applied the Global Reporting Initiative (GRI) G4 guidelines to sustainability reporting and entered the Green Bonds market. When it comes to Green IS, in specific, it is part of most business activities today. The focuses over the past

years have been on reducing internal travel by utilizing video conference systems and paper waste through enforcement of duplex printing. In the near future, Nordea will try to use Green IS to reduce emissions in employees computing.

ACKNOWLEDGEMENTS

We would like to thank the employees at Nordea and in particular Dennis Jönsson for their engagement and support of this project, Izak Benbasat for comments on drafts of this article, and reviewers and editors at ISJ. We would also like to thank the Department of IT at Copenhagen Business School for their financial support

REFERENCE

Accenture (2010). Shaping the Green Agenda, Accenture.

Achilladelis, B., Jarvis, P. & Robertson, A. (1971) *A study of success and failure in industrial innovation: Report on Project SAPPHO to SRC*. University of Sussex.

Anderson, L. M. & Bateman, T. S. (2000) Individual environmental initiative: championing natural environmental issues in US business organizations. *Academy of Management Journal*, **43**, 548-570.

Astley, W. G. & Sachdeva, P. S. (1984) Structural Sources of Intraorganizational: Power: A Theoretical Synthesis. *Academy of Management Review*, **9**, 104-113.

Bansal, P. (2003) From issues to actions: the importance of individual concerns and organizational values in responding to natural environmental issues. *Organization Science*, **14**, 510-527.

Bansal, P. & Roth, K. (2000) Why companies go green: a model of ecological responsiveness. *Academy of management Journal*, **43**, 717-736.

Bengtsson, F. & Ågerfalk, P. J. (2011) Information technology as a change actant in sustainability innovation: insights from Uppsala. *The Journal of Strategic Information Systems*, **20**, 96-112.

Bingham, C. & Kahl, S. (2012) The process of schema emergence: assimilation, deconstruction, unitization and the plurality of analogies. *Academy of Management Journal*, **56**, 14-34.

- Bose, R. & Luo, X. (2011) Integrative framework for assessing firms' potential to undertake Green IT initiatives via virtualization – a theoretical perspective. *The Journal of Strategic Information Systems*, **20**, 38-54.
- Broadbent, M. & Kitzis, E. S. (2005) *The New CIO leader*. Harvard Business School Press, Boston, MA.
- Butler, T. (2011) Compliance with institutional imperatives on environmental sustainability: building theory on the role of Green IS. *The Journal of Strategic Information Systems*, **20**, 6-26.
- Chen, A. J. W., Boudreau, M. C. & Watson, R. T. (2008) Information systems and ecological sustainability. *Journal of Systems and Information Technology*, **10**, 186-201.
- Corbett, J. (2010). Unearthing the value of green IT. In: Proceedings of the 31st International Conference on Information Systems, St Louis, USA.
- Corbin, J. M. & Strauss, A. (1990) Grounded theory research: procedures, canons, and evaluative criteria. *Qualitative Sociology*, **13**, 3-21.
- Cyert, R. M. & March, J. G. (1963) *A behavioral theory of the firm*. Prentise Hall, Englewood Cliffs, NJ.
- Daft, R. L. & Weick, K. E. (1984) Toward a model of organizations as interpretation systems. *Academy of Management Review*, **9**, 284-295.
- Daily, C. M. & Johnson, J. L. (1997) Sources of CEO power and firm financial performance: a longitudinal assessment. *Journal of Management*, **23**, 97-117.
- Davern, M. J. & Kauffman, R. J. (2000) Discovering potential and realizing value from information technology investments. *Journal of Management Information Systems*, 121-143.
- Day, J. (2007) Strangers on the train: The relationship of the IT department with the rest of the business. *Information Technology & People*, **20**, 6-31.
- DeSanctis, G. & Poole, M. S. (1994) Capturing the complexity in advanced technology use: adaptive structuration theory. *Organization Science*, **5**, 121-147.
- Dutton, J. E. (1997) *Strategic agenda building in organizations*. In: *Organizational Decision Making*, Shapria, Z. (ed), pp. 105-, Cambridge University Press, Cambridge, UK.

- Dutton, J. E. & Ashford, S. J. (1993) Selling issues to top management. *Academy of Management Review*, **18**, 397-428.
- Dutton, J. E., Ashford, S. J., O'Neill, R. M., Hayes, E. & Wierba, E. E. (1997) Reading the wind: how middle managers assess the context for selling issues to top managers. *Strategic Management Journal*, **18**, 407-423.
- Dutton, J. E., Ashford, S. J., O'Neill, R. M. & Lawrence, K. A. (2001) Moves that matter: Issue selling and organizational change. *Academy of Management Journal*, **44**, 716-736.
- Dutton, J. E. & Duncan, R. B. (1987) The creation of momentum for change through the process of strategic issue diagnosis. *Strategic Management Journal*, **8**, 279-295.
- Dutton, J. E. & Jackson, S. E. (1987) Categorizing strategic issues: links to organizational action. *Academy of Management Review*, **12**, 76-90.
- Elliot, S. (2011) Transdisciplinary perspectives on environmental sustainability: a resource base and framework for IT-enabled business transformation. *MIS Quarterly*, **35**, 197-236.
- Feldman, M. S. (2000) Organizational routines as a source of continuous change. *Organization Science*, **11**, 611-629.
- Feldman, R. (2002) *Epistemology*. Prentice Hall, Upper Saddle River, NJ.
- Finkelstein, S. (1992) Power in top management teams: dimensions, measurement, and validation. *Academy of Management Journal*, **35**, 505-538.
- Golden, B. R. (1992) Research notes. The past is the past—or is it? The use of retrospective accounts as indicators of past strategy. *Academy of Management Journal*, **35**, 848-860.
- Gregor, S. (2006) The nature of theory in information systems. *MIS Quarterly*, **30**, 611-642.
- Harison, E. & Boonstra, A. (2009) Essential competencies for technochange management: towards an assessment model. *International Journal of Information Management*, **29**, 283-294.
- Hedman, J. & Henningsson, S. (2010) Three strategies for Green IT: storefront, tuning and redesign. *IT professional*, **13**, 54-57.

- Hedman, J., Henningsson, S. & Selander, L. (2012) organizational self-renewal: the role of green is in developing eco-effectiveness. In: Proceedings of the 33rd International Conference on Information Systems. Orlando, FL.
- Howard-Grenville, J. A. (2007) Developing issue-selling effectiveness over time: issue selling as resourcing. *Organization Science*, **18**, 560-577.
- Jenkin, T. A., Webster, J. & McShane, L. (2011) An agenda for 'Green' information technology and systems research. *Information and Organization*, **21**, 17-40.
- Kim, Y. S. & Ko, M. (2010) Identifying Green IT leaders with financial and environmental performance indicators. In: Proceedings of the 16th Americas Conference on Information Systems, Lima, Peru.
- Kuo, B. & Dick, G. (2010) The greening of organisational IT: what makes a difference? *Australasian Journal of Information Systems*, **16**, 81-92.
- Leonard-Barton, D. (1988) Implementation as mutual adaptation of technology and organization. *Research Policy*, **17**, 251-267.
- Marcus, A. A. & Fremeth, A. R. (2009) Green management matters regardless. *The Academy of Management Perspectives*, **23**, 17-26.
- Melville, N. P. (2010) Information systems innovation for environmental sustainability. *MIS Quarterly*, **34**, 1-21.
- Molla, A., Cooper, V. A. & Pittayachawan, S. (2009). IT and eco-sustainability: Developing and validating a green IT readiness model. In: Proceedings of the 30th International Conference on Information Systems, Phoenix, Arizona.
- Murphy, K. E. & Simon, S. J. (2002) Intangible benefits valuation in ERP projects. *Information Systems Journal*, **12**, 301-320.
- Nandhakumar, J., Rossi, M. & Talvinen, J. (2005) The dynamics of contextual forces of ERP implementation. *The Journal of Strategic Information Systems*, **14**, 221-242.
- Ocasio, W. (1997) Towards an attention-based view of the firm. *Psychology*, **1**, 403-404.
- Orlikowski, W. J. (1992) The duality of technology: rethinking the concept of technology in organizations. *Organization Science*, **3**, 398-427.

- Peppard, J. (2001) Bridging the gap between the IS organization and the rest of the business: plotting a route. *Information Systems Journal*, **11**, 249-270.
- Peppard, J. (2007) The conundrum of IT management. *European Journal of Information Systems*, **16**, 336-345.
- Preston, D. S., Chen, D. & Leidner, D. E. (2008) Examining the antecedents and consequences of CIO strategic decision - making authority: an empirical study. *Decision Sciences*, **39**, 605-642.
- Ranson, S., Hinings, B. & Greenwood, R. (1980) The structuring of organizational structures. *Administrative Science Quarterly*, **25**, 1-17.
- Remenyi, D., Money, A. & Bannister, F. (2007) *The effective measurement and management of ICT costs and benefits*. Elsevier, Jordan Hill, Oxford.
- Rokeach, M. (1979) *From Individual to institutional Values*. In: Understanding Human Values. Rokeach, M. (ed), pp. 47-70. The Free press, New York, New York.
- Sabherwal, R. (1999) The relationship between information system planning sophistication and information system success: an empirical assessment. *Decision Sciences*, **30**, 137-167.
- Sarkar, P. & Young, L. (2009) Managerial attitudes towards Green IT: an explorative study of policy drivers. In: Proceedings of the 13th Pacific Asia Conference on Information Systems, Hyderabad, India.
- Schmidt, N. H., Ereke, K., Kolbe, L. M. & Zarnekow, R. (2010). Predictors of green IT adoption: implications from an empirical investigation. In: Proceedings of the 16th Americas Conference on Information Systems, Lima, Peru.
- Schon, D. A. (1963) Champions for radical new inventions. *Harvard Business Review*, **41**, 77-86.
- Seidel, S., Recker, J. & Vom Brocke, J. (2013) Sensemaking and sustainable practicing: functional affordances of information systems in green transformations. *MIS Quarterly*, **37**, 1275-1299.
- Sher, P. J. & Lee, V. C. (2004) Information technology as a facilitator for enhancing dynamic capabilities through knowledge management. *Information & Management*, **41**, 933-945.

- Tsoukas, H. (1989) The validity of idiographic research explanations. *Academy of Management Review*, **14**, 551-561.
- Tushman, M. & Nadler, D. (1986) Organizing for innovation. *California Management Review*, **28**, 74-92.
- Van de Ven, A. H. (1992) Suggestions for studying strategy process: a research note. *Strategic Management Journal*, **13**, 169-188.
- Van de Ven, A. H. & Poole, M. S. (1995) Explaining development and change in organizations. *Academy of Management Review*, **20**, 510-540.
- Von Bertalanffy, L. (1956) General system theory. *General systems*, **1**, 11-17.
- Walsh, J. P. & Ungson, G. R. (1991) Organizational memory. *Academy of Management Review*, **16**, 57-91.
- Ward, J. & Peppard, J. (1996) Reconciling the IT/business relationship: a troubled marriage in need of guidance. *The Journal of Strategic Information Systems*, **5**, 37-65.
- Watson, R. T., Boudreau, M.-C., Chen, A. J. & Sepúlveda, H. H. (2011) Green projects: An information drives analysis of four cases. *The Journal of Strategic Information Systems*, **20**, 55-62.
- Watson, R. T., Boudreau, M.-C. & Chen, A. J. (2010) Information systems and environmentally sustainable development: energy informatics and new directions for the IS community. *MIS Quarterly*, **34**, 23-38.
- Weick, K. E. (1979) *The Social Psychology of Organizing*. McGraw Hill.
- Wixom, B. H. & Watson, H. J. (2001) An empirical investigation of the factors affecting data warehousing success. *MIS Quarterly*, **25**, 17-41.