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Dynamic capabilities in the public sector: Research agenda in the context of digital transformation

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Abstract: Dynamic capabilities, which were initially developed for the private sector but have increasingly been applied to public sector organizations, can be used to frame the analysis of digital transformation. This article considers the research agenda on the capabilities enabling public sector organizations to implement digital transformation, manage multi-stakeholder collaborations, and improve service delivery in a changing environment. There are five emerging areas of dynamic capabilities in the public sector: conceptual discussion, management and performance, measurement frameworks, innovation and public value creation, and digital transformation. Future research agendas should focus on understanding multiple actors involved in the digital transition, and longitudinal and comparative studies.

Keywords: Digital transformation, Dynamic capabilities, Public organisations, Public sector

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1. Introduction

Digital transformation works as one keyword associated with terms such as innovation or government electronic (Liva et al., 2020), and it permeates various fields, including the administration and management public (Haug et al., 2023). Digital transformation of public sector organizations is approached as a process of implementing government innovations facilitated by information and communication technologies, which reformulates internal processes, organizational structures, governance, service delivery models, regulatory aspects, relationships between levels of government, and between private and public operators (Liva et al., 2020).

Digital transformation in the public sector aims to improve the provision of services, aiming for efficiency and accessibility for citizens and expanding public value created through co-prudence and stakeholder involvement (Gasco-Hernandez et al., 2022). It is a flow of significant continuous

change to two levels: processes, procedures, culture, structures, tasks, and responsibilities (Tangi et al., 2021) and expectations. First, at the level of routines and processes generally internal to The organization; second, at the level of the interaction environment with users and service providers, relates to products, services, and business models (Haug et al., 2023).

Regarding the capabilities facilitators of change, the literature suggests that the evolution of digital government is related to the interaction skills development with citizens and other actors, capabilities for interagency service provision, and the offering of capabilities platforms (Janowski, 2015). Furthermore, leaders involved in digital transformation strategies have highlighted the limitations of resources organizational in the sector public: lack of skills technical and non-technical, silos of arrangements institutions, distrust and lack of incentives for change, lack of a vision organizational, lack of involvement and thinking strategic (Wilson, Mergel, 2022).

The literature more recent also informs that the pace of technology adoption changes the notion of "digital," impacting the deepening of digital transformation, namely, internal and external services to the citizens (Gasco-Hernandez et al., 2022). Furthermore, the project government for digital technologies, namely emerging technologies, must combine capabilities such as blocks that are agile, sustainable, inclusive, and responsible (Mazzucato, Kattel, 2020).

Therefore, there is one need for more integrated approaches for the public sector that can understand the change from the perspective of the entire organization under the lens of capacity organization (Gasco-Hernandez et al., 2022). We argue that the integrated approach refers to the capabilities more high, vital to detect, leverage, and reconfigure resources, internal and external, supporting the transformation in the digital context (Teece, 2009; Teece, 2023) to satisfy actors needs and, consequently, of stakeholders and citizens (Trivellato et al., 2021).

The following research questions guide our reflection: How has research on dynamic capabilities in the public sector developed? How is the research agenda on dynamic capabilities addressing the digital transformation of the public sector?

In this study, the literature review served to understand the development of the research area, and documentary analysis guided the framing of the main focuses of the research field. We opted for a systematic, comprehensive, and descriptive literature review (Nadkarni, Prügl, 2020) in the Web of Science. To ensure consistency of documents, we used only articles on dynamic capabilities in the public sector associated with digital transformation processes, digital governance, digital government, or applications, such as artificial intelligence. By manual selection, we analyzed and categorized the main approaches in the field.

The contributions of this study consist of two parts. Firstly, it contributes to the systematization of studies about DC in the public sector, the main areas in discussion, and the emergence of a future research agenda on digital transformation. Second, it contributes to the investigation of digital transformation in governments, with approaches centered on technology- actors (Haug et al., 2023).

The study also responds to the need to understand the sociotechnical changes in technology adoption and the transformation of employees' processes, duties, and tasks. In contrast, external

pressures drive digital transformation (Tangi et al., 2020). From the point of view of external pressures, our study corroborates the potential of the DC to rethink, build, integrate, and reconfigure internal and external skills to deal with environments in quick change (Teece, 2009).

The analyses indicate the need to understand and conceptualize digital transformation from an organizational perspective. The dynamic capabilities approach and understanding digital transformation as an organizational process should be explored effectively by involving citizens and businesses as stakeholders. The analyses should develop methods to reach these stakeholders, understand their processes and structures, and establish longitudinal and comparative analyses that allow the creation of DC measurement frameworks.

The paper is organized as follows. The research methods and analysis section explains the research design. The third section presents the results of the analysis of the research field. The fourth section on results discusses the future research agenda and whether there is an integrated DC approach to support digital transformation in the public sector.

2. Framing studies on DC in public sector organizations

A sample of fifty-three papers was obtained in April 2024. Thirty-nine papers were retained and analyzed based on the inclusion and exclusion parameters mentioned above. Regarding the main research question about how research on DC in the public sector has been developed, we carried out a literature review and documentary analysis of the articles, which allowed us to identify five research clusters. We then analyzed the thematic groups of the research field, prioritizing the articles in the enriched citation sample. This contrast made it possible to confirm the main focuses of the field and which approaches are related. Also, the approaches of the excluded documents are used to evaluate potential synergy with the digital transformation agenda in the public sector.

According to the framing of studies on DC in public sector organizations, we classify the research topics in Table 1.

Table 1: Main themes and discussion of studies on DC in the public sector

Themes	**Main discussion**
Concept	Conceptualization of DC in the public sector. Constituent elements of DC. Summary of how to conceptualize DC in the public sector (Kattel, 2022). The catalytic role of DC in organizations, not just in companies, is reacting quickly to the changes internal/external to adapt to new environments, opportunities, and challenges (Panagiotopoulos et al., 2023). Model analytics captures the background, the micro-foundations, and the effects of DC on the organization's public (Piening, 2013). Governments need capacities and DC that should be present. An intervention government is only effective if the State has the capabilities correspondents to take action. Governments need to create DC (Mazzucato, Kattel, 2020).
Management and performance	The DC of managers impacts organizational performance mediated by the organizational capacity for change (Widianto et al., 2021). Mechanisms through which the DC improves performance (Panagiotopoulos et al., 2023).

	DC and ambidexterity organizations maintain or develop design capabilities depending on the volatility of the environment (Adam et al., 2019). Public sector professionals are advised to focus on using interactive controls and developing two DCs: flexibility strategy and employee training (Nuhu et al., 2019). The DC also partially mediates the relationship of artificial intelligence capabilities with creativity and performance organizational, and creativity organizational Medea the DC (Almheiri et al., 2024). Mediation of DC in the relationship between the management system and government performance measurement (Castelo, Gomes, 2023). Digital adoption, deliberate learning, and management DC improve productivity in a digital transformation process (Bjerke-Busch, Thorp, 2023). Test DC in the performance of organizations in the public sector in the government domain electronic (Panagiotopoulos et al., 2023). Capabilities for detection, apprehension, transformation, and partnership agility impact government performance and mediate digital transformation (Xiao et al., 2023). Digital capabilities, like DC, are related to increasing agility and all areas of targeted performance (Atobishi et al., 2024).
Measurement and evaluation	Offers one routine evaluation structure fundamental to DC (Kattel, 2022). The assessment framework combined technologies and DC (Panagiotopoulos et al., 2023). An integrated framework for strategic planning, implementation, and research of reform government is based on ICT, DC, and assessment (Malinauskiene, 2014).
Public value, innovation, and collaboration	DCs are associated with public value as facilitators of generating and promoting innovation. Detection, capture, and transformation capabilities contribute to creating public value (Karttunen et al., 2024). DC for creating public value through public-private partnerships (Coombes, Nicholson, 2021). DC plays a significant role in developing value creation (Abdullah et al., 2019). The capacity for innovation emerges from organizational DC, from a set of routines, processes, tools, and structures that stimulate innovation (Gullmark, 2021). Innovation DC, namely technological capabilities, marketing, and team organization, affect the success of public sector innovation projects (Hashim et al., 2022). The principles of good governance can improve performance and innovation in service provision public through DC (Luna-Reyes et al., 2020). Development of internal capabilities and acquisition of external capabilities are integrated through DC in phases of public-private partnerships (Zhang, Leiringer, 2023). Governments should invest in building their strength in critical areas, such as productive capacity, procurement capabilities, and symbiotic public-private collaborations that genuinely serve the public interest (Mazzucato, Kattel, 2020). DC can play a decisive role in implementing government policy proposals and help public organizations align their results with the needs of stakeholders (Castelo, Gomes, 2023).

	DC can improve digital innovation of the digital government platforms (Senshaw, Twinomurinzi, 2022). The construction of new relations between government and business promotes the urban digital economy, with the capability for services to play a role as a mediator (Chen et al., 2023).
Emerging technologies	DC is required to achieve customer-oriented and supportive government progression stages for the e-gov transformation (Klievink, Janssen, 2009). DC is necessary to apply enterprise architecture to adopt and implement Big Data technology analytics (Gong, Janssen, 2021). There are a limited number of studies about artificial intelligence capabilities realized in the government sector, and these studies often have contradictory and inconclusive results (Almheiri et al., 2024). The DC IoT enables detection and response in real-time and can stimulate digital transformation by unlocking the potential of digital government in a government intelligent based on data, capable of providing policies and services of public interest and public value (Chatfield, Reddick, 2019).

2.1. Conceptual approach to dynamic capabilities in the public sector

The conceptual studies about the DC in the public sector (Kattel, 2022; Piening, 2013; Panagiotopoulos et al., 2023; Mazzucato, Kattel, 2020) discuss the elements of constituents and normative change to explain the reaction quick to the changes internal and external, and the impulse to adapt to new environments, opportunities and challenges.

The analytical models developed capture the antecedents to change based on the micro-foundations of detecting, improving, and transforming the effects of DC in public organizations. Regarding the public sector, micro-functions serve to understand challenges, interpret information for decision-making, involve collaborators and partnerships to leverage resources and knowledge, and formulate and shape policies, strategies, and practices to drive change or innovation.

This research approach also argues about the need for DC for governments so that governmental intervention in moments of turbulence and crisis, such as the COVID-19 pandemic, requires DC so that the State can act effectively. Therefore, the DC applied to the public sector emphasizes strengthening the sector's innovation capacity and the capabilities of state-owned companies, reconfiguring practices and policies, and improving the adaptability and resilience of organizations.

2.2. Dynamic capabilities associated with management and performance in the public sector

The study of DC, management, and performance in the public sector focuses on the skills of managers and the capacity for organizational adaptation and change to influence the effectiveness and efficiency of public organizations.

Gulmark (2021) and Widianto (et al., 2021) show that the ability to change an organization acts as a crucial link that transforms managers' skills in improving performance tangibles. Panagiotopoulos, Protogerou, and Caloghirou (2023) demonstrate that information and communication technolo-

gies act positively at building sensing, seizing, and transforming capabilities in government locations. Castelo and Gomes (2023) investigate how the DC mediates the relationship between management systems and performance measurement government. Adam, Lindahl, and Leiringer (2019) demonstrate that the need for DC in highly volatile is still more pronounced. The authors use the concept of ambidexterity organizational - one's ability to explore new opportunities while optimizing existing skills combined with the DC to adapt and respond effectively to changes and innovations. Bjerke-Busch and Thorp (2023) examine how the digital adoption, learning, and management of DC impact productivity during the digital transformation process. Nuhu, Baird, and Appuhami (2019) discuss that implementing control systems aligned to the DC facilitates organizational change and, consequently, allows one response to be more agile to the demands of the public and services provided. Almheiri (et al., 2024) argue that artificial intelligence capabilities must be integrated into the DC and creativity, combining technology, competence, and culture, to obtain superior performance in the public sector. Xiao (et al., 2023) evaluate how the DC and agility in partnerships impact the government's performance to step that plays a role as a mediator in digital transformation. Atobishi (et al., 2024) discuss digital capabilities as DC and how they are related to the increased agility and performance in specific target areas.

2.3. Dynamic capabilities measurement framework

The focus of measurement frameworks and DC in the context of the public sector is based on measuring the impact of DC in the evaluation of routines fundamentals necessary for the promotion and integration reform strategy based on technologies and modernization of the public sector. Most studies offer some model, framework, or measurement structure applied to the case studies or surveys. Specifically, Kattel (2022), Malinauskiene (2014), and Panagiotopoulos, Protogerou, and Caloghirou (2023) contribute nouns, offering guidelines and structures for an approach integrated with DC.

Kattel (2022) discusses one DC assessment and identification structure from routines fundamentals about sensemaking, connection for network building, collaborations, and partnerships, and modeling for formulation and active implementation of policies, strategies, and practices susceptible to adaptation circumstantial. Malinauskiene (2014) proposes a framework integrated for strategic planning, implementation, and government reform research based on information and communication technologies. Panagiotopoulos, Protogerou, and Caloghirou (2023) offer a model to test the applicability of DC and operational capabilities in the context of the public sector and support integrating functions, organizations, and technologies.

2.4. Dynamic capabilities for public value creation, innovation, and collaboration

The field of studies about DC, innovation, collaboration, and the creation of public value covers miscellaneous dimensions in the public sector.

Karttunen (et al., 2024) discuss how DC, including detection, capture, and transformation, enables organizations to identify new opportunities, capture relevant resources, and transform these resources into initiatives and innovations that benefit society. Coombes and Nicholson (2021) explore

how the DC can be used effectively in public-private partnerships, combining resources and skills to improve public service delivery and innovation, promoting public value creation. Abdullah et al. (2019) analyze how the DC plays a crucial role in developing strategies and practices that create public value, emphasizing the need for adaptability and learning continuous response to changes in the demands and expectations of citizens. Gullmark (2021) discusses how the organizational DC, including routines, processes, tools, and structures, are flexible and experimental to drive innovation in the public sector. Hashim (et al., 2022) examine how the capabilities of technology, marketing, and team organization influence the success of innovation projects in the public sector. Luna-Reyes (et al., 2020) argue that good governance principles can improve performance and innovation in service delivery public through the development of DC. Zhang and Leiringer (2023) explore how the DC facilitates the development of public-private partnerships, integrating capabilities internally and acquiring new capabilities externally to achieve public goals. Mazzucato and Kattel (2020) argue that governments must invest in capacity-building and collaborations between the public to meet public interest and promote innovation. Castelo and Gomes (2023) examine how the DC is fundamental to implementing policies of government aligned with the needs of interested parties. Chen (et al., 2023) analyze the construction of new relations between government, and companies that can promote the urban digital economy.

2.5. Dynamic capabilities and emerging technologies

The field of studies on dynamic capabilities and emerging technologies focuses on applying technologies in the public sector. Klievink and Janssen (2009) discuss the DC required to achieve customer-oriented government stages and support the digital transformation of e-government. Gong and Janssen (2021) analyze how DC is applied to architecture businesses that adopt and implement Big Data and analytics technologies in the public sector. Panagiotopoulos, Protogerou, and Caloghirou (2023) analyze DC and combined technologies for the performance of organizations in the public sector in the context of implementing government e-sites. Senshaw and Twinomurinzi (2022) analyze how DC can be used to improve innovation in the government platform. Almheiri (et al., 2024) analyze the capabilities of artificial intelligence associated with DC in the government sector. Chatfield and Reddick (2019) discuss how IoT-enabled DC can stimulate digital transformation and promote data-driven government intelligence.

3. Reflexions

Conceptual approach to Dynamic Capabilities in the public sector discussion, overall, understanding and improving DC in the public sector is essential for an effective response to the crisis, innovation, and success in -the long-term strategic term. Although all studies use the concept of dynamic capabilities, only the studies identified in this field discuss and justify the use of this concept within the public sector field. Therefore, when applied to the public sector, a more appropriate discussion on dynamic capabilities as an emerging concept from organizational studies and strategic management business is needed.

Studies on dynamic capabilities associated with management and performance in the public sector include research involving investment in the development of DC through training, innovation, and organizational flexibility; in the use of combined DC and other management resources, such as management control systems; and a holistic approach that integrates technology, competence, and culture to achieve high performance.

There is a need for a unified direction for DC, management, and performance in the public sector. In other words, there is a lack of consistent frameworks associated with the public policy cycle, for example. It is expected that with more substantive contributions from the research field, organizations will be able to choose a more structured plan or approach that is more emergent and adaptable (Gullmark, 2021). Furthermore, with a consolidated analysis framework, other different combinations of internal and external factors can be used to test capacity development, for example, the use of chatbot logs combined with human service in the public service.

Studies on the measurement of dynamic capabilities offer guidelines and practices for managers interested in improving measurement and evaluation—the strategy for implementing and evaluating continuous DC. However, evaluation frameworks and reflections on evaluation frameworks (Kattel, 2022) are still a gap in this research area.

Studies on the creation of public value in the public sector associated with digital transformation or digital government have gained the attention of researchers, whether focusing on value-creation processes that occur outside the organization (Panagiotopolous et al., 2019) or on the strategic actions of public managers creating public value (Haug et al., 2023), or on increasing the creation of public value through co-production and involvement of citizens and stakeholders (Gasco-Hernandez et al., 2022). However, this does not translate into research on dynamic capabilities.

It is necessary to broaden and nuance the discussion on dynamic capabilities and value creation, related to the concepts of innovation and collaboration. Public value creation, innovation, and co-production are interchangeable concepts. After all, to innovate, organizations change their forms and modes of organizational interactions and implement and focus on solutions. Solutions correspond to practices and ways of improving public value (Barrutia et al., 2022). These aspects can be linked and addressed under the aspects of organizational innovation requires capabilities at the organization level; the continuous generation of innovations is leveraged by partnerships, improving and changing existing processes, routines, and cultures; then, these efforts to develop solutions of public interest lead to the creation or improvement of public value. In terms of implications, practices, collaboration, and innovation to create public value should be better addressed by studies from the point of view of theoretical discussions and applied concepts to advance the discussion on organizational-level capabilities to absorb, integrate, and transform.

These studies demonstrate the complexity and importance of DC in the context of digital transformation and the use of emerging technologies in the public sector, emphasizing the different approaches applied to DC with practical implications on the need for adaptation, continuous learning, DC combined with other factors, as well as technologies and strategic collaboration. Although the approaches correspond to many different elements associated with emerging technologies, there is a common path that needs to be explored by studies: the need to investigate how new administrative

routines and processes that support new technologies are being absorbed into traditional public sector routines. For example, investigating the information processes of the public service and the use of chatbots for pre-screening and service flow.

4. Final considerations for future agenda

The field of research on DC in the public sector has recently gained more consistency. Our analysis corroborates the research question about a developing field of study. We identified five groupings on DC in the public sector: foundational concepts that deal with the theoretical discussion on DC applied to the public sector; DC, management, and performance in the public sector; measurement frameworks on DC in the public sector; innovation, collaboration, public value creation, and DC in the public sector; and, DC and digital transformation in the public sector—most approach DC based on Teece's (2009) concept of micro-foundations.

The studies highlight The importance of DC for innovation in the public sector and demonstrate that the development and application of DC are associated with operational improvements, responsiveness to the needs of interested parties, and service provision to the public. The field also emphasizes the need for collaborations among sector audiences to engage citizens and the public. However, there are gaps regarding scale partnerships and how to ramp up DC for multiple actors. Relative to the implications of practices, the development of DC is associated with investments in apprenticeships and adaptation of practices in the public sector.

Regarding the gaps and challenges in the field, we identified that the research agenda lacks an in-depth commitment to address DC and digital transformation in the public sector. This commitment must be operated on three levels: conceptual, methodological, and understanding of digital transformation processes in the dimension of the actors.

Regarding the conceptual approach, we reinforce the argument of (Haug et al., 2023) that the term digital transformation requires an approach tuned. Therefore, it is necessary to structure the theorization of digital transformation as one remodeling general aspects of the organization. Although the adoption mass of emerging technologies is exacerbating the borders of organizational structures of bureaucracies public, the technologies also require shaping acts and renewal of processes, structures, and routines.

From a methodological point of view, the research field lacks longitudinal analyses to compare and evaluate the measuring frames settled down in terms of DC in the public sector.

From the point of view of approaching digital transformation from a stakeholder perspective, Haug, Dan, and Mergel (2023) already highlighted that the focus of technologies should be redirected to the actors. The actors must be understood as users and interested parties – namely public-private partnerships, private service providers, and other arrangements emerging collaboration governmental and private; that said, the DC needs to be analyzed also at the level of collaboration of multiple actors, those who consume services and those who support the provision of services. Furthermore, digital transformation, as a process, requires one approach to ambidexterity; for

example, GovTechs – solutions sociotechnical, promoted per partnerships public-private need adjustments constants, given the nature of the solutions that imply in factors contextual relative to the use of technologies, and data, risks, costs, and also new actors.

We consider that the studies excluded from this analysis about the effect of the moderator government in the development of DC for companies in the context of digital transformation strongly indicate the need for approaches enlarged to the actors in a more volatile.

Therefore, a future research agenda should integrate these multiple actors in the processes of implementing and mobilizing DC in the public sector, investigating beyond needs and expectations, but also including analyses of the co-production of services and participation in the digital transformation of the public sector.

As we indicated in the introduction to this article, a holistic and integrated approach to digital transformation and DC must include the internal and external dimensions of organizational aspects and investigate the interactions and influences of the actors embedded in these processes. The field must advance an appropriate conception of digital transformation. A nuanced understanding of DC in the public sector must be driven by longitudinal and comparative analyses that allow us to delve deeper into analytical structures and contextual factors, such as data regulation, artificial intelligence, and those that affect the transformation.

This study contributes to the systematization's nuanced understanding of the emerging field of research about the DC in the public sector. Contribute also to literature on the relationships between digital transformation and the performance of organizations in the public sector. The research agenda map provides a comprehensive framework study of DC in the public sector. Implementing this agenda can contribute significantly to innovation and adaptation in the public sector, including digital transformation, ensuring that organizations are prepared to face future challenges, effectively meet citizens' needs and rights, and include stakeholders.

This study has limitations in choice methodology, although this may result from the need for an approach to conceptual and theoretical consistent digital transformation in the public sector. Studies critical were identified during our analyses through references enriched by example. However, no studies were included due to the keywords' scope. Tangi (et al., 2021) discuss The approach to digital transformational government as a process related to second-class capabilities order made possible by digital technologies that transform how organizations are structured and organized". Trivellato, Martini, and Cavenago (2021) analyzed the relationship between innovation and capabilities in the public environment, categorizing actors, physical resources and infrastructure, structures and systems, and organizational culture. Barrutia (et al., 2022) analyzed the effect of different government combination capabilities on public value in innovation projects in cities.

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