

Corporate Information System and Environmental Sustainability Dimension – The Associated Link Evaluation

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Abstract. *The assessment of the link between the information system or the informational system, as some authors call it, refers to the information system, and the environmental dimension within the organization or, better said, environmental sustainability, which answers, through excellence, the question of how we propose to study this connection or interdependence between the information system and the environmental sustainability dimension. To proceed to an in-depth study of the link between the information system and a dimension of sustainability, we proposed to expand the search parameters to the following fields of reference in terms of sustainability: environmental sustainability along its component dimensions and information system along its component dimensions. By its purpose, the article tests a methodological framework developed to evaluate informational systems and environmental sustainability. Considering the novelty of the environmental issue, the action research approach could be transformed into a tool to help provide possible theoretical and practical solutions for the business environment in terms of the information system.*

Keywords: information system, environmental sustainability, methodological framework, competitive advantage.

Introduction

The link between a corporate information system and environmental sustainability is a critical aspect of modern business practices. Integrating information systems with environmental sustainability initiatives can lead to improved resource efficiency, reduced environmental impact, and overall corporate responsibility. By carefully evaluating these aspects, organizations can ensure a robust link between their corporate information system and environmental sustainability dimensions, fostering a holistic and responsible approach to business operations.

The associated link evaluation between the information system or the informational system, as some authors call it, refers to the information system, and the environmental dimension within the organization or, better said, environmental sustainability, which answers, through excellence, the question of how we propose to study this connection or interdependence between the information system and the environmental dimension of the sustainability. The research stages are inherent within the entire research process. The most imperative is the exhaustive analysis and

interpretation of current studies published on the topic of the connection between information systems and the environmental dimension of sustainability. Following the specialized literature review, it was reached to an overview of the perspective of various authors, experts in multiple fields, and authors who can objectively or subjectively deal with the issue of the link between the information system and the environmental dimension of sustainability.

After this stage, the next obvious step is represented by the formation and formulation of a scientific point of view regarding the studied issue. Based on the rigorous research, it can be noticed that there are authors who have focused their research efforts on the field of economic sustainability, while others focused their research attention on the field of environmental sustainability. Considering the quintessence of the Triple Bottom Line theory or Elkington's theory, economic sustainability, environmental sustainability, and social sustainability represent parts of a whole (Elkington, 1994), the three pillars of sustainability are perfectly integrated into a single organic unit. With reservations of rigor, it can be stated that the specialized literature has not yet addressed, in a thorough manner, the direct link between the information system and the environmental dimension or environmental sustainability, which is approached in the current article. Subject to the information systems evaluation method, the DeLone and McLean (D&M model) has been used, as it is the most popular and validated measure for the IS success model (Adebawale, 2017). Being a gap in the specialized literature, we propose to address this direct link in a rigorous and detailed way.

The objective of this research is to clarify and approach the current gap in the field of environmental sustainability and information systems by answering the following questions: What is the relationship between the information systems dimensions and environmental sustainability? What is the impact of their combination of information system dimensions on environmental sustainability? Therefore, to investigate how it can be reached to answer to above questions, a research model must be designed that has a comprehensive view of both the components of information systems and environmental sustainability.

Literature review

Research has explored the concept of “Green IS”, emphasizing the integration of information systems with environmental sustainability principles. Studies like “Green Information Systems: Directives for the IS Discipline” by Watson et al. (2010) provide foundational insights into the design and implementation of information systems with a focus on sustainability. Life Cycle Assessment is commonly used to evaluate the environmental impact of products and services. Literature in this area discusses how information systems can facilitate LCA processes. “A Review of the Use of Information and Communication Technologies in the Building Industry for Delivering Energy Efficiency” by Singh and Oyedele (2016) is an example that touches on the integration of ICT tools for environmental impact assessment. Several studies explore the environmental implications of computing technologies. Works such as “The Green and the Brown: A Framework for the Integration of ICT in Smart Cities” by Albino et al. (2015) discuss the role of information systems in smart cities and their potential impact on sustainability. The intersection of management of supply chain, environmental sustainability, and information systems was approached with great interest in the literature. With the increase of interest in the Internet of Things (IoT), research explores how IoT technologies can be used for environmental monitoring. “Internet of Things (IoT) for Smart Cities: Critical Success Factors” by Perera et al. (2017) discusses the role of IoT in the context of smart cities and sustainability. The literature on how information

systems contribute to corporate sustainability reporting is also noteworthy. “A Review of Information Systems Research on Online Social Accounting Disclosure” by Dumay and Guthrie (2017) explores the role of information systems in online social accounting and disclosure for corporate sustainability.

Due to the increasing attention to the sustainable development of companies, some studies exclusively aim to understand the role that the information system plays in companies' sustainable development. Consequently, one of the objectives of the specialized literature has been to explore the potential of the information system as an organizational mechanism to improve managerial decision-making capabilities and increase productivity. It was found that through the adoption and implementation of the information system, an enterprise resource system, a support system for supply chain collaboration (Hadaya et al., 2012), and a social reference system to support sustainable social trade sales (Lee et al., 2015) were implicitly formed. The role of the information system in the sustainable development of companies is still a matter of the most important and relevant current maxim that emphasizes the need for further in-depth studies. In terms of academia, a large body of literature has continuously contributed to sustainability research. Therefore, the authors claim that the information system has supported companies to transform into environmentally sustainable entities to face global environmental challenges, challenges that are constantly growing, and respond to the demands of consumers, demands that are constantly changing (Elliot et al., 2011).

Old literature has stated that simple good cooperation between the companies themselves and the information system generates sustainable competitive advantages (Kettinger et al., 1994). Some specialized works exclusively followed the role of the information system in the sustainable development of companies. Thus, one of the theories indicates that resources generate the sustainable competitive advantage produced by the information system. From the perspective of this resource-based theory, the performance of an organization is directly proportional to the capacity of the information system (Piccoli et al., 2005). Thus, the capacity of the information system supports the entire operation of the companies and brings its contribution through the continuous increase of organizational performance, in the long term (Peppard et al., 2004). Also, other authors stated that there is a complementarity between the information system and the other resources, and this mutual complement generates a sustainable competitive advantage. The same authors indicated two categories of factors as influencing factors: organizational factors, especially the management team, and environmental factors, such as the stable business environment versus the turbulent business environment (Wade et al., 2004). While, other authors categorized the resources that generate sustainable competitive advantage for the company, such as IT-type resources, that is, IT assets, IT capabilities, complementary resources, such as technological characteristics, the implementation process, and subjective resources, such as switching costs, structural characteristics of the value system (Fan Zeng et al., 2020). Therefore it can be outlined the gravity of the continuous negative impact on the environment. As well, it provides organizations with a series of risks, but also opportunities. This is where the company's information system comes into play. Information system research can bring key answers regarding the connection between key factors: information, organization, and the natural environment. Also, after searching and finding answers, one can continue with the creation, improvement, and application of an environmental strategy and even an entire ecological system. We find in the literature the factors that help promote or, on the contrary, inhibit, the successful adoption of environmentally sustainable business practices, the implementation of organizational culture, and the formation of an influence between environmentally sustainable business practices and business performance

(Melville, 2010). The close relationship between the information system and the environment can be observed, as by its definition organizational sustainability can represent a synergy between enhancing ecological resilience and economic profitability (Herghiligu et al., 2019). Businesses are considered key contributors to environmental sustainability due to their innovation capabilities from micro to macroeconomic: local, national, and even global influence and due to their rapid change capabilities (Elliot, 2011). The literature has analyzed the challenges of environmental sustainability, including access to the state of environmental deterioration, the acceleration of deterioration caused by human activities, and the uncertainty of the human response to deterioration. It described how people cope with these challenges by reviewing previous studies in the fields of environment, society, governments, industries and alliances, organizations, and individuals and groups.

By its initial definition (WCED, 1987), sustainability comprises three dimensions, social, economic, and environmental. As the article title states, the current research does approach and focus on one of the sustainability dimensions, namely the environmental dimension. The motivation for focusing on this dimension resides in the fact that the environmental dimension supports companies in measuring sustainability performance, especially in the manufacturing industry, proven by being analyzed alone or along the other two among the 94% of the research papers on sustainability (Eslami, 2019). Overall, most of the research approached the environmental dimension of sustainability by focusing on the following main components: emission, pollution, resource consumption, and biodiversity. Looking deep in detail, water, material, carbon footprint, emissions, waste, biodiversity, landfill, transport, resource, and energy can be considered the most dominant indicators when the environmental dimension of sustainability is assessed.

Although it can be considered that multiple research efforts have been made in the sustainability field, we have collected a relatively limited number of articles regarding both information systems and sustainability. Therefore, to describe the link between sustainability and information systems, after reviewing the specialized literature, the general conclusion is that most of the articles include empirical studies. Thus, we note that empirical studies have been performed to explore how the information system can positively influence and sustain the environmental sustainability of corporate operations and how ecological initiatives can be implemented as part of a corporate strategy in the process of organizational sustainability (Bharadwaj, 2000). As well, based on the literature review, the following key factors stood out in ecological practices: environmental awareness, industry norms, internal training, and the attitudes of customers and capital holders (Hu et al., 2016).

Methodology

Theoretical Framework

The study aims to investigate the influence of system quality, information quality, and service quality as independent variables and user experience and environmental sustainability dimension as dependent variables. The research is also focused on testing the link between “user experience” and the environmental sustainability dimension. Thus, the research framework is divided into two parts.

In Figure 1 it can be observed the corporate information system with its dimensions, information quality, system quality, service quality, intention to use, use, and user satisfaction.

These dimensions were considered based on updated model of McLean and Delone (2003), as this is one of the most widely used for measuring information systems' success (Nkanata, 2019; Kamil, 2021). Likewise in the model (Figure 1), the environmental sustainability dimensions can be found. There is no general agreement on what environmental sustainability comprises, the dimensions comprised within the research framework considered its primary objectives (eg. environmental quality), subsidiary objectives that are deducted from them (low consumption resources), and objectives in terms of solutions (the intensive usage of recycling or manufacturing based on low impact environment design) (Gudmundsson, 2007).

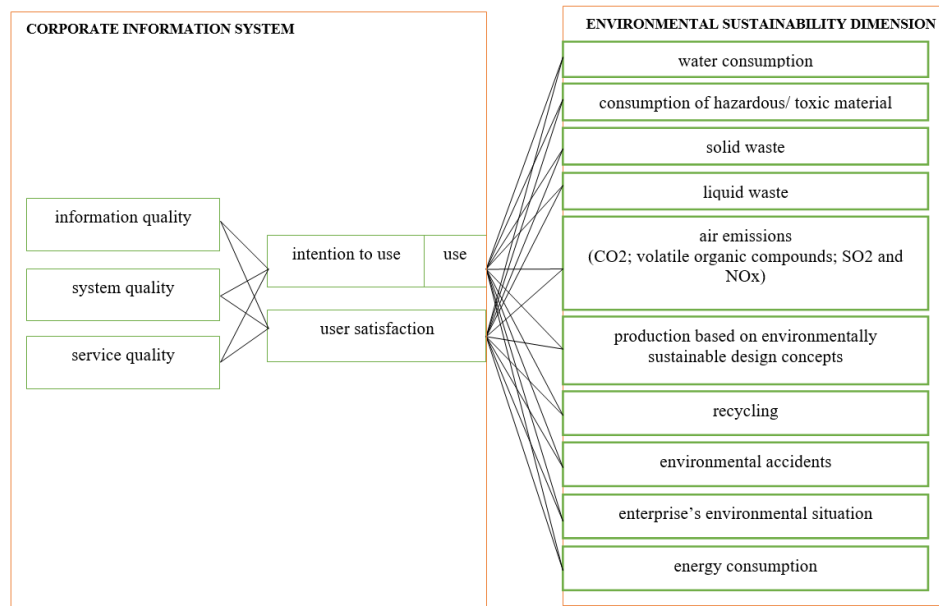


Figure 1. Proposed research model

Source: Authors' research results.

Measurement Development

To support the investigation and testing of the proposed research framework, the survey was used as a method for data collection. To assure validity, the survey questions were extracted from previous from prior studies with validated scales for both the McLean and Delone Model items (Tilahun, 2015; Cho, 2015; Ojo, 2015). In terms of the environmental dimension of sustainability, the assessment within the survey has been constructed by using its main component indicators, namely water consumption, solid waste generation, liquid waste, air emissions, sustainable production, recycling, and environmental accidents.

Data Collection

The questionnaire consists of 29 items apart from demographic questions. All responses were measured on a five-point Likert scale with the following values considered: "1 = Strongly disagree to "5 = Strongly agree". The sample dimension approached for this study has been determined by selecting only the staff employee population from a Romanian multinational company that activates in automotive, in their second year of activity. Thus, the questionnaire was distributed online to 20 employees of different hierarchical levels, out of which 18 questionnaires were validated to be used for final analysis.

Results and discussions

The outcome of the survey is analyzed by using Statistical Package for the Social Sciences 22.0 (SPSS) software applying descriptive and inherently tests. Referring to the main purpose approached within this study, the correlation analysis is used for the investigation of the relationship between variables or their dimensions. The result of such a test will reflect the degree of linearity of the relationship between the dependent variables analyzed that describe methods to overcome resistance to change and the independent variables used to depend on which statistical analysis was performed.

As the questionnaire used in the research represents a tool for psychological assessment, a Cronbach Alpha coefficient analysis is required to ensure the consistency. Practically and directly, an instrument is reliable and consistent when composed items are correlated among themselves.

Table 1. Reliability statistics result

Cronbach's Alpha	N of Items
0.935	15

Source: Authors' research results.

Considering that the value of the coefficient is very close to 1 (0.935), it can be say with certainty that the used research instrument can be considered consistent (Hair et al., 2006), and the analysis procedure could follow.

Table 2. Correlation tests results on dimensions within the Corporate Information System

	SYSQ	INFQ	SERQ	USE	USERSAT
SYSQ	1.00				
INFQ	.517*	1.00			
SERQ	0.42	.813**	1.00		
USE	.725**	0.29	0.11	1.00	
USERSAT	.532*	.768**	.494*	.726**	1.00

Legend Table 2:

SYSQ – „information quality”; INFQ – „system quality”; SERQ – „service quality”; USE – „use”; USERSAT – „user satisfaction”

Source: Authors' research results.

In the first stage of the result analysis, Spearman r correlations on all five dimensions of the Corporate Information System variable, namely SYSQ, INFQ, SERQ, USE, and USERAT are made. Results stated in Table 2 show that there is a statistically significant positive relationship between SERQ and INFQ, with .813, INFQ and UNSERSAT, with .768, and USE and USERSAT with .726, considering a risk of 1%. The significant influence of USE on SYSQ is also consistent with previous studies (Aparaicio et al., 2018; Cidral et al., 2018; Ghazal 2018; Ojo., 2017). Thus, it is again proven that a high level of system quality provides as well a high level of use. The result that shows USE has a significant and positive effect on SYSQ is consistent with previous studies (Alzahrani et al., 2019; Stefanovic et al., 2016; Yakubu D., 2018). Such results indicate that the use of the system quality is influenced by high use of the system, high reliability, ease learn or ease of use.

Table 3. Correlation tests result on dimensions of Corporate Information Systems on dimensions of Environmental Sustainability

Variables	WCOM	CHTM	SW	LW	AIREM	ESDC	RECY	EA	EES	EC
SYSQ	0.292	.481*	.517*	0.414	.534*	0.325	.530*	.475*	0.425	0.022
INFQ	.498*	0.114	.618**	0.419	0.19	.493*	0.406	0.294	0.291	-0.186
SERQ	.743**	0.245	.749**	.579*	0.274	.547*	.683**	0.468	0.375	0.118
USE	0.092	.523*	0.266	0.402	.704**	0.467	0.329	.499*	.522*	0.068
USERSAT	0.264	0.263	0.426	0.421	.505*	.593**	0.302	0.372	0.425	-0.155

Legend Table 3:

WCOM – „water consumption”; CHTM – „consumption of hazardous/ toxic material”; SW – „solid waste”; LW – „liquid waste”; AIREM – „air emissions”; ESDC - production based on environmentally sustainable design concepts; RECY – „recycling”; EA – „environmental accidents”; EES – „enterprise’s environmental situation”; EC – „energy consumption”

Source: Authors’ research results.

In the second stage of result analysis, Spearman’s correlations between all five dimensions of Corporation Information Systems variables and all ten dimensions of the Environmental Sustainability variable. Results stated in Table 3 show that there is a statistically significant positive relationship between SERQ and WCOM, SW, and RECY, by achieving a result/ coefficients values of 0.743, 0.749, 0.683. As well, subject to Corporation Information Systems dimensions, INFQ had a significant positive relationship with SW, with a result of 0.618.

Regarding the main dimensions that are reflected as a relationship in the research framework, namely USE and USERSAT on all dimensions of the Environmental Sustainability variable, AIREM, and ESDC show a statistically significant positive relationship proven by the following result 0.704, namely 0.593. A high level of relationship between user satisfaction within the information system on production based on environmentally and sustainable design concepts shows that respondents acknowledge the organizational sustainability approach, and thus, as effects.

Taking into account the need to analyze the certain link concretely proposed in the developed research model (Figure 1) it can be asserted that this semnificative and positive correlation coefficient value (0.743) between corporate managers willingness to use a particular information system technology and air quality aspect can be explained by the very existence of European Green Deal (EP, 2024).

Apart from the main high positive results on the correlations, also two results stand out with negative values showing that there is an inverse correlation between INFQ and EC, and USERSAT and EC, by obtaining the following results/ coefficients values -0.186, and -0.155. Such a result proves that in the analyzed sample the lack of strategies focused on reduced energy consumption led to a low level of information quality and subsequently to a low level of user satisfaction.

Conclusion

The paper, by its literature review and empirical study, proposes a research framework that can be future developed in terms of academic point of view, or used, in terms of practical point of view. Looking in terms of a practical point of view, this study can support those organizations that intend to apply practices to become more “sustainable” by focusing on their informational systems. Thus, it is reiterated the idea that this action research approach can prove to be a powerful study tool in the interaction between the information system and environmental sustainability. Considering the

novelty of the environmental issue, the action research approach could be transformed into a tool to help provide possible theoretical and practical solutions for the business environment in terms of the information system.

As we look toward the future, several trends and perspectives are likely to shape the associated link evaluation between corporate information systems and the environmental sustainability dimension. In conclusion, the future of the associated link between corporate information systems and environmental sustainability involves a blend of technological advancements, regulatory developments, and a broader perspective on sustainability that encompasses social and economic dimensions. It will require a holistic and integrated approach to ensure that information systems contribute effectively to corporate sustainability goals. Looking into the future, the associated link between corporate information systems and environmental sustainability is likely to undergo significant changes and developments. In summary, the future of the link between corporate information systems and environmental sustainability involves leveraging advanced technologies, embracing new business models, and addressing global challenges collaboratively. Organizations that strategically integrate sustainability into their information systems will be better positioned to navigate a rapidly changing and environmentally conscious business landscape.

Future directions of research

Future research directions on the associated link evaluation between corporate information systems and the environmental sustainability dimension are likely to explore cutting-edge technologies, innovative methodologies, and evolving challenges. These future research directions can contribute to advancing knowledge and practices at the intersection of corporate information systems and environmental sustainability, addressing the evolving challenges and opportunities in this critical domain. In essence, by its purpose, the article developed a methodological framework that can support the assessment of organizational sustainability simply and feasibly. Following additional adjustments to the survey, future study results could show a much more detailed picture of the level of information systems and environmental sustainability and can provide both practical and academic information on what points require improvement. In future work, the same methodological approach can be applied to different fields of activity using benchmarking to explore the potential gap(s) toward other industries.

Limitations

While research on the associated link between corporate information systems and environmental sustainability has made significant strides, there are several limitations and challenges that researchers and practitioners should be aware of. These limitations may impact the generalizability, applicability, and depth of findings. Some key limitations include data quality and availability, interdisciplinary challenges, contextual variability, rapid technological changes, limited longitudinal studies, lack of standardized metrics, overemphasis on environmental aspects, ethical and privacy concerns, limited attention to small and medium enterprises (SMEs), resistance to change, complexity of sustainability challenges, limited focus on end-user behavior. Researchers and practitioners should be mindful of these limitations when interpreting and applying findings from studies on the associated link between corporate information systems and environmental sustainability. Addressing these challenges can enhance the robustness and relevance of future research in this important and evolving field. One of the main limitations of the study refers to the analyzed sample. Thus, the restriction of the geographical location of the respondents implies

additional precautions for generalizing the results to companies from another part of Romania, or a different country. As the survey's initial purpose was to be applied within a sole company, it did not consider all types of employees. For future survey applications, it can be considered all types of employees within the company, and an additional item can be added to the questionnaire to support the possibility of analyzing and comparing the feedback from different points of view. Considering the nature of the questions approached within the questionnaire, it can be suggested a tendency of the respondents especially in the case of those with executive functions to evaluate certain questions to higher degrees. Therefore, respondents's tendency of concealment and desirability about certain aspects were inevitable. Although, by its nature statistical analysis, is a complex one, in the current study just reliability tests and correlation tests were used as the first method to test the questionnaire items and to check their feasibility to be used for a much more complex analysis based on a higher sample.

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