Creating Environmental Sensemaking through Green IS: An Experimental Study on Eco-Nudging Paper Printing Behavior

Completed Research

Kenan Degirmenci
Queensland University of Technology
kenan.degirmenci@qut.edu.au

Jan Recker
University of Cologne
jan.recker@wiso.uni-koeln.de

Abstract

Through a field experiment, we analyze how the work practice of paper printing is influenced through the availability of two types of information systems that support environmental sensemaking, an email reporting system that allows for reflective disclosure and an online discussion forum for information democratization. We implemented both systems in an ongoing sustainability initiative in a large university. Our results show that the engagement with both types of sensemaking systems leads to a significant reduction of paper consumption. We also uncovered an interesting interaction effect, which suggests a substitution effect between the two system types. Our findings suggest that IS-enabled sensemaking can be a powerful resource in the design and implementation of sustainability initiatives in organizations, which offers recommendations for Green IS to further enhance the understanding of environmental sensemaking and sustainable work practices.

Keywords

Green IS, environmental sustainability, sensemaking theory, work practices, paper printing, field experiment.

Introduction

Information systems (IS) that support sensemaking are an important class of IS to not only support economic goals but also promote environmentally sustainable behaviors (Elliot 2011; Melville 2010; Seidel et al. 2018; Watson et al. 2010). Our ambition is to explain how information systems that allow for environmental sensemaking actually impact users’ work practices. To facilitate such an explanation, we carried out a field experiment in which we studied how the work practice of paper printing is influenced through the availability of two different types of information systems: IS that support reflective disclosure and information democratization (Seidel et al. 2013). We chose paper printing as a work practice because a sustainable behavior change in paper printing entails several benefits for the environment. For example, the paper industry in the United States, which is the second largest paper industry in the world, is the largest user per ton of product of industrial process water and accounts for around 40 percent of the industrial wood harvest, 34 percent of the municipal solid waste, and 9 percent of total manufacturing CO₂ emissions (Environmental Paper Network 2007).

Our study contributes to Green IS research in two main ways: first, we quantify and compare the main effects of reflective disclosure and information democratization on work practices’ environmental output. Thereby, we empirically verify the role of environmental sensemaking for organizations that strive for converting work practices into more sustainable work practices. Second, we analyze interaction effects between reflective disclosure and information democratization, which allows us to clarify the interdependencies of the two sensemaking features, which in turn provides new knowledge relevant to the research on the design of IS for environmental goals (Loock et al. 2013; Recker 2016; Seidel et al. 2018). In this paper, we briefly describe setup, execution and results from our study. We proceed as follows: we give background on the theory of sensemaking and describe the sensemaking features of reflective disclosure.
and information democratization in more detail. After presenting our hypothesis development, we describe the experimental design of our study and present findings from our data analysis. Finally, we discuss some implications and limitations.

Theory and Hypothesis Development

Sensemaking theory (Weick 1995) describes the processes for developing an understanding of the ambiguity that surrounds work practices (Maitlis 2005). It structures cognitive processes involved in sensing, weighing, and synthesizing external stimuli into the formation of beliefs (Tallon and Kraemer 2007). The theory suggests that through sensemaking, circumstances are turned into a situation that is comprehended explicitly and that enables to translate beliefs into actions (Weick et al. 2005). From an environmental viewpoint, sensemaking allows information seeking, meaning ascription, and action, by which individuals are enabled to interpret relevant information about the environmental impact of personal decisions (Vlaar et al. 2008; Watson et al. 2012). Environmental sensemaking therefore involves the sensing, weighing, and synthesizing of external stimuli in a way that lead to pro-environmental behaviors. Environmental sensemaking can occur at the organizational level as suggested by Seidel et al. (2013), but we are interested in particular on sensemaking by individuals: how do users of information systems use these systems to “make sense” about the environmental consequences of their actions? One important element of sensemaking theory is that individuals have initial perceptions and understandings about actions (their work practices in our case), i.e., they possess an initial sense, which is subject to change based upon the stimuli that the individuals receive (Seligman 2000). It is therefore purposeful to understand how the initial sense can be altered, for example, towards a more environmentally-friendly orientation. Information systems that provide relevant features can offer such stimuli through the provision of appropriate information, and in turn enable sensemaking.

In order to trigger environmental sensemaking, technically any information system that provide relevant features or services can be used, e.g., enterprise portal solutions, wiki websites, community platforms, social networks, microblogs, newsfeeds, email support, etc. (Loeser et al. 2017; Recker 2016; Seidel et al. 2013). In sensemaking literature, different formations of sensemaking features have been discussed, for example, the seven properties of sensemaking in Weick (1995), or the four design principles for sensemaking in Seidel et al. (2018). To focus on an initial set of features for examination, we examine two features of IS that Seidel et al. (2013) considered relevant in their case study to make sensemaking possible: features for reflective disclosure and information democratization. Reflective disclosure features allow environmental sensemaking through the monitoring, analysis, and presentation of environmental indicators (e.g., carbon footprint, total energy consumption, and renewable energy consumption) (Henkel et al. 2017; Seidel et al. 2013). When systems define and diffuse environmental key performance indicators for each individual in the organization, individuals can become increasingly aware of the impact of their practices, in turn potentially evoking behavioral change. On basis of this logic, we form our first hypothesis and bring it to the paper printing context that will be the empirical domain of the study we report below, in which an email-based reporting system is used to allow employees reflect on their paper printing behavior, in particular by providing comparative information about their paper consumption in environmental terms over time and in relation to others. These disclosures will enable them to reflect on past actions and consider behavioral changes in light of the impact of individual actions (e.g., how much trees, greenhouse gases, or energy can be saved by reducing paper printing); in other words, the environmental credentials of their actions will be made sense of:

\[ H_1: \text{ Reflective disclosure will have a significant impact on sustainable work practices, such that employees engaging with an email reporting system will reduce their paper consumption.} \]

A similar yet distinct cognitive engagement with actions and their footprint is said to be triggered by information democratization features. The possibility to discuss, share and learn from others’ behaviors and outcomes can induce a change in attitude and view, and also allows identifying new action opportunities and behavioral change possibilities. Individuals are enabled to access and interact related to the sensemaking process by assisting in active participation in a sustainability conversation, which may induce them to establish sustainable work practices (Hilpert et al. 2013; Seidel et al. 2013). Through diffusion and network cultivation of information, individuals are encouraged to engage with a sustainability initiative through feedback and comments on issues that are relevant for the initiative, and through
opportunities to influence decisions made as part of the initiative (Loeser et al. 2017; Seidel et al. 2013). In the context of our study, we will use an online discussion forum to allow employees to hook into conversations about various topics regarding paper printing, which might help them to reconsider their paper printing behavior (Henkel et al. 2017):

\[ H2: \text{Information democratization will have a significant impact on sustainable work practices, such that employees engaging with an online discussion forum will reduce their paper consumption.} \]

From this, we deduce that reflective disclosure features enable sensing and weighing of environmental stimuli, and information democratization features enable synthesizing the different stimuli through interaction and dialogue. We also expect that these effects will be significant yet distinct, thus, they will interact. This is because reflective disclosure depends on the action possibilities provided by information democratization in order to be effective, and at the same time, information democratization depends on the basis of information acquisition provided through IS features of reflective disclosure, suggesting a codependence but also a mutual reinforcement effect between both sensemaking mechanisms (Seidel et al. 2013):

\[ H3: \text{There will be an interaction effect between reflective disclosure and information democratization on sustainable work practices, such that employees will reduce their paper consumption even more when they engage with both an email reporting system and an online discussion forum.} \]

**Method**

**Experimental Design**

Our objective was to measure individuals’ behaviors at the workplace regarding paper printing. Thus, we designed a field experiment. This allowed us to study both the formation of sensemaking through IS and its actual impact on sustainable practicing, which is exactly what has been demanded from Green IS research (Gholami et al. 2016). Specifically, we used a 2 (with/without reflective disclosure) × 2 (with/without information democratization) between-subject, full-factorial experimental design in which we manipulated the presence and absence of IS features for sensemaking, i.e., reflective disclosure and information democratization at the workplace.

**Measures**

Our dependent variable was paper consumption, which enabled us to assess the realization of sustainable work practices through environmental sensemaking. We measured our dependent variable by tracking participants’ paper consumption with a print management tool that allowed monitoring paper printing practices including total pages printed, number of single-sided prints, number of color prints and so forth. We tracked data for six weeks to mitigate bias from potential short term disturbances in printing. The independent variables were realized through the provision of two types of information systems providing different environmental sensemaking features, such that one group did not have any feature available (control), two groups had one feature each available, and one group had access to both features.

To operationalize reflective disclosure, we designed an email reporting system that allowed participating subjects to access and review environmental indicators in relation to their work practices of paper printing on a weekly basis. For example, the email reports provided participants with a comparison of their achieved ratio of grayscale duplex printing to colored single-side printing and their corresponding paper consumption, all in comparison to other participants, which we expected to affect the awareness of the work practice. Though not influencing paper reduction, we included color printing due to the harmful environmental impact in terms of chemicals in printer inks (Cartridge World 2013) and the impact on costs (the print management tool we used in the study calculated $0.08 per color page and $0.011 per black and white page). To avoid rebound (boomerang) effects (Schultz et al. 2007), we designed the disclosure features such that each participant received their own data in comparison to previous times and to aggregate data in the form of the participants’ average. In addition to this descriptive information, to further reduce rebound effects for participants consuming less paper than their peer average, we integrated injunctive information that allowed participants to perceive what is commonly approved or disapproved (Hasan et al.
2013; Schultz et al. 2007). For this purpose, we made use of green bars to indicate individual paper consumption below the average, and red bars for above average. Figure 1 shows an exemplary email report for a comparison of sheets of paper.

![Figure 1: Comparative Results for Reflective Disclosure](image)

**Figure 1. Comparative Results for Reflective Disclosure**

To operationalize information democratization, we designed an **online discussion forum** to allow participants the possibility of dialogue, which facilitates individuals to reconsider their work practice behavior. To provide relevant topics for participants in the forum as a basis for discussions, before treatment implementation, we surveyed participants on how they felt about sustainability considerations at work. Further questions related to their paper printing behavior, e.g., on reasons to print single-sided rather than double-sided, or on challenges to go paperless. To code the data from participants' responses, we applied coding techniques known from grounded theory (Charmaz 2014). We started with an initial line-by-line coding in order to identify central ideas in the data, and then proceeded with focused coding to sort and synthesize the most significant and frequent initial codes. Through the coding process, we identified six topics. From week to week, participants were invited to discuss these topics. Each topic involved a poll to stimulate the discussions and to enable users to influence decisions made as part of the initiative. Figure 2 shows an exemplary topic from the forum.

![Forum Discussion]

**Figure 2. Sustainability-Related Topic for Information Democratization**

To examine the effectiveness of each treatments, we measured engagement of users with the email reporting system and the online discussion forum: at the end of our initiative, we asked participants to report on the
frequency of their reading the email reports and their type of the usage of the online forum (read, post, and/or vote). These measures served as manipulation checks to determine which participants actually used the treatments and in what intensity, i.e., how much sensemaking could possibly originate from using the systems.

**Procedures**

We conducted our field experiment in a large university in Australia, in which staff members are able to freely use printers at their own leisure and where the printers allow both color and grayscale printing, as well as single versus duplex printing freely at the disposition of any individual. These conditions were required for our experiment in order for participants to freely choose between printing options. We proceeded as follows: First, we established an initiative with the aim to reduce paper consumption and advertised within the network of the organization (via email, the news website, intranet, and so forth). Second, we tracked data on participants’ paper consumption over a period of six weeks from October 16 to November 26, 2017, with the organization’s print management tool, which we used to develop the printer usage data for our email reports. Third, with an open-ended survey we collected qualitative data that we used to develop the topics and polls for our online discussion forum. Fourth, we made the treatments available to participants during the six weeks by sending email reports each Tuesday and creating a new topic in the online forum each Thursday: the email reports were only sent to the reflective disclosure group, the online discussion forum was only provided for the information democratization group, and both treatments were implemented in the combined group. Fifth, at the end of the initiative, one week after the final treatments were sent, we asked participants to complete a second survey in order to collect data on manipulation checks to control for the different groups with regard to using the corresponding treatment substantially enough.

**Participants**

Participant selection involved screening employees for frequency and volume of printing. To allow for natural variation, we recruited employees who use printers both frequently and rarely as part of their work. For the recruitment, we contacted the university’s faculty managers, heads of schools, personal assistants, and others to distribute our invitation to participate in our initiative. The call for participation in our initiative was also advertised through diverse news channels of the university, the university’s intranet, and on diverse social media websites. In total, 95 employees of the organization participated in our study (23 in the control group, 24 in the reflective disclosure group, 25 in the information democratization group, and 23 in the group receiving both treatments). Participants were mostly female (66.3%) and on an administrative job position (58.9%) with an average age of 41 years. The average years working in the organization was 8 years, and the average knowledge of computers and IT was 5.32 on a scale from 1 (very low) to 7 (very high). All participants gave their consent that their paper printing behavior will be tracked through the university’s print management tool, which was used for the study.

**Data Analysis**

**Preliminary Results**

Besides paper consumption in the form of sheets of paper printed, the organization’s print management tool allowed us to track further indicators including total pages, single-sided pages, double-sided pages, color pages, black & white pages, as well as environmental indicators (trees consumed, carbon dioxide produced, energy in bulb hours) and economic indicators (costs in Australian Dollar). The range of consumption of the four groups for total pages was 6,643–22,342, for single-sided pages 1,111–3,550, for double-sided pages 5,532–18,792, for color pages 1,783–12,135, for black & white pages 4,860–10,207, and the costs ranged between $196.10 and $1,083.08. In sum, all participants consumed 32,192 sheets of paper, which equaled 3.86 trees consumed, 407.63 kg carbon dioxide produced, and 25,605 bulb hours of energy consumed. The descriptive statistics showed that the group with both treatments had the lowest paper consumption measured in sheets of paper (3,877), followed by the reflective disclosure group (6,279), the information democratization group (9,090), and the control group with no treatments, which exposed the highest paper consumption (12,946). However, care must be taken by comparing the results of the descriptive statistics, because they do not involve controlling for the effectiveness of the treatments, which
is required to measure the actual impact of the email reporting system and the online discussion forum on the paper consumption. To that end, we used the manipulation check data as covariates and tested our hypotheses with a general linear model.

**Hypothesis Testing**

To test our hypotheses, we analyzed the data with a general linear model, analysis of covariance (ANCOVA), with SPSS. We used paper consumption as the dependent variable, our treatments of reflective disclosure (REFL) and information democratization (INFO) as the independent variables, and our manipulation checks (REFL_CHK; INFO_CHK) as the covariates of the analysis. To control whether demographic variables affected the results, we conducted further ANCOVA tests by splitting the data into two subsets for binary coded variables. For gender, we split the data into female and male; for age, we compared participants less or equal the average age of the sample (41 years) and above; for job role, we compared administrative and academic staff; for knowledge of computers and IT, we compared participants below the reported average (5.32) and above; and for years working in organization, we compared participants less or equal the average (8 years) and above. We found significant differences for gender and job role: while the treatments showed no effect for male participants, female participants were affected by the treatments (R²: 0.482; Adjusted R²: 0.370; REFL: F = 24.637, p < 0.001; INFO: F = 13.770, p < 0.001; REFL * INFO: F = 12.357, p < 0.001); for job role, the treatments showed no effect for academic staff, however, administrative staff were affected by the treatments (R²: 0.491; Adjusted R²: 0.364; REFL: F = 16.557, p < 0.001; INFO: F = 6.857, p < 0.05; REFL * INFO: F = 6.134, p < 0.05). In terms of frequencies, 41 of the female participants were administrative staff and 22 were academics, while 15 of the male participants were administrative staff and 17 were academics. Table 1 shows the results of the tests of between-subject effects for the complete dataset.

<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>R²</th>
<th>Adjusted R²</th>
<th>Effect</th>
<th>F</th>
<th>Sig.</th>
<th>Partial Eta Squared</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paper Consumption</td>
<td>0.300</td>
<td>0.207</td>
<td>REFL</td>
<td>18.596</td>
<td>0.000</td>
<td>0.183</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>INFO</td>
<td>11.446</td>
<td>0.001</td>
<td>0.121</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>REFL * INFO</td>
<td>10.695</td>
<td>0.002</td>
<td>0.114</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>REFL * REFL_CHK</td>
<td>0.355</td>
<td>0.702</td>
<td>0.008</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>INFO * INFO_CHK</td>
<td>0.106</td>
<td>0.900</td>
<td>0.003</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>REFL * INFO * REFL_CHK * INFO_CHK</td>
<td>2.418</td>
<td>0.055</td>
<td>0.104</td>
</tr>
</tbody>
</table>

Notes: REFL = Reflective Disclosure, INFO = Information Democratization, REFL_CHK = Manipulation Check for Reflective Disclosure, INFO_CHK = Manipulation Check for Information Democratization

**Table 1. Tests of Between-Subject Effects**

Results show that 20.7% of the variance of paper consumption was explained through our treatments of REFL and INFO. The main effects of the treatments on paper consumption were statistically significant at p < 0.001, with 18.3% of the variance explained for REFL and 12.1% of the variance explained for INFO, in line with hypotheses H1 and H2. The interaction effect between REFL and INFO on paper consumption was also statistically significant, at p < 0.01, with 11.4% of the variance explained. However, a combined instance did not even more improve on paper consumption reduction in a statistically significant way. In other words, our results showed an interaction effect as we expected in hypothesis H3, but no magnifying effect when both treatments were combined. Figure 3 presents the plot of the ANCOVA.

To investigate the effects underlying the interaction in more detail, we then ran a simple effects analysis (see Table 2). For participants who did not receive the REFL treatment, we found a significant mean difference of 988.87 papers consumed at p < 0.001 between participants with and without the INFO treatment. In the case when participants received the REFL treatment, there was no significant mean difference (99.05, p > 0.10) between participants with and without the INFO treatment. There was a significant mean difference of 941.74 papers consumed at p < 0.01 between participants with and without the REFL treatment, when participants did not receive the INFO treatment. In the event of receiving the INFO treatment, results did not show a significant mean difference (51.92, p > 0.10) between participants with and without the REFL treatment.
### Table 2. Simple Effects Analysis

<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>Treatment 1</th>
<th>Treatment 2</th>
<th>Mean Difference (I-J)</th>
<th>Std. Error</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paper Consumption</td>
<td>Without REFL</td>
<td>Without INFO (I), with INFO (J)</td>
<td>988.87</td>
<td>293.85</td>
<td>0.001</td>
</tr>
<tr>
<td></td>
<td>With REFL</td>
<td>Without INFO (I), with INFO (J)</td>
<td>99.05</td>
<td>176.03</td>
<td>0.575</td>
</tr>
<tr>
<td></td>
<td>Without INFO</td>
<td>Without REFL (I), with REFL (J)</td>
<td>941.74</td>
<td>331.32</td>
<td>0.006</td>
</tr>
<tr>
<td></td>
<td>With INFO</td>
<td>Without REFL (I), with REFL (J)</td>
<td>51.92</td>
<td>259.16</td>
<td>0.842</td>
</tr>
</tbody>
</table>

Notes: REFL = Reflective Disclosure, INFO = Information Democratization

### Discussion and Implications

#### Summary of Findings

Our findings show that implementing the environmental sensemaking features of reflective disclosure and information democratization can reinforce sustainability initiatives by affecting users’ work practices. In our context of paper printing, the implementation of the email reporting system as a form of reflective disclosure was found to have a significant impact on the work practice of paper printing (according to our ANCOVA results: 941.74 papers reduced, p < 0.001, partial eta squared: 0.183), likewise the online discussion forum as the information democratization treatment also influenced paper consumption significantly (988.87 papers reduced, p < 0.001, partial eta squared: 0.121). Hence, the main effects of our field experiment were supported by the results. Although the paper reduction effect for information democratization was slightly higher, we cannot argue that one or the other treatment is more important because our simple effects analysis showed no significant differences between these effects.

We also identified an interaction effect between reflective disclosure and information democratization (p < 0.01, partial eta squared: 0.114). Although the descriptive statistics reveal a large difference between the reflective disclosure group (6,279 sheets) and the information democratization group (9,090 sheets), our test results suggest that the difference is marginal, based on the estimated marginal means considering controls for the treatment manipulations. Thus, interestingly, our results suggest a substitution effect:
adding information democratization to reflective disclosure and vice versa does not lead to any further enhancement of sustainable work practices. This suggests that our treatments are interchangeable in view of nurturing employees’ sustainable behaviors, in our particular case, the reduction of paper consumption, but they are not complementary. By corollary, this would also suggest that sensemaking can be over-engineered.

**Implications and Future Research Opportunities**

Our study provides first insights about how IS that supports environmental sensemaking ‘nudges’ users to improve their work practices environmentally. First, our research offers a first operationalization of the sensemaking features of reflective disclosure and information democratization in a Green IS context with a focus on main effects and interaction effects. Second, we contribute to Green IS literature through the first quantitative evaluation of a specific Green IS implementation using reflective disclosure and information democratization features on the individual level. In a first instance, our study provides insights whether there is any effect of sensemaking features on employees’ work practices from an environmental sustainability perspective. As a next step, we recommend to study how the effect might be different through different systems or concatenations. In this regard, we also note that our instantiation of reflective disclosure in the form of an email reporting system can be regarded as a passive form of participation, and the instantiation of information democratization in the form of an online discussion forum as an active form of participation. We, therefore, recommend focusing on a comparison between active and passive participations in sustainability initiatives in future studies. Third, our results suggest that female participants and administrative staff were more affected by our treatments than male participants and academic staff. This insight provides an opportunity to further analyze these demographic findings in future studies. Further research could focus on the role of gender and job role in sustainability initiatives by examining differences between female and male participants as well as administrative and academic staff. Fourth, our results allow discrimination of sensemaking mechanisms: while both reflective disclosure and information democratization are effective instruments to apply in sustainability initiatives with the objective to evoke transitions to sustainable work practices, our results suggest that information democratization may be more effective than reflective disclosure. Our results further inform knowledge on the interdependence between reflective disclosure and information democratization as sensemaking mechanisms, in turn contributing to the literature on sensemaking theory in general (Schultz et al. 2007; Tallon and Kraemer 2007; Weick et al. 2005). Finally, in our study, we focus on IS-enabled sensemaking. Further research could compare differences between IS-enabled and non-IS sensemaking features such as educational training on paper printing reduction or printing quota limitations.

From a practical perspective, our research informs organizations on the effects of sensemaking mechanisms that have substantive potential to shape sustainability initiatives. Since the interaction effect of our analysis suggests a substitution effect between reflective disclosure and information democratization, we recommend that organizations take this effect into consideration for the design of sustainability initiatives and the role of IS within such initiatives. We suggest that organizations, which plan a sustainability initiative involving the participation of employees, first verify whether employees are open to reflective disclosure arrangements such as email reports on their work practice in focus of the initiative. We presume that this approach is particularly important in cases when employees feel such reports to be intrusive or otherwise annoying. Depending on the corporate culture of the organization, discussions about sustainability-related topics might be welcoming, accessible, and inclusive for employees in the organization, which would make the sensemaking feature of information democratization a first choice for sustainability initiatives. Apart from the substitution effect between reflective disclosure and information democratization identified in our study, we nevertheless acknowledge that a combination of both instances might be beneficial. This might be particularly the case for situations that substantially differ from our experimental setting. In that case combining both sensemaking features might bring potential benefits for a successful transition to sustainable behaviors within the framework of an initiative.

**Limitations**

Several limitations exist. First, the scope of the study is limited in terms of the selection of the organization, work practice, and IS tools. We note that the operationalization choices are bound to one study context at a time. In general, the theory should hold for a variety of organizations, work practices, and IS tools;
however, empirically this aspect of the theory is best explored programmatically through a series of studies. We commenced our field experiment empirically within one organization, which limits generalizability; however, it was a suitable setting for an initial evaluation of the sensemaking features to determine whether there was any effect as theorized. Further, we focus on one work practice, paper printing. Other work practices such as business travels might lead to different results. According to the case study by Seidel et al. (2014), 65 percent of greenhouse gas emissions in the Americas from 2009 to 2012 were produced through business flights. Thus, physical work travel is also a relevant general work practice prone to the influence of environmental sensemaking, and also one that could be improved through IS (e.g., by using video conferencing solutions instead of travel). Also, such practices are subject to different environmental impacts (e.g., reduce energy primarily, not paper consumption) and thus the mechanisms for improvement might be different. This may mean information systems with different features are needed to trigger sensemaking. In the long term, we suggest future research to investigate the consumption of other nonrenewable, harmful, or environmentally undesirable resources, and to examine other IS-enabled work practices, such as file sharing, video conferencing, phone conferencing, and instant messaging.

Second, limitations relate to our implementations, i.e., our selection of an email reporting system for reflective disclosure and an online discussion forum for information democratization. Both the email reports and the online forum were characterized by high accessibility to users, which made them effective and ecologically valid manipulations. Still, reflective disclosure and information democratization features can also be implemented differently. For example, a reflective disclosure feature can also be implemented as a dialog window on the printer that would show a count of how many pages have been printed so far, how many in color, duplex, etc. – for the participant and comparatively to the peers. Regarding information democratization, a live feedback system could also be an appropriate choice to engage participants in a sustainability conversation. However, such systems like a dialog window and a live feedback system are both technically and regulatively more restrictive to implement into an organization, which would have impeded our field experiment design. Therefore, we decided to utilize an email reporting system and an online discussion forum in our study due to their high practicability, easy implementation, and adequate applicability for feedback and interaction about participants’ paper printing behaviors. Nevertheless, we acknowledge that other treatments might lead to different results.

Third, there are limitations regarding participant selection. Sampling for a study on environmental sustainability may lead to self-selection among the experimental subjects (Kankanhalli et al. 2005). Respondents who were more concerned about environmental sustainability might also be those who were more likely to participate in our study. Therefore, we also collected data about employees with minimal (or no) printing behaviors to mitigate this bias.

Acknowledgements

This research is supported by a grant from the Australian Research Council (DP150100163). We thank all the participants of our study for participating. We are grateful for everyone who advertised our initiative within the university including the university’s registrar, facilities management, sustainability office, internal communications, heads of schools and personal assistants to heads of schools, as well as faculty managers and institute managers. We also thank the university’s printing services for providing access to the university’s print management tool for the study. Finally, for valuable feedback during study design and paper writing, we thank Gabriel Abu-Tayeh, Daniel Beverungen, Tobias Brandt, Adela Chen, Vanessa Cooper, Tuba Degirmenci, Christopher Henkel, Qi Qi Jiang, Johann Kranz, Richard Medland, Stefan Seidel, and Richard Watson. A research-in-progress paper about the study design was presented at the 37th International Conference on Information Systems.

References


