Emerging Trends Regarding the Digitalization of Public Administration in the Context of Business and Sustainable Consumption: Bibliometric and Empirical Study

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Abstract

This study aims to investigate how the digitalization of public administration, through the implementation of electronic service delivery platforms, the adoption of digital public policy frameworks and the use of citizen engagement tools, intersects with the development of sustainable businesses and the promotion of responsible consumption models. The bibliometric analysis was carried out on a sample of 642 specialized articles, published between January 2010 and December 2024, selected from the Web of Science and Scopus databases and processed using the VOSviewer application. By mapping keyword co-occurrence networks, keyword burst phenomena and citation clusters, thematic developments and key concepts in the international literature on the subject could be identified. The results highlight a growing interest in integrating digital solutions into sustainability-oriented public policies, highlighting the emergence of the concepts of "sustainable digital governance" (e.g., policy interoperability and transparency), "smart cities with an ecological and social dimension" (e.g., low-carbon infrastructure coordinated through the Internet of Things), and "green e-governance" (such as digital platforms for environmental monitoring and public participation). The study reveals a growing convergence between the digital transformation agenda of public administration and the United Nations Sustainable Development Goals, in particular Goal 9 (Industry, Innovation and Infrastructure) and Goal 12 (Responsible Consumption and Production). The analysis of research cluster developments shows a transition from a focus on infrastructure and access in 2010–2015, to service integration and citizen engagement in 2016–2020, and in recent years (2021–2024) holistic e-governance models aligned with sustainability objectives are emerging.

By empirically clarifying the digitalization strategies frequently associated with sustainable outcomes in the business sector—such as open data portals, AI-based decision support systems, and integrated services—the study provides a direction for potential research aimed at exploring the causal relationships between the adoption of digital policies and measurable sustainability indicators, such as reduced resource consumption and increased adoption of circular economy practices among local businesses. In addition, the results suggest policy implications for prioritizing interoperable digital platforms and cross-sector partnerships to accelerate the SDGs. This bibliometric mapping also highlights some areas that are still insufficiently researched, such as the use of blockchain technology for green public procurement, and provides an information basis for designing digital governance interventions aimed at effectively supporting sustainable business ecosystems and responsible consumption models.

Keywords

Digitalization of public administration, sustainable business, responsible consumption, bibliometric analysis, VOSViewer.

Introduction

The introduction of digitalization of public administration has become, in the last decade, a strategic priority for governments around the world, with the potential to improve the efficiency, transparency and sustainability of administrative processes (Dunleavy, 2015; Janssen and Helbig, 2018). This digital transformation is starting to be associated with the concept of sustainable development that promotes sustainable businesses and encourages responsible consumption models (Gil-Garcia, Gasco-Hernandez and Pardo, 2023). In this context, the specialized literature emphasizes the role that digital technologies can have in facilitating the transition to more sustainable economic and social models, but, despite the progress made, the integration of digitalization into public policies oriented towards sustainable development and sustainable consumption continues to face a series of challenges related to institutional adaptability, digital skills and citizens' perception.

Although numerous studies have separately analyzed the impact of digitalization on public administration efficiency or the link between emerging technologies and responsible consumption practices, there is still a gap in the specialized literature regarding the integrated assessment, on the one hand, of how the digitalization of public administration can support the development of sustainable businesses and, on the other hand, of the perception of future public administration specialists on these interdependencies. Therefore, the identified knowledge gap consists in the lack of a bibliometric approach that identifies emerging trends in the international literature and examines, at the same time, the perspective of students or young professionals in the field. The present study aims to fill this gap through a bibliometric analysis of relevant publications and, in parallel, by investigating the attitudes and future perceptions of public administration specialists regarding the role of digitalization in promoting sustainable businesses and responsible consumption. This methodological combination offers a new perspective on how the academic literature evolves and on the expectations of those who will work in public administration, thus contributing to a new paradigm of the subject.

1. Review of scientific literature

The digitalization of public administration has become a central topic in academic literature, being recognized as a key factor for efficiency, transparency and sustainability (Janssen et al., 2020). This transformation facilitates citizens' access to services and improves the capacity of governments to respond to social and economic challenges. Alcaide Muñoz and Rodríguez Bolívar (2021) highlighted the potential of digitalization to support the Sustainable Development Goals (SDGs) by integrating technologies into administrative processes, reducing the carbon footprint and promoting transparency. The concept of smart cities is also relevant in the context of sustainable urban governance and in this context Yigitcanlar et al. (2019) define smart cities as systems that use digital technologies to optimize resources and improve the quality of life, while reducing the impact on the environment. As such, public administrations have the role of coordinating digital strategies that support sustainable businesses. From this perspective, sustainable digital governance has gained importance in recent years and Estevez and Janowski (2019) define digital governance as a framework that integrates information technologies to support data-based decision-making, with a focus on sustainability because it is considered that digitalization can reduce bureaucracy and promote public policies that encourage responsible consumption. These ideas are also supported by Medaglia, Misuraca and Aquaro (2021) who also highlight the contribution of green e-government but also to the reduction of resource consumption by digitalizing administrative processes as argued by Zampou and Pramatari (2011).

The impact of digitalization of public administration on sustainable business can be significant according to Bocken et al. (2014) who note that digital public policies can stimulate companies to adopt circular business models, which reduce waste and promote recycling. In addition, government digital platforms would facilitate collaboration between the public and private sectors, stimulating innovation in the field of sustainability, argue Turok et al. (2020).

The perceptions of young public administration professionals can be essential for the future of digitalization and Pereira et al. (2020) found a positive attitude of students towards digitalization, considering it crucial for promoting sustainability. Thus, adapting educational programs to include digital skills and knowledge about sustainability becomes a necessity to prepare future generations of leaders (Holland et al., 2021). In 2020, important theoretical foundations were outlined regarding the link between digital governance and

sustainability, as Erkut (2020) emphasized the need to move from "digital government" to "digital governance", highlighting that the sustainable transition involves expanding from a purely technical structure to multiple and participatory governance processes. This challenge is not only technological, but also the creation of governance structures that include citizens in the decision-making process, avoiding information overload and unilateral decisions. This situation was also demonstrated by the COVID-19 pandemic, which in 2020 acted as a strong catalyst for the digitalization of administration (Negescu et al., 2021; Popescu et al., 2021), so that governments were forced to move their services online to ensure the continuity of public functions under conditions of social distancing. This led to a significant increase in academic interest in e-government and the SDGs (Figure no. 1), with an exponential increase in the number of scientific publications after 2019. The rapid implementation of digital solutions has demonstrated the potential of these tools to maintain essential public services in crisis situations. If 2020 marked a conceptual maturation and practical impetus for the agenda of sustainable digitalization of governance, in 2021, as the health crisis continued, the focus shifted to integrating digital transformation into sustainable development strategies. Burlacu et al. (2021a, 2021b) highlighted that the digitalization of public administration can promote sustainable development and a more inclusive society because the proliferation of information technologies offers the hope of making administration more efficient and improving the relationship with citizens, strengthening social inclusion. In addition, e-government has been recognized as a path to tangible benefits for the state and society, including increased service efficiency, expanded access to information and decision-making processes, augmented civic participation, and reduced operational costs (Burlacu et al., 2021b).

Another important aspect of 2021 was the link between good governance and digitalization, with studies confirming the contribution of digital governance to achieving good governance principles, including creating public value, administrative modernization, increasing transparency, reducing administrative burdens, and combating corruption (Călin et al., 2022). Our analysis highlighted that, at least in theory, digital changes in the public sector can reduce corruption, stimulate economic growth, and strengthen democratic processes (Haug et al., 2024). However, there are researchers who have drawn attention to potential risks, such as excessive surveillance or deepening inequalities of access, emphasizing the need to address these challenges (Durkiewicz and Janowski, 2021).

In 2022, the topic of environmental sustainability in the context of e-governance was increasingly present in the mainstream of scientific work, with the concept of green e-governance starting to be articulated as an important research and policy direction. Digital government initiatives have proven essential in the transition to a circular economy, facilitating practices of product reuse, repair and recycling (Burlacu et al., 2022b). It is thus argued that the digitalization of supply chains and open data platforms allow for better monitoring of material flows and the involvement of non-governmental actors in circular economy solutions, supporting SDG 12 (Responsible Consumption and Production).

The concept of smart cities has evolved towards a sustainability-focused approach, transforming into smart sustainable cities. Studies have shown that such approaches are increasingly needed to achieve urban sustainability, by strengthening disaster resilience and combating climate change (Kuzior et al., 2023). The stated goal of such cities is to improve the quality of life of citizens and address social and environmental issues in a holistic manner.

Research has also highlighted the need to overcome structural challenges to ensure the long-term sustainability of digital government institutions, including data security, digital skills of the population and unequal access to technology (Burlacu et al., 2022a). In 2022, a consensus emerged on the need for inclusive digital transformation strategies that involve all actors and ensure that no one is left behind, and in 2023, previous trends were consolidated, with the literature providing stronger empirical evidence and new perspectives, with a notable focus on smart governance. A global study on smart cities revealed the expansion of digitalization strategies at the local level, recognizing cities as laboratories for sustainable innovation (Kuzior et al., 2023). The development of urban e-government would thus depend on national policies, although visionary municipalities can outpace the national pace in adopting green and participatory technologies and the key factors for effective urban e-government would include both the level of human development and IT infrastructure, underlining the importance of investments in education and technology. In fact, smart cities have begun to be seen as a means of achieving integrated urban sustainability, combining economic development with social inclusion and environmental protection.

Another important direction in 2023 was the attention paid to the perception and involvement of young people in the process of digitalization and sustainable transition, where it was found that the younger generation has high expectations regarding the digitalization of public services (Méndez-Rivera et al., 2023). Studies have highlighted that the digitalization of public services meets the expectations of young people, accustomed to the widespread use of ICT and they appreciate the transparency, speed and efficiency offered

by e-services, strengthening their trust in digital public institutions. They have proven to be important ambassadors of e-government tools in their communities, promoting the adoption of new technologies. The involvement of the younger generation becomes a pillar of the sustainability of digital transformation, both as demanding users and as agents of change. In 2023, the concept of the "twin transition" was deepened - the interconnection of the digital and green transitions, which makes digitalization and sustainability viewed as complementary, so that digital technologies can optimize resource management and support green initiatives, and the digital transformation itself can be governed sustainably, minimizing negative effects (high energy consumption, e-waste, etc.). Recent literature speaks of green IT and green e-governance as necessities to mitigate the climate impact of digital infrastructures and to ensure that the benefits of digitalization are not canceled by its environmental externalities.

The 2024 literature indicates a stage of reflection and synthesis on the progress made and the existing gaps and a bibliometric analysis (Lubis et al., 2024) revealed that, although the discourse on the link between digital governance and the SDGs has become increasingly present, explicit research at this intersection is still limited, especially in public administration journals. There is a gap in the specialized literature, with the connections between the digitalization of government and the sustainability agenda requiring more in-depth investigation (Lubis et al., 2024).

On the other hand, 2024 brings concrete empirical evidence of the benefits of the interconnection between e-government and sustainability. The study by Zhao et al. (2025) on digital environmental governance in China shows that the use of digital tools in monitoring and enforcing environmental regulations has become a driver of the green transition of the economy, which may lead us to the idea that digital environmental governance can contribute to improving environmental performance, the effect being more pronounced in regions with high levels of pollution and the mechanism identified would be the strengthening of regulatory enforcement through digital technology. The spatial propagation effect is also interesting, noting that digital innovations in a region also help neighboring regions to progress towards sustainability.

On the other hand, the study of current scientific literature has also highlighted a direct correspondence between e-government themes and certain SDGs, such as reducing inequalities (SDG 10), promoting innovation and resilient infrastructure (SDG 9) and strong and accountable institutions (SDG 16) (Adams and Paul, 2023; Marcovecchio et al., 2019) so that designing digital public policies to target these targets could generate strong synergies. An expansion of the research area towards citizens' perceptions and behaviors in relation to these changes is also noted. In fact, we were drawn to the fact that in 2024, International Youth Day had the theme "From clicks to progress: Youth digital paths for sustainable development", highlighting the trust that society places in young people in using digital technologies for a sustainable future, as it has been found that young people actively campaign for open government solutions, greener cities and responsible consumption, using the online environment for collaboration and innovation, and young people's perception of the digitalization of government is generally positive, considering it a way to promote transparency and government accountability, but expecting it to serve the purpose of protecting the environment and ensuring a fair future (Van Ryzin, 2021).

2. Research Methodology

The main purpose of this study is to identify and analyze emerging trends regarding the digitalization of public administration in relation to the development of sustainable businesses and the promotion of responsible consumption, while monitoring the perception of future public administration specialists on these aspects. To achieve this objective, an extensive bibliometric analysis of the international scientific literature was used, a quantitative method established for examining the structure and evolution of a research field by studying publication data (articles, authors, journals, citations, keywords).

Bibliometric analysis is approached in the specialized literature as a robust tool for mapping the evolution of a scientific field. Van Eck and Waltman (2010) highlight that the VOSviewer software allows the construction and visualization of co-occurrence networks of terms and citation clusters, thus facilitating the identification of thematic clusters and research trends. Zupic and Čater (2015) emphasize the importance of bibliometrics for quantifying scientific impact and for highlighting the relational dynamics between concepts or authors. In the context of the current research, this method proves to be appropriate because it allows, on the one hand, to identify the chronological evolution of academic interest in the digitalization of public administration and sustainability and, on the other hand, to discover conceptual relationships between topics such as digital governance and responsible consumption models.

Bibliographic data were extracted from the Web of Science database, internationally recognized for its exhaustive coverage of academic publications. The data collection process was carried out on March 15,

2025 and involved the formulation of logical combinations of search terms: "public administration digitalization" OR "e-government" OR "digital governance" AND "sustainability" OR "sustainable development" OR "sustainable business" OR "responsible consumption" OR "circular economy" OR "green e-government" OR "smart cities". In order to capture recent trends, filters were applied that included research articles, reviews and book chapters published between January 2010 and December 2024, with increased attention paid to the "post-2019" interval (i.e. the years 2020–2024), this threshold being chosen against the backdrop of the disruptions generated by the COVID-19 pandemic and the strategic acceleration of digital transformation projects in administration. Following the initial query, 820 bibliographic records were identified. By applying the inclusion criteria, which targeted only publications in English reviewed by the academic community, and by excluding duplicate articles, those irrelevant to the topic of interest after analyzing the titles and abstracts, as well as materials that did not fit into the specified chronological interval, a final batch of 642 papers was reached. The main inclusion criteria were: the central theme addressed (the intersection between the digitalization of public administration and elements of sustainability or responsible consumption), the type of publication (research articles, reviews, book chapters), the interval 2010–2024 and the English language. Conference papers and publications in other languages were excluded in order to preserve a homogeneous and comparable sample.

For data analysis, the VOSviewer application (version 1.6.19) was used, which allowed the following procedures to be carried out: analysis of keyword co-occurrence networks to identify key themes and their evolution over time, analysis of citation clusters to delimit relevant scientific communities, and analysis of keyword bursts to detect the sudden emergence of new concepts. Bibliographic data were imported in .txt format, normalized to avoid synonyms and terminological variations, then processed to generate the co-occurrence matrix and thematic maps. The "post-2019" period was justified by the need to assess how the pandemic influenced the prioritization of digitalization with an impact on sustainable development and responsible consumption, a scenario in which e-governance projects and smart cities initiatives experienced significant accelerations.

3. Results and discussion

The results of the bibliometric analysis carried out with VOSviewer highlighted an exponential increase in the number of publications on digitalization in public administration in relation to sustainability, especially observable after 2019–2020. This phenomenon confirms the earlier findings of Gil-Garcia, Gasco-Hernandez and Pardo (2023), who had already signaled an upward trend in academic interest in integrating digital solutions into sustainable development strategies. The sharp increase in publications after 2019 can be interpreted in the context of global agendas (such as the UN 2030 Agenda) and the crisis generated by the COVID-19 pandemic, which accelerated the adoption of digital platforms in administration (McKinsey Global Institute, 2021). In this sense, our data support the conclusions of Janssen and Helbig (2018), who argued that force majeure events (such as a pandemic) favor the rapid transition to digital infrastructures designed to ensure the continuity of public services with a reduced impact on the environment.

Figure no. 1 (network map) illustrates the thematic structure of the analyzed scientific literature, based on the co-occurrence of keywords extracted from the titles, abstracts and keywords of the publications. The visualization, generated with the VOSviewer software, includes a significant number of terms (represented as nodes), the size of which is proportional to their frequency in the data set. The lines between the nodes indicate the frequency with which two terms appear together in the same document, the thickness of the line reflecting the strength of the link. The color of the nodes denotes the membership in a particular thematic cluster, identified by the VOSviewer clustering algorithm based on co-occurrence links.

The map reveals the existence of several distinct but interconnected thematic clusters that define the research landscape at the intersection of public administration digitalization and sustainability in the urban and business context: Red Cluster: Central and dense, groups terms related to smart city technology and infrastructure, including "smart city", "Internet of Things", "big data", "artificial intelligence". This forms the technological core of the field. Green Cluster: Groups fundamental concepts related to sustainability and the environment, such as "sustainable development", "sustainable cities", "circular economy", "energy efficiency", "climate change". The strong connection with the red cluster emphasizes the study of technology in order to achieve environmental and sustainability objectives. Blue Cluster: Concentrates terms associated with governance, politics and urban development processes, including "governance", "policy", "urban development", "citizen participation", "smart city development". This represents the decision-making and socio-political dimension. Yellow Cluster: Delimits the area of e-government and public services, with terms such as "e-government", "government", "stakeholders", "social sustainability".

This cluster is closely related to digital governance and the interaction between the administration and citizens/actors.
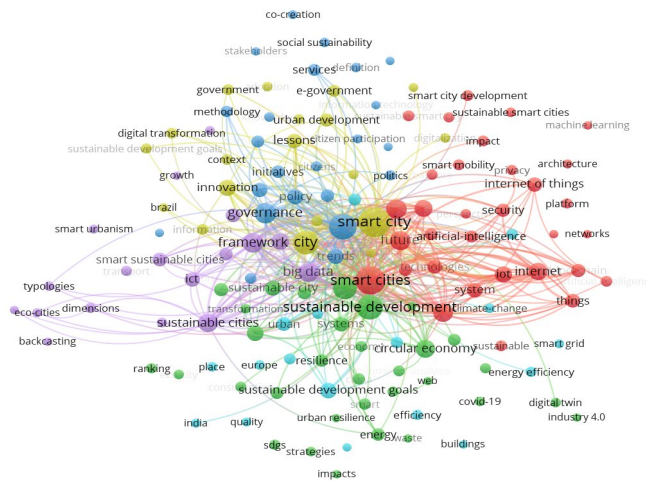
Figure no. 1. Network map of keyword co-occurrence on public sector digitalization and sustainability (Generated with VOSviewer)

The analysis of connections highlights a significant interconnection between these clusters, suggesting a multidisciplinary approach to the topic. Terms such as "smart city", "sustainable development" and "digital transformation" occupy central positions and have large dimensions, confirming their role as conceptual pillars in the analyzed literature. The map visually illustrates how research explores the interdependencies between the digitalization of the public sector (represented by the Blue and Yellow clusters, connected to technology in the Red cluster) and sustainability objectives (represented by the Green cluster), often through the lens of the concept of "smart city". The presence of terms related to "sustainable business" and "responsible consumption" (although perhaps with a lower frequency than other central terms) in connection with these main clusters indicates their integration into the broader discussion on digitalization, sustainability and governance.
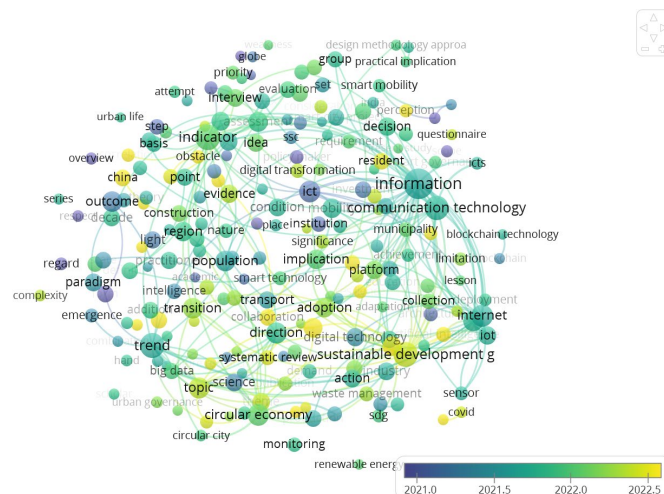
Figure no. 2. Thematic evolution of the domain: Overlay map of co-occurrence of colored keywords by average year of publication (Generated with VOSviewer)

The conceptual map presented in Figure 2 shows the co-occurrence of key terms and their temporal evolution. It is thus found that academic interest in this field has increased significantly, as evidenced by the growing number of publications linking digitalization to public sustainability, which indicates a growing recognition of the synergy between the two terms. The analysis identified a central core of concepts related to information technology (ICT, information, internet, platform) around which thematic groups gravitate, including urban governance and mobility (smart city, smart mobility), connected both to technology (iot, sensor, big data), as well as social actors (resident, population) or administrative structures (municipality, policy, decision).

An evolution of concepts is also observed, so that the discourse on the "smart city" goes beyond the purely technological perspective, explicitly integrating the sustainability dimension and stronger links appear between smart city and sustainable development, circular economy, waste management, renewable energy, reflecting a deeper understanding of the role of technology in achieving ecological and social goals and this dynamic favors the emergence of new integrative concepts, such as "sustainable digital governance" and "ecological e-governance", signaling the alignment of digital solutions with the principles of sustainable development. The temporal analysis (indicated by the colors of the nodes in Figure 2) confirms the recency of terms such as digital transformation, IoT and Covid and the convergence of digital and sustainability agendas in public administration represents a paradigm shift in research and practice that implies the need for digitalization policies to be correlated with environmental and social objectives (SDGs), and sustainability strategies to use digital tools.

Conclusions

The results of the bibliometric analysis confirm the existence of an exponential increase in academic interest in the intersection between the digitalization of public administration and sustainability, especially since 2020, when the pandemic context accelerated the rapid adoption of digital solutions in the public sector. Mapping of keyword co-occurrence networks identified three dominant thematic clusters: "sustainable digital governance", in which terms such as interoperability, transparency and digital public policies are closely connected; "smart cities with an ecological and social dimension", where the concepts of the Internet of Things, low-carbon infrastructures and integrated waste management appear in interdependence; and "ecological e-governance", characterized by the concern for digital environmental monitoring, online public participation and green e-government initiatives. Among the limitations of this approach are, first, the dependence on a single database (Web of Science) and the search terms used, which may exclude relevant studies published in other platforms or under other equivalent keywords. Also, the bibliometric analysis reflects only the published literature and does not include technical reports or informal practices in public administration, which may provide a partial picture of the real dynamics of implementation of digital initiatives. Regarding future research directions, the development of empirical case studies that investigate the concrete way in which local or central administrations implement green e-government digital solutions and measure the impact on sustainability indicators, such as greenhouse gas emissions, natural resource consumption or the degree of civic participation would be welcome.

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