Spring 3-1-2025

GenAI for Sustainable Development: An Inductive Analysis of International Organizations

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Research-in-progress

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Abstract

Generative AI (GenAI) presents significant potential to address sustainability challenges. By offering solutions for resource efficiency, strategic decision-making, and aligning practices with sustainable development goals (SDGs), GenAI enables organizations to harmonize environmental preservation, economic growth, and societal values. Despite its promise, achieving sustainability with GenAI requires a holistic approach that considers its life cycle, including design, training, validation, implementation, and use, to address energy consumption and resource efficiency challenges. Existing research provides limited insight into the processes and strategies organizations use to integrate GenAI effectively for sustainable development. We bridge the gap by conducting an exploratory case study examining the influence of GenAI on sustainable development within international organizations. The findings aim to enhance understanding of GenAI's dual role in driving sustainability efforts and ensuring its own sustainable implementation, contributing to environmentally and socially responsible organizational practices.

Keywords: GenAI, sustainability, sustainable development, sustainable development goals (SDGs), case study, services, energy consumption

This work is supported by FCT - Fundação para a Ciência e Tecnologia, I.P., by project reference UIDB/00731/2020.

Introduction

GenAI, defined as AI model capable of generating new content (e.g., text, images/videos, speech/music) (Benbya et al., 2024; Feuerriegel et al., 2024) in a few seconds based on prompts, introduces a transformative approach to tackling global challenges such as climate change (Prasad Agrawal, 2023). By facilitating the development of more sustainable products, services, organizational processes, and strategies (Fosso Wamba et al., 2024), GenAI can contribute to preserving resources and supporting sustainability efforts. This advanced technology ultimately has the potential to enhance the capacity for future generations to fulfill their own needs, aligning with long-term goals for sustainable development (Brundtland, 1987).

Significant efforts and global investments have been dedicated at all levels (e.g., international, national, regional, and local) to raise social awareness and to increase peoples' understanding of the importance of sustainability for all, however, little is known about the process through which organizations might pursue sustainability, also called sustainable development (Sun et al., 2024). While existing literature provides insights into both GenAI and sustainability independently, little is known about the processes, practices, and strategies necessary for achieving sustainable development goals with the support of digital technologies (SDGs)[1].

With an exploratory qualitative case study (Eisenhardt, 1989) we are collecting and analyzing semi-structured interviews from international organizations that are implementing or using GenAI into their operations for sustainable development. Our aim is to inductively elaborate an explanation to our research question, which is: How does GenAI affect sustainable development (the process of pursuing sustainability) in international organizations?

Our short paper is organized as follows. We provide an overview of the latest technological advancements, GenAI, with its core capabilities and opportunities for supporting sustainable development. Next, we

[1] https://sdgs.un.org/goals

present the procedures we are following for collecting and analyzing semi-structured interviews with key professionals across different countries. We continue with the initial insights through five key topics. Lastly, in the conclusions we present the takeaways and our planned contribution to theory and practice.

Theoretical Background

Generative Artificial Intelligence (GenAI)

Generative AI (GenAI) is part of AI models and has the capacity to generate new content the form of text, image/video, speech/music, and code in response to prompts (Benbya et al., 2024). Compared to other technologies, its uniqueness lies not only in its ability to perform tasks that were once exclusively within the realm of human capability but also in generating new content in a few seconds. Since its market introduction, generative AI has seen widespread adoption across various industries, driving new human-GAI interactions particularly within organizations (Brown et al., 2024). Its technical foundation relies on generative modelling, enabling it to create new content samples by learning and replicating patterns from its training data (Feuerriegel et al., 2024). GenAI provided remarkable results for practical use cases (e.g., search engine optimization (SEO)) to elaborate suggestions for solving real world problems across various domains. For example, it can write texts, make suggestions on a topic useful for brainstorming such as optimizing renewable energy systems, discovering more efficient carbon capture materials and processes, and suggestions for climate-resilient agriculture (Prasad Agrawal, 2023). GenAI exhibits characteristics and offers action possibilities that might support organizations to deal with grand challenges such as sustainability and human impact on the planet.

Sustainability and Sustainable Development

We align with the perspective of the United Nations Commission, wo defined sustainability as "meeting the needs of the present without compromising the ability of future generations to meet their own needs" (Brundtland, 1987). The goal of sustainability is to ensure efficient and responsible management of environmental, economic, and social resources. The Triple Bottom Line framework emphasizes the interconnectedness of environmental, social, and economic performance, implementing the idea that companies should care as much for social and environmental issues as much as for profit, providing a holistic view on the assessment of the sustainability impact of Generative AI in business (Elkington, 1998). Inappropriate uses of our current resources, whether through under-use or over-use, exacerbates the threat of climate change that in turn results in significant losses for our society and future generations. Considering that these resources require substantial energy, raw materials, and labor to be produced, when they are not utilized efficiently in our daily lives, it leads to waste and missed opportunities (Sun et al., 2024). Proper management and optimal use of resources are essential to ensure their sustainability and to maximize their contribution to societal well-being.

Green Information Systems (Green IS) offer new opportunities to leverage information technology in transforming organizational processes and practices to enhance sustainability (Kirchner-Krath et al., 2024). These initiatives aim to improve energy efficiency by optimizing data center operations, implementing smart energy management systems, and encouraging the use of energy-efficient hardware and software (Piccoli & Pigni, 2022). They also focus on reducing environmental impacts by promoting paperless operations, facilitating remote work to decrease commuting emissions, and enabling better resource management through advanced analytics and IoT integration (Smyth et al., 2024). Green IS also aim to foster the development and introduction of environmentally healthier products and services by supporting sustainable supply chain practices (Fosso Wamba et al., 2024), enhancing product lifecycle management, and encouraging innovation in eco-friendly product design. Through these efforts, Green IS have the potential to help organizations align their operations with sustainability goals. GenAI represents a pioneering approach to addressing global challenges and to create a more sustainable future.

Despite significant efforts to build social awareness and enhance sensitivity towards sustainability, there remains limited understanding of the process through which organizations might pursue sustainability, named sustainable development (Sun et al., 2024). While existing literature provides insights into both

GenAI and sustainability independently, little is known about the processes, practices, and strategies necessary for achieving sustainable development goals (SDGs)[2].

Research method

This study explores the role of GenAI in sustainable development in international organizations with an exploratory case study (Eisenhardt, 1989). We are conducting a qualitative case study (Sarker et al., 2018) about Generative AI and sustainable development. We are in the process of collecting semi-structured interviews with employees from different types of organizations that develop, implement, or use GenAI within their organization.

Data collection

To conduct the qualitative case study, we developed an interview protocol to guide the semi-structured interviews. We identified the relevant respondents through LinkedIn, we focused on those profiles that indicated in their profile they we are working with GenAI for sustainable purposes at different levels and for different tasks. In addition, we searched online for companies that indicated in their website or social profiles that they were working with GenAI and sustainability. We contacted them with a message on LinkedIn and subsequently followed up with emails containing the information letter once the participants agreed to take part in the interview. The selected companies are digital engineering company, technology consulting firm, telecommunications provider, data analytics consultancy, and a healthcare technology company. For each company, we also collected archival data such as organizations' webpages promoting the new initiatives about GenAI and sustainability, presentations as online seminars publicly available, online articles about the organizations and their new projects linked to our research topic.
The interviews were conducted virtually through video conference (Teams and Zoom). To ensure data quality and accurate documentation, all interviews were electronically recorded with participant consent and transcribed using automated transcription features provided by the video conferencing platforms. To maintain participant confidentiality, only essential professional information was retained in the raw dataset, including participants' positions, years of experience, and contact information. Personal identifiers were systematically removed from the dataset during the curation process. Participation in the study was voluntary, with participants retaining the right to withdraw their data at any point until the project's formal conclusion to ensure integrity of the collected data. We collected 10 interviews (please see Table 1).

Company	Country	Field	Role of interviewee	Time (min)	Period
Company A	Multiple countries	Industrial manufacturing, technology, engineering	Data Scientist/ GenAI Developer	41	Oct 2024
Company B	Portugal	Software engineering	Generative AI Engineer	24	Oct 2024
Company C	Portugal	Consulting for data analytics, AI	AI Consultant	71	Oct 2024
			Data Scientist	54	Oct 2024
Company D	Multiple countries	Consulting for data analytics, AI	Head of AI/ R&D Manager	69	Oct 2024
Company E	Multiple countries	Telecommunication	Generative AI Expert	47	Oct 2024
Company F	Portugal	Healthcare advanced technologies	Head of Information Technology	52	Oct 2024
Company G	Germany	Education and consulting GenAI	Keynote Speaker/ Author	48	Oct 2024
Company H	Multiple countries	Data science & GenAI	Data Scientist	82	Oct 2024
Company I	Brazil	AI solutions	Product owner	51	Oct 2024

Table 1. Field interviews by company, country, field, role of employees, length, and period

Data analysis

We conducted a preliminary data analysis and followed a predominantly inductive approach (Corbin & Strauss, 2014). Gioia methodology will guide the procedures for the analysis of the data we collected. Based

[2] https://sdgs.un.org/goals

on this, we are developing first-order codes by using the words from the respondents to better capture the essence of the information our respondents shared with us as presented in the findings section.

Preliminary findings

The organizations implemented and used GenAI for different tasks and procedures (please see Table 2). Common use cases include adopting GenAI-powered chatbots (such as Microsoft Copilot) for customer service, specifically to provide real-time responses to client inquiries. Employees are also using GenAI to streamline document management and information retrieval (especially from large document collections or unstructured data), enabling quicker access to essential data, minimizing the need for manual searches, historically more time consuming. One company developed an internal knowledge hub that allows employees to access specific documentation and policies without needing to sift through extensive files, aiming to promote operational efficiency. In some organizations, GenAI is integrated with knowledge hubs and chatbots, allowing employees to retrieve insights rapidly and automate routine tasks, such as classifying support tickets and generating content for marketing campaigns. In the healthcare and logistics industries, GenAI assists in processing large datasets, summarizing lengthy reports, and creating models for client segmentation or diagnostics. One healthcare company, for example, uses GenAI to support document analysis, which cuts down analysis time and shows how to improve accuracy in patient data handling. Similarly, in logistics, GenAI automates the handling of regulations in email processing, enabling compliance teams to respond within minutes instead of hours. GenAI is also being used to streamline employee onboarding and training, some companies provide GenAI-powered systems that offer step-by-step instructions for common tasks, such as setting up accounts or requesting time off.
Based on our data analysis, we identified five key themes that emerged from the interviews with our respondents as follows.

Achieving operational efficiency for reducing resource consumption

GenAI allows organizations to improve operational efficiency by automating routine tasks like document processing, content generation, and handling customer inquiries. By streamlining information retrieval and expediting decision-making, GenAI enables organizations to operate more smoothly and respond to needs more quickly. This enhanced efficiency translates into reduced resource consumption, such as fewer labor hours required from employees for repetitive tasks. This allows employees to focus on higher-value activities, increasing overall productivity and offering a more sustainable allocation of resources. As explained by the head of Information Technology department of company F:

> *"Generative artificial intelligence has helped immensely, primarily in terms of facilitating information search. This is one of the main selling points currently, especially for large organizations or even smaller companies that deal with lots of documentation. It facilitates quick and effective access to information [...] You can't be wasting time searching for information."*

Systematic training of GenAI across functions in preparation of sustainable development

As part of the implementation process, the organizations dedicated particular attention to the training of their collaborators across business functions (e.g., human resources, marketing, financial operations, etc.). The aim is to enable employees with less technical backgrounds to perform more technically advanced tasks (e.g. data analysis and coding) with the support of GenAI, which in turn will decrease the time for performing the tasks and decrease the interactions with other collaborators. Such systematic training is functional to develop new organizational knowledge and skills such that the internal resources (e.g., workforce, time, technological endowment) can be allocated to the necessary tasks and to be prepared for the process of achieving sustainable goal, as explained by the Head of AI, R&D from company D:

> *'We had a request that by the end of this year the aim was to train everyone, regardless of whether they work in human resources, marketing, financial services... to train everyone in generative AI, precisely so that they would also have the knowledge to be able to use this type of technology internally.'*

Empowering new services while safeguarding data privacy, security, and ethics

When the organizations implemented GenAI in their operations both for their internal needs (e.g., preparation of documents for interacting with the clients) and for empowering new services and products created for other organizations (e.g., chatbots), they must comply with ethical and regulatory procedures, particularly in relation to General Data Protection Regulation (GDPR) and the emerging AI Act. This is a mandatory requirement for not only remaining on the market but also for assuring the protection of their and of clients' rights regarding data privacy, security and ethics. This new layer of complexity is more evident for advanced technologies such as GenAI because the quality of their outputs and suggestions are strictly connected and dependent of the data they are trained and updated on. GenAI opens up new opportunities for the organizations and the end users for sustainable development, however, data privacy, security and ethics must be addressed and they must comply with national and international regulations to be able to pursue the process of sustainability as the consultant from company C said:

> *"Training was also very important in terms of preparing people to know how to use it, but to know what they were using it for and how it could also be a risk, right? It could jeopardise, for example, the exposure of internal data, the exposure of our clients' data."*

High energy consumption for GenAI training and use demand energy efficient options

Most of the companies acquired GenAI from large, third-party platforms with high development and implementation costs. Besides the implementation costs, the organizations faced additional costs for GenAI training based on the data from the organizations, which requires high energy consumption. This highlights the negative impact on the environment, which represent one of the three pillars of sustainability (e.g., environment, economic, and social). The same issue emerges also for the actual use of GenAI on a daily basis to meet organizational needs. If on one side GenAI has the potential to support organizations with sustainable development, on the other side during both the implementation and use, it actually creates negative effects on the environment. To deal with these challenges (e.g., high costs and high energy consumption) some of the interviewed companies opted for smaller GenAI solutions, which require less energy consumption. Based on this emerging awareness, the organizations are searching for new options with more energy-efficient models, which until recently have been mainly overlooked as highlighted by Generative AI engineer from company B:

> *"There's a serious concern about this type of technology, including energy consumption... training these models is extremely expensive and costly, even from an environmental point of view".*
> *"In most of these projects, we use these models... which are then trained by us, can be fine-tuned by us either using fine-tuning strategies or using prompt engineering. But we don't develop a large language model from scratch... that's expensive."*

Perpetuation of systemic bias in GenAI outputs restricts the pursue of sustainability

Systemic bias continues to exist in GenAI outputs emerging from the data they were trained on. One of the key advantages of GenAI is its ability to learn from large datasets and provide insights in a few seconds based on prompts. However, the quality of the data and its fairness defines the quality and trustworthiness of the suggestions it provides. For example, it GenAI is trained on databases that contain disparities based on demographic, socio-economic, and cultural factors, it will learn to continue to perpetuate such biases (e.g. underrepresentation of diverse populations) that can potentially affect areas like financial decisions, and customer service interactions. When such systemic bias perpetuates in GenAI outputs, this not only has a negative impact on the next decisions human actors will make, but this also restricts the organizations with their pursue of sustainability as those decisions have an impact on certain categories of the population (social dimension of sustainability). This issue reinforces the need for diversified and exhaustive datasets that reflect diverse populations to reduce bias, which in turn will enable the organizations with their pursue of sustainability as pointed out by the consultant from company C:

> *"We have to make sure that our solutions cover all kinds of situations, not that they are specific to certain roles. I remember that at the beginning, when the models started coming out and they started doing some tests, if I tried to create a story, if I talked*

> *about a doctor, it would take on a male role, if it was a nurse, it would always be a lady… the model tended to give some professions more to females and others to males."*

Conclusion

We are conducting an exploratory case study (Sarker et al., 2018) to discover how does GenAI affect sustainable development (the process of pursuing sustainability) in international organizations. Gioia methodology guides the data collection and analysis (Gioia et al., 2013). We collected semi-structured interviews with employees working in different organizations and in different departments to better understand how the organizations interact with GenAI and which impact it has on sustainable development. We identified five key themes that are (a) achieving operational efficiency for reducing resource consumption, (b) systematic training of GenAI across functions in preparation of sustainable development, (c) empowering new services while safeguarding data privacy, security, and ethics, (d) high energy consumption for GenAI training and use demand energy efficient options and (e) perpetuation of systemic bias in GenAI outputs restricts the pursue of sustainability.

Preliminary findings suggest that Generative AI can significantly streamline operations, reduce resource consumption, and enable diverse tasks across business functions, which prepares the organization for sustainable development. However, it also highlights the need for a systematic training across business functions to gain GenAI advantages at the organizational level. Additionally, our initial findings highlight the importance of balancing data privacy and regulatory compliance with innovation and discovery. The need for responsible, ethical AI use is further highlighted by environmental concerns about the high energy consumption of large language models and bias issues brought on by insuficient datasets.

Our aim is to contribute to theory by explaining the process through which international organizations use GenAI for sustainable development within their organizations, which will have an impact on our environment, economy, society (Kirchner-Krath et al., 2024; Prasad Agrawal, 2023). Our project will contribute to practice by showing the strategies, procedures, and initiatives developed by the interviewed organizations to leverage the potential of one of the most advanced and powerful technologies of the moment, GenAI, to develop sustainability within and outside of the selected organizations. This will allow us to provide practical insights about best practices achieved but also those initiatives that did not deliver the expected results such that future organizations can avoid them and start with those activities that contribute to sustainability and its continuous development.

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