Effects of formalizing a CSR policy on the adoption of Green IT practices

Julien de Benedittis

Mines Saint-Étienne, Univ. Jean Monnet Lyon, UR COACTIS, Institut Henri Fayol, 158 cours Fauriel, 42023 Saint-Étienne, France

julien.de-benedittis@emse.fr

Nadine Dubruc

Mines Saint-Étienne, Univ. Jean Monnet Lyon, UR COACTIS, Institut Henri Fayol, 158 cours Fauriel, 42023 Saint-Étienne, France

dubruc@emse.fr

Michelle Mongo

Mines Saint-Étienne, Univ. Jean Monnet Lyon, UR COACTIS, Institut Henri Fayol, 158 cours Fauriel, 42023 Saint-Étienne, France

michelle.mongo@emse.fr

Sophie Peillon

Mines Saint-Étienne, Univ. Jean Monnet Lyon, UR COACTIS, Institut Henri Fayol, 158 cours Fauriel, 42023 Saint-Étienne, France

peillon@emse.fr

Mots-clés : Sobriété numérique ; Green IT ; RSE ; Pratiques.

Résumé : Les préoccupations environnementales concernent aujourd'hui toutes les entreprises indépendamment de leur secteur d'activité. A l'image de la société, les entreprises s'appuient de plus en plus sur les technologies numériques. Néanmoins, ces dernières ont un impact environnemental qui n'est plus à démontrer, poussant les organisations à adopter des pratiques plus vertueuses concernant leur système d'information. Si des travaux antérieurs ont établi un lien entre l'adoption d'une stratégie Green IT et la formalisation d'une politique RSE dans l'entreprise, ils ne s'intéressent pas aux aspects opérationnels de cette stratégie à savoir les pratiques réellement déployées dans les organisations. En s'appuyant sur le référentiel de bonnes pratiques développé par le Cigref, nous avons interrogé 454 organisations (PME et ETI) pour déterminer si la formalisation d'une politique RSE affectaient le déploiement de pratiques de Green IT. Nous avons par ailleurs utilisé la taille de l'entreprise et la présence d'une DSI comme variables modératrices. Nos résultats indiquent que lorsqu'une entreprise a effectivement mis en place une politique RSE, elle sera plus susceptible de favoriser l'adoption de pratiques de Green IT. Nous identifions également quelques pratiques les plus développées au sein de notre panel.

1. Introduction

Despite their highly intangible nature as well as their positive social and economic effects, digital technologies remain tangible with significant consequences on the environment. The carbon footprint of the digital sector is now estimated at "*4% of the global greenhouse gas emissions and the sharp increase in uses suggests a doubling of this carbon footprint by 2025*" (ADEME, 2019). This situation is taken seriously by the political authorities since the REEN[1] law was definitively adopted by the French Parliament in November 2021. It aims at the convergence of digital and ecological transitions to empower digital players, from professionals in the sector to consumers. This new policy applied specifically to the digital sector complements the many treaties and regulations, both national and international, aimed at responding to climate issues. Organizations also recognize this need for action, which translates into the deployment of Corporate Social Responsibility (CSR) policies in which environmental protection is integrated. By reducing waste and greenhouse gas emissions, organizations contribute to reducing the impacts on future generations (Mazurkiewicz, 2004). Organizations are invited to integrate into this CSR policy the consideration of the environmental impact of their digital processes and materials (Bohas & Poussing, 2016, Chuang & Huang, 2018).

Green IT makes it possible to reconcile the digital and ecological transitions and corresponds to "*the integration of ICTs in the processes of dematerialization and decarbonization of the economy*" (Attour & Depret, 2014). Green IT refers to a range of initiatives and technologies that will seek, directly (in their incarnations) and indirectly (through facilitation) to monitor, control, and modify our impact on the environment (Berthon & Donnellan, 2011). Thus, in addition to "green" ICTs developed to have a lesser impact on the environment, "IT for Green" qualifies the use of ICTs, green or not, in policies aimed at greening lifestyles (Flipo *et al*., 2016). However, a techno-centric approach to the phenomenon limits the consideration of uses. The angle of digital sobriety as an "*approach which consists of designing more sober digital services and moderating daily digital uses*" (www.greenit.fr) makes it possible to integrate the eco-responsible uses made of these ICTs into organizations and the extent to which they are integrated into organizational practices. The development and adoption of Green IT practices, defined as "practices that deal with issues of material and energy resource consumption, environmental pollution, disposal and recycling, and related processes", is considered to have a significant impact on organizational performance (Ainin *et al*., 2016: 1930). To study the impact of CSR on Green IT practices, we have chosen SMEs and intermediate companies (whose workforce is less than 5,000 employees) as a field of study. If the literature effectively affirms that small structures have limited resources that should be rationalized, Del Brio & Junquera (2003) also highlight the lack of research on the environmental performance of these small organizations. They indicate that the literature has paid very little attention to environmental management within these structures.

The literature considers that the establishment of different CSR strategies facilitates the adoption and implementation of different types of Green IT practices (Hba & Manouar, 2017; Bohas & Poussing, 2016). However, if this link is indeed established, nothing is said about the precise nature of these Green IT practices. Our study aims to understand more deeply this relationship existing between CSR policies and the impact-induced on Green IT practices adoption. Our research question is as follow: Does the formalization of a CSR policy influence

---

[1] REEN : Réduire l'empreinte environnementale du numérique / Reducing the digital environmental footprint.

the adoption of Green IT practices in small and medium-sized organizations? If so, which kind of green practices? In addition, we will also seek to determine whether the formalization of an IS unit as well as the number of employees within the firm moderate the relationship between CSR policy and Green IT practices adoption.

2. Literature review

Green IT is attracting more and more attention in academic circles given public concerns about the environment and the impact of ICTs (Dedrick, 2010). Green IT is defined as "*the study and practice of designing, manufacturing, using and disposing of computers, servers, and associated subsystems – such as monitors, printers, storage devices, and networking and communications systems – efficiently and effectively with minimal or no impact on the environment*" (Murugesan, 2008: 25-26). Bose & Lu (2011) explain that the meaning of being "green" differ from one organization to another. Each company can consider that the efforts made in e-waste management or electrical power control contribute to its Green IT policy. Thus, Green IT practices differ considerably from one company to another, from one business sector to another, but Bose & Lu (2011) indicate that Green IT is a combination of all these practices. The adoption of these practices is however like other types of innovation according to Chong & Olesen (2017) even if they note that there are differences between these green initiatives and more traditional innovative approaches. They explain that the cost of entry for these green technologies is higher, therefore requiring more time to reach breakeven. Besides, to adapt to new green technologies, organizations will have to develop new organizational skills and transform their business processes. This is made complex in companies whose size does not allow them to have the necessary resources. The study by Azzone *et al*. (1997) also highlights that the size of a company is a factor that influences its environmental options.

For Hba *et al*. (2016) Green IT initiatives have gradually become a lever of CSR strategy providing strategic management and CSR reporting techniques. This implies that the firm's Green IT strategy is aligned with its ICT strategy as well as with its CSR policy to ensure the achievement of sustainability objectives and technological efficiency in terms of energy saving and value creation (Hba *et al*., 2017). This would thus imply that a firm already defined an IS/IT strategy as well as a CSR policy before the definition of a Green IT strategy. The latter would consequently be the result of the alignment between the two formers. The study from Bohas & Poussing (2016) also provides evidence that the formalization of a CSR policy influences the adoption and implementation of Green IT practices. To do so, they rely on Faucheux & Nicolaï's (2011) typology of Green IT strategies ("preventive" and "curative") adopted at a specific moment in time, as well as on Berkhout & Hertin (2001) and Jenkin *et al*.'s (2011) typology that provides three distinct Green IT strategies based on the changes due to the implementation of Green IT ("reducing", "substituting" and "transforming"). If the result of Bohas & Poussing's (2016) study provides empirical pieces of evidence of the link between CSR and Green IT, their results are based on the type of Green IT strategies that are developed, not the specific practices that are implemented.

In their study on the effects of Green IT on the competitiveness of firms, Chuang & Huang (2015) suggest breaking down Green IT into three distinct forms of capital. The objective is to understand the internal and external resources on which the organization can rely and which will contribute to the adoption of more sober digital practices. Thus, the human capital of the organization measures the skills available internally, the training courses that are deployed and

those that should be, or even the awareness among staff that is made on the subject. Structural capital refers to the digital heritage of the organization and how the organization manages its computer equipment by adopting practices particularly related to energy management, responsible purchases of equipment (e.g., refurbished), etc. Finally, relational capital identifies the links that the company establishes with its external partners (suppliers, customers, etc.) and how the digital sobriety policy is formalized, for example, the identification of a Green IT manager.

If the academic literature has not currently proposed good practices in terms of Green IT, the professional literature has taken hold of the subject. The serious and proven frames of reference have thus been proposed by Opquast and the GreenIT.fr club (72 Green IT practices mainly oriented toward the technical aspect of the IS) or the association of IS professionals, Cigref, who suggests 100 practices encompassing the technical dimension but widens the spectrum to the organizational and human aspects of the IS. Our choice of frame of reference to retain is that of the Cigref concerning the human and organizational aspects that it includes and allowing us to link it to Chuang & Huang's (2015) framework (see Appendix A for an abstract of practices that were retained within the survey). Cigref is an association created in 1970 and recognized in the French information systems community by both professionals and academics. Nevertheless, Cigref is an association of large companies and public administrations. Consequently, if their recommendations are mainly intended for their large members and potentially applicable to other organizations, considering factors specific to SMEs (in particular their size and the frequent absence of the formalization of an IT department) does not make it possible to ensure that the practices identified by Cigref apply to them.

Below we present the conceptual model we develop to test the following hypothesis.
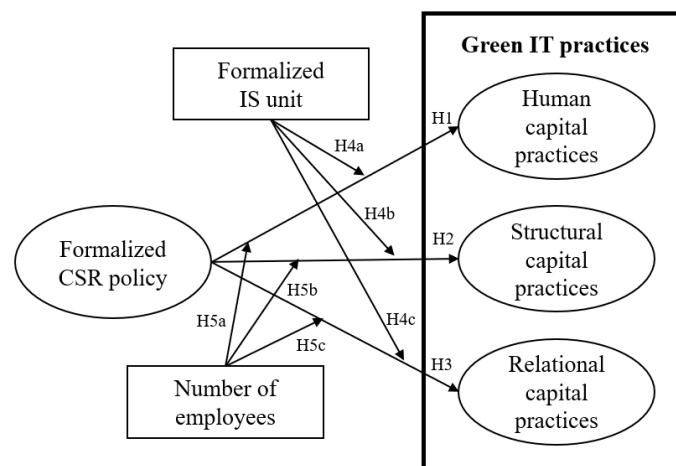
Figure 1: Conceptual model

H1: the formalization of a CSR policy has a positive influence on the adoption of Human Capital Practices.
H2: the formalization of a CSR policy has a positive influence on the adoption of Structural Capital Practices.
H3: the formalization of a CSR policy has a positive influence on the adoption of Relational Capital Practices.
H4: the formalization of an IS unit has a positive influence on the adoption of:

H4a: Human Capital Practices.
H4b: Structural Capital Practices.
H4c: Relational Capital Practices.
H5: the number of employees has a positive influence on the adoption of:
H5a: Human Capital Practices.
H5b: Structural Capital Practices.
H5c: Relational Capital Practices.

3. Research design

To study the adoption of Green IT practices in French organizations, we opted for a quantitative approach. A survey was developed based on the selection of 30 Green IT practices from the reference frameworks provided by Cigref (a renowned IS professional institute). This repository is made up of 100 practices divided into 8 large families (strategy and monitoring; support for people and professions; responsible purchasing and life cycle; projects; digital services; ecosystems; data; infrastructure). In order not to impose too large a survey on respondents, the research team reduced this catalog of practices to retain 30 of them, evenly distributed among the three forms of capital provided by Chuang & Huang (2015). Items related to Green IT practices were measured using a 5-point Likert scale anchored by "strongly disagree" (1) and "strongly agree" (5). Items related to the presence (or absence thereof) of a CSR policy, IS department as well as the number of employees were measured using discrete quantitative variables.

The survey was delivered online from November 2021 to March 2022. It was sent to French organizations (nationwide) whose number of employees had to be between 10 and 5 000 regardless of their sector of activity. The initial invitation was followed by a second round of email reminders. A total of 1,389 contacts bounced back because of delivery failure out of 18,125 emails sent by a digital marketing service provider. A total of 1,546 responses were received, among which 454 were complete and usable (3% response rate). The respondents were CEOs (42%), IS managers (20%), and other managers (38%) working in various activity sectors (mainly Information & Communication (19,60%), Specialized, scientific, and technical activities (16,52%) and Manufacturing industry (14,98%)). Our sample is characterized by 58% of organizations that declared a formalized CSR policy. These companies declared having an average number of 369 employees but with a median of 110 employees, an average annual growth comprised between 10 and 45 million euros, and 74% having formalized an IS unit (on average composed of approximately 14 employees and with a median of 2).

Principle Component Analysis (PCA) was used to assess all items' convergence. Reliability tests were carried out on items validated by the PCA leading to Cronbach's Alpha of 0.904 for human capital practices, 0.847 for structural capital practices, and 0.914 for RC practices.

4. Results

We analyzed variance (ANOVA) to test the effect of the presence of a CSR policy on human capital practices. The test is significant $F(1.453) = 36.604$ with $p < 0.000$ and with $M_{presence\_CSR\_policy} = 0.230$ and $M_{absence\_CSR\_policy} = -0.324$. Firms that have formalized a CSR policy declare better human capital practices scores than companies that have not formalized a CSR policy. H1 is validated.

The next ANOVA tested the effect of the presence of a CSR policy on structural capital practices and is also significant $F_{(1.453)} = 10.645$ with $p < 0.001$ and with $M_{presence\_CSR\_policy} = 0.128$ and $M_{absence\_CSR\_policy} = -0.179$. Consequently, firms that have formalized a CSR policy declare better structural capital practices scores than companies that have not formalized a CSR policy. H2 is validated.

The last ANOVA tested the effect of the presence of a CSR policy on relational capital practices and is significant $F_{(1.453)} = 27.098$ with $p < 0.000$ and with $M_{presence\_CSR\_policy} = 0.201$ and $M_{absence\_CSR\_policy} = -0.281$. Firms that have formalized a CSR policy declare better relational capital practices scores than companies that have not formalized a CSR policy. H3 is validated.

To study moderator roles we used Hayes' (2013) macro-PROCESS (Model 1). This explores the moderator role of the presence of an IS unit in the three previous relations. The test was not significant, thus not validating H4a, H4b, and H4c. Studies of the moderator role of the number of employees on the presence of a CSR policy on human capital and structural capital practices are significant with human capital practices: $F_{(1.453)} = 4.234$ with $p < 0.252$ (H5a is validated) and structural capital practices: $F_{(1.453)} = 11.294$ with $p < 0.0008$ (H4b is validated). On the other hand, the study of the moderator role of the number of employees on the presence of a CSR policy on relational capital practices is not significant with $p < 0.768$. H5c is thus not validated.

5. Discussion

Our results show a strong influence of a formalized CSR policy on the adoption of Green IT practices, confirming previous studies related to our topic (Bohas & Poussing, 2016; Chuang & Huang, 2015). By looking more specifically at the descriptive statistics of our results and by studying the mean obtained for each practice, we can identify a list of practices most frequently adopted in organizations. Among the top 3 of the most frequently cited practices, we first find the incentive for employees to take care of computer equipment to limit their renewal (HC); followed by the definition of rules for archiving and cleaning of data in coherence with the GDPR[2] (SC) and finally the control of data storage capacities by the company (SC). The first practice relating to relational capital comes in fifth place. The identification of those precise practices makes it possible to complete the very strategy-oriented approaches adopted by Bohas & Poussing (2016) and Chuang & Huang (2015). This allows the proposal of concrete practices organizations can directly implement when willing to work on a more sustainable information system.

Regarding the moderating variables, our results on the size of the organization are in line with the proposals of Azzone *et al*. (1997) who indicate that size influences the environmental choices of companies. Nevertheless, these choices do not seem to apply when it comes to practices of a relational nature. These practices have a significant strategic impact in terms of managerial decisions and choice of partnerships with external parties (particularly suppliers). These elements thus have a dimension that is both internal to the organization, but also external. Consequently, it is possible to envisage that, in certain situations, the constraints external to the organization negatively influence the Green IT policy of the organization.

---

[2] RGPD: General Data Protection Regulation

Contrary to Hba *et al.*'s (2016, 2017) results and what they imply, ours suggest that the presence of an IT unit is not mandatory to influence the adoption of these green practices within organizations. However, this cannot mean that defining an IT strategy is not necessary, only that it does not have to come from the IS unit, which may be the case for small organizations that do not have the resources (financial and/or human) to formalize such a department.

This study is not without limits. It deserves to be supplemented by an in-depth study of intra- and intersectoral differences. These results would allow public authorities to identify the most mature sectors and those in which awareness-raising efforts are to be reinforced.

6. References

ADEME. (2019). *La Face Cachée Du Numérique*.

Ainin, S., Naqshbandi, M. M., Dezdar, S. (2016). Impact of adoption of Green IT practices on organizational performance. *Quality & Quantity*, *50(5)*, 1929-1948.

Attour, A., & Depret, M. H. (2014). Technologies de l'information et de la communication, soutenabilité et stratégies territoriales des villes durables : Le cas des EcoCités de France. *Innovations, 44(2)*, 187–212.

Azzone, G., Bianchi, R., Mauri, R., Noci, G. (1997). Defining operating environmental strategies: Programmes and plans within Italian industries. *Environmental Management and Health, 8(1)*, 4-19.

Berkhout, F., Hertin, J. (2001). Impacts of information and communication technologies on environmental sustainability: Speculations and evidence. *Report to the OECD*, Brighton, UK, 21.

Berthon, P., & Donnellan, B. (2011). The Greening of IT: Paradox or promise? *Journal of Strategic Information Systems*, *20(1)*, 3–5.

Bohas, A., Poussing, N. (2016). An empirical exploration of the role of strategic and responsive corporate social responsibility in the adoption of different Green IT strategies. *Journal of Cleaner Production*, *122*, 240-251.

Bose, R., & Luo, X. (2011). potential to undertake Green IT initiatives via virtualization – A theoretical perspective. *Journal of Strategic Information Systems*, *20(1)*, 38–54.

Chong, J., & Olesen, K. (2017). A Technology-Organization-Environment perspective on eco-effectiveness : A meta-analysis. *Australasian Journal of Information Systems*, *21(1)*, 1–26.

Chuang, S. P., & Huang, S. J. (2015). Effects of business greening and Green IT capital on business competitiveness. *Journal of Business Ethics*, *128(1)*, 221–231.

Dedrick, J. (2010). Green IS: Concepts and issues for information systems research. *Communications of the Association for Information Systems*, *27(1)*, 11.

Del Brío, J. A., Junquera, B. (2003). A review of the literature on environmental innovation management in SMEs: implications for public policies. *Technovation, 23(12)*, 939-948.

Faucheux, S., Nicolaï I. (2011). It for Green and Green IT: A proposed typology of eco-innovation. *Ecological Economics*, *70(11)*, 2020-2027.

Flipo, F., Deltour, F., & Dobré, M. (2016). Les technologies de l'information à l'épreuve du développement durable. *Natures Sciences Sociétés, 24(1)*, 36–47.

Hayes A. F. (2013). *Introduction to mediation, moderation, and conditional process analysis – A regression-based approach* New York, Guilford Press.

Hba, R., Bakkas, A., El Manouar, A., Abdou, M., Idrissi, J. (2016). Eco-strategy: Towards a new generation managerial model based on Green IT and CSR. *International Journal of Computer Science & Information Technology*, *8(2)*, 51-62.

Hba, R., Manouar, A. (2017). Eco-strategy: CSR strategy and Green IT updated model for ICT management. *International Journal of Scientific Research & Engineering Technology*, *8(1)*, 123-130.

Jenkin, T. A., Webster, J., McShane, L. (2011). An agenda for "Green" information technology and systems research. *Information and Organization*, *21(1)*, 17-40.

Mazurkiewicz, P. (2004). Corporate environmental responsibility: Is a common CSR framework possible? World Bank. Retrieved September 08, 2022, from https://documents1.worldbank.org/curated/en/577051468339093024/pdf/421830csrframework01PUBLIC1.pdf

Murugesan, S. (2008). Harnessing green IT: Principles and practices. *IT professional*, *10(1)*, 24-33.

7. Appendix

Appendix A – List of practices retained in the survey

Relational practices:

1. My company integrates digital sobriety into its overall strategy in conjunction with the IT and CSR departments.
2. My company raises awareness and demonstrates interest in the approach to convince and involve managers and teams.
3. My company dedicates a specific budget to managing and measuring digital technologies' environmental and societal impacts.
4. My company defines a grid of responsible purchasing criteria according to the types concerned (hardware, software, services).
5. My company chooses products whose components are replaceable and repairable.
6. My company generalizes environmental clauses in project calls (or purchase calls) of services.
7. My company includes in the IT unit's project portfolio an alignment criterion between the general strategy and the "digital sobriety" strategy.
8. My company includes in the search for innovation a means of measuring the benefit/risk between the value of services/products and their environmental and social impact.
9. My company makes an inventory of digital solutions and identifies duplicates and unused ones to remove them.
10. My company has an up-to-date data retention policy with clear principles on what data should be retained and what can be deleted.
11. My company favors service providers whose AI (Artificial Intelligence) solutions are sustainable.

Human practices

12. My company develops awareness of the environmental impact of digital technology in its daily activities for each profession.
13. My company offers professional training courses related to digital sobriety.
14. My company integrates "responsible digital" skills into IS functions.
15. My company incorporates "responsible digital" skills into the planning of employment and skills.
16. My company encourages employees to take care of computer equipment and limits unnecessary renewal of equipment.
17. My company ensures that awareness of digital sobriety is long-term (e.g., regular campaigns, challenges, etc.).
18. My company has a digital sobriety guide for all employees so that they are informed of their options for acting (e.g., connecting to the local network, sharing via collaborative platforms instead of sending a file...).
19. My company favors the use of "chats" instead of internal emails, the use of the telephone, and travel between offices for simple exchanges between employees.
20. My company gives users the means to see their impact and the consequences of their actions to reduce it (e.g., a dashboard with stored data, the weight of attachments, the quantity of emails, etc.) and gives information on "how to do otherwise".
21. My company minimizes the number of devices per user in agreement with him (ex. a smartphone or a single PC for professional and personal use).

Structural practices

22. My company rationalizes applications, reducing their number, when possible, archives, and deletes obsolete applications.
23. My company defines with the suppliers a sober configuration of the solutions (e.g., black and white double-sided printing).
24. My company favors a modular, frugal, even low-tech application architecture (simple technologies, inexpensive, accessible to all, and easily repairable).
25. My company, when using data centers, promotes services that have good environmental practices (e.g., the use of renewable energies...).
26. My company has control over data storage capacities.
27. My company limits data flow and storage volumes to what is necessary.
28. My company defines data archiving and cleaning rules consistent with the GDPR (General Data Protection Regulation).
29. My company implements regular monitoring of data center energy indicators.
30. My company orders and distributes work in such a way that it does not have machines (e.g., computer, server, printer, etc.) available 24 hours a day, 7 days a week