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*Document Version*

Final published version

*Published in:*

Journal of Cases on Information Technology

*DOI:*

[10.4018/JCIT.2018100103](https://doi.org/10.4018/JCIT.2018100103)

*Publication date:*

2018

*License*

Unspecified

*Citation for published version (APA):*

Brooks, S., Hedman, J., Henningsson, S., Sarker, S., & Wang, X. (2018). Antecedents and Effects of Green IS Adoptions: Insights from Nordea. *Journal of Cases on Information Technology*, 20(4), 32-52.  
<https://doi.org/10.4018/JCIT.2018100103>

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Journal article (Publisher's version)

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Uploaded to [CBS Research Portal](#): July 2019

# Antecedents and Effects of Green IS Adoptions: Insights from Nordea

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## ABSTRACT

This article develops an empirically grounded model of antecedents and effects of green information systems (IS) initiatives. The model is empirically based on an in-depth case of the Nordic financial institution. The authors' study examines the effect of several organizational factors, and characteristics of Green IS initiatives themselves on organizations' intention to adopt Green IS initiatives. Their study finds that employees' attitudes toward these initiatives affect their participation in the initiatives, as well as the success of Green IS initiatives. The adoption of the initiatives was seen to affect individual and organizational level outcomes, with positive experiences enabling employees to continue to use/support the initiatives, and organizations also often realizing improvements in practice.

## KEYWORDS

Adoption, Case Study, Green IS, Green IT, Nordea, Sustainability, Theoretical Model

## INTRODUCTION

Over the last many years, organizations have found themselves increasingly pressurized to reduce their environmental impact, in an effort to stay competitive. It has been argued that green business practices, a form of sustainability even if that means basic recycling practices, can have a significant effect on organizational bottom line. Consequently, organizations have become increasingly interested in initiatives and practices supporting sustainability, including factors influencing its initiation, the process of implementation, and their impacts (Murugesan, 2008; Schryen, 2012).

However, becoming a sustainable organization is not easy. Organizations have to be engaged in "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (Brundtland et al., 1987). This is a complex process that includes environmental, economic, and social dimensions (Kleindorfer et al., 2005; Porter & Kramer 2007; Hedman & Henningsson, 2011). The essence of sustainability is that these three dimensions need

DOI: 10.4018/JCIT.2018100103

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to be addressed and balanced simultaneously rather than being viewed as trade-offs or with one of the dimensions being superior to the other two. It will consequently engage many stakeholders of sustainability, such as individuals, business, governments, and society (Watson et al., 2010).

The information systems (IS) discipline is increasingly paying attention to green practices in general, and Green IS initiatives in particular (Watson et al., 2010; Melville, 2010; Elliot, 2011; Schryen, 2012); IS is said to be part of the problem but also part of the solution (Seidel et al., 2013). Our review shows that previous literature has examined antecedents, adoption, and consequences of Green IS initiatives.

Notwithstanding the value of these contributions, our review identifies three gaps within these streams of research that we seek to address in this study. First, limited attention has been given to the varying nature of Green IS initiatives. Green IS initiatives span across a wide range of initiatives (Corbett 2010), ranging from the use of energy efficient hardware to product redesign. However, how the intrinsic attributes of Green IS initiatives impact adoption and effects of Green IS has been less studied.

Second, few studies have examined the process of adoption. It is known from the general IS adoption literature that how the process of implementing IS initiatives unfolds has notable effects on the outcome of initiatives (e.g., Kwon & Zmud, 1987). For example, the adoption of Green IS initiatives may not lead to benefits, and organizations may fail to implement these initiatives successfully. Therefore, a deeper understanding of the Green IS implementation process is important to grasp the effects of Green IS initiatives.

Third, the understanding of the impacts of the Green IS initiatives has been limited so far. It has been suggested that adoption of Green IS may induce both environmental and economic benefits. Furthermore, as organizations implement various types of Green IS initiatives, these Green IS initiatives may in turn change the organizations, and influence future adoption. However, our literature review reveals that there are mixed findings regarding the environmental, economic and organizational effects of Green IS initiatives adoption (e.g., for environmental outcomes, research has suggested that it can be negative, neutral, or positive effects; for economic outcomes, there can be positive or neutral). In addition, the effects on the third dimension of the triple bottom line, the social dimension, have been largely ignored in previous research. Finally, few studies have examined the recursive impacts of Green IS initiatives. In other words, a successful adoption/implementation of an initiative can have effects on future attitudes.

In this study, we address these above-mentioned voids by taking a holistic approach to Green IS adoption, from antecedents, through adoption phases, to the effects of the adoption. Our research objective is to develop an empirically based understanding of how Green IS adoption is initiated and implemented within organizations, and how it impacts the adopting organization.

With this research objective in mind, we aim to (1) explain how the nature of different Green IS initiatives relates to antecedents, adoption and effects of Green IS, (2) unearth the role of the adoption process in the triggering of different outcomes of Green IS, and (3) understand the rationale behind the mixed findings regarding the environmental, economic and organizational effects of the adoption of Green IS initiatives.

The rest of the article is organized as follows: First, we discuss the background literature. This is followed by a description of our case organization, a brief discussion of the methodology employed in this study, and our interpretation of the case study data with respect to Green IS adoption. We conclude with a discussion of the limitations and future directions and a recapitulation of the study's key contributions. Finally, the contributions and opportunities for future studies are discussed.

## LITERATURE REVIEW OF GREEN IS

We follow Watson et al. (2010) and define Green IS as “an integrated and cooperating set of people, processes, software, and information technologies to support individual, organizational, or societal

goals” (p. 24) concerned with sustainability and environmental concerns. We would like to distinguish it from Green Information Technology (IT), which involves the specific green technologies and technological infrastructure. In other words, Green IT focuses on how certain information technologies can better support sustainability. As a foundation for this research, we conducted an updated literature review of the Green IS research domain following Wang et al. (2015). In the following, we summarize the current status of research on Green IS.

## **Antecedents to Green IS**

Previous literature has identified a variety of factors that influence the initiation and adoption of organizational Green IS initiatives. Those factors can be classified into environmental, organizational and Green IS factors. For environmental factors, previous literature has identified factors such as environmental uncertainty (Schmidt et al., 2010; Lei & Wai Ting Ngai, 2012), competition, institutional forces (Lei & Wai Ting Ngai, 2012) and stakeholders’ pressure (Simmonds & Bhattacharjee, 2012). Of these studies, institutional forces and regulations are particularly important and have been repeatedly examined.

For organizational factors, previous literature has identified various factors such as top management support (Nedbal et al., 2011), ability (Molla & Cooper, 2014), attitude (Gholami et al., 2013), operational inefficiencies (Simmonds & Bhattacharjee, 2012), internal resistance (Mann et al., 2009), Green IS policy (Alaraifi et al., 2011), and business size (Mann et al., 2009). These factors deal with organizations’ strategies and characteristics. On the other hand, few studies have examined the role of employees within organizations.

Recent studies have also started examining the role of Green IS initiatives. For example, Nedbal et al. (2011) state that technological compatibility and complexity can influence initiation of Green IS initiatives. On the other hand, the characteristics of the Green IS initiatives have not received as much attention as environmental and organizational factors.

To summarize, previous literature has identified various important organizational and environmental factors that influence the initiation and adoption of Green IS initiatives. However, few studies have examined the role of Green IS initiatives’ attributes as well as employees within organizations.

## **Green IS Adoption and Implementation**

Our review identifies relatively fewer studies examining the implementation process of Green IS initiatives. Instead of viewing initiation as the end, these studies also look at post-initiation to examine the implementation of Green IS initiatives in more detail. Some of these studies view initiation as the starting point. For example, Mann et al. (2009) develop a three-step implementation framework: determination of the external and internal factors, determination of the sophistication of the strategy, technology, and processes, and measurement of the sustainability of the proposed venture. Other studies examine how organizations engage in Green IS initiatives more deeply. For example, Hjalmarsson and Lind (2011) show how organizations go through the entrepreneurial stage, collective stage, formalization and control stage, and elaboration stage. Here more studies are needed to further examine the implementation process of Green IS initiatives.

## **Effects of Green IS**

Prior studies have examined three major categories of effects: environmental, economic and social effects. For environmental effects, most studies find positive impacts. For example, Gimenez Thompson et al. (2012) find that environmental practices implementation is positively related to the environmental performance of organizations. However, Haigh and Griffiths (2008) find that Green IS initiatives could result in positive or negative environmental outcomes for service-oriented operations.

For the economic effects, many studies also find positive outcomes. For example, Vykoukal et al. (2010) argue that Green IS initiatives (grid technology) have economic benefits for companies.

Similar to environmental outcomes, previous literature has shown that the economic outcomes may not always be positive. For example, Takeda et al. (2012) show that using consolidation centers may not reduce cost and generate positive economic outcomes. Further, our review shows that social outcomes have received little attention. Among the few, is the work of Tarafdar et al. (2010), who show that IT services providers can facilitate the adoption of sustainable IT in client organizations, leading positive social benefits such as greater employees' well-being. Finally, our review only finds one study examining the recursive effects of Green IS initiatives. In their study examining HP's different Green IS initiatives, van Osch and Avital (2010) show how Green IS initiatives adopted previously can influence HP's subsequent adoption of other initiatives. Clearly, more studies are needed to examine various recursive effects of Green IS initiatives.

To summarize, our review show that previous literature has several limitations. First, relatively less studies examine how Green IS initiatives' attributes as well as employees within organizations influence the adoption of Green IS initiatives. Second, few studies have examined the implementation process of Green IS initiatives. Third, the results of Green IS initiatives environmental and economic outcomes are mixed, and social outcomes receive less attention. Besides, few studies examine the recursive effect of Green IS initiatives. To address those limitations, we conducted a case study to gain deeper understanding of Green IS initiatives.

## **THEORETICAL FRAMEWORK**

In line with the literature review, our research design follows the natural flow of Green IS initiatives. As previous studies have shown, there are multiple different factors that can influence the decision to implement Green IS. These antecedents can arise from any level of analysis. Of interest to our case are the antecedents presenting from the organization and the technology. It is important to recognize that the impetus for beginning Green IS adoption can be layered across boundaries.

From these motivations to begin adoption, the intent to proceed must be formed. Like all projects, there must be a point when the decision is made to continue down the path towards completion of the goal. This intention and the factors that comprise the overall decision to proceed, such as managerial support, will influence the actual implementation of the initiative. This implementation is not likely to be completely smooth and problem-free; rather, factors concerning the antecedents, combined with the factors surrounding the intention to adopt, should lead to a given outcome. A well-planned project completed with managerial and user buy-in is likely to have fewer adoption issues than a poorly-planned project.

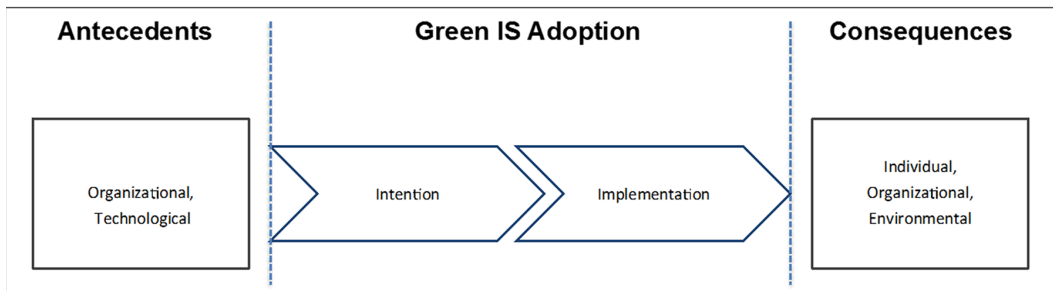
Once the Green IS initiative has been incorporated within the organizational routines, a multitude of effects can occur. These effects, as with the antecedents, will stretch across analytic levels. For example, if an organization implemented an initiative to recycle all paper waste, individuals will be affected as their normal routines will be forced to change, the organization will be affected as it will need to have processes to handle the waste properly, and the environment itself will be affected by potentially lowering the need for new paper to be created and trees harvested for the creation of the paper. Having knowledge of the effects that Green IS initiatives can cause will provide greater insight and knowledge when deciding to consider future initiatives. This is what has happened with HP, as told by van Osch and Avital (2010). Figure 1 shows this conceptual research design. To apply this model, we analyze Nordea's transition to Corporate Social Responsibility (CSR).

## **RESEARCH METHODOLOGY**

### **Study Context**

We examined the Green IS adoption, its antecedents and consequences at Nordea, a Nordic financial institution. Nordea started to expand the strategic horizon in 2006, giving attention to long-term

Figure 1. Conceptual research design



objectives. In the process of establishing long-term strategic objectives for Nordea, CSR emerged as a key concern among Nordea's customers and employees. This was at a time when CO<sub>2</sub> emissions and global warming emerged on many politicians' agendas, competing banks had published Green budgets, and the Swedish state (at that time Nordea's biggest shareholder) was putting pressure on organizations to be more sustainable.

### Research Approach and Case Selection

Nordea and its adoption of Green IS is the focal point for the generation of new insights in this paper. Recognizing the paucity of in-depth field studies on the adoption of Green IS, our strategy was to study one relatively unexplored case in depth and develop additional insights in the gaps identified by our review. Based on the recommendations of methodologists (e.g. Patton, 2005), we sought to identify an organization that could potentially be a unique and exemplary source of insights on this topic.

Nordea appears to be well suited to our study's objective since the company has been through the process of establishing Green IS as an integrated practice. We see Nordea's adoption of Green IS as exemplary for a number of reasons. First, Nordea had relatively quickly made a significant leap in its adoption of Green IS. From a distance, the Green IS adoption presented a clear starting point, which would enable the study of antecedents that triggered the adoption process. Second, with the high level of IT use in the financial industry, we expected the adoption of Green IS to consist a significant and integrated part of a bank's sustainability work. Finally, in the extant literature there is a lack of Green IS adoption of studies on large, multinational organizations. Nordea, being a Fortune 500 company, represents a group of organizations that by their sheer size have important impacts on society and the environment.

### Data Collection and Analysis

Guided by our theoretical framework (Figure 1), we focused data collection to the adoption of Green IS and its antecedents and consequences. The Green IS adoption was not always explicit or the members of the organization not even aware of their actions. The reasoning and motivation behind actions were essential to understand why Green IS was adopted, and the effects on a deeper level than financial returns and economic rational objectives. Among existing alternatives, we considered the need for rich and contextually embedded information best being met by an interpretative approach based on qualitative data. Our methodological stance may be seen as interpretive in that it uses texts reflecting the subjects' experiences with the process to develop a second-order theoretical understanding of the phenomenon (Lee, 1991; Walsham, 1995). Overall, the methodological guidelines summarized in Sarker and Sarker (2009) were utilized.

### Step 1: Data Collection

Our engagement with Nordea, with intensive data collection through semi-structured interviews and other documentary evidence, contributed to our broader understanding of Nordea’s greening transformation and the role of Green IS adoption in this process.

The nineteen interviews (Table 1) started in March 2010 with the Green IT manager to get an overview of the development process. The initial interviews were based on a broad framework, including antecedents, adoption, and consequences related to Green IS (Table 2). The ambition was to identify relevant initial conditions, states, events, and transformations necessary to capture Nordea’s Green IS development process (Van De Ven, 1992).

After initial interviews, it was jointly decided together with Nordea representatives on how to expand the study. The interviews lasted on average 60 minutes. The respondents ranged from the CIO to the line and IT executives at senior and middle level. All interviews were recorded and transcribed. External and internal documentation, including annual reports from 2005-2012, CSR reports from 2009-2012, projects plans for Green IS projects, workshop documentation, project proposals, and return on investments-analyses, were used to complement the interviews and to triangulate research findings.

### Step 2: Data Structuration – Coding and Clustering

We examined and made sense of our data, guided by the logic of constant comparative analysis to identify initial concepts, to link this evolving set of concepts to higher-level categories, and then to identify potential linkages between the categories as appropriate (Charmaz, 2000; Sarker & Sahay, 2003). Following protocols based on Saldaña (2015) the initial coding process was conducted by

Table 1. Interviews

Name	Position/role	Interview date	Interview language	Type
Dennis Jönsson	Green IT manager and project manager for Live meeting	2010-03-19 2010-05-19 2010-08-09 2010-10-08 2012-04-20 2014-03-12	Swedish	Face-to-face Face-to-face Phone Face-to-face Face-to-face Face-to-face
Erika A Andersson	Project co-worker, Video conferencing	2010-07-01	Swedish	Face-to-face
Tim Gilbert	Active user and idea creator	2010-07-01	English	Phone
Rikke Højland	Project co-worker, conferencing	2010-07-14	English	Face-to-face
Susann Remnert	Group IT Communication	2010-07-22	Swedish	Phone
Liisa Jauri	CSR manager	2010-09-07	English	Live meeting
Juha Olkinuora	Premises manager and Ecological footprint manager	2010-09-07 2010-10-25	English	Phone
Tobias Edström	Project leader of Power-off	2010-09-14	Swedish	Phone
Jackline Casselgård	IT developer of Power-off	2010-09-14	Swedish	Phone
Patrik Felixson	Chairman Green IT committee	2010-09-14	English	Phone
Ylva Andersson	Group IT Communication	2010-09-20	Swedish	Phone
Tapio Saarelainen	CIO	2011-02-25	English	Phone
Tone Lauritzen	Eco-Footprint manager	2012-04-20	English	Face-to-face



Table 2. Interview questions

Category	Questions
Antecedents	When did you hear of Ecological Footprint in the context of Nordea? What are the drivers behind ecological work? Why does Nordea engage in this kind of project? Does the pressure come from internal or external sources? Customers? Employees?
Adoption	How would you say that Nordea works with Ecological Footprint? How is it included in the overall governance and control model of Nordea?
Consequences	How does Ecological Footprint/CSR/Green IT impact you and the employees of Nordea? How would you say that Nordea use with Ecological Footprint/Green IT/CSR in their communication? - Examples? - What is the impact?

two of the authors. The other authors of this paper were able to review and comment upon the list of coding categories. The categorization of passages was made using constant comparison to passages already coded with the same categorization.

Implicitly, the constant comparative process involved data triangulation across respondents (e.g., Patton, 2005). This process led to the discovery of adoption steps, antecedents and consequences of the transformation process. In understanding the role of the antecedents and consequences, we first examined data from relevant interviews, and then identified the antecedents and consequences that respondents mentioned. Next, we organized them under the major categories identified in the review of the Green IS literature, and attempted to discern correlational tendencies (Walsham, 1995) between the adoption and the antecedents and consequences.

One method to support (internal) validity is replication. Through replication across multiple quotes, the findings (theoretical constructs and propositions, in this context) may be generalizable beyond the immediate case (Yin, 2013). Here, the objective of validity in qualitative studies is not to verify correct answers but rather to convince the readers of the likelihood of the propositions' existence. The triangulation between the interviews and documentation described in Step 1 increases internal validity.

### Step 3: Visualization

In analyzing the code categorization, we constructed a timeline as to visualize major events and decisions. By conducting a cross-stakeholder analysis to sensitize multiple interpretations (Klein & Myers, 1999) we were able to compare and reflect upon the codes. After discussing the coding scheme within the research team, we compared the empirical findings from our interviews with internal documents such as presentations and annual reports as to confirm and disconfirm our findings. Finally, pooling our different data sources, we used our conceptual research design to yield a holistic model of Nordea's Green IS adoption. Table 3 present a sample of concepts resulted from our coding.

## GREEN IS AT NORDEA

In 2006, Nordea initiated a strategic repositioning that emphasized customer focus. A new CEO was appointed. He brought in a different management style involving discussions with shareholders, employees, and customers. He also initiated a revision of the corporate values and the ones that emerged were "It's all about people," "One Nordea team," and "Excellence of customer experiences."

In this revision, CSR emerged as a key concern among Nordea's customers and employees in this process. As a response 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 broad grip over all sustainability activities, including

Table 3. Samples of concepts

Process Stage	Concepts	Exemplary Quotes from the Case
Antecedents	Organizational factors	“It was Christian Clausen who started the discussion about more acting on CSR”
	Technological factors	“It makes no sense travelling all around the Nordics to have meetings all over when you can have it in two minutes with a camera, more in terms of efficiency and making it more efficient”
Adoption	Implementation	“I don’t really know why, but it’s probably because they are not used to it.”
Outcomes	Individual outcomes	“When we started rolling out, people - particularly in Sweden, actually - we got a bit complaints.”
	Organizational outcomes	“My department, one of the worst travelers within Nordea, used to spend 1.3 million euros in 2008, now we are down to 500,000 euros in 2010.”
	Environmental outcomes	“The customers’ reactions to switching to electronic letters have been overwhelmingly positive.”

production of green annual report, participation in external committees, and facilitate future work. The CSR manager explains the link between CSR and the new corporate values:

*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 (CSR Manager).*

To organize all sustainability-focused initiatives under one umbrella, a new initiative titled labeled the Eco-footprint, was started. The initiative organized eight workgroups, including internal paper, external paper, internal logistics, waste management, water usage, energy consumption, buildings, and Green IT. The Eco-footprint initiative had some ambitious environmental goals by 2016, which is reduction by 50% energy usage by person, 50% for customer paper, and 50% for internal printing.

### Emergence of Green IS

Green IS emerged on Nordea’s radar in 2007. One employee working with Nordea’s IT infrastructure operations was reading the latest reports on global warming while waiting for a flight that would take him to Nordea’s headquarters. This employee stated:

*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 presentation was on how Nordea could use IT more effectively to save costs while reducing environmental impact at the same time. He got positive response on the presentation and was promoted to Green IT manager the following year. The Green IT Manager, CSR manager, and premises manager formed a steering group responsible for the different Green IS initiatives around Nordea, including virtualization of servers and consolidation of server halls to save energy, Power-off project to turn off computers during night, facility management systems that focused on monitoring and controlling energy consumption in buildings, and videoconference systems used to reduce travel. In the remainder, we draw upon these three Green IS projects.

### *Power-Off System*

The idea of the Power-off system was that by turning off computers when not in use. The Green IT manager became the project manager for the Power-off initiative. First, he launched a feasibility study. The study explored different options for completing the task, including commercial products and internal solutions. Eventually, the analyst in charge of the feasibility study recommended that modifying the current platform management system could complete the task. The business case suggested that the total cost would be roughly €80,000 for the first year, and then €36,000 as annual running costs from 2nd year and beyond (Nordea, 2012). Expected cost savings would be in the area of €500,000 over the initiative's lifetime. When the project was fully implemented, between 20,000 and 26,000 computers were shut down every night, and as a manager said:

*... 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 background of the facility management system is very different than for the Power-off system. The premises manager had driven a sustainability agenda for a long time, ensuring that Nordea's buildings were certified for low energy consumption and taking part of North-European green building council. He had encountered a problem. Nordea's corporate electric power provider could not provide detailed figures of power consumption, only aggregated measures. The premise manager viewed this a major issue, since he could not follow up the power consumption at business unit level.

When in place, the data from the facility management system was essential for the next generation of facility management system, since it provided Nordea with data to identify a new issue. The first system made it possible to monitor energy consumption at location and over time, which showed that Nordea's branch offices used as much energy weekdays as weekends. One participant commented:

*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 amount energy when people are not there as when they are there. It's great when IT systems can provide us with this information (Premises manager).*

### *Live Meeting*

Nordea uses several video conferencing systems, from a low-end system to a high-end system directly connecting meeting rooms of Nordea offices. The intended usage of Live Meeting is for everyday use between employees to support the internal interaction and to complement and enhance phone calls, instant messages, and e-mails. The rationale for using these technologies include reductions in travel costs, release of employee time (hanging around airport lounges), and decrease in CO<sub>2</sub> emissions. The main video conferencing project is Live Meeting, which has been installed at most employees' computers for a couple of years but is not frequently used.

The Live Meeting project started in the winter of 2010, when Nordea realized that Live Meeting was hardly used. A project worker began to work on the project and the main goals are to get the system up and running and get more employees to use it. The vision of how Live Meeting may influence Nordea's activities is dual. Cutting the travel is one part of it, but also enrich communication that else had been mediated by phone calls. Video conferencing as a mean to replace travelling got a boost when travel with plane was suspended during the ash cloud's presence over Europe. Top management, including CEO, is also trying to set a good example on the use of video conferencing.

## SUMMARY

By 2012, CSR played an important part in the long-term agenda and affects most organizational activities of Nordea. The bank continuously works on integrating CSR and Green IS; for example, lending and investments (environmental, social, political and governance analyses in the credit process). Nordea enforced sustainability clauses with all its suppliers to prevent child labor and other misuse. The work follows a strategic plan with long-term goal to reduce the banks' environmental impact. In support of the sustainability initiatives, Nordea signed the United Nations Process for Responsible Investments and follows with the OECD guidelines for multinational enterprises. Nordea also engaged in more general attempts to influence the society at large, such as the "Carbon disclosure project".

## CASE ANALYSIS

Our main findings are summarized in Table 2. Below we discuss our findings in more details.

### Antecedents

One of our main findings is that within organizations, attributes of organizations and Green IS initiatives both influence the adoption of Green IS initiatives. However, those attributes, especially attributes of Green IS initiatives, receive little attention in the previous literature.

#### *Role of the Organization in the Adoption of Green IS Initiatives*

After being appointed as the CEO in 2006, Christian Clausen initiated a revision of the corporate values. As one participant stated, this was the beginning of a more structured and formalized greening process of Nordea:

*I don't remember in what order or how everything happened, but I know when Christian Clausen started publishing these values, at the same time he had started these different initiatives, and I am certain that it was Christian Clausen who started the discussion about more acting on CSR (Facility manager).*

The above quote highlights the key role played by the leader in initiating the adoption of any CSR or Green IS. Essentially, the leadership of the new CEO triggers restructuring and reshaping the expectations of the company's employees in terms of how they want to do business. Clearly, Nordea started adopting Green IS in a more systematic and structured way after the leadership of the CEO shifted and gave sustainability an organizational platform.

The adoption of Green IS initiatives can also be influenced by the green mindset of employees. In Nordea, to investigate and support the adoption and use of Green IS Initiatives (e.g., Live Meeting), the Green IT manager announced a position on the intranet and recruited a person from customer support, who was not mainly motivated with the green IS, but had the right mindset of embracing a challenging project. One participant commented:

*I did not bring in the Green IT as a motivator for myself other than I just thought that this was a fun project, I wanted to gain that experience, sort of break and something new to do from this work that I had been doing for two years (Live Meeting staff).*

As seen from the quote above, employees' mindsets surrounding sustainability had an impact on their motivation to adopt Green IS initiatives. Motivations, including both intrinsic and extrinsic, can influence the attitude towards green IS, leading to greater adoption and continuous intention to use

(Koo & Chung 2014). In applying it to understanding the situation of Nordea, whilst top managers have a more proactive green mindset, the live meeting staff did not agree with them initially. In such a context, he/she may still launch Green IS initiatives due to internal requirements, but probably not go any step further. On the other hand, if he/she had a more proactive green mindset toward green practices, they might be more willing to adopt various kinds of Green IS initiatives, even if not asked to do so.

When Nordea wanted to adopt Green IS initiatives further, what seemed to be lacking was people with experience and knowledge for taking the work to the next step. One participant stated:

*I think here in Nordea there are many 'green thinking' people, who have the mindset, but many times they do not have the competences to do it. I look for people that have such competences and are adding value by also having the knowledge (Facility manager).*

Based on the quote above, employees' past experiences and skills concerning Green IS initiatives can also influence their future Green IS initiatives adoption. In Nordea, it is likely that the more organizations and managers that are exposed to and involved in Green IS initiatives beforehand, the more likely they are able to identify the potential opportunities. If there were enough employees available for Green IS initiatives, the company might be able to adopt and start new Green IS initiatives immediately.

Based on these discussions, we propose that:

**P1:** The attributes of organizations, such as managers' leadership, employees' green mindsets and past experiences with Green IS, will influence the adoption of Green IS initiatives.

### *Role of Technology on the Adoption of Green IS Initiatives*

The Live Meeting project in Nordea has evolved in phases, each with an individual objective. One participant stated:

*Our first goal was to map the usage, 100% of that. The next major step was to try out in a smaller group, which we did by putting out an article on the Internet saying that anyone could join.... Our next step would be to get somewhat a larger audience than the 1,500 and to do more or less the same (Live Meeting worker).*

The above quote emphasizes the importance of the goal of Green IS initiatives in influencing and shaping the adoption process of Green IS initiatives. Previous literature has identified different eco-goals, such as eco-efficiency and eco-effectiveness. Eco-efficiency is defined as "the delivery of competitively-priced goods and services that satisfy human needs and bring quality of life, while progressively reducing environmental impacts and resource intensity throughout the life cycle, to a level at least in line with the earth's estimated carrying capacity" (DeSimone & Popoff, 2000). Eco-effectiveness refers to the design of products that "celebrate interdependence with other living systems" and "work within cradle-to-cradle life cycles rather than cradle-to-grave ones" (McDonough & Braungart, 1998). While eco-efficiency might focus on reducing energy consumption, eco-effectiveness may guide the design of computing equipment to be more environmentally friendly. Therefore, a Green IS initiative with the eco-goal of eco-efficiency (e.g., Power-Off) is probably adopted differently from another Green IS initiative with the eco-goal of eco-effectiveness (e.g., redesign the production process). Further, the same Green IS initiatives can be understood differently. Here is how another employee views Live Meeting:

*I thought of it more in terms of efficiency, I mean it makes no sense travelling all around the Nordics to have meetings all over when you can have it in two minutes with a camera, more in terms of efficiency and making it more efficient. Then of course the Green effects (Live Meeting worker).*

Therefore, we propose that:

**P2:** The eco-goals of Green IS initiatives will influence the adoption of Green IS initiatives.

### **Adoption**

Another finding of our study is that employees play a significant role during the implementation process of Green IS initiatives, while few studies examine stages beyond initiation and the processes.

#### *Intention and Implementation*

Organizational and technological characteristics undoubtedly influence the adoption of Green IS initiatives, but that is not the whole story. The problem that is hampering adoption partially is traditions, habits, and legal constraints. The problem is not only manifested in the unnecessary use of paper documents, but also in the slow adoption of Live Meeting technology for video meetings. One participant commented:

*So what is the big jump? You use e-mail, you use Communicator, then... what's the big jump from the IM to the video conference technology? What is the barrier?*

Some users blame their equipment:

*'I don't have a camera, I don't have a headset, I don't have....,' but since a few years back they all have computers with webcams and microphones that work perfectly fine.... I don't really know why, but it's probably because they are not used to it (Live meeting worker).*

The above quote emphasizes that people's attitudes toward Green IS initiatives also influence the success of the adoption. Attitudes are the degree of like or dislike that an individual has toward something. They are generally positive or negative, but people can be conflicted so that they can feel both positively and negatively towards the same object, or can be apathetic in that they don't have an opinion either way. In Nordea, the use of electronic documents and the adoption of Live Meeting can be negatively affected, especially when people are not used to the new tool.

These arguments are also consistent with previous literature on IT implementation. Any implementation of a new system, new processes, or new policies such as Green IS initiatives, will always involve people, many of whom will resist the change (Gosain, 2004). Project managers understand that handling the change management issue can be one of the biggest struggles in implementation of new Green IS initiatives. This is why the attitudes toward Green IS initiatives can have a substantial impact on the change management. Therefore, we propose that:

**P3:** Employees' attitudes toward Green IS initiatives will influence their participation in the implementation process of Green IS initiatives.

### **Consequences**

Lastly, our analysis shows that Green IS initiatives can result in positive social, economic and environment effects, depending on a variety of factors such as specify type of initiatives implemented and how they are implemented. Besides, there are feedback influences from individual effects to future adoption of Green IS initiatives, which we do not see in the current literature.

### *Individual Effects from the Implementation of Green IS Initiatives*

When the rollout of Power-Off projects started, it got a chill welcome. One participant stated:

*When we started rolling out, people - particularly in Sweden, actually - we got a bit complaints. Probably they were not used to turning on the computer.... but there was very few if you consider how many users there are (Project leader).*

When the project was fully implemented, between 20,000 and 26,000 computers were shut down every night. As commented by one GIT manager:

*For what we can imagine, this system will turn off fewer and fewer computers in that this affects people's behavior that they turn off computers when they leave. I myself didn't turn off when I left, and that was what we saw all over Sweden where people were not used to do it (GIT manager).*

There are two interesting findings from the Power-Off projects (Nordea, 2012). The first is that over time, fewer and fewer computers were being turned off automatically each night. In Dec. 2009, the automation turned off 77% of all client computers included in the system; one year later, only 70% of the client computers are turned off this way. The second interesting finding is that the Swedes, based on percentage, were not as dedicated as the Finns, Danes, or Norwegians in manually turning off computers when leaving at night. On average, only 10% of the Swedes turned off the computers, whereas the average among the other Nordic countries is between 45-70%. The reason for this might be that the Swedes were used to upgrading computers overnight instead of manually turning them off.

As emphasized in previous examples and quotes, employees can change their behaviors. In Nordea, after the implementation of the Power-Off project, people initially did not have a positive attitude toward it. Over time, more people began to turn off their computers. Though employees can change their behaviors, some may refuse to change due to their negative attitudes. In Nordea, when people have a negative attitude, they might refuse to start using any of the initiatives implemented. Based on this, we propose:

**P4:** The organization's adoption of Green IS initiatives will influence individuals' use of Green IS initiatives, depending on what Green IS initiatives are implemented, how they are implemented, and what the original attitude towards the initiative was.

### *Organizational Effects from the Implementation of Green IS Initiatives*

As organizations adopt different Green IS initiatives with various strategies, they expect to receive positive outcomes. Specifically, organizations want to improve their performance at the minimum, and try to achieve a competitive advantage when possible. Natural Resource-Based-View (NRBV) identifies three inter-related strategies to support sustainability: pollution prevention, product stewardship and sustainable development (Hart, 1995). For Nordea, the strategies of pollution prevention and sustainable development are of concern.

A pollution prevention strategy can be seen with Nordea's Power-off initiative for reducing energy consumption. Green IS initiatives, such as turning off computers, require deeper changes in organizations and are hard to imitate (Corbett, 2010), thus potentially leading to a competitive advantage as described by NRBV.

A sustainable development strategy is also seen within Nordea. Their adoption of collaboration technologies (Corbett, 2010) and the facility management system show an organizational commitment to ecological improvement, and can lead to a competitive advantage given that sustainable development initiatives often require business process redesign and are hard for competitors to imitate.

In Nordea, the impact of collaboration technologies adoption is quite large. An illustration of the green impact comes from an IT infrastructure manager:

*One of the areas where we can make a difference is related to travelling specifically air-travel. My department, one of the worst travelers within Nordea, used to spend 1.3 million euros in 2008, now we are down to 500,000 euros in 2010.... So by reducing traveling Nordea saves money, the employees get a better balance between work and private life, leading higher efficiency in work, and we are reducing our impact on the environment.*

Based on the quote above, it can be argued that the implementation of Green IS initiatives can have positive impacts on the organizations and the environment. More importantly, there can be different kinds of impacts, depending on the specific Green IS initiative implemented. It can be argued that organizations expect to obtain positive outcomes after the implementation of Green IS initiatives. These outcomes can be revised business processes (which is one type of new structure), reduced energy consumption, and so on (Schryen 2012). In Nordea, the implementation of Live Meeting not only reduced the cost of travelling, but also changed the way that employees did their jobs.

The concept of sustainable development argues that organizations should lower or eliminate the ecological impacts by their activities. As such, this strategy deals with every aspect of an organization. In Nordea, the Live Meeting project lowered the ecological impacts as well as changed the employees' way of work. Therefore, after being successfully implemented, Live Meeting likely offers Nordea a performance improvement. Based on the above, we argue that:

**P5:** The adoption of Green IS initiatives influences organizations' performance, depending on what Green IS initiatives are implemented and how they are implemented.

### *Environmental Effects from the Implementation of Green IS Initiatives*

Nordea's implementation of Green IS initiatives has been beneficial for the natural environment. In 2011, Nordea's Green IS team mapped and suggested improvements to the process for reuse and recycling of old IT equipment and mobile phones, improved virtual collaboration tools and conducted training on these, and investigated potential ways to implement default double-sided printing from a technical point of view. Each of these initiatives affected the environment positively.

Another initiative underway at Nordea that lead to environmental benefit was the print-reduction project. This project focused on reducing the amount of physical papers produced internally and externally. One participant stated:

*Since, we started to use video conferencing systems (Lync shows the PowerPoint presentation to all participants), we have stopped printing PowerPoint presentations (Eco-Footprint manager).*

In 2008, Nordea sent approx. 125 million letters to their customers in the form of bank statements, invoices, etc. As Nordea states, "We realized that reducing the number of letters we send out has a positive effect on the environment, our costs and customer convenience" (Nordea, 2012). The team cooperated closely with their largest external print partner to identify the types of letters that are distributed in large volumes. Nordic Portfolio Manager in Deposit & Loan Products stated:

*The customers' reactions to switching to electronic letters have been overwhelmingly positive. Most customers appreciate the convenience of receiving their bank documents electronically in their netbank rather than in the form of printed letters that end up in the garbage (Nordea, 2012).*



Due in part to these Green IS initiatives, Nordea was able to reduce their CO<sub>2</sub> emissions from 55,420 tons in 2009 to 42,330 tons in 2011, their energy consumption from 236,391 MWh in 2009 to 212,679 MWh in 2011, and their total waste from 4,330 tons in 2009 to 3,370 tons in 2011 (Nordea, 2012). Based on this data, it the implemented Green initiatives had effect on the overall natural environment as well. Therefore, we propose:

**P6:** The adoption of Green IS initiatives influences the natural environment, depending on what Green IS initiatives are implemented.

*Feedback Influences from Individual Effects to the Adoption of Green IS Initiatives*

Once the system is showcased and proved working, managers and staff members in the IT department are generally positive to using the system. One participant commented:

*I had interviews with a lot of people, and when I talked to them, they were like: ‘Oh, yes you’re going to start this live meeting and get it up and running, great! So if I have any question can I turn to you?’.... so they were very enthusiastic in terms of that and also in error reporting (Chairman Green IT committee).*

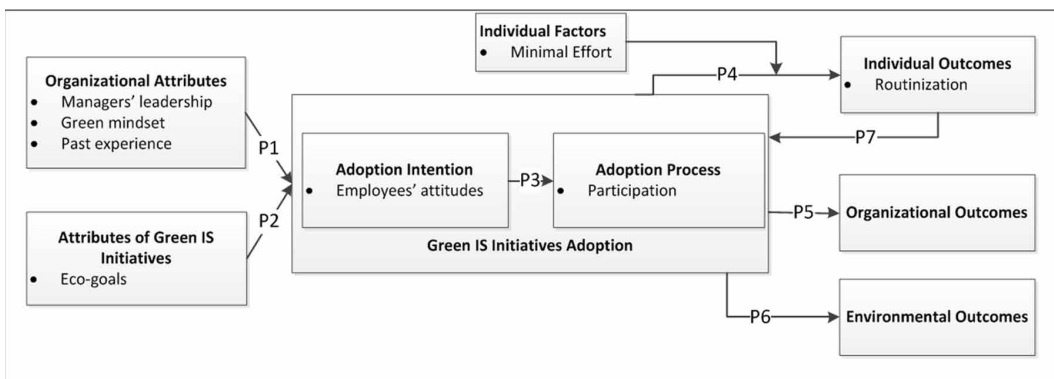
Based on these quotes, after individuals really see the effects and benefits of Green IS initiatives implemented functionally, they are more likely to adopt them. Therefore, there is a feedback effect from individual effects to the adoption of Green IS initiatives. In Nordea, after the Green IS initiatives (e.g., Live Meeting) were implemented, they will further influence how employees adopt Green IS initiatives, especially when employees realize the benefits of the systems. Therefore, we propose that:

**P7:** There is a recursive influence of individual outcomes on future Green IS initiatives adoption: When a positive outcome results, employees are more likely to engage in Green IS initiatives adoption in the future.

**DISCUSSION**

Based on the insights from Nordea (summarized in Table 2), we propose a theoretical model to guide future Green IS study (refer to Figure 2). Organizational attributes (P1) and the attributes of Green IS initiatives (P2) indeed influence organizations’ adoptions of Green IS initiatives. These two types of attributes cover the “antecedents” part of our conceptual framework in Figure 1. During the

Figure 2. Theoretical model for future Green IS study



adoption implementation, employees' attitudes toward Green IS initiatives play an important role in influencing their participation and the success of Green IS initiatives (P3). This proposition deals with the "adoption" part of the conceptual framework in Figure 1. After the implementation, an organization may improve their economic (P5) and environmental performance (P6), and employees may choose to adopt the initiatives (P7). In addition, individual effects may further influence adoption of Green IS initiatives within the organizations (P4). These outcomes deal with the "consequences" section of our conceptual framework in Figure 1. Once the implementation is completed, organizational changes and Green IS initiatives function as new instances of social structures to influence people's actions. Thus, the relationships between Green IS initiatives, people, and the organization are recursive, and they are continually intertwined.

### **Theoretical Contributions**

This paper advances our theoretical understanding of Green IS in several ways. First, we contribute to the current literature by clarifying the role of Green IS initiatives' attributes as well as employees in the initiation and adoption of Green IS initiatives. We believe that this is an important contribution because our review shows that few studies have examined factors focusing on Green IS initiatives' attributes and employees. We also examine one important factor focusing on managers: leadership, which has not been empirically examined in previous literature.

Second, relatively few studies have examined stages beyond initiation, and our study takes one step further to examine the implementation process of Green IS initiatives. Specifically, we emphasize the importance of employees in the process of implementation and argue that their attitudes are essential for their participation in the process of implementation, which further clarify the role of employees.

Third, even though the concept of Green IS has been recognized as a multidimensional phenomenon, previous literature has mainly examined its economic and environmental effects. However, the results are mixed, and additional empirical studies are needed to clarify how various contexts and conditions lead to different effects of Green IS initiatives. Few studies have examined the social outcomes of Green IS initiatives. Our study represents some progress in this regard. Based on the insights from Nordea, we show how individual, organizational, and economic outcomes are resulted under what circumstances. Future studies are needed to further examine different outcomes of Green IS initiatives and clarify the corresponding contexts.

Fourth, we also examine the recursive effects of Green IS initiatives. We show that individual outcomes have recursive effects on future Green IS initiatives adoption within organizations. Therefore, our study highlights that previous adoption of Green IS initiatives should be not interpreted as an end but have an important effect on subsequent adoption. To the best of our knowledge, few studies have examined the recursive effects of Green IS initiatives

Finally, we developed a conceptual model to provide a more theory-driven understanding of Green IS adoption and implementation. In our theoretical model, we tried to understand the whole process of Green IS. Given the lack of a theoretical understanding of the whole process of Green IS initiatives, our model can serve as a foundation for future studies as well as providing an ecological perspective to the value of IS (Schryen, 2012).

### **Practical Contributions**

The findings in this paper are of relevance to IT practitioners as well as government regulating agencies. First, our study can be used as educational material to help practitioners understand Green IS initiatives. Practitioners can thus better understand the role of each step of Green IS initiatives from a more holistic perspective. Instead of treating each step as being isolated, our model can help link each step together and practitioners can better manage the whole implementation process of Green IS initiatives. This should result in successful implementation, and benefit organizations subsequently.

The factors identified which influence the adoption of Green IS initiatives should also be valuable for practitioners. First, our study highlights that Green IS initiatives have different eco-goals. As such, practitioners can better understand different Green IS initiatives and select more suitable initiatives for their organizations. Second, our study shows that employees play an important role. Therefore, when deciding on Green IS initiatives, organizations may want to involve employee representatives so that the managers can make better decisions.

Third, our study shows that employees' attitudes are important in the implementation process of Green IS initiatives. Managers need to make sure that employees have positive attitudes toward the Green IS initiatives implemented. For example, managers may hold discussion sessions so that employees can understand the rationale of initiatives. Managers can also provide training sessions or let employees try these initiatives first so that employees can see the benefits.

Fourth, our study describes how different outcomes are resulted from Green IS initiatives. Managers can thus understand how Green IS initiatives can help reduce the environmental footprint and obtain economic benefits, as well as understand the different individual outcomes. For example, in Nordea, only 10% of the employees in Sweden chose to turn off the computer.

Finally, practitioners need to understand the recursive effect of Green IS initiatives. Specifically, Green IS initiatives implemented may change organizations over time and influence their subsequent adoption decisions. Therefore, practitioners need to understand that their organizations can change after the implementation of Green IS initiatives. Additionally, government regulation-creating agencies need to know that organizations need the chance to understand the benefits Green IS initiatives. Once organizations successfully implement Green IS initiatives and understand that Green IS initiatives can result in various positive outcomes, they are more likely to adopt additional Green IS initiatives in future.

## **Limitations and Future Research Directions**

There are several particularities of the transformation of Nordea that may have influenced the analysis above. First, some might argue that Nordea is not an ecologically sustainable organization in its purest sense. Admittedly, Nordea has not distanced itself from objectives of economic sustainability committing to a *raison d'être* in ecological sustainability.

Second, Nordea is an organization that is fused with IS. From top to bottom, IS is integrated in the daily operations. The prominent position of IS increase probability that potential implications of IS in the transition will surface and stand out, it also implies that for organizations where IS plays a minor, or at least more supportive role, the transition may play out differently. The embeddedness of Green IS in the transition process may be downplayed.

Third, Nordea operates in the financial industry that is considered to be conservative and resistant to change. As elaborated below, we see Nordea in a vulnerable transition process that requires a careful and sensitive managerial touch. It might be assumed that management's role may vary based on the institutional characteristics of the industry as well as the specific organization. Besides, new insights may be generated by interviewing additional participants from Nordea (e.g., employees actively practicing Green IT).

With these limitations in mind, future research can involve empirical testing of our model using more quantitative methods. Further, in this study, we only focused on organizational and individual level factors. Although these factors are important and relevant, future studies can expand our model by including other factors such as those at the environmental and societal levels. Finally, with regards to external validity, as this is a single case study, the generalizability to other cases is unknown. However, it has been argued that the use of one case is similar to the use of one experiment, in the sense that neither one is sufficient to reject or disprove propositions, and that several are necessary to demonstrate accuracy of a theory (Eisenhardt & Graebner, 2007; Lee, 1989; Yin, 2013).

## **CONCLUSION**

As practitioners become increasingly interested in Green IS, researchers have begun to examine the topic in greater depth. However, several limitations remain in the current literature. To address those limitations, we empirically examine the adoption, implementation, and effects of Green IS initiatives within the Fortune 500 bank, Nordea. Based on the in-depth case analysis, our study highlights the important role of organizational factors and the characteristics of the Green IS initiatives themselves on the adoption of Green IS initiatives. Our study also shows that the success of Green IS initiatives can be influenced by employees' attitudes. Lastly, the adoption of Green IS initiatives can result in individual and organizational level outcomes, and there are recursive influences of these impacts on the adoption of Green IS initiatives in the future. Those results make important contributions to the current literature, and can help IT practitioners better understand Green IS. Future studies can empirically test the developed model or examine other relevant environmental and societal factors, which can influence the adoption and implementation of Green IS initiatives.

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