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**CREATING VALUE THROUGH THE USE OF
GOVERNMENT DATA: NEW BUSINESS MODELS FOR
DIGITAL GOVERNMENT**

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Dissertação submetida ao Programa de Pós-Graduação em Engenharia de Produção da Universidade Federal do Rio Grande do Sul como requisito parcial à obtenção do título de Mestre em Engenharia de Produção, modalidade Acadêmica, na área de concentração em Sistemas de Produção e Qualidade.

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Esta dissertação foi julgada adequada para a obtenção do título de Mestre em Engenharia de Produção na modalidade Acadêmica e aprovada em sua forma final pelo Orientador e pela Banca Examinadora designada pelo Programa de Pós-Graduação em Engenharia de Produção da Universidade Federal do Rio Grande do Sul.

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Dedicatória

If I have seen further, it is by standing on the
shoulders of giants.” Sir Isaac Newton.’.

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RESUMO

Na economia atual orientada por dados, o uso de informações por empresas e instituições públicas tornou-se comum. Com base na ideia de que a monetização de dados deve seguir limites éticos e legais, esta pesquisa revisa extensivamente a literatura relevante e analisa um projeto governamental que propõe modelos de negócios para capturar valor dos dados governamentais. Portanto, o objetivo geral desta dissertação é entender e mapear como um governo pode estrategicamente aproveitar seus dados como uma nova fonte de receita. O estudo contribui para o debate sobre economias baseadas em dados, oferecendo insights teóricos e recomendações práticas para navegar nesse cenário. As descobertas fornecem direcionamentos para governos interessados em aproveitar o potencial dos dados governamentais para capturar valor. As recomendações incluem estabelecer terminologias e definições padronizadas em todo o setor público para melhorar a comunicação e a colaboração, realizar avaliações sociais para entender as percepções públicas e desenvolver indicadores mensuráveis para avaliar o impacto dos esforços de digitalização do governo. Além disso, priorizar a integração dos sistemas internos e estabelecer acordos de cooperação de dados pode facilitar processos de tomada de decisão mais eficientes e promover a inovação. Os formuladores de políticas são incentivados a desenvolver um marco legal bem definido para abordar questões relacionadas à propriedade dos dados, privacidade, segurança e acessibilidade, a fim de inspirar confiança entre os cidadãos e potenciais usuários de dados. Recomenda-se uma consideração cuidadosa dos custos operacionais associados à anonimização de dados, juntamente com a exploração contínua de fontes diversas de informação e testes empíricos da arquitetura proposta para se adaptar a cenários em evolução. A dissertação propõe uma abordagem holística para o uso eficaz e responsável dos dados governamentais para gerar receita, contribuindo para o diálogo contínuo sobre seu potencial. A arquitetura estabelecida assegura a relevância e a eficácia contínuas na exploração do potencial total dos dados governamentais para capturar valor.

Keywords: Data Monetization; Public Administration; Data-Driven Models; e-Government; Digital ecosystem.

ABSTRACT

In today's data-driven economy, the use of information by companies and public institutions has become commonplace. Based on the idea that data monetization must follow ethical and legal limits, this research extensively reviews relevant literature and analyzes a government project that proposes business models to capture value from government data. Therefore, the overall objective of this dissertation is to understand and map how a government can strategically leverage its data as a new source of revenue. The study contributes to the debate on data-driven economies, offering theoretical insights and practical recommendations for navigating this landscape. The findings provide guidance for governments interested in harnessing the potential of government data to capture value. Recommendations include establishing standardized terminologies and definitions across the public sector to improve communication and collaboration, conducting social assessments to understand public perceptions, and developing measurable indicators to assess the impact of government digitalization efforts. Additionally, prioritizing the integration of internal systems and establishing data cooperation agreements can facilitate more efficient decision-making processes and promote innovation. Policymakers are encouraged to develop a well-defined legal framework to address issues related to data ownership, privacy, security and accessibility in order to inspire trust among citizens and potential data users. Careful consideration of operational costs associated with data anonymization is recommended, along with continued exploration of diverse sources of information and empirical testing of the proposed architecture to adapt to evolving scenarios. The dissertation proposes a holistic approach to the effective and responsible use of government data to generate revenue, contributing to the ongoing dialogue about its potential. The established architecture ensures continued relevance and effectiveness in exploiting the full potential of government data to value capture.

Keywords: Data Monetization; Public Administration; Data-Driven Models; e-Government; Digital ecosystem.

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1 INTRODUCTION

In the data-driven economy, businesses increasingly rely on data for a myriad of purposes (CLEMONS et al., 2017). The era of big data emphasizes the collection of vast amounts of information, often without prior knowledge of its potential utility (AALTONEN; ALAIMO; KALLINIKOS, 2021). This data serves as a critical resource for informed decision-making, significantly enhancing the value proposition for both private enterprises and public institutions. For instance, in healthcare, the aggregation and analysis of patient data have revolutionized treatment strategies and improved patient outcomes (GROVER et al., 2018). Similarly, in the realm of urban planning, the utilization of data on mobility patterns and resource usage has led to more efficient and sustainable urban designs (MONINO, 2021).

Consequently, individuals willingly provide their personal data in exchange for the services offered by these organizations. This exchange of data for services has become an integral part of the digital ecosystem, shaping everything from e-commerce to social media platforms. Users, consciously or not, become key participants in this data-driven transaction, with the understanding that their data is a form of currency (RUKANOVA et al., 2023; TEMIZ et al., 2022; TRKMAN; POPOVIČ; TRKMAN, 2023). In public organizations, data provision is not only accepted but also mandated to ensure the seamless delivery of services. For example, government agencies rely on citizen data to allocate resources efficiently, respond promptly to emerging needs, and design policies that reflect the diverse demographics they serve (ČERNÁKOVÁ, 2015; RUKANOVA et al., 2023).

The provision of these services results in the accumulation of vast collections of personal data by both private and public entities. And in the transformative power of data motivates organizations to offer services in exchange for this information. It fuels innovation, guides strategic planning, and enhances competitiveness. Businesses, therefore, have a special interest in acquiring and leveraging this invaluable resource (KASSEN, 2021). Furthermore, beyond its instrumental role in day-to-day operations, personal data holds strategic significance. It allows organizations to tailor products and services to specific user preferences, thereby increasing customer satisfaction and loyalty (CLEMONS et al., 2017; KAUFFMAN; WEBER, 2020). *Which business models, then, effectively capitalize on this data as a revenue source?* This question delves into the heart of modern business strategy. The most successful enterprises

have mastered the art of data monetization, whether through targeted advertising, subscription-based models, or strategic partnerships (NAJJAR; KETTINGER, 2013; TEECE, 2018). *And how should public administration strategically implement such business models?* This inquiry speaks to the evolving nature of governance in an increasingly digital world. Effective public sector organizations are those that harness data-driven insights to optimize resource allocation, enhance service delivery, and foster citizen engagement (DE CHIARA, 2018; TEMIZ et al., 2022).

This dissertation seeks to address these questions, premised on the notion that the monetization of personal data is permissible within legal frameworks, but must strictly adhere to ethical and legal boundaries. Additionally, it underscores the importance of critically evaluating the business models underpinning service provision. To this end, an exhaustive review of pertinent literature has been conducted, complemented by the monitoring of a government project, aimed at proposing business models that extract value from government data. This research represents a significant contribution to the ongoing discourse surrounding data-driven economies, offering both theoretical insights and practical recommendations for businesses and public institutions navigating this dynamic landscape. Through a multidisciplinary approach, this dissertation aims to shed light on the interplay between personal data, business models, and public administration, ultimately fostering a more informed and ethically grounded approach to data utilization in the contemporary world.

1.1 **THEME RELEVANCE**

The chosen theme is especially relevant in today's fast-paced digital era. Information has become the cornerstone of our economic and social structures. It serves as the fundamental foundation and essential structure that supports all technological endeavors (CLEMONS et al., 2017; KAUFFMAN; WEBER, 2020; OAS, 2022). We are currently witnessing an unprecedented increase in information creation, especially due to the internet, social media, and the easy flow of data. This includes a wide range of information, such as the websites we visit, how long we stay on them, our preferences, where we are, and many other details. Various industries are collecting this constant flow of information. It is important to highlight that the public sphere is deeply intertwined with this increase in data (ALAMSYAH; ZHU, 2022;

TEMIZ et al., 2022). Whenever people interact with their local public administrations, a significant amount of sensitive information is generated (TRKMAN; POPOVIČ; TRKMAN, 2023; VAN VEENSTRA; KOTTERINK, 2017). These interactions continue to add to the already substantial pool of data available for collection and analysis (DE CHIARA, 2018; TEMIZ et al., 2022). The introduction of big data into the economy has given rise to new and innovative business models specialized in collecting, processing and using this enormous amount of information (DE CHIARA, 2018). This new economic scenario is dynamic, with rapid changes and the emergence of completely new types of businesses (TEMIZ et al., 2022).

However, what truly sets this economy apart is the sheer abundance of information available for processing. It is crucial to understand that although the fundamental principles of economics remain the same, there has been a notable change in the way we use information (KASSEN, 2021). This change is evident in the creation of new services that are based on insights from data, as well as in the improvement of existing services through the intelligent use of available information (ČERNÁKOVÁ, 2015; RUKANOVA et al., 2023). This transformation represents a significant departure from older economic models, emphasizing the potential of information as a valuable resource for driving economic growth and improving service delivery. This change is what directs the focus of this dissertation, which aims to explore the implications, challenges and opportunities that arise from this data-centric paradigm, with emphasis on the role of the government as an agent capable of extracting value both for itself, as well as for its citizens and organizations.

1.2 THEME JUSTIFICATION AND OBJECTIVES

The increasing digitalization of government services, a phenomenon globally known as e-Gov, represents a significant milestone in the evolution of interactions between the State and citizens. **The overall aim of this dissertation is to understand how a government can strategically leverage its data as a novel source of revenue and as a means to boost economic growth.** Furthermore, we seek to provide a practical contribution by serving as a valuable reference for governments in countries in the process of digitizing their services. Proposing models for generating resources from the data generated by these digital services is

a pragmatic aspect of indisputable relevance. To achieve these objectives, specific goals were outlined that will guide this investigation:

a) To understand and Map the Main Data-Related Business Models: This fundamental step will involve an in-depth analysis of the business models associated with the management and use of data in the public sector context. An effort will be made to identify and classify the most prevalent models, providing a solid basis for subsequent analyses;

b) To identify the Main Challenges in Implementing These Models and the Benefits Generated: A comprehensive understanding of the challenges faced in implementing these models will be essential to propose pragmatic solutions. Furthermore, it is imperative to evaluate the concrete benefits generated from these implementations, demonstrating the added value to the public administration environment;

c) To identify the Main Resources and Capabilities in the Digital Public Administration Paradigm: Analyzing the interactions between the different resources and capabilities that make up the digital public administration ecosystem is vital for effective implementation. This stage will aim to map the resources and capabilities in different entities, within the governmental, and understand how they collaborate in the process of digital transformation of the public administration;

This research represents an effort to advance understanding of the complex and interconnected dynamics of e-Gov, providing practical and strategic guidance for governments seeking to modernize their services and leverage the benefits derived from the digital revolution. At the end of this study, it is expected to contribute significantly to the improvement of public administration in the context of the digital era.

1.3 RESEARCH STRUCTURE

Once the objectives of this work are defined, and the clarifications about the importance of this research are presented, it is necessary to establish the study design by which these objectives will be achieved, showing the proposed research method and design. This dissertation is composed of two distinct articles, each contributing to a comprehensive and in-depth understanding of the phenomenon of digitalization of public services and the use of this

data generated to create new forms of revenue. Each article adopts a unique methodological approach, reflecting the multifaceted and complex nature of the subject matter.

The first article is a Systematic Literature Review, which focuses on the critical analysis and synthesis of the existing body of knowledge on the digitalization of public services and the implementation of a digital government (e-Gov). This approach provides an overview of key trends, gaps, and debates within the field, serving as a theoretical foundation for subsequent study. The second article, in turn, presents a Qualitative Case Study, seeking a more in-depth understanding of the participants' experiences and perspectives in the context of generating new forms of remuneration for the Government through the use of data. This approach allows for the exploration of dynamics and transformations in a pilot project, offering valuable insights into the nuances of the phenomenon in question.

Moving forward to Paper 2, a Qualitative Case Study, a deeper understanding of participants' experiences and perspectives in the realm of generating new forms of remuneration for the Government through data utilization was attained. This approach enabled the exploration of the dynamics between public organizations, providing insights into the phenomenon of the public data monetization through the lens of the resource based view (RBV). When combining the findings of Paper 1 and Paper 2, a holistic comprehension of the digitalization of public services and its implications on revenue generation for the Government emerged. The systematic review established the theoretical background, while the case study delved into the experience of a government pilot project who aims to deploy new data business models to generate revenue. Together, these two papers formed the backbone upon which this dissertation was built, providing a comprehensive and multifaceted understanding of this complex subject matter.

1.3.1 *Research Method*

The research methodology employed in this study integrates both inductive and deductive approaches. The inductive method, as elucidated by Marconi and Lakatos (LAKATOS; MARCONI, 2009), involves deriving general truths after a thorough examination of numerous cases. On the other hand, the deductive method revolves around the formulation and testing of hypotheses. This research endeavors to harmonize these two methodologies to gain a comprehensive understanding.

In Figure 1.1 it was provided an illustrative representation of the research methodology, drawing from the methodological conceptions of science as outlined by Marconi and Lakatos (LAKATOS; MARCONI, 2009). It shows the various facets, including the qualitative approach as well as the classification of the descriptive approach, which was used in this research. The classification approach aligns with the descriptive paradigm. Descriptive research endeavors to delineate the characteristics of a specific population or phenomenon and may also seek to establish relations between variables. Additionally, the approach is characterized by triangulation, a methodological stance that integrates diverse sources and techniques for data collection.

The methodology further embraces case study method, which delves into the phenomena within their contexts, especially when the demarcation between the phenomenon and its environment is less distinct. Moreover, the research encompasses elements of field research, which involves the study of a specific group of individuals to discern the nuances of interaction through observational methods. The study also assumes a conceptual and theoretical underpinning, predominantly engaging in analytical discourse concerning the observations derived from the research.

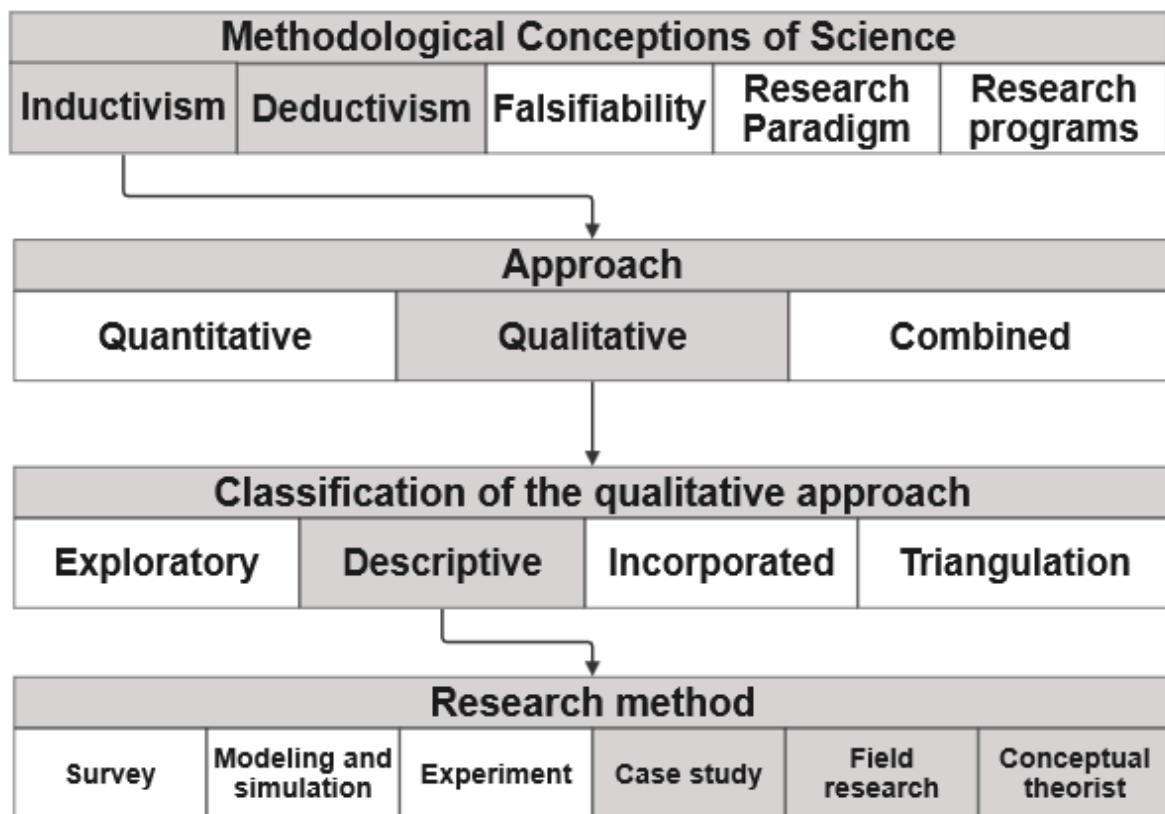


Figure 1.1 - Research Methodology

Source: MARCONI and LAKATOS (2009).

In the systematic literature review approach (used in the article 1), it was aimed for an insightful analysis of the existing body of knowledge on the digitalization of public services and the implementation of a digital government (e-Gov). The methodology followed the guidelines established by the PRISMA method, ensuring an impartial and rigorous evaluation of the selected sources. The selection of studies was conducted through a careful search strategy in academic databases, including *Scopus* and *Web of Science* (WoS), with previously defined inclusion and exclusion criteria. In addition, manual searches were carried out in relevant journals, as well as a citation analysis to ensure the comprehensiveness and representativeness of the reviewed literature.

In the second article we adopted a qualitative case study approach, seeking to understand the complexities of creating new digital services for the government and how to generate value from these services through the lens of the resource-based view (RBV). This

approach allows for in-depth exploration of the public organizations’ experiences and perspectives in a data-driven business model. Data collection was carried out through project monitoring and semi-structured interviews. This strategy allowed the capture of rich and contextual narratives, providing valuable insights for understanding the phenomenon in question.

1.3.2 *Research Design*

The development of the research and execution of its activities to achieve the proposed objectives occurs through two stages, presented in the article format. The articles represent the means to achieve the general objective of this dissertation. The dissertation structure is based on two articles; its research questions, goals, and methods are shown in Table 1.1.

Table 1.1- Structure of the research stages

Research Question		Research Goals	Dissertation Specific Goals	Theoretical Lens	Method
Paper 1	<p>RQ1: What data monetization models exist that can be used by public governance?</p> <p>RQ2: What are the advantages and challenges of these models?</p>	Aims to explore how data can be monetized and which of these models can offer benefits to digitized governments (e-Gov)	<p>a) To understand and Map the Main Data-Related Business Models</p> <p>b) To identify the Main Challenges in Implementing These Models and the Benefits Generated</p>	Business Models	Systematic Literature Review
Paper 2	RQ: What are the resources and capabilities necessary for the development of a digital monetization platform based on public government data?	This research aims to delineate the essential resources and capabilities necessary for the establishment of a government data monetization platform	c) To identify the Main Resources and Capabilities in the Digital Public Administration Paradigm	Ecosystems Theory Resource Based View (RBV)	Qualitative Case Study

Paper 1 – “*Data Monetization as a business model for e-Governments: Research advances and opportunities,*” explores the intersection of digital government (e-Gov) and data monetization,

focusing on how governments can leverage data for additional revenue and improved public services. The study highlights the challenges and benefits associated with implementing e-Gov and provides a comprehensive analysis of various data monetization models. The methodology employed is a systematic literature review, following the PRISMA protocol, which aims to reduce bias and ensure replicability. The study is divided into three phases: planning, execution, and reporting/analysis. The literature search was conducted in well-established databases such as Scopus and Web of Science. The results are categorized into four main sections: (i) Advantages/Benefits of e-Gov, (ii) Challenges in e-Gov Implementation, (iii) Data Monetization Models, and (iv) e-Gov Monetization Models Applicability. The analysis reveals disparities in production across regions, indicating a relation between development indicators and production outcomes. The study identifies six major benefits of e-Gov implementation, including improved public services, administrative efficiency, and enhanced citizen trust. Additionally, ten great challenges are outlined, including digital literacy, privacy concerns, and infrastructure costs. Twelve data monetization models are mapped, such as asset sale, service/product innovation, and data exchange. The applicability of these models to e-Gov is discussed, emphasizing the need for customization based on each government's specific context. At the end, it was presented a comprehensive table summarizing data monetization models, their benefits, challenges, and potential implications for the public sector. This table serves as a valuable guide for digital governments seeking to navigate the complexities of data monetization. The study also identifies several research opportunities, including exploring legislation related to government digitization, examining data-driven public policies, and considering citizens' perspectives on monetization as a state business model. Thus, the research contributes to the existing literature by addressing the relationship between data monetization models and digitized governments. It highlights the need for nuanced approaches to data monetization in e-Gov, considering governance, legislation, and data protection. The study's limitations include its coverage and definition of e-Gov, which leaves room for further research in these areas. Future research directions are suggested, such as exploring diverse sources of information and identifying key inputs to monetization models.

Paper 2 – “*Digital transformation in public governance: monetization of public data to create new revenue sources*”, explores how public data can be used to boost economic growth in specific regions. The study focuses on a project in southern Brazil that demonstrates how

governments can make money from their data to create new sources of funding. The research highlights the importance of turning public data into valuable assets to improve decision-making and stimulate economic opportunities. It emphasizes the need for effective data management in the digital era and discusses concepts like "data," "big data," and data-driven approaches. Additionally, the article discusses how the Resource-Based View (RBV) theory can help evaluate the impact of government actions on economic development. By looking at the resources and capabilities of governments through the RBV framework, the study shows how these factors can drive innovation, enhance competitiveness, and promote economic growth in a region. The study also addresses the challenges faced in organizing and sharing government data for digital services, pointing out the complexities of making data useful for different users. By overcoming these challenges and exploring the potential of data monetization, governments can open up new opportunities for generating revenue, fostering innovation, and supporting sustainable development. Overall, the article underscores the transformative power of using government data to strengthen regional economies. In the end, the study proposes a structural model for implementing data monetization from the perspective of public governance resources and capabilities.

It is important to note that the data analyzed in this research emanates from an umbrella project within the government. The insights gained from this analysis not only contribute to a broader understanding of digital platform and data-driven business models, but also underscore the adaptability required as technology and regulatory landscapes continue to evolve. This research forms a valuable foundation for similar efforts in other contexts, recognizing the distinct nature of data ecosystems in the public and private sectors.

1.4 STUDY DELIMITATIONS

This dissertation presents some delimitations that are important to be highlighted. As something common to literature reviews, a limitation of this study is its coverage. There will always be additional searches that cover search topics that were not found through the search performed. That said, the bibliography used in this study should represent most of the English-language and peer-reviewed articles that address the topics of digital government (e-Gov) and data monetization forms. Another limitation of the research was the definition of the concept

of e-Gov, while there are many articles dealing with the subject of e-government, but not defining it as such. On the monetization side, there is a gap in the definitions of data monetization when dealing with public data, so most of the referenced research deals with the implications of this form of remuneration in the industry.

In other hand, the study of paper 2 was conducted within the confines of a government entity situated in an economically developed region of an emerging economy. The primary dataset utilized in this study was sourced from the Department of Traffic (DETRAN), offering a unique first-hand perspective on pertinent information. The chosen methodology adopted an exclusively qualitative approach, a deliberate decision arising from the inherent challenges in quantifying nascent phenomena. Given the incipient nature of the subject matter, precise metrics or comparative benchmarks were lacking, rendering a qualitative approach the most suitable for gaining insights.

1.5 DISSERTATION STRUCTURE

This dissertation is organized into four main chapters. In this first chapter, the work's context and objectives were presented, justifying the importance of this research from an academic and practical point of view. This chapter also presented the study method, structure, and limitations. The next two sections, give the proposed articles, according to the architecture shown in Table 1.1. The fourth chapter presents the final considerations of the present dissertation, discusses the results, and presents a conceptual collaboration model consolidated from the findings and future research opportunities.

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2 PAPER 1 - Data Monetization as a business model for e-Governments: Research advances and opportunities

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Abstract

This study organizes existing research regarding digital government and data monetization models. Our research answers two questions: (1) What data monetization models exist that can be used by public governance? (2) What are the advantages and challenges of these models? We found descriptive models about digital governments and data monetization forms. Thus, this literature review theorizes a description of digitized governments and forms of data monetization that can improve the understanding of the value of digital government data. Regarding the research topics, this study found 57 relevant articles about the subjects. The review showed us that there is a gap in the connection between data monetization practices and digital public governance models. Our study contributes to the existing literature by addressing the relationship between data monetization and digitized governments. We offer insights into public data monetization and navigate into data-driven monetization while upholding principles of transparency, security, and legality.

Keywords: Data Monetization; e-Gov; Business Models; Digital Transformation.

2.1 INTRODUCTION

With the advance of digital Governments (i.e., a term known as e-Gov), public administration has been looking for new digital ways to offer their services to society. Some concepts like Society 5.0 in Japan have been gaining attention because it considers how e-Govs can support the population with data. With this advance, there was a massive generation of available data by the government and its citizens. In this vein, Muñoz and Sánchez (2015) state that institutional action by government officials is necessary for new models of public management to emerge. Thus, governments have sought new ways to remunerate their assets through technological innovation (Aaltonen et al., 2021; Arundel et al., 2019).

Some research (e.g., (Oni et al., 2020), (Sun et al., 2015), (Twizeyimana and Andersson, 2019)) shows that business models can generate new sources of funds for public

entities. However, Larsson and Grönlund (2016) affirms that many Governments can still not implement a digital administration in a way that adequately meets some social demands of this new era. For instance, municipalities have a unique direct interaction with citizens. The relationship between municipalities and their citizens is unavoidable: business registrations, automobile registry, real estate development, or even the subscription of a child in a school, for instance - all require citizens to meet the municipality.

Therefore, it is necessary to introduce technology both in the conventional tasks of the municipality and in the public sector management, with public citizens and their needs being the focal point of such application to achieve this governance mode. Considering this, the catalyst of public administration renovation is the ICTs (Clemons et al., 2017; European Commission. Directorate General for Communications Networks, Content and Technology. et al., 2020). All these interactions generate data, but still, it has some challenges to be addressed so it can generate, process, and deliver it as an asset (Anshari and Lim, 2017).

Thus, in this context of public administration, a new source of funds for the Government may be the monetization of its data. While still in its infancy in governments, data monetization already constitutes a powerful means to generate additional revenues by using data to add new services to existing offerings, developing new business models, and even directly selling data-based products, services, or utilities (European Commission. Directorate General for Communications Networks, Content and Technology. et al., 2020). When talking about monetization, the first thought commonly occurring is data sale (NAJJAR and KETTINGER, 2013). However, monetization should be seen as a way of looking at data and generating value from its use, thus obtaining a quantifiable economic benefit (Liu and Chen, 2015). The measurement of the value of data can provide vital information for public policies such as digital trade and national data policies and corporate strategies such as investment and outsourcing decisions in data-driven decision-making processes. For example, we can see the reduction of operational costs achieved through analyzing data from the public health administration as an economic gain for the Government and a way to monetize that original data (Baecker et al., 2020; Grover et al., 2018). Thus, using data to optimize public administration can generate a competitive advantage for the Government and its local economy.

Hence, this study aims to explore how data can be monetized and which of these models can offer benefits to digitized governments (e-Gov). To achieve this, we performed a literature

review to define and understand what the academy has mapped to tackle the problem. We proposed the following research questions (RQ) to respond to the study demand:

- RQ1: What data monetization models exist that can be used by public governance?
- RQ2: What are the advantages and challenges of these models?

Research articles that illustrate case studies that discuss how public governance is digitized; map and analyze the remuneration potential of available data were identified. From those, we discovered many perspectives that do not align with the research areas proposed in this article. We found that the use of trendy terms like 'digitization' and 'monetization' contributed to the lack of coherence in the literature on e-Gov. As a result, while there are numerous articles on e-Gov, they do not reach a consensus on its definition. Similarly, there are monetization models based on industry data, but there is not enough research on this aspect when that proposes monetization in a digitized government. This gap becomes evident when we draw parallels between the challenges of the digitization of a government and the main models currently used by the industry. The sale of assets, for example, is widespread to be practiced with the data of e-commerce. However, an e-Gov, demands all sorts of legislation and policies that determine how this monetization should be and what its limit is (i.e., what is the limit of the data to be used considering the data protection laws).

In conclusion, our study significantly contributes to the existing literature by addressing the relationship between data monetization models and digitized governments (e-Gov). Through a comprehensive literature review, we have identified prevailing discrepancies in the treatment of e-Gov concepts. Furthermore, our work highlights a crucial gap: the lack of studies investigating monetization models tailored to digitized governments. While asset sales have gained traction as a strategy of data monetization, the intricacies of governance, legislation, and data protection inherent to e-Gov demand a more nuanced approach. Our study offers insights into data monetization within e-Gov and serves as a foundation for governments to navigate data-driven monetization while upholding principles of transparency, security, and legality. Moreover, this comprehensive analysis culminates in a table that stands as an essential guide for digital governments looking to enter the complex domain of data monetization. This table not only summarizes the results obtained, but also serves as a beacon to guide governments in choosing monetization models aligned with their e-Government visions, taking into account the imperatives of effectiveness, transparency and citizen-centric service. With its holistic view of each model's intricate nuances, the table highlights strengths and key considerations, providing

a reliable compass for successfully navigating towards a more promising and sustainable digital future.

2.2 THEORETICAL BACKGROUND

2.2.1 *Electronic Government (e-Gov) and Data Monetization*

Prior research (Hartanti et al., 2021) (Irani et al., 2023) (Rukanova et al., 2023) (Twizeyimana and Andersson, 2019), indicates that governments lack the managerial agility to update their way of providing services due to rapid technological changes. The e-Gov is an initiative that aims to increase government performance; when properly applied, this initiative leads to an increase in the effectiveness of services and the internal capacity for collaboration of public entities, making the participation of citizens in decision-making processes increase as well (Sun et al., 2015). The e-Gov is commonly conceptualized as the use of Information and Communication Technologies (ICTs) by public governance, combined with organizational changes to improve Government structures and operations (Twizeyimana and Andersson, 2019). Not only that but open government data is beginning to gain traction in both public policy and industry (Temiz et al., 2022).

The e-Gov standard describes how governments should work, share information, and digitally deliver services to internal and external customers (Sun et al., 2015). According to the Organization of American States (2022), Electronic government (or e-Government) is the application of ICTs to government functions and procedures to increase efficiency, transparency, and citizen participation. Therefore, e-Government can not be seen simply as moving public services online. However, in its broader sense, it refers to the technology-enabled transformation of government, i.e., governments' intent to reduce costs while leveraging economic development, increasing transparency in government, improving service delivery and public administration, and facilitating the advancement of an information society. The e-Government objective is to create a new dynamic relationship between governments and citizens, in other words, a cycle that will become simpler and more participative for citizens.

The literature that references data monetization as a government business (e.g., Anshari and Lim, 2017; Arundel et al., 2019; Beynon-Davies, 2005; Černáková, 2015; Cordella and Willcocks, 2012; Greer and Klein, 2010; Hartanti et al., 2021; Temiz et al., 2022) usually refers to situations in the context of developed countries. In such places, there is a favorable socio-technical context that favors remuneration models. However, most of these studies

present an open data monetization strategy and lack a detailed explanation of other ways to monetize data. Therefore, we propose a more objective definition of the term where we understand that data monetization is: the practice of using owned data to create monetary value directly or indirectly. On the other hand, we have existent literature (e.g., Faroukhi et al., 2020; Kamau and Willems, 2019; Monino, 2021 and Su and Jin, 2021) that focuses on data-driven business models when implemented by the industry, so the proposition/adaptation of these models for the public sector requires further research. For example, other organizations can learn data monetization models from retail business models, as shown in Najjar and Kettinger (2013) research. The potential of open data resides in the characteristics of the data (which is cumulative and combinatorial) and that the value derived from these data is often proportional to the size of its volume (Temiz et al., 2022). However, in order to understand the terms of adopting a digital government and its value gains, we need to take a step back to explore the ways in which digitalization can be implemented and what barriers must be overcome.

The problem is that for government data to value capture, additional investments are needed in addition to the need for specific skills to deal with this new paradigm (Hartanti et al., 2021). For example, Najjar and Kettinger's research (2013) analyzed the journey of data monetization for a drug retailer and concluded that it is important to consider how creating and sharing data will change relationships and business models. Liu and Chen (2015) show in their study, that public data monetization is still a recent issue in the domains of Information Systems literature. They define it as generating resources from available data sources or real-time information. Baecker et al. (2020), in turn, show in their research the result of a survey with the main data monetization models (e.g., Asset Sale, Data Insights Sale, Data Enrichment, Data Bartering) by consulting 102 real industry cases.

As extensive research is starting to emerge concerning how organizations manage data and derive value from it, there remains a significant gap in understanding and addressing the bias present in digital government. This distinction is of utmost significance and should not be overlooked, as achieving value through open data hinges on achieving harmony both within organizations and among various stakeholders (Temiz et al., 2022). From the list of Baecker et al. (2020) (who reviewed 102 real-world cases from diverse industries with regard to the use of data and provides a set of 12 generic models for monetizing data), we identified that some of these models may be suitable for the universe of generated data by public governance. For instance, a strategy based on data in which the industry uses geolocation, climate, and customer

density data from its bases manages to optimize the pricing of its services and thus increase its sales (Clemons, 2009). The Government also has this mass of data that can be either offered as a service for local industry, promoting economic growth in an optimized way, or it can be offered as a pure consumption service where the potential customer of this data pays the Government for the use of a set of custom data (Welle Donker and Van Loenen, 2016). So, even with the same kind of data (in some cases), public governance and the industry do not behave similarly when monetizing such data. Hartanti et al. (Hartanti et al., 2021) agree with this when they state that the implementation of digital technologies requires different approaches by the authorities so that the delivery of services to citizens is done in a smart way. Furthermore, as stated by Hartanti et al. (2021), the utilization of data analytics is an important tool not only to assure that citizens have access to public services but also to generate public value to communities.

Based on these findings, we intend to understand which data monetization models can be used by the public administration, what are the benefits of these models and what are the challenges to be faced for their implementation. Grounded on this information, we intend to propose a simplified way of assessing the level of maturity that governance is inserted in and propose a theoretical model of the overlapping of these challenges that public administration can face during its digital transformation journey.

2.3 METHODOLOGY

A systematic literature review was carried out with a focus on remuneration models for government data to answer RQ1 and RQ2. A systematic literature review uses a well-defined research protocol (e.g., Preferred Reporting Items for Systematic Reviews and Meta-Analyses - PRISMA) that seeks to reduce bias and ensure that the findings can be replicated and understandable Tranfield et al. (2003). This method is significant in research that shares concepts with other areas of knowledge. For example, this is the case for remuneration models driven by government data, which directly parallels the industry's payment models. In addition, many searches in other areas of knowledge use synonyms for search terms in our search questions.

We followed the model and recommendation of Tranfield et al. (2003) to conduct this systematic review, being divided into three phases: planning (Phase 1), execution (Phase 2), and reporting and analysis (Phase 3). In Phase 1, based on the gaps found in the

literature regarding e-Gov business models for implementing compensation models, a protocol used by database searches was developed, and search strings were defined (Table 2.1). In this phase, the basis of Scopus and Web of Science were defined to carry out the research, as they are two primary databases with high indexes of scientific articles.

We perform database searches without stipulating limits on search dates. Thus, 2005 is the year of publication of the first article found that refers to the database results and the beginning of 2023 is the year of publication of the last article considered in the basket found. The asterisk character was necessary in keywords to encompass idiomatic differences (i.e., *monetization* in USA and *monetization* in UK) and to include different keyword endings (i.e. and -gov* representing the endings govern, or government, or governance). “Open data” and “public data” became necessary because different localities treat public and open data as synonyms. We use the terms "value appropriation", "value capture" and revenue as synonyms of what we aim for in our search, which is value when linked to monetization.

Table 2.1 - Search Strings by Article Indexer

Data Base	Search String
Scopus	TITLE-ABS-KEY ((<i>e-gov*</i> OR " <i>public data</i> " OR " <i>open data</i> " OR <i>government</i> OR " <i>public services</i> ") AND (" <i>business model</i> " OR <i>innovation</i> OR " <i>moneti* model</i> " OR " <i>revenue model</i> ") AND (" <i>value appropriation</i> " OR " <i>value capture</i> " OR <i>moneti*</i> OR <i>revenue</i>)) AND (LIMIT-TO (LANGUAGE , " <i>English</i> ")) AND (LIMIT-TO (SRCTYPE , " <i>j</i> "))
WoS	((ALL=(<i>e-gov*</i> or " <i>public data</i> " or " <i>open data</i> " or <i>government</i> or " <i>public services</i> ") AND (" <i>business model</i> " or <i>innovation</i> or " <i>moneti* model</i> " or " <i>revenue model</i> ") AND (" <i>value appropriation</i> " or " <i>value capture</i> " or <i>moneti*</i> or <i>revenue</i>))) AND DT=(<i>Article</i>) AND LA=(<i>English</i>)

In Phase 2, we performed searches in the databases using the search strings presented in Table 2.1. We placed the following inclusion criteria in the search engines: the string must be in the Title, Abstract, or Keywords of the article; only articles published in peer-reviewed journals were included; Articles must be written in English and searches were carried out until the beginning of 2023. Although following (Tranfield et al., 2003), the study was not restricted to high-level journals; it was considered that a more open scope of journals would ensure that articles relevant to the study were included. Thus, limiting journals to a list of high-level publications (such as the Academic Journal Guide) could restrict the number of articles found. The digitization of public governance is a multidisciplinary field, and many articles dealing

with the topic are still published in medium and low-range journals. The inclusion and exclusion criteria are presented in Table 2.2.

Table 2.2 - Inclusion and Exclusion criteria

I/E	Criteria	Motivation
Inclusion	RI-1	The article covers data monetization models and/or strategies.
	RI-2	The article addresses the models and/or challenges of digitizing public governance.
Exclusion	RE-1	The article has only the title, abstract and keywords in English, the body text is in another language.
	RE-2	Full article text unavailable.
	RE-3	The material is either non-academic (reports and prefaces) or not from a journal.
	RE-4	The definition of "monetization" is not related to business models involving data.
	RE-5	The definition of "e-Gov" is unrelated to digitized governance models.
	RE-6	Articles that address monetization without mentioning anything related to data, information, or other similar terms.
	RE-7	Articles that address digital governance without mentioning something related to public service or other similar terms.
	RE-8	Articles not in interest group: business, engineering, telematics (information technology).

Therefore, the articles published by areas of interest were limited to business, engineering, and telematics (information technology). The search performed in both databases resulted in 1,330 articles found. A total of 242 duplicate articles were eliminated, resulting in 1,088 articles. Titles, abstracts, and keywords were read to verify if the selected articles were suitable for the research objectives, and if not, they would be discarded. Using the exclusion criteria, we discarded 1,035 articles from the search basket, as shown in Table 2.3.

Table 2.3 - Exclusion criteria accounted

Exclusion criteria	Number of Discarded Articles
CRE-1	5
CRE-2	30
CRE-3	4

CRE-4	87
CRE-5	75
CRE-6	123
CRE-7	163
CRE-8	550
Total discarded articles	1,037

These criteria aimed to select the articles that presented e-Gov models, their advantages and challenges, and models or strategies for data monetization, resulting in 57 accepted articles (see Appendix A) from our SLR protocol. This criterion consisted of the total reading of the article, the theoretically based sections, and conclusions to analyze whether the selected articles had public governance digitization models and/or data monetization models. Figure 2.1 highlights our PRISMA protocol and research steps to include or exclude works.

In addition to using the PRISMA protocol, we discovered that the number of selected articles was substantial, which posed a challenge to our review process. To address this issue, we developed and utilized a simplified protocol for content analysis that aided in creating the final basket of articles. This approach not only helped to streamline our review process but also ensured that the articles selected for analysis were relevant to deepen our study focus. By adopting this approach, we were able to effectively manage the large volume of articles and provide a more thorough and comprehensive analysis of the relevant literature. While conducting the content analysis, we used the rules shown in Table 2.4.

Table 2.4 - Coding rules for content analysis

Code	Definition of the code
Title	Title of the article.
Topic	Research objectives and/or questions fully showed in the paper.
Type of Data	This rule involves categorizing articles based on the type of data being monetized (open data, government data).
Monetization method	This rule involves categorizing articles based on the method used to monetize data (selling data, data licensing, data sharing).
Industry	This rule involves categorizing articles based on the industry or industries that are monetizing data.
Motivation	This rule involves categorizing articles based on the motivations for data monetization (increasing revenue,

	improving customer experience, reducing costs, or generate new way of revenue).
Risks and Benefits	This rule involves categorizing articles based on the risks and benefits of data monetization (privacy risks, data security risks, economic benefits, or social benefits).
E-Government Services	This rule involves categorizing articles based on the e-government services being offered (online tax filing, e-voting, online citizen services, or digital identity management).
Adoption	This rule involves categorizing articles based on the adoption of e-government services (high adoption, low adoption, barriers to adoption, or drivers of adoption).
Governance	This rule involves categorizing articles based on the governance of e-government services (centralized, decentralized, federated, or hybrid).
Benefits	This rule involves categorizing articles based on the benefits of e-government services (cost savings, efficiency gains, improved citizen engagement, or enhanced transparency).
Challenges	This rule involves categorizing articles based on the challenges of e-government services (privacy concerns, security risks, digital divide, or lack of user trust).

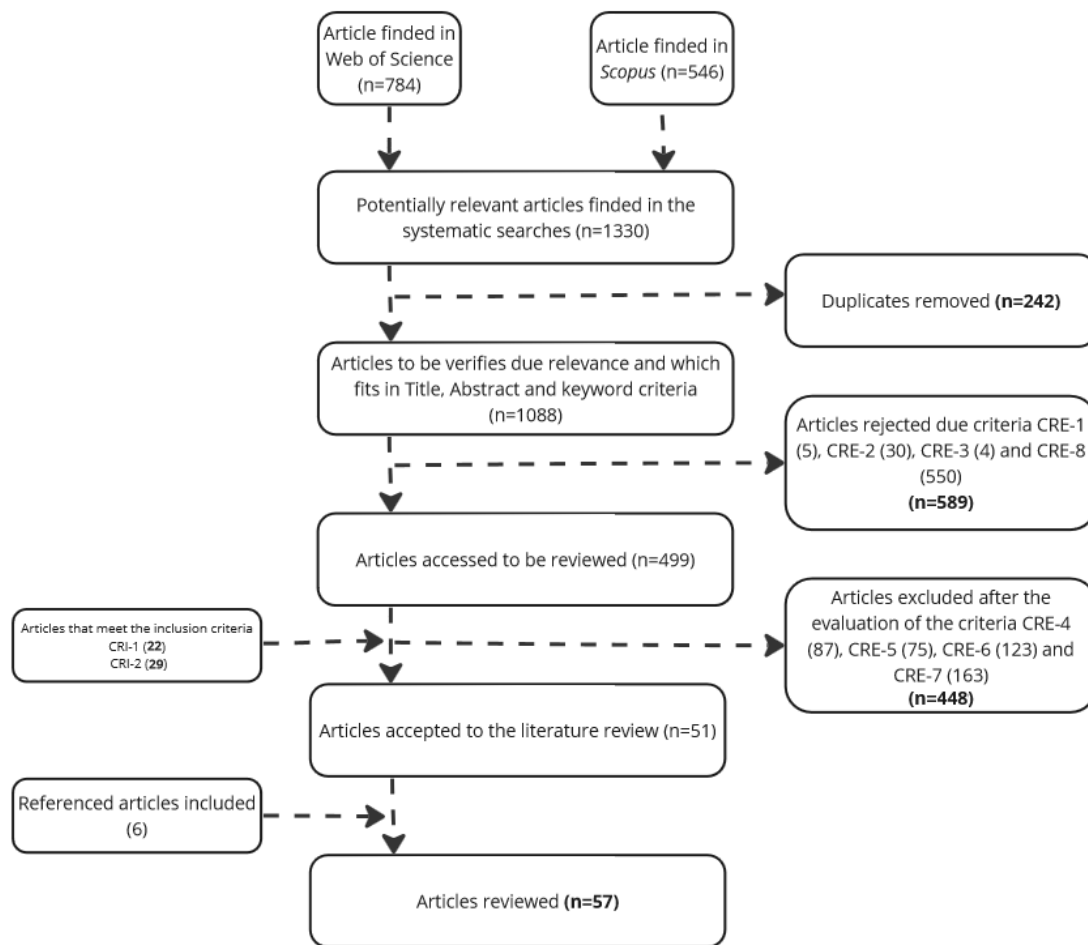


Figure 2.1- Flowchart of the PRISMA protocol used in this systematic review

2.4 RESULTS

The results were divided in: (i) Advantages/Benefits of the e-Gov: where we discuss the capabilities of an electronic government and its implementation advantages; (ii) Challenges in an e-Gov implementation: where we bring the challenges found in the literature, for that implementation to be successful ; (iii) Data monetization Models: we discuss the models already used successfully by the industry; and finally (iv) e-Gov monetization models applicability: where we make the relation between the monetization models and the difficulties to be tackled when implemented in the e-Gov.

A closer analysis of Figure 2.2 highlights the disparities in production across different regions, particularly in relation to their Human Development Index (HDI). Evidently, regions

with higher HDI scores tend to exhibit greater levels of production. This underscores a significant relationship between development indicators and production outcomes.

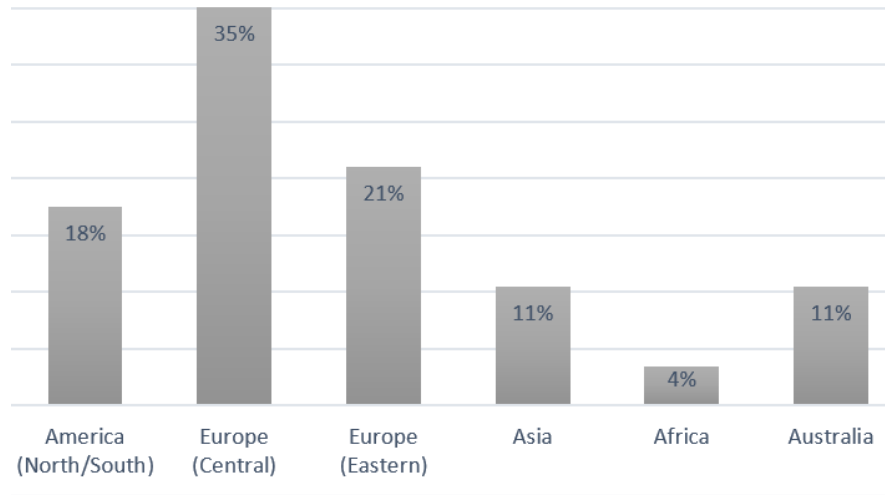


Figure 2.2- Classification of selected articles by Region

In Figure 2.3 we can see that the recent years have witnessed an upward trend in production pertaining to the given theme. This trend not only signifies the ongoing evolution of this subject but also underscores its expanding trajectory. Conversely, there exists a scarcity of research focused on this topic preceding the onset of the SARS-CoV-2 (COVID-19) pandemic.

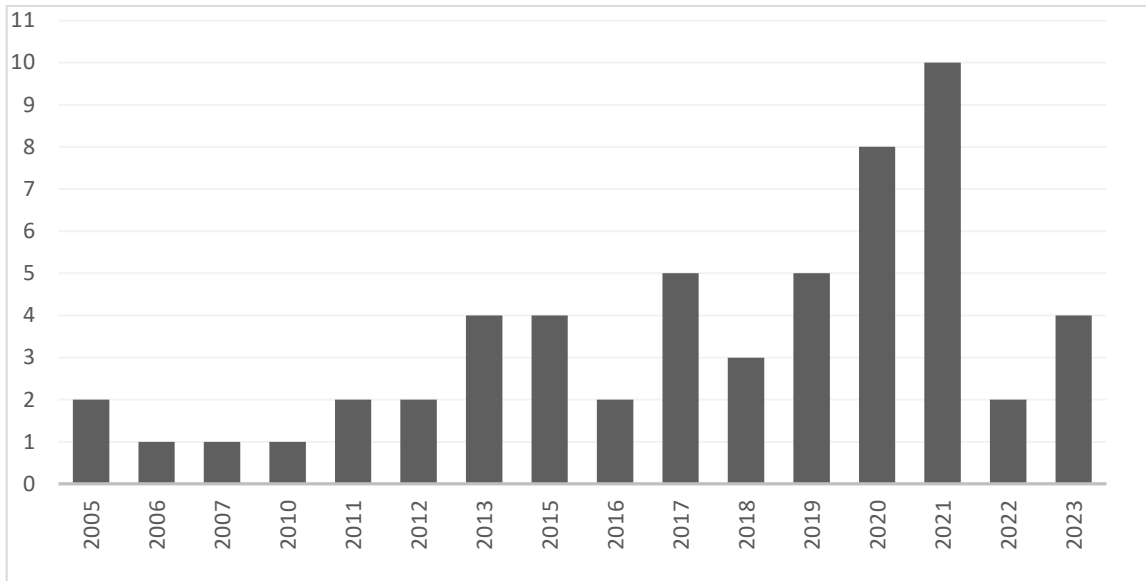


Figure 2.3 - Classification of selected articles by year of production

This observation leads us to deduce that the surge in demand for remote services has acted as a catalyst for the acceleration of digital transformation in public services. The endeavor to implement models for data monetization necessitates a meticulous adaptation of data sources, a domain that lacks robust exploration within the realm of public data. Drawing insights from successful practices within the private sector paradigm, the incorporation of case studies can serve to systematize experiential knowledge, thereby facilitating its wider dissemination.

2.4.1 *Advantages/Benefits of the e-Gov*

With the implementation of digitalized governments, citizens become more informed and can classify the information they have had access to. Yan et al. (2017) agree with this statement and add that projects to create digital governments (e-Gov) are worthwhile because their users are more satisfied with the convenience and speed of digitalized state services.

Table 2.5 summarize a list of the benefits of using e-Gov, based on the dimensions pointed out by Twizeyimana and Andersson (2019), Hartanti et al. (2021) among other reviewed works. In the table, we list the benefits found in the analyzed literature, a brief description of how this benefit can act in the implementation of a digital government, the list of authors that foment this description and the possible source of the data who can leverage the benefit. In this last column, we suggest, in a non-exhaustive way, possible sources of the nature of the data linked to benefit. Overall, the nature of data that can promote the benefit varies depending on

the specific benefit and the goals that benefit. Understanding the nature of data is essential for effective data management, analysis, and interpretation, as it helps to ensure that data is reliable, accurate, and relevant for its intended use.

Many (small) local governments are encouraged by the success of their federal counterparts in the success of the implementation of digital services (Twizeyimana and Andersson, 2019). Sadeh et al. (2020), point out that another advantage occurred during the COVID-19 pandemic, as with services made electronically available, public governance could maintain services of basic need for the population operationally. For instance, Beynon-Davies (2005) conducted a study in the UK reporting the digitization of the Department of Inland Revenue. While Černáková (2015) studied Slovakia and the provision of digital public services and their gains as a society. Finally, Larsson and Grönlund (2016) conducted studies to verify the sustainability of e-governments in Sweden.

However, it is not only in the way the services are offered that there is an advantage in implementing an e-Gov. De Filippi (2013), Polezharova et al.(2020) and Samad et al. (2019), for example, look at the possibility of taxation (or its model revision of these taxation rules) using data from a digital government. Some authors look at the institutional side of education to create data management models (de Langen, 2011; Tsai and Liou, 2012). Greer and Klein (2010) and de Langen (2011) also show a gap to be considered in the business model for open education. Dhanshyam and Srivastava (2021) suggest that digitization and optimizing public administration can facilitate the creation of partnerships between public and private entities. This view is seen in De Saulles (2007) work; however, the author observes that adapting public policies on information is necessary to mitigate possible conflicts when the public meets the private.

Table 2.5 - Advantages/Benefits of e-Gov implementation

Benefit	Description	Authors	Nature of data
Improvement of Public Services	Improvements in public services are linked and interdependent so that each benefit listed directly affects the others listed. The improvements go from reducing costs with maintenance and execution of services (measurable in financial indicators) to improving the responsiveness of the public administration to the needs of citizens (increasing the indicators of trust and acceptance of the population with the local administration).	Anshari and Lim (2017); Freeman et al. (2018); Muñoz and Sánchez (2015) ; Sun et al. (2015); Twizeyimana and Andersson (2019).	Demographic Data, Geographic Data, Performance Metrics, Feedback Data and Financial Data.

Improvement in administrative efficiency	Improving efficiency can include reducing administration costs, increasing quality, standardizing processes (with this systematization, reaching new levels of agility, robustness, economy, and public management). With digitization, it is also possible to improve administrative efficiency related to responsiveness (with increased inclusion and participation of citizens), storage of public data, human reduction of the decision chain (delivering services with equality, honesty, and reducing the possibility of corruption).	Freeman et al. (2018) ; Muñoz and Sánchez (2015) ; Sun et al. (2015); Twizeyimana and Andersson (2019).	Workflow Data, Resource Utilization Data, Compliance Data, Performance Metrics Data and Budget and Financial Data.
Qualities / capabilities of an Open Government	Open public governance is achieved through the transparency of its actions. This governability can be achieved using shared databases, public resources available for citizens' consumption, and digital platforms (where public entities manage to interact with each other and with their citizens). Public auditing of this data is also a direct benefit of open government.	Anshari and Lim (2017) ; Freeman et al. (2018); Muñoz and Sánchez (2015) ; Sun et al. (2015); Twizeyimana and Andersson (2019).	Open Data, Citizen Feedback, Performance Metrics, Budget Data and Social Media Data
Improvement in ethical behavior and professionalism	Ethics must be the backbone of a government, so the ability to audit broadly encourages this behavior. For example, automated services (or without direct contact between the public servant and the client) help reduce the human decision chain (delivering services with equality and honesty and reducing the possibility of corruption).	Freeman et al. (2018) ; Muñoz and Sánchez (2015) ; Sun et al. (2015); Twizeyimana and Andersson (2019).	Ethics Violation Data, Employee Survey Data, Compliance Data, Citizens Feedback Data and Training and Development Data.
Social improvement with the gain of confidence in the government	With this improvement in ethics and transparency, there is a social gain in terms of trust in the decisions that this digitized Government takes. In addition to being traceable, the decision is made based on data and not on personal will.	Freeman et al. (2018); Muñoz and Sánchez (2015); Sun et al. (2015); Twizeyimana and Andersson (2019).	Public Opinion Polls, Citizen Feedback Data, Open Data, Performance Metrics and Public Safety Data.
Increased social welfare	With improvements being made according to practical needs (and measurable indicators), social well-being tends to increase, as the problems that the administration needs to tackle can be prioritized according to transparent indicators. Thus, again, there is a human reduction in the decision-making chain (delivering services with equality and honesty and reducing the possibility of corruption).	Freeman et al. (2018) ; Muñoz and Sánchez (2015) ; Sun et al. (2015); Twizeyimana and Andersson (2019) .	Economic Indicators, Health Data, Education Data, Social Assistance Data and Housing Data.

2.4.2 *Challenges in an e-Gov implementation*

Currently, much of the world is fully aware that the potential of these initiatives will only be achieved with a better understanding of the obstacles and their solutions (Sun et al., 2015). However, many studies (Beynon-Davies, 2005), (Mousa, 2013), (Twizeyimana and Andersson, 2019) indicate that achieving the goals promised by digitization was not a guarantee of success in some projects. Table 2.6 lists the challenges foreseen in the literature in each of the benefits listed in Table 2.5, when they are implemented. In the table, we list the challenges

found in the analyzed literature, a brief description of how this challenge can act in the implementation of a digital government, and the list of authors that foment this.

Sometimes, the objective is wrongly placed within the project (i.e., it is not a genuine part of the scope and is only a promise) (Twizeyimana and Andersson, 2019). It occurs when there is no synergy between the project's conception and disclosure (Welle Donker and Van Loenen, 2016). Sometimes this happens because of a failure of communication during project management, resulting in misunderstandings about project execution requirements (e.g., deadlines, resources, and infrastructure) (Yang and Paul, 2005). Most of the time, these implementation failures occurred because the project scope was too large and ambitious, and the responsible government did not have the necessary knowledge for successful execution (Oni et al., 2020; Seetharaman et al., 2011; Twizeyimana and Andersson, 2019). Twizeyimana and Andersson (2019) further state that failures to implement an e-Gov project increase resistance to future projects linked to e-Gov, due to the loss of trust and credibility in this type of project as ways to modernize public governance. Seetharaman et al. (2011) informs that despite this, in recent years, interest in this topic has increased considerably. We understand that the pandemic has accelerated ongoing digitization processes for emerging governments or developing countries. Thus, it is possible to understand that this academic gap maps the appropriate business models for e-Govs.

Other points to be considered during the implementation of an e-Gov are highlighted by Cordella and Willcocks (2012) when they indicates issues of public policy and public valuation during his study carried out in Great Britain, when outsourcing of Information Technology (IT) services was carried out. Harlow and Chadha (2021) highlight the challenge posed by the digitization of public governance on the use of local mass media. Meanwhile, Kassen (2021) investigates the motivations that drive citizens to use open data provided by the government. Ramli et al. (2020) examine the concept of Society 5.0 in the context of the digital economy. According to the Japanese government's Council for Science, Society 5.0 is “a human-centered society that balances economic progress with the resolution of social issues through an integrated system of cyberspace and physical space”. This understanding suggests that innovative governance reforms will be necessary for societies to adapt to new ways of thinking about social welfare achieved through highly connected IT systems and data utilization (De Coninck et al., 2023; Irani et al., 2023; Rukanova et al., 2023; Trkman et al., 2023). In this regard, the deployment of an e-Gov system is essential, if not a prerequisite, for achieving this

social milestone. Therefore, digitizing government and monetizing data are critical components for achieving Society 5.0 sustainably, especially as industries vertically integrate through digital transformation of their assets and processes.

Table 2.6 - Challenges for the e-Gov implementation

Challenge	Description	Authors
Digital literacy and digital exclusion	Digital literacy refers to the awareness, skills, understanding and reflection of the approach required by an ordinary citizen to comfortably use/operate in an information-rich, IT environment. The difference between having this digital skill, particularly focused on the use of the internet, and not having it creates a new type of information gap, which can be generically known as the digital exclusion. Digital literacy will alleviate this knowledge gap and provide ordinary citizens with participation in the exchange of information through the computer network. e-Govs have the potential to equalize the capacity to access government and its services and increase barriers to this uneducated citizen's participation. Thus, those without access to learning digital skills will not be able to enjoy the opportunities and benefits of a digitized government.	Anshari and Lim (2017); Černáková (2015); Kassen (2021); Larsson and Gronlund (2016); Twizeyimana and Andersson (2019).
Structure cost and sustainability	The costs to the structure and to having some level of sustainability for digital governments are difficult to measure, so a cost-benefit analysis, or the proposition of a business model, is necessary to reach this objective. Governments must determine how investments in sustainability programs can yield cost savings through their implementation or other business models.	Beyon-Davies (2005); Kassen (2021); Mousa (2013); Seetharaman et al. (2011); Sun et al. (2015); Twizeyimana and Andersson (2019); Welle Donker and Van Loenen (2016).
Privacy, Security and Trust	Governments are responsible for the custody of an immense amount of personal information about taxpayers and generate an even greater data load through citizens' transactions during ordinary day to day activities. Therefore, protecting the privacy of this information stored in databases while making effective use of that information is a vitally important requirement. In this way, without security, the objective of achieving high adoption by citizens is hampered. The costs of this security are high but need to be addressed in the planning phase; if not, security breaches and data leaks will be broken public trust in digital government. And a successful e-Gov project requires building trust between agencies, Governments, and citizens.	Cordella and Willcocks (2012); De Saulles (2007); Kassen (2021); Klabi et al. (2013); Seetharaman et al. (2011); Twizeyimana and Andersson (2019); Zhang (2021)
Availability and preservation of data	Historical documentation and civil registration are of particular importance to governments. The digitization of these assets allows, in addition to the easy accessibility of this information, making the need for physical space for their storage more compact and convenient.	Cordella and Willcocks (2012); Kassen (2021); Klabi et al. (2013); Seetharaman et al. (2011); Sun et al. (2015); Twizeyimana and Andersson (2019).
Education, marketing, and challenges for the workforce	The e-Gov is only useful if the population knows the services offered. In this context, education and marketing are vitally necessary to achieve the implementation objectives of a digital government. In addition, a well-trained and properly motivated team of workers is also	Seetharaman et al. (2011); Twizeyimana and Andersson (2019).

	critical for an e-Gov's success.	
Metrics, legislation, and public policy	Governments must regularly assess the progress and effectiveness of their investments in digitizing their activities to determine whether objectives are being met on time. Implementing computer systems within governments can face legal and/or political barriers. Legislatures must ensure that laws are up to date and that they recognize digital data, documents and transactions. The legislative structures of a government must always consider the impact of changes in legislation and public policies.	Beyon-Davies (2005); Kamau and Willems (2019); Klabi et al. (2013); Mousa (2013); Seetharaman et al. (2011); Twizeyimana and Andersson (2019).
Transparency and accessibility	Citizens usually do not understand how a government decision is made. This gap in transparency can lead to increased questioning about government decisions and can decrease more active community participation. This lack of transparency can also hide deviations or favoritism towards contracted suppliers. Furthermore, governments must serve all publics, regardless of their physical capabilities. Thus, digitized services must be planned and designed with the appropriate interfaces for the accessibility of people with disabilities.	Cordella and Willcocks (2012); Kassen (2021); Klabi et al. (2013); Seetharaman et al. (2011); Twizeyimana and Andersson (2019).
Content Management	Managers of optimized content can help managers identify barriers to a more efficient governance model. A well-mapped content management framework is necessary to be fully aware of the data generated and available. Without this mapping, decision makers and public policy makers will not be able to carry out assertive and swift analyses to react to the demands of social and/or economic development.	Kassen (2021); Seetharaman et al. (2011); Sun et al. (2015); Twizeyimana and Andersson (2019).
Interoperability	Implementing incompatible systems and making them more difficult to use increases the workload demanded by public servants and citizens to use the digitized services. Reliable e-Gov demands review of legacy systems.	Beyon-Davies (2005); Cordella and Willcocks (2012); Seetharaman et al. (2011); Sun et al. (2015); Twizeyimana and Andersson (2019).
Infrastructure Development	All countries implementing digital governments face problems developing a basic infrastructure to support these digitized services. Many developing countries do not have the infrastructure to deliver digital services across their territory, even if this is a legal requirement. Within the challenges of implementing and delivering e-Govs, planning and dimensioning infrastructure demands are necessary for decision makers and public policy makers. And they must be taken after planning the services and before their delivery, as that way they will have the real dimension of the technological needs for e-Gov.	Arundel et al. (2019); Beyon-Davies (2005); Cordella and Willcocks (2012); Kassen (2021); Mousa (2013); Seetharaman et al. (2011); Sun et al. (2015); Twizeyimana and Andersson (2019); Welle Donker and Van Loenen (2016); Williams and Hall (2006).

2.4.3 *Data monetization Models*

Although the monetization concept has become a trend in research and the industry as demonstrated in the review by Faroukhi et al. (2020), the monetization problem is tackled by many researchers in different contexts (e.g., retails, healthcare, social media, to mention a few).

When we searched, we did not find governments applying as many monetization models as those in the industry. Occurring more recurrently, open data, and this model is already consolidated in the use of data by governments. We understand that we need to expand the understanding and, starting from the Governments that make use of data (Anshari and Lim, 2017; Beynon-Davies, 2005; Černáková, 2015; Cordella and Willcocks, 2012; Sadeh et al., 2020; Seetharaman et al., 2011; Twizeyimana and Andersson, 2019; Yang and Paul, 2005) and from the industry, where this business model is more mature and consolidated (Eskelinen et al., 2017; Faroukhi et al., 2020; Liu and Chen, 2015; Monino, 2021; NAJJAR and KETTINGER, 2013; Snihur et al., 2021; Zhang, 2021), we arrived at twelve models.

In the data monetization paradigm, the industry took the lead on this journey. And in the surveys that shows the journey of digital transformation of business models, the main models currently used successfully were found. Baecker et al. (2020) proposed a list of models for data monetization based on this business vision, which converges with what was proposed by Najjar and Kettinger (2013) who in their research derive hypotheses from practical cases in the corporate world. This convergence is consistent with the results of the work carried out by the other authors consulted in this systematic review (e.g., (Ramli et al., 2020) in its vision of society 5.0 and data privacy; (Monino, 2021) in its vision of Data as a support tool for decision making; (Larsson and Grönlund, 2016) tackling the necessary problem of sustainability).

Data monetization has become a valuable source of revenue generation for businesses and governments alike (Temiz et al., 2022), and the benefits extend beyond just revenue generation. In the context of public administration, data monetization can lead to economic benefits for governments and citizens (Kassen, 2021).

In their study, Najjar and Kettinger (2013) highlight the importance of considering factors such as Technological Context, Organizational Context, and Environmental Context when adopting data monetization models internally by the government. By taking these factors into account, governments can develop data-driven policies and programs that can improve public services, increase efficiency, and reduce costs (Rukanova et al., 2023).

One of the economic benefits of data monetization in the context of public administration is cost savings. By utilizing data analytics, governments can identify inefficiencies in their processes, leading to cost savings in the long run (Rukanova et al., 2023) (Trkman et al., 2023). For instance, analyzing transportation data can help governments optimize routes, reducing fuel costs and improving transportation efficiency. Data monetization

can also lead to increased revenue generation for governments (Snihur et al., 2021). By selling data to other businesses or providing access to data through APIs, governments can generate revenue streams that can be used to fund public services and infrastructure projects.

Moreover, data monetization can help improve the quality of public services. Governments can use data to identify areas of need and develop targeted solutions that meet the needs of citizens. For example, analyzing healthcare data can help governments develop personalized healthcare plans for citizens, leading to improved health outcomes (Temiz et al., 2022; Trkman et al., 2023). The economic benefits of data monetization are not limited to revenue generation and cost savings. Data monetization can also lead to increased innovation in public services. By using data analytics and machine learning algorithms, governments can develop new services and programs that are tailored to the needs of citizens.

In summary, data monetization can provide various economic benefits to public administration. The models proposed by authors, (Baecker et al., 2020; Larsson and Grönlund, 2016; Monino, 2021; Ramli et al., 2020), provide different visions of how data monetization can be applied in various contexts. By adopting these strategies, governments can improve public services, reduce costs, and generate new revenue streams (Temiz et al., 2022). Ultimately, data monetization can help governments better serve citizens and improve the overall quality of life (European Commission. Directorate General for Communications Networks, Content and Technology. et al., 2020). Thus, in Table 2.7 we use these data to build a consolidation of these monetization strategies, their brief description, their possible economic benefits when used and the authors that support these consolidations.

Table 2.7 - Data Monetization Models and Their Economic Benefits

Model	Description	Economic benefits	Authors	Application Example
Asset Sale	In line with the research findings, the analysis showed that the industry often sells data per se as an asset. However, it was identified that there are differences in how data is provided to third parties. First, the data is sold directly to the customers, ensuring them full control over the asset. In other cases, such as LinkedIn, data is accessed and	The creation of new forms of remuneration and the extension of the client list.	Baecker et al. (2021); Liu and Chen (2015); Najjar and Kettinger (2013); Teece (2018)	Direct sale: GPS/Location data, as used in exercises apps, google maps, and such. Pay-per-search: Access through API (Application Programming Interface), which allows the supplier to measure quantity of records retrieved, or how many times the access was made.

	retrieved only on a “pay-per-search” model, maintaining control of the database. In a third model, data is sold to customers in real time according to predefined criteria for each service contract, mimicking the "data-as-a-service" business model.			Predefined dataset: infogroup/Data Axle gets this data and sells it as a processed and customized dataset
Business Processes Improvement	Another promising way to monetize data is to improve and/or optimize existing (internal) business processes. Industry can use the data collected to increase process efficiency, improve process transparency, generate process management data and monitor process performance. In addition, data can be used to improve security within business processes.	Cost reduction, sales and productivity increase, fraud and inconsistency detection or decision-making assistance.	Baecker et al. (2021); Monino (2021); Najjar and Kettinger (2013).	Logistics enterprises can improve their supply chain based on data, airlines can review the process of checking reducing the queue time
Service/ Product Innovation	A strategy often used in the industry is to create new offers for customers based on the data collected. This strategy benefits new products and services that are sometimes created and supported with this data, and sometimes based on the insights that this data can generate for the need for new services and products.	The creation of new forms of remuneration and new business segments.	Baecker et al. (2021); Larsson and Gronlund (2016); Monino (2021); Najjar and Kettinger (2013).	Healthcare data collected by smart wristbands can generate new services offered by healthcare companies, focused on the target audience. Moreover, streaming companies like Netflix can generate customized rental products/services according to the customer's consumption
Services/ Products Optimization	Using data to optimize and improve the products and services offered is one of the most basic usage strategies in creating value with data. In these cases, the industry can take the data of its products and services, internally or externally. Thus, products and services can be changed constantly based on continuous data capture and these existing services can be improved according to the consumer profile information. This profile can be converged with external data to improve customer interaction and predict consumption needs.	Improve company reputation, increase sales, and improve customer experience	Baecker et al. (2021); Monino (2021); Najjar and Kettinger (2013).	Hotel services can be customized according to customer profile; and the automobile industry proposes improvements in its vehicles according to the feedback of its buyers
Data selling for Analysis/ Prediction	The sale of information/knowledge derived from analysis/prediction is a well-	The creation of new forms of remuneration	Baecker et al. (2021); Liu and Chen (2015);	We can see this in travel/food/fashion reputation apps. Another example of strategy, in the

	regarded strategy in the industry. However, insights from the data need not necessarily be derived from analyzing the data alone, they can also be found in different views on the database.	and business segments.	Najjar and Kettinger (2013).	context of B2C (Business to Customer), is commonly seen in portals comparing services/products/prices.
Contextualization	The strategic use of certain types of data can create additional value for customers or internal processes in some specific contexts. For example, context-related data includes weather, social media, location, and domain-specific data. Unlike individualization, contextualization views data with a focus on the macro aspect. A department store, for example, uses its customer base data to create generic and globalized service standards.	Price optimization and sales increase.	Baecker et al. (2021); Larsson and Gronlund (2016); Najjar and Kettinger (2013).	Walmart/Amazon using data to recommend products that were bought together; and airlines/travel agencies using contextual pricing methods
Individualization	The individualization of certain aspects of an industry's value chain based on data is another source of value generation. This strategy is based on the use of data to create profiles linked directly to customers, making it possible to create value for the customer and the business at an individual level. It is a strategy that is opposed to contextualization, foreseeing the use of data in the micro aspect	Improving the user experience, increasing sales through the personalization of marketing campaigns or the customization of products and services.	Baecker et al. (2021); Larsson and Gronlund (2016); Najjar and Kettinger (2013).	This strategy is regularly used by marketing, through customized recommendations, or targeted and personalized advertisements (e.g., a running shoe for a jogger, makeup for makeup artists, microphones for youtubers).
Building and strengthening the relationship with the consumer	Companies can leverage their customer relationship using the data collected in transactions. For this purpose, the industry regularly collects data focusing on customer behavior and needs. For example,	Optimizing customer acquisition and retention, increasing trust and confidence, improving customer loyalty and satisfaction, and creating forms of recurring economic compensation.	Baecker et al. (2021); Liu and Chen (2015); Najjar and Kettinger (2013); Romero et al. (2021)	Companies can bind customers to services. So, that through this additional data, they can offer performance monitoring services. Or ensure they offer the lowest price for that customer by monitoring competitors. For instance, Gadgets have firmware updates per customer needs. For example, broadcasters can use viewer data to assess the continuity of a show or map what would make the customer keep watching.

Strategic opening of data	Strategically opening data is a promising form of a source of economic benefit that companies are hesitant to promote. The industry can use this strategy to guarantee third parties and/or suppliers' access to specific pieces of its mass of data through APIs (Application Programming Interface).	Increasing the capabilities of business partners, improving business value from co-creations, new partnerships, apportioning operational costs and increasing business visibility.	Baecker et al. (2021); Larsson and Gronlund (2016); Liu and Chen (2015); Medase and Barasa (2019); Najjar and Kettinger (2013); Ramli et al. (2020).	E-commerce can make sales through credit cards using the financial authorization service provided by many banks through electronic interfaces, no longer needing to have their banking service. Third parties can use this data to build new services and products. Suppliers can use this data to create smart delivery ecosystems.
Data Enrichment/Refining	Data enrichment is the aggregation of internal and external sources of information followed by any steps that carry out the transformation and cleaning of this data. Data can be seen as oil, in the raw state they are costly to extract and have great weight, thus requiring proper refining until they are used extensively in the production chain. Refining the data itself can already be seen as a monetization strategy that can generate a source of value for the business. In some companies it ended up becoming the predominant way of generating value.	Increasing value creation (internally), increasing data/information availability (and its extent) and checking the content of these databases.	Baecker et al. (2021); Larsson and Gronlund (2016); Monino (2021); Najjar and Kettinger (2013).	Gnip can be seen as a classic example of this strategy, as its focus as a company is on processing and aggregating data from social networks. Taking a large amount of raw data and refining it to remove relevant information. In many cases, however, this strategy is preliminary and constitutes an early stage of other business strategies concerning data monetization. As such, it is often seen combined with other data analysis strategies.
Data Exchange/Barter	Data exchange occurs when a company exchanges data for assets. Thus, the data is used in a quantified way for its benefits through its exchange for other specific data, predictions, tools, services, and other agreements. Examples of this exchange include data providers and analytics that individually grant discounts based on contribution to the company's database or by directly exchanging data with business partners in the financial area.	Exchanging values in the form of tools, services, or data.	Baecker et al. (2021); Larsson and Gronlund (2016); Najjar and Kettinger (2013).	Some companies like Meta (old Facebook inc.) trade its data with (and within) other companies and consumers using the barter strategy (offering some sort of advantages to the customer if their app is used). Taking a large amount of raw data and refine it to remove relevant information. Furthermore, data exchange often occurs in retail, where point of sale (POS) data is exchanged for demographic information or predictive analytics.
Data control and privacy guarantee	An emerging strategy for data monetization presents itself as a contemporary "anti-pattern" to existing strategies. For	Improving the company's reputation and image with its	Baecker et al. (2021); Liu and Chen (2015);	One of the strongest examples of this new bias are browsers based on anonymity, such as

	<p>example, the industry that collects data from their customer interactions (B2C often) can generate economic benefit by not using this data or by giving the customer full control over this data.</p>	<p>customers, the loyalty of these customers and increasing the company's market share</p>	<p>Lu (2017); Najjar and Kettinger (2013); Parra-Arnau (2017); Ramli et al. (2020).</p>	<p>DuckDuckGo. Where the premise of use is that their browsing and historical data belong only to the user and the sale (or not) is linked to his/her authorization. Thus, by guaranteeing privacy, reliability and control of your data, customer information collected and stored is converted into valuable benefits for the industry, such as increased customer loyalty, increased market share and visibility among customers. These specific cases can predominantly be seen on web tools and services like some search engines, data management tools or identity management platforms.</p>
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2.5 ANALYSIS AND DISCUSSION

After selecting the basket of articles, the content of the texts was analyzed. Initially, we attempted to understand both the data monetization models that can be utilized by public governance (RQ1) and the challenges and benefits associated with these models (RQ2). To accomplish this, we analyzed a total of 57 articles related to these two research questions. Out of these articles, we selected the ones focusing on data monetization models. We also analyzed if those articles addressed the challenges and benefits of implementing these models. This approach allowed us to analyze the data holistically and gain a comprehensive understanding of the relationship between data monetization and public governance.

In the articles of the selected portfolio, six advantages/benefits arising from the implementation of a digital government were found: (i) Improvement of Public Services; (ii) Improvement in Administrative Efficiency; (iii) Qualities/Capabilities of an Open Government; (iv) Improvement in ethical behavior and professionalism; (v) Social improvement with the gain of confidence in the government; and (vi) the Increased social welfare. On the other hand, ten challenges that the digitization of a government can face during its implementation were also found: (i) Digital literacy and digital exclusion; (ii) Structure cost and sustainability; (iii)

Privacy, Security and Trust; (iv) Availability and preservation of data; (v) Education, marketing and challenges for the workforce; (vi) Metrics, legislation and public policy; (vii) Transparency and accessibility; (viii) Content management; (ix) Interoperability; and (x) Infrastructure Development. Concerning data monetization, 12 models of data monetization were mapped that can be used as a reference for the convergence between the two scenarios of data remuneration and public governance: (i) Asset Sale; (ii) Business Processes Improvement; (iii) Service/Product Innovation; (iv) Services/Products Optimization; (v) Data selling for Analysis/Prediction; (vi) Contextualization; (vii) Individualization; (viii) Building and strengthening the relationship with the consumer; (ix) Strategic opening of data; (x) Data Enrichment/Refining; (xi) Data Exchange/Barter; and (xii) Data control and privacy guarantee.

By converging the two research questions analyzed in Tables 4 to 6, we present Table 2.8. This table consolidates the possibilities of data monetization with potential sources of public information. It outlines the benefits and challenges identified in the literature, offers observations on applicability, and provides an example of implementation in the public sector. First, it is necessary to point out that different forms of government (e.g., China, USA, Norway, etc.) will demand their customizations in each monetization model. In China, for example, contextualization models can be facilitated in their implementation, while opening data can be a little more bureaucratic. In the USA, on the other hand, the sale of assets can be much simpler to develop (given its legislation), while the privacy control can suffer a little to be implemented. In Norway, improving business processes can be a catalyst for monetization if we think of this country from the point of view of high human development. This process also represents an improvement in the quality of life of its citizens. Thus, each location has its particularities that must be considered when devising a local e-Government.

Table 2.8 - Analysis of monetization models and their applicability to a digital government (e-Gov)

Monetization Models	Benefit	Challenge	Descriptions	Public Application Example
Asset Sale	(i) Improvement of Public Services; (iii) Qualities/Capabilities of an Open Government; (vi) the Increased social welfare	(ii) Structure cost and sustainability; (vi) Metrics, legislation and public policy; (x) Infrastructure Development	The sale of assets is a strategy that has an important need to be well evaluated in legal matters (who owns the data? Is it necessary any form of approval from the citizen to monetize its data?). For, as much as this strategy has many important benefits, it cannot be interpreted in the same way as its application in the industry. In addition, it needs a	Through the Federal Data Strategy working group, the U.S. government aims to leverage Data as a Strategic Asset. Hence, the U.S. General Services Administration uses the Open Data to

			possible adaptation in terms of sustainability and infrastructure of the Government.	generate value.
Business Processes Improvement	(i) Improvement of Public Services; (ii) Improvement in Administrative Efficiency; (iv) Improvement in ethical behavior and professionalism; (v) Social improvement with the gain of confidence in the government; (vi) the Increased social welfare	(ii) Structure cost and sustainability; (vi) Metrics, legislation and public policy; (viii) Content management;	In the governmental paradigm, the optimization of business processes can be seen as one of the great motivators of implementing an e-Gov. Considering that an optimized governmental process can be seen as less bureaucratic and more responsive to the citizens who must be served, the inherent benefits of this strategy encompass the totality of options previously listed. However, the difficulties that can be seen lie in the need to adapt the infrastructure. The need to change the legal frameworks that govern this bureaucracy. And the process needs to be previously mapped with quality.	In the last years the SouGov platform, developed by the Special Secretariat for Debureaucratization, Management and Digital Government and its Secretariat for Personnel Management and Performance, of the Ministry of Economy in Brazil, aims to generate greater and better connectivity between active, retired and pensioners employees and the Management of the Federal Public Administration.
Service/ Product Innovation	(i) Improvement of Public Services; (ii) Improvement in Administrative Efficiency; (iii) Qualities/ Capabilities of an Open Government; (vi) the Increased social welfare	(ii) Structure cost and sustainability; (viii) Content management;	From the public perspective, service innovation will increase the quality of these services and increase efficiency. This innovation can be achieved when there is an interface between information from different sectors of public government. In this way, the population will gain from improving the service with effective integration between databases. Also resulting in the improvement of social well-being. However, to have this proper integration, it is necessary to observe the cost of this structure and the existence of a proper content management.	The Japanese government, through its digital agency in Tokyo (part of JETRO, Japan External Trade Organization) at the end of 2021 proposed a specification of a systems project for the exam support service to innovate and optimize the available service available in the digital government (e-Gov).
Services/ Products Optimization	(i) Improvement of Public Services; (ii) Improvement in Administrative Efficiency; (v) Social improvement with the gain of confidence in the government; (vi) the Increased social welfare	(ii) Structure cost and sustainability; (viii) Content management;	This strategy greatly impacts the population's quality of life as it encourages the optimization of existing services. Thus, with this optimization, citizens' confidence in their local government would increase, and this gain in trust can be understood as a social gain. However, for this social gain to occur, the structural cost of this optimization must be well measured, and the information/data generated must be managed efficiently.	The U.S. Data Center Optimization Initiative (DCOI) requires agencies to optimize and consolidate data centers to deliver better services to the public while increasing return-on-investment to taxpayers.
Data selling for Analysis/ Prediction	(ii) Improvement in Administrative Efficiency; (iii)	(ii) Structure cost and sustainability; (vi) Metrics,	One of industry's most basic forms of monetization may be the most controversial in public government. It demands strong legislative and	The Federal Revenue Service of Brazil (RFB) and the Federal Data Processing

	Qualities/Capabilities of an Open Government; (iv) Improvement in ethical behavior and professionalism; (v) Social improvement with the gain of confidence in the government;	legislation and public policy; (x) Infrastructure Development	legal assessment for compliance with data protection laws to be an effective possibility. A possible application of this model would be the sale of access to datasets with information regarding consumption in a sectorized/regionalized manner. For example, with data provided by the electronic invoice that are profiled anonymously, for example a group of data from a certain region of the state demonstrating the preferences of types of food purchased by period of the year.	Service (SERPRO) will provide a new platform for the provision of accounting and tax services. In addition, <i>Integra Contador</i> will allow automated access to a set of information that, until now, was only available by individual consultation at the Federal Revenue Service Virtual Center, the e-CAC.
Contextualization	(i) Improvement of Public Services; (ii) Improvement in Administrative Efficiency; (iii) Qualities/Capabilities of an Open Government; (iv) Improvement in ethical behavior and professionalism; (v) Social improvement with the gain of confidence in the government; (vi) the Increased social welfare	(iii) Privacy, Security and Trust; (vi) Metrics, legislation and public policy; (vii) Transparency and accessibility;	A public entity can use this strategy to create locality profiles (a neighborhood, a school, a health unit, for example) outlining the main and likely customers for the public services offered. With this data set it is possible to use other strategies to customize services according to what is expected for use in that location. That would greatly improve the quality of life through well-executed services (generating operating costs reduction and thus promoting a form of value generation). However, as this is direct data linked to citizens, it is necessary to have transparency in developing this strategy. There needs to be legal compliance too.	The Canadian Government uses this strategy to enhance the understanding of concerns and thus to increase participation processes responsiveness. In order to test the proposed approach, a qualitative analysis process was handled based on a random sample of public transportation data in a city in Canada.
Individualization	(i) Improvement of Public Services; (ii) Improvement in Administrative Efficiency; (iii) Qualities/Capabilities of an Open Government; (iv) Improvement in ethical behavior and professionalism; (v) Social improvement with the gain of confidence in the government; (vi) the Increased social welfare	(iii) Privacy, Security and Trust; (vi) Metrics, legislation and public policy; (vii) Transparency and accessibility;	<i>Individualization</i> is a strategy that needs to be strongly adapted in order to prove suitable for use in public governance. It can be seen not as the creation of individual profiles (as in the industry) but as an abstraction of these to address minorities and small niche groups with the specific needs of citizens. If well planned and executed, has potential to leverage the contextualization strategy, focusing where contextualization deals diffusely. The same list of contextualization can be found in the challenges this strategy may face, given that the two are opposite sides of the same coin.	The US Government, through the Department of Education, uses the Data-based Individualization (DBI) to Plan for and Optimize Student Learning for Back to School. Since fall of 2020, over 700 school districts were surveyed about the difficulties challenged to provide instruction and accommodations to students with disabilities during remote instruction.
Building and strengthening the relationship with	(iv) Improvement in ethical behavior and	(i) Digital literacy and digital	Unlike industry, public agencies can use this strategy to generate citizen empowerment concerning public	The South Korean Government uses this strategy to address the

the consumer	<p>professionalism; (v) Social improvement with the gain of confidence in the government; (vi) the Increased social welfare</p>	<p>exclusion; (v) Education, marketing and challenges for the workforce; (vii) Transparency and accessibility; (viii) Content management; (x) Infrastructure Development</p>	<p>administration. So, in the governmental perspective, the consumption relationship (where the purpose is to increase the sales of products and services) should be reviewed as a relationship between citizens and services (where the purpose is to provide more assertive services and not be consumed in big quantities). In this sense, one of the great challenges to be tackled for effectively using this strategy is the problem of electronic illiteracy (especially when dealing with poor or developing countries). For this strengthening, the use of services in a digitalized form must be current and effective. And, for effectiveness, the citizen must be able and qualified to do so. But not only the citizen is framed in the problem of education, it is necessary that the public servants also have the proper training so that they can instruct the use of these services in a correct way.</p>	<p>requests of the Seoul citizens to access public information and services, improve government transparency, and encourage business growth. The Seoul Metropolitan Government opened two user-friendly online portals: Seoul Open Data Plaza and Seoul Information Communication Plaza. Through these sites, citizens have been able to access city statistics, internal approval documents, policy notes, and other public data freely and easily.</p>
Strategic opening of data	<p>(i) Improvement of Public Services; (iii) Qualities/ Capabilities of an Open Government; (iv) Improvement in ethical behavior and professionalism; (v) Social improvement with the gain of confidence in the government;</p>	<p>(ii) Structure cost and sustainability; (iii) Privacy, Security and Trust; (vi) Metrics, legislation and public policy; (vii) Transparency and accessibility; (ix) Interoperability;</p>	<p>Differently from what is mapped to industry, the opening of data in the public view can be understood as implementing the Open Government. This strategy can be one of the most powerful to bring revenue to the Government. It can be through different public entities sharing data (Health and security, for instance), local industry using these data to improve the local economy, and many other options. As it is about sharing Government's data, the need for legislative validation is imperative. It will ensure the transparency of who accessed what (and why they are accessing it) and that standards of interoperability and access are maintained in the long term. So, as not to result in partially executed projects and industries failing to adhere to the use of data for not having legal compliance.</p>	<p>The National Freight Data Hub (NFDH) is an Australian initiative for industry and governments to share and use freight data. The Hub will provide open access to government data. Freight operators, producers and customers will benefit from the increased data sharing generated from the Hub, helping everyone understand better how and where freight is being moved, where the delays are and where the opportunities are to become more globally competitive.</p>
Data Enrichment/ Refining	<p>(i) Improvement of Public Services; (ii) Improvement in Administrative Efficiency; (iii) Qualities/ Capabilities of an Open Government; (iv) Improvement in ethical behavior</p>	<p>(ii) Structure cost and sustainability; (iv) Availability and preservation of data; (v) Education, marketing and challenges for the workforce;</p>	<p>This is one of the strategies that could take advantage of all sorts of benefits of a digital government (either direct or indirect). However, it is one of those that require great attention in treating its challenges. As it is a strategy that proposes extracting information from data, it demands a great availability concerning the storage and processing of this data. This is linked</p>	<p>The Australian Institute of Sports uses data enrichment strategies to data owners (typically the peak bodies in each sport) creates aggregated views of their entire sport. Through this dataset (when shared) is</p>

	and professionalism; (v) Social improvement with the gain of confidence in the government; (vi) the Increased social welfare		to an operational cost that needs to be sustainable. In addition, public servants must have the necessary technical training. So, the refining of this data is carried out with quality. Or in the case of outsourcing this refining, it is included in the budget for the cost of technology. A large part of the other possible strategies may/or may not be developed through the result of this strategy.	possible to create new views of Sport Nutrition statistics, Key Performance Indicators (KPIs) to other fields of knowledge, sport governance returns of investments reports, etc.
Data Exchange/Barter	(ii) Improvement in Administrative Efficiency; (iii) Qualities/Capabilities of an Open Government; (iv) Improvement in ethical behavior and professionalism; (vi) the Increased social welfare	(iii) Privacy, Security and Trust; (iv) Availability and preservation of data; (vi) Metrics, legislation and public policy;	This strategy, if well implemented, can be the great catalyst for major improvements in the quality of public services. Therefore, the information contained in the data of a public entity can be exchanged with another entity (or with the due legislative framework carried out by a Public-Private Partnership). For example, we can propose a hypothetical situation where the security forces exchange data with the road and road regulatory agency (tolls, for instance), creating the so-called electronic fencing, where tolls warn the authorities of vehicles stolen in transit. Or, in the case of a partnership with the industry, these same data from a toll being used by vehicle insurance providers to obtain more competitive prices according to the behavior of the insured vehicle (traffic hours, frequency, among other possible data).	Many Countries uses this strategy through their government business model. Malaysia, for instance, created the MyGDX platform that provides data integration services across agencies to facilitate the provision of End to End (E2E) online services. The implementation of MyGDX allows information to be coordinated and shared more efficiently. MyGDX can reduce the agency's duplication of development and infrastructure maintenance costs. Through MyGDX, the agency's role in exercising its jurisdiction can also be strengthened.
Data control and privacy guarantee	(ii) Improvement in Administrative Efficiency; (iii) Qualities/Capabilities of an Open Government; (iv) Improvement in ethical behavior and professionalism; (v) Social improvement with the gain of confidence in the government;	(i) Digital literacy and digital exclusion; (iii) Privacy, Security and Trust; (iv) Availability and preservation of data; (v) Education, marketing and challenges for the workforce; (vi) Metrics, legislation and public policy; (vii) Transparency and	This strategy is gaining momentum today, as the COVID-19 pandemic has forced the digitization of many public services in unplanned ways. As a result, causing data leaks in many services provided by the Government. Thus, we believe that the new legal standards that have emerged to mitigate these problems (e.g., LGPD in Brazil, or GDPR in Europe) and the States' due compliance with these laws, make this one of the hottest and most important topics. for the citizen user of digital services. In this bias, one of the most emblematic challenges becomes digital illiteracy in the eyes of the population and the educational training of public servants. This overcoming challenge opens ways	In 2007, the Estonian government suffered a severe cyber-attack. That led Estonia to modernize and thus become a leader in government digitization in Europe. To address the population's expectations about their data security, a document was created in 2008 to elaborate the Cybersecurity Strategy. From this document Estonia created a framework dedicated to this standardization.

		accessibility;	for the challenges of citizens' trust in the Government and the transparency of this data.	
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The presented table highlights various monetization models along with their benefits, challenges, and potential implications for the public sector. These models encompass a spectrum of models, ranging from asset sales and business process improvements to data exchange and privacy guarantees. Each model presents distinct advantages, addressing different facets of public service enhancement and societal well-being. Asset sales, for instance, offer the potential to improve public services and the capabilities of an open government, but they necessitate careful legal evaluation and adaptability for sustainability.

On the other hand, models like service innovation and optimization emphasize improvements in administrative efficiency and citizen trust, though they require meticulous infrastructure planning and legal adjustments. Furthermore, Table 2.8 underscores the importance of data in driving these models. From service/product innovation to strategic data opening, effective data management and utilization emerge as crucial factors for successful implementation.

The central role of legislation, policy, and proper metrics cannot be overlooked, as they guide the responsible deployment of these models while ensuring privacy, security, and transparency. Nevertheless, Table 2.8 focal point lies in highlighting how each model aligns with the objectives of a digital government. These models empower governments to enhance public services, efficiency, ethical conduct, and citizen confidence, ultimately leading to societal welfare gains. The presented examples from various countries, such as the US, Brazil, Japan, Australia, and more, demonstrate how these models have been practically applied to achieve their intended goals.

Hence, Table 2.8 stands as a cornerstone of the research, encapsulating the culmination of efforts to dissect monetization models and their potential for reshaping the e-Gov landscape. The analysis reaffirms that the choices governments make regarding these models can significantly impact their ability to deliver effective, transparent, and citizen-centric monetized public data services. As the driving force behind the study, this table serves as the primary result, showcasing the intricacies of each model and their alignment with the goals of a digital government.

2.5.1 *Research Opportunities*

Since our study analyses the benefits, challenges, data monetization models, there are some research opportunities:

- **Legislation related to government digitization** - As society moves towards a digital reality, it is necessary to carry out more in-depth studies regarding how this digitization is sustainable and improves the quality of life of the citizen, either through the optimization of bureaucratic processes, or through the creation of new public services. This new reality needs a legal framework that adheres to the constitutions of each location;
- **Data driven public policies** - With the digitization of governments, it is necessary to think about public policies guided by the creation/use of data, in this way, further research may be necessary to understand how this new means of information management will collide with the diffuse rights of the population;
- **Society 5.0 and data monetization** - With the technological revolutions accelerated by the effects of the COVID-19 pandemic, hyper connectivity will make the concept of smart cities something closer to reality, so that a greater depth is needed regarding the use of data generated by a highly digital society. How can this digitization be done so that society be centered on humans and not on assets?
- **Citizens' Perspectives** - Additional research should consider investigating the adoption of monetization as a state business model from the point of view of taxpayers, especially when thinking about developing or poor countries.

2.6 CONCLUSIONS

This article presents a literature review representing the state of the art of research on digital government (e-Gov) and data monetization models. In this regard, areas not comprehensively covered by the academy were detected about the use of data monetization for public data. Where there is some literature, it is limited to countries with great socio-economic and cultural maturity and cannot simply be extrapolated to other poor or developing countries (Hartanti et al., 2021; Kauffman and Weber, 2020; Temiz et al., 2022). However, a good body of literature deals with monetization models applied to private industry data. About public services digitization, the bibliography has present gaps because while it deals with the topic, there are certainly

researches that discuss digital government, but not labeling it that way. In other words, some references deal with e-Gov tangentially, not directly defining it. This imbalance between definitions allowed a more realistic view of the line of research. Furthermore, it allowed us to identify areas that are still little explored that deserve further investigation, like the scope of a digital government, legal approaches, social impacts of digital literacy for an e-Gov (Winkler and Wulf, 2019).

The definition of parameters for the classification of articles allowed a greater ordering of the review, revealing more easily the panorama of research in the areas. Moreover, with the classification of the basket of selected articles, it was possible to verify the inconsistency points and the main trends where the literature is still incipient. For instance, the standardization of nomenclatures when talking about digital government, the sociological needs where e-Gov is already in operation, possible metrics to assess the digitization of a government, etc.

By reviewing the literature on digital governments, it was possible to understand and map its main requirements for implementation and possible benefits of this new form of public administration that can rise along its use. In the literature on the forms of monetization, it was also possible to identify that this is a line of research being consolidated through the evolution of scientific publications in the area. However, the 57 articles selected in this work demonstrated that this evolution, concerning digital public government, occurred in a fragmented way, without consistent concepts that could define the forms of an e-Gov.

It was found that data monetization in industry accounts for most applications of business models for data. However, it was also observed that, although the concept of monetization in industry is accepted and disseminated in the literature, the use of these models is still limited to specific cases like asset sales, customer profiling, purchase prediction, and correlated purchase suggestion. Similarly, no guidelines were identified that could guide the application of data monetization models to data generated by public administration. Therefore, in addition to discussing the applicability of data monetization forms in public administration, it is important to verify the implementation models of digital government, so that this applicability is possible. However, the essence of our models is to demonstrate that the challenges of implementing an e-Gov are intrinsically linked to the possible monetization models. Thus, the challenges of an e-Gov and the monetization models are both internally dependent. For example, digital illiteracy is directly linked to the use or not of digitized public services and consequently to the existence or not of data to be monetized.

2.6.1 *Research limitations*

As something common to literature reviews, a limitation of this study is its coverage. There will always be additional searches that cover search topics that were not found through the search performed. That said, the bibliography used in this study should represent most of the English-language and peer-reviewed articles that address the topics of digital government (e-Gov) and data monetization forms. Another limitation of the research was the vague definition of the concept of e-Gov, while there are many articles dealing with the subject of e-government, but not defining it as such. On the monetization side, there is a gap in the definitions of data monetization when dealing with public data, so most of the referenced research deals with the implications of this form of remuneration in the industry.

Thus, there is ample opportunity for future research as previously presented, whether validating monetization propositions in different e-Gov projects and/or different contexts of public governance. Such searches will deliver further insight into the search terms and its limitations. In relative terms, it can be said that the number of publications related to the union of researched themes is still incipient. This aspect signals the need to further expand the number of research on the topic, since current scientific production still leaves gaps that can still be tackled and resolved.

2.6.2 *Future Research*

While this systematic literature review has provided a comprehensive understanding of public data monetization models and revealed several important insights, some methodological limitations highlight areas for future research that can expand and deepen our understanding. The following directions are suggested for further investigations:

- **Exploration of Diverse Sources of Information** - Our review focused exclusively on the analysis of articles published in academic journals. However, the exclusion of public documents, whitepapers and greenpapers may have limited our understanding of public data monetization practices in government contexts. Future research may consider including these additional sources of information in order to gain a more complete picture of public data monetization models and their implications;
- **Identifying the Most Relevant Data for Monetization Models** - Table 2.8, which presents different public data monetization models, provided an overview of the methods employed. However, deeper investigation is needed to determine

which data types are best suited for each specific model. Future studies can perform detailed analysis to identify the types of data that best align with each monetization strategy, considering factors such as perceived value, market demand and technical feasibility;

- **Analysis of Key Inputs to Monetization Models** - Additional research may focus on identifying the key inputs that feed public data monetization models. By understanding the critical data that influence the effectiveness and profitability of models, government decision makers can improve their strategies for collecting, processing and delivering information. This can also lead to insights into potential gaps in currently available data;
- **Empirical tests of the model** - Future research should investigate the relationships between IT/Infrastructure demands and data monetization models. Through these relationships it will be possible to propose new indicators to guide the performance of these disruptive business models and with these indicators it becomes feasible to perform empirical tests of the models;
- **Analyzing the Digital Government Ecosystem from an Academic Perspective** - Exploring the digital government ecosystem through an academic lens can provide a deeper understanding of the motivations, interactions, and dynamics underlying the digitized services offered by governments. Investigating how academic perspectives shape approaches to the design, implementation, and evolution of government digital services can offer valuable insights to improve the effectiveness of these services.

The methodological limitations of this systematic literature review highlight several opportunities for future research that can enrich our understanding of public data monetization models, identify relevant data for specific models, and analyze the digital government ecosystem in a more holistic and academic way. Such research has the potential to significantly contribute to the emerging field of data governance and digital public policy.

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2.7 APPENDIX A – SYSTEMATIC LITERATURE REVIEW ARTICLES

Authors	Year	Title	Description
Aaltonen et al.	2021	The Making of Data Commodities: Data Analytics as an Embedded Process	This paper studies the process by which data are generated, managed, and assembled into tradable objects called <i>data commodities</i> .
Anshari and Lim	2017	E-Government with Big Data Enabled through Smartphone for Public Services: Possibilities and Challenges	This article proposes a model with potential solutions of the big data in the e-government's dimensions.
Arundel et al.	2019	Advancing innovation in the public sector: Aligning innovation measurement with policy goals	The research focuses on public management theory and empirical research on public sector innovation to propose a framework for the collection of micro-level data of value to research and public policy to support public sector innovation.
Baecker et al.	2020	Business Strategies for Data Monetization: Deriving Insights from Practice	This paper provides a set of 12 generic strategies for monetizing data, ranging from sole asset sale to strategically opening data and guaranteeing control.
Beyon-Davies	2005	Constructing electronic government: the case of the UK inland revenue	In this paper is presented a case study of the developing role of e-Government strategy experienced by a major UK central government department, the Inland Revenue.
Černáková	2015	ICT and Innovation in the Provision of Public Services: The Case of Slovakia	This paper discusses factors which determine the adoption of information and communication technology (ICT) in public services.
Clemons	2009	Business Models for Monetizing Internet Applications and Web Sites: Experience, Theory, and Predictions	This paper explores several data monetizing areas and divides them into two basic categories, those that sell some product, experience, content, or service and earn revenues from the sale, and those that provide access to consumers and charge for access
Clemons et al.	2017	Understanding the Information-Based Transformation of Strategy and Society	The analysis in this article examines four economic entities that produce and consume value, as well as three determinants for the modes of their operations. The economic entities include consumers, producers, markets, and society, whose interactions are determined by viability, networks, and agency.
Cordella and Willcocks	2012	Government policy, public value and IT outsourcing: The strategic case of ASPIRE	The paper suggests how more disciplined uses of outsourcing, learning from private and public sector experiences alike, can assist the performance of government agencies.
De Conink et al.	2023	Antecedents of the intention to adopt crowdsourcing for innovation in government: Findings from Belgium and the Netherlands	The article analyses the use of crowdsourcing in public innovation in Governments.
De Filippi	2013	Taxing the cloud: introducing a new taxation system on data collection?	Proposes taxation of cloud and digital businesses to mitigate tax evasion.
de Langen	2011	There is no business model for open educational resources: a business model approach	Business models for monetizing open education resources.
De Saulles	2007	When public meets private: conflicts in information policy	It addresses the commercial use of public sector information and the conflict of these public policies.
Dhanshyam and Srivastava	2021	Governance structures for public infrastructure projects: Public-private management regimes, contractual forms and innovation	The research tries to answer whether the public infrastructure should be managed by the public, private or public-private partnership.
Eskelinen et al.	2017	Designing a Business Model for Environmental Monitoring Services Using Fast MCDS Innovation Support Tools	This is an empirical approach to help find new ideas and produce business models in an open data context by relying on open source application ideologies.

Faroukhi et al.	2020	An Adaptable Big Data Value Chain Framework for End-to-End Big Data Monetization	This paper proposed a global and generic BDVC (Big Data Value Chain) framework that supports most of the needed phases, namely: Data generation, data acquisition, data preprocessing, data storage, data analysis, data visualization, and data exposition.
Freeman et al.	2018	The Effects of Revenue and Social Capital on Collective Governance: Implications for Political Complexity	The goal of this article has been to contribute to understand the factors that explain the formation of collective governments and the consequences for understanding variation in political complexity.
Greer and Klein	2010	A new model for financing public colleges and universities	Proposal of business models based on Public-Private Partnerships (PPP) for student financing.
Grover et al.	2018	Creating Strategic Business Value from Big Data Analytics: A Research Framework	In this study, they examine the impact on organizational value regarding the use of big data and analytics.
Harlow and Chadha	2021	Looking for community in community news: An examination of public-spirited content in online local news sites	Traditional monetization models in communication vehicles.
Hartanti et al.	2021	Citizens' Trust Measurement in Smart Government Services	This study proposes a framework to measure trust in smart government services and its impact on service adoption and satisfaction.
Irani et al.	2023	The impact of legacy systems on digital transformation in European public administration: Lesson learned from a multi case analysis	This research conducted an analysis on four cases of digital transformation in three European public administration settings
Kamau and Willems	2019	Of Binding Provisions and Trust Marks; Roadmap to a Global Legal Framework for the Digital Economy	This article proposes a new and global legal framework for the digital economy: structured cooperation between states and companies under the administration of an autonomous body.
Kassen	2021	Understanding motivations of citizens to reuse open data: open government data as a philanthropic movement	The purpose of the article is to understand the socioeconomic conditions and driving forces that facilitate and motivate civic developers to reuse open data and create their own data-driven service (free Apps, in this study).
Kauffman and Weber	2020	Special Section: The Economics of Sharing and Information Security	This Special Section, on the Economics of Sharing and Information Security, features three papers about the economic incentives to "engage" as a consequence of strategic actions taken by these third parties in the context of privacy and information security.
Klabi et al.	2013	A Reputation Based Electronic Government Procurement Model	The use of electronic power of attorney as a monetization model through cost reduction (The objective is to minimize the total cost that the government could pay in practice in case of problems occurring during the externalization of transport operations that may induce hidden costs).
Larsson and Grönlund	2016	Sustainable eGovernance? Practices, problems and beliefs about the future in Swedish eGov practice	A case study is performed in the context of Swedish e-Governance practice, at national and municipal level. Interviews are used to investigate practitioners' views, which are analyzed by using a framework developed based on e-Governance literature that highlights sustainability.
Liu and Chen	2015	A Review Of Data Monetization: Strategic Use Of Big Data	This study reviewed the data monetization related papers from industry thought leaders and summarized several guiding principles based on the similarities and dissimilarities of their methodologies.
Lu	2017	The unique Chinese legal approach to online ad blocking: Is it in the right direction?	This research tries to understand the impact of ad blockers on the economy.
Medase and Barasa	2019	Absorptive capacity, marketing capabilities, and innovation commercialisation in Nigeria	The authors find that absorptive capacity measures comprising openness and formal training are positively associated with innovation performance.
Monino	2021	Data Value, Big Data Analytics, and Decision-Making	This paper illustrates the buzz words related to data, especially big data and open data, in order to illuminate the discussions of data valorization.
Mousa	2013	E-government challenges at the UK's customs and tax department	Research findings provide practical implications that could aid government decision makers to plan for the future of electronic government by identifying the key potential challenges associated with the adoption of e-government initiatives.
Muñoz and Sánchez	2015	E-Government and Reforms in Public Administrations in Crisis Periods: A Scientometrics Approach	A literature review that aims to understand the importance of an e-Gov in public administration reform to mitigate problems arising from the economic crisis.

Najjar and Kettinger	2013	Data Monetization: Lessons from a Retailer's Journey	This research proposes maturity models and theoretical models for the monetization journey in the industry.
Oni et al.	2020	E-Revenue Adoption in State Internal Revenue Service: Interrogating the Institutional Factors	This paper empirically investigates the factors influencing adoption of e-revenue system in SIRS in Nigeria.
Parra-Arnau	2017	Pay-per-tracking: A collaborative masking model for web browsing	This paper proposes a new tracking paradigm that aims at returning control to users over tracking and advertising, and allowing them to participate in the monetization of heir browsing data.
Polezharova et al.	2020	E-Commerce Taxation in Russia: Problems and Approaches	The purpose of this article is to describe a mechanism for taxing e-commerce profits of multinational corporations (MNCs).
Ramli et al.	2020	Over-The-Top Media in Digital Economy And Society 5.0	This article proposes ways of regulating copyright laws to protect the economic rights of creators and thus enable the monetization of this content.
Romero Leguina et al.	2021	Optimizing the Frequency Capping: A Robust and Reliable Methodology to Define the Number of Ads to Maximize ROAS	This paper tries to investigate how to improve the performance of marketing campaigns using data and machine learning.
Rukanova et al.	2023	Public value creation through voluntary business to government information sharing enabled by digital infrastructure innovations: a framework for analysis	In this paper they argue that there is a need to understand public value creation as an interactive process, involving both government and business actors.
Sadeh et al.	2020	Governmental Intervention and Its Impact on Growth, Economic Development, and Technology in OECD Countries	This paper brings OECD data on the impacts on economic growth and development through government intervention.
Samad et al.	2019	Tax perceived as barrier to innovation	This study aims to examine the tax effects on innovation among Malaysian firms. The results indicate tax plays a significant role in innovation engagements for these firms.
Seetharaman et al.	2011	Effective governance in e-government	Many factors have to be taken into consideration in designing, planning and implementing e-government initiatives. The three factors that the article addresses are business models, critical success factors and collaboration.
Snihur et al.	2021	Managing the Value Appropriation Dilemma in Business Model Innovation	This paper demonstrates how the creation of complementary laws should be considered so that the modernization of business models does not lead to the precariousness of workers.
Su and Jin	2021	The Impact of Online Platforms' Revenue Model on Consumers' Ethical Inferences	This paper demonstrates that consumers perceive online platforms that employ the advertising-based revenue model to be less ethical than platforms that employ the service-fee-based revenue model.
Sun et al.	2015	An implementation framework for E-Government 2.0	This paper provides an architecture for e-Government 2.0 composed of Web 2.0 technologies and a management agenda.
Teece	2018	Profiting from innovation in the digital economy: Enabling technologies, standards, and licensing models in the wireless world	This paper addresses the issue of licensing and Licensing is shown to be a difficult business model to implement from a value-capture perspective.
Temiz et al.	2022	Open data: Lost opportunity or unrealized potential?	In this paper they investigate the reasons for investing in open data. They explore the motives and beliefs about open data investment expressed by open data experts in both public and private organizations.
Trkman et al.	2023	The roles of privacy concerns and trust in voluntary use of governmental proximity tracing applications	The study empirically evaluates the impact of privacy concerns together with two of its antecedents – trust in government and trust in technology – on the intention to use a PTA (proximity tracing applications).
Tsai and Liou	2012	An approach for enhancing industry-university collaboration by funding of university-owned enterprises for technological universities in Taiwan	This paper proposes that revenue from technology transfer ventures is one way to increase a university's budget.
Twizeyimana and Anderesson	2019	The public value of E-Government – A literature review	This study organized existing research on the public value of e-government to investigate the current state of this research and to identify the public value of e-government.
Welle Donker and Van Loenen	2016	Sustainable Business Models for Public Sector Open Data Providers	The researched cases have demonstrated that it is vital for a sustainable open data business model to have a guaranteed main source of revenue.
Williams and Hall	2006	Implementing Information Technology Programs: Comparing Three IT Implementation Models	The three IT implementation theories analyzed in this article attempt to synthesize business and public sector models to create frameworks to guide IT implementation
Winkler and Wulf	2019	Effectiveness of IT Service Management Capability: Value Co-Creation and Value Facilitation Mechanisms	They investigate the value co-creation through IT systems and IT service relationships.

Yan et al.	2017	Local Governments' Strategy for the Development of Social Organizations	This study tries to show the relations between government and social organizations, and how it impacts local society.
Yang and Paul	2005	E-government application at local level: issues and challenges: an empirical study	From the preliminary results of this research, it is safe to say that there is a huge potential for software developers in the field of e-government applications.
Zhang	2021	Infrastructuralization of Tik Tok: transformation, power relationships, and platformization of video entertainment in China	This study tries to understand the growth process of the TikTok app platform and how it strengthens its relationship with its users.

3 PAPER 2 - Digital transformation in public governance: monetization of public data to create new revenue sources

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Abstract

This study investigates the role of government's resources and capabilities available to fostering economic development through data monetization. To this aim, we use a testbed project in southern Brazil as a case study. The project aimed to catalog and make available a variety of datasets from different government bodies, with an emphasis on crucial sectors such as transport, finance, and agriculture. While the lack of a centralized data repository presents challenges, the strategy of carefully preparing and developing business models to provide digital services using government data represents a strategic response to local market demands and create new sources of revenue. Using a case study and longitudinal research approach, the analysis was carried out considering the Resource-Based View (RBV) theory, evaluating the impact of government economic development initiatives over time. The research results in important findings regarding the insights and lessons learned during the follow-up of the case study and a government's data monetization journey. It is concluded that access and use of government data can improve the quality of decisions and stimulate new commercial ventures and investments. Additionally, a monetization model was proposed to optimize the use of this data. Our findings suggest that adherence to legal frameworks, particularly data anonymization, may hold greater sway in driving the success of government data monetization initiatives. Our results highlight the importance of governments investing in technology and transparency to maximize the economic potential of their data.

Keywords: Data monetization, Government, Resources, Platforms.

3.1 INTRODUCTION

The growing digitalization of society has triggered a new era of opportunities and challenges for governments around the world. Amid this transformation, data monetization has emerged as a viable strategy for governments to tap the economic potential of their increasingly growing public data sets (De Chiara, 2018; OECD, 2019). With technological advancement and

large-scale data collections (also called Big Data), public administrations have at their disposal vast sets of data that were previously underused. Strategic use of government data can not only drive economic development, but also improve the efficiency of public services and promote transparency and accountability (Anshari & Lim, 2017).

However, for this to be achieved effectively, it is essential to understand the resources and capabilities required to develop a digital monetization platform based on government data (Bharadwaj, 2000; Suoniemi et al., 2020). Successful implementation of a government data monetization platform requires careful analysis of the specific conditions of each national context. Aspects such as technological infrastructure, data policies, regulatory frameworks and institutional capacity play a crucial role in determining the success of this venture (Hein et al., 2023). Additionally, it is important to consider the ethical and security challenges associated with monetizing government data. Issues related to privacy, protection of personal data and potential misuse of information must be carefully addressed to ensure citizen trust and system integrity (Baecker et al., 2020).

In this context, it is necessary to understand the resources and capabilities necessary for the development of a digital monetization platform based on public government data. In line with government guidelines (OECD, 2019; OECD & CAF Development Bank of Latin America, 2023), there is growing interest in building an environment that enables effective data monetization. As highlighted by the OECD (2019), this approach represents a unique opportunity for governments to diversify their revenue sources and drive economic innovation. However, the success of this endeavor depends not only on political will, but also on adequate technological infrastructure (Eriksson & Goldkuhl, 2013).

Additionally, growing demands for transparency and accountability have put governments under pressure to adopt models that not only generate additional revenue, but also promote accountability for the efficient management of public resources (Agozie & Kaya, 2021; Dhanshyam & Srivastava, 2021). In periods of economic crisis, such as those experienced recently, financial pressures on governments intensify, highlighting the importance of seeking financing alternatives to maintain essential public services (OECD & CAF Development Bank of Latin America, 2023). Given this scenario, data monetization emerges as a strategic response to diversify government revenue sources and ensure long-term financial sustainability. Furthermore, continued technological advancement and changes in consumer behavior have

transformed expectations regarding government services. Data monetization appears as an opportunity for governments to offer more personalized and efficient solutions, aligned with citizens' demands (Aladalah et al., 2018; Hartanti et al., 2021). This approach not only generates additional revenue, but also stimulates innovation and economic development, catalyzing the creation of new products, services and business opportunities (Arundel et al., 2019; Asplund et al., 2021).

However, it is important to recognize that data monetization presents significant regulatory and ethical challenges. Issues related to privacy, security and ethics in the use of government data need to be addressed proactively to mitigate possible risks and ensure the responsible and ethical use of data (Trkman et al., 2023). Consequently, through the examination of these factors, the primary objectives of this study are twofold: firstly, to delineate the essential resources and capabilities necessary for the establishment of a government data monetization platform; and secondly, to enhance comprehension regarding the broader ramifications and hurdles inherent in this endeavor within the contemporary digital landscape. Therefore, the research question that guides this study is: What are the resources and capabilities necessary for the development of a digital monetization platform based on public government data?

This question highlights the importance of identifying the essential elements that underpin the creation and effective operation of such a platform. In addition to guiding the implementation of government-wide data monetization initiatives, the answer to this question will also contribute to a broader understanding of the digital infrastructures needed for the data economy. It is critical to recognize that data monetization represents a multifaceted approach, with several possible models for its implementation. There are different ways to create the technological environment necessary to enable data monetization, each with its own advantages and challenges (Neis et al., 2023). Therefore, this study aims to investigate the specific characteristics of the data monetization platform developed in a case study of a government in the southern region of Brazil. The selected case study involves the monetization process of this government's public data, which was conducted by the Government and Academia, although it included consultations with relevant external actors. In structuring this approach, we use the Resource-Based View (RBV) to direct our internal analysis of the resources essential to the development and operation of the data monetization platform. Our goal is to extract lessons and insights that can be generalized and applied in other government contexts. In this way, this

study aims to provide valuable insights into the fundamental requirements for successfully building a public data monetization platform, based on a specific case study and broader considerations about the needs and challenges faced by governments in the digital era.

3.2 THEORETICAL BACKGROUND

3.2.1 *Big Data in public organizations*

The digital age has fundamentally revolutionized the way we collect, process, and use information. Effective data management has become crucial for decision-making in different sectors, driving the emergence of fundamental concepts such as “data”, “big data” and “data-driven” (Curuksu, 2018). The term "data" refers to raw information or unprocessed facts. In modern times, massive data collection has become ubiquitous, fueled by digital interconnection and connected devices (Patil & Mason, 2015). The ability to extract this data is essential to understand patterns, identify trends, and inform informed decisions.

The term "big data" refers to extremely vast and complex data sets that exceed the capabilities of traditional data processing tools (Kitchin & McArdle, 2016). Characterized by the three V's - volume, variety, and velocity - big data demands innovative approaches to storage, processing, and analysis. This massive amount of data not only offers significant opportunities, but also presents unique challenges (Kitchin & McArdle, 2016). By adopting advanced analytics technologies, organizations can use big data to develop insights, innovative products, and services. The opportunities arising from big data analysis for organizations are considered crucial: big data has been described as "the goldmine of disruptive change in a networked business environment" (Kitchin & McArdle, 2016). With the adoption of big data technologies, organizations expect to obtain benefits in several areas, such as e-commerce, e-government, science, health and safety (Fosso Wamba et al., 2015).

Governments, for example, can use big data to increase transparency, promote citizen engagement in public affairs, prevent fraud and crime, enhance national security, and support people's well-being through better education and healthcare (Patil & Mason, 2015; Suoniemi et al., 2020). Economic value can be measured by increased profit, business growth, and competitive advantage resulting from the adoption of big data (Patil & Mason, 2015). Economic

value frequently encompasses monetary benefits appropriated by organizations. In general, big data is perceived as a source of innovative products, services and business opportunities (Ritala et al., 2024).

The "data-driven" paradigm highlights the importance of guiding decisions based on tangible data, rather than relying solely on intuition or experience (Ritala et al., 2024). Data-driven companies and organizations seek to integrate advanced analytics to inform models and operations, enabling sustainable competitive advantage. The use of data requires an understanding of some needs to achieve competitive advantage. One of the first steps when working with data is its acquisition and processing. It is important to note that here the term acquisition covers the issue of data produced by the organization, and not just acquired from external sources (Patil & Mason, 2015). This is important when we think about public sector bias, because state organizations have certain data monopolies and, due to the nature of their business model, this exclusivity obligation, added to the amount of population that generates this data, can produce a substantial amount of raw information. Therefore, it is necessary to observe the need for a data-driven organizational culture and the importance of data governance to guarantee its quality and responsible use (De Chiara, 2018).

3.2.2 *Resource-based View (RBV) in the Government perspective*

The Resource Based View (RBV) approach has been widely adopted as a theoretical framework for understanding the competitive advantage of organizations.

This perspective highlights the importance of an organization's internal resources and capabilities in the pursuit of a sustainable competitive advantage (Barney, 1991). Strategic resources, according to the RBV, are tangible and intangible assets controlled by an organization, which are valuable, rare, difficult to imitate and non-substitutable (Barney, 1991). These resources may include human capital, physical assets, brand reputation, proprietary technology, among others. The key is that these capabilities must provide the organization with a sustainable competitive advantage, allowing it to outperform its competitors in the market.

From a government perspective, it is important to reframe the term "competitive advantage" so that it is understood as "superior performance". Because, as in the governmental scenario there is a monopoly on certain resources and capabilities (such as some types of

information private to its citizens, for example) and there is no external competition to be overcome, it is necessary that the “competitive advantage” targets internal challenges that generate an improved management capacity. Therefore, wherever we refer to the issue of competitive advantage, we must understand it as a competition between public administration and itself.

Capabilities (Barney, 1991) and also dynamic capabilities (Teece et al., 1997), refer to an organization's capacity to integrate, build and reconfigure its resources to face challenges from the external environment. While resources are the building blocks, capabilities are the processes and routines that allow the organization to take full advantage of those resources. For example, innovation capability can be a critical capability that allows an organization to transform its resources into innovative products or services. In the RBV view, resources and capabilities are closely interconnected. Resources provide the basis on which capabilities are built, while capabilities enhance the effective use of those resources (Barney, 1991). For example, a strategic resource such as a patented technology only becomes truly valuable when an organization can successfully commercialize it.

The identification of resources and capabilities within an organization can be carried out through detailed internal analyses, such as resource audits, competency assessments, and organizational process analyzes (Peteraf, 1993). These analyzes involve the evaluation of tangible and intangible resources, as well as the analysis of organizational capabilities essential for the execution of the strategy. In government organizations, key resource and capability groups may differ slightly compared to private sector organizations. Resources such as qualified human capital, information technology infrastructure, and institutional knowledge can be critical to effective government performance (Gawer, 2021). Government capabilities may include the ability to formulate policies, implement programs, and manage public resources.

In the government context, consideration of technological aspects is crucial to guarantee efficiency, transparency, and quality in public services. This includes the adoption and updating of information technology (IT) infrastructure to facilitate internal and external communication, the secure storage of data, and the implementation of information systems that enable data-driven decision making (Irani et al., 2023). Furthermore, the government must pay attention to emerging technological trends, such as artificial intelligence, blockchain and the

Internet of Things, and evaluate how these technologies can be applied to improve public services and operational efficiency.

The human aspects are equally important for the success of government organizations (Bryson et al., 2007). The government needs to ensure that it has qualified human capital in all areas, from administrative employees to technical experts and political leaders. This includes investing in skills development programs, talent recruitment and retention, as well as promoting an organizational culture that values innovation, collaboration, and the provision of quality services to citizens. Furthermore, the government must be attentive to the needs of diversity and inclusion, ensuring representation and equal opportunities in its workforce (Bharadwaj, 2000).

Financial aspects are crucial to ensuring the viability and sustainability of government operations (Bryson et al., 2007). The government needs to establish and maintain effective financial management practices, including responsible budgeting, cost control and transparent accountability. This involves ensuring that financial resources are allocated efficiently to priority areas such as health, education, public safety, and infrastructure. Additionally, the government can consider public-private partnerships and other innovative forms of financing to help maximize the impact of available resources and achieve its public policy objectives. However, from the most basic aspects of a public or private entity (technological, human, and financial), other dimensions can be considered by the government from the perspective of the RBV. It also highlights the importance of institutional knowledge as a strategic resource. This includes understanding and leveraging the established rules, norms, and practices that shape the environment in which government operates. For example, understanding relevant laws, regulations and government policies can enable the government to identify opportunities for innovation and improvements in the delivery of public services.

Relations with other government entities, civil society organizations, companies and citizens can be considered strategic resources (Barra & Zotti, 2018). Building solid partnerships and collaboration networks can expand the resources and capabilities available to the government, facilitating the achievement of its strategic objectives. RBV recognizes that the external environment can significantly impact an organization's ability to create and maintain competitive advantage (Barra & Zotti, 2018). In a government context, this includes factors such as demographic shifts, economic trends, natural disasters, and climate change. The

government needs to pay attention to these environmental aspects and adapt its models and policies accordingly.

By considering these diverse aspects from an RBV perspective, the government can develop a more comprehensive and holistic understanding of its strategic resources and capabilities. This can help the government identify areas of strength and weakness, as well as opportunities to improve its performance and meet the needs and expectations of a project to use its internal data more effectively.

3.2.3 *Data monetization*

Data monetization is an increasingly relevant phenomenon in contemporary digital public administration (OECD, 2019). It is the practice of collecting, processing and commercializing data as part of a profitable business model (Aaltonen et al., 2021; Najjar & Kettinger, 2013). This reflects a significant shift in the modern economy and governance, where the exchange of personal data has become a fundamental basis (Johnson, 2020). In the government context, data monetization operates within legal frameworks that establish the limits and regulations for this practice. It is crucial to note that, although permitted, this activity must be conducted ethically and in compliance with current laws (Najjar & Kettinger, 2013). In this sense, the literature highlights the importance of a careful approach, emphasizing the need for clear legal limits and ethics in data monetization (Anshari & Lim, 2017).

It should be noted that data monetization models vary according to the government context in which they are applied (Neis et al., 2023). Because business models relating to data are deeply dependent on the legal frameworks of each government in which they operate. This highlights the importance of adaptability and customization of these models to meet the specific needs of each government entity (Agozie & Kaya, 2021). Furthermore, it is essential to recognize that well-managed data monetization can bring significant benefits to government entities, as long as it is accompanied by a clear awareness of the legal and ethical implications involved (Baecker et al., 2020). In this context, it is crucial that public managers understand not only the potential benefits, but also the challenges and responsibilities associated with the practice of data monetization within the government context (Neis et al., 2023). Adopting transparent, ethical and legally compliant approaches is essential to ensure that data

monetization contributes positively to institutional objectives and the well-being of society as a whole (Agozie & Kaya, 2021).

Monetizing data will be neither simple nor easy if the government has not successfully established the use of data internally. Najjar and Kettinger (2013) suggest that companies must first have established sufficient capabilities and resources to handle data internally within their business before sharing or monetizing data with partners. This is especially true also in the government paradigm, when we look at the scenario through the legal needs imposed on public data. Just like companies, governments can achieve results more easily and quickly by investing in internal processes and services. The common objective of data monetization is to provide a solution for multiple customers to ensure economic viability. Data-driven solutions must be built on an appropriate data infrastructure as well as an organizational culture that supports monetization. Governments must invest in their data infrastructure, which translates into quality data that is easily and securely accessed, while attracting and training enough employees to use and refine this data. Before starting the journey of digital transformation that data monetization requires, governments must understand their digital maturity and objectives for using this data (Najjar & Kettinger, 2013), as well as the current state of their capabilities, data and possibilities of monetization (Aaltonen et al., 2021).

Incorporating the principles of the RBV into the research objective underscores the importance of identifying and leveraging the specific resources and capabilities that enable effective data monetization within the governmental context. By focusing on how government entities can strategically utilize their data as a valuable resource, the study aims to elucidate not only the technical aspects of developing a digital monetization platform but also the organizational and strategic considerations essential for its success. Through this lens, the research seeks to provide actionable insights that empower public managers to navigate the complexities of data monetization while aligning with legal and ethical frameworks and ultimately contributing to the broader objectives of governmental institutions and societal welfare.

Therefore, we propose a more objective definition of the term where we understand that data monetization is: the practice of using owned data to value capture directly or indirectly. Where at least two agents will be involved, one possessing the data and the other using the data.

And the value of the data is defined by whether the service offering derived from the data is unique or is part of an existing offer.

3.3 METHODOLOGY

In this section, we describe the specific steps of the methodology used for this study, focusing on how the government testbed project was approached and implemented. This section offers a more in-depth look at the process that was used to achieve the proposed objectives. We investigate the understanding of superior performance where the purpose of the public organization is to leverage its local economy and generate new sources of revenue rather than maximizing profit in a testbed project proposed by a state in the southern region of Brazil. In this testbed project, in partnership with academia, new ways to use public data were proposed based on government-held data. A case study is considered a suitable approach when exploring a complex phenomenon (e.g., use of public data and its monetization) within real-life contexts, in order to theorize it (Voss, 2010). Furthermore, a case study is considered a relevant research approach when the aim is to answer questions aimed at understanding “how” and “why” a phenomenon happens. The case study approach is also advisable for research that is in its formative stages (Crowe et al., 2011).

3.3.1 *Case Description*

The decision to focus on the Southern region of Brazil for this study stems from several key factors that underline the state's proactive approach to fiscal optimization and public efficiency. This region has undergone a concerted effort to streamline public services by refining its taxation policies and maximizing the value derived from government assets. As part of this initiative, the government has recognized the significance of its data resources and aims to harness their potential for governance and regional economic growth. However, this endeavor has encountered various challenges, from assessing the value and accessibility of these datasets to navigating the complexities of decentralization.

To address these challenges, the government initiated the testbed project, which aims to catalog and provide access to a diverse range of datasets from different government agencies. By initially focusing on critical sectors like transportation, finance, and agriculture, the project

strategically selects datasets crucial for economic development. Nonetheless, the absence of a centralized data repository underscores the complexity of consolidating disparate datasets. Each agency has administrative freedom to manage its resources. In this way, each agency also has its own database and, observing current data legislation, the process and authorization for interoperability between these agencies becomes a costly and bureaucratic process. The thorough preparatory work, including reports, and interviews, sets the groundwork for identifying potential beneficiaries and guiding market research and trend analysis.

Essentially, this study in the Southern state of Brazil is justified by its unique position in pursuing tax optimization, and initiating efforts to unlock value within government assets, particularly data. The testbed project serves as a catalyst for economic development, providing vital information resources to local entities and businesses, thereby facilitating more informed decision-making processes and fostering the emergence of new ventures and investments. This initiative serves as a noteworthy case study, illustrating the complex relationship between government data, fiscal policies, and regional economic development in enhancing public efficiency.

Moreover, the testbed project plays a pivotal role in driving the region's economic development by supplying crucial information resources to local entities and businesses. The utilization of this information has the potential to enhance decision-making processes, leading to the establishment of new commercial ventures and improved decision quality in both the public and private sectors.

3.3.2 The case study and the longitudinal research

The methodological process was divided into two distinct phases: initially, a case study was adopted, allowing the researchers to collect a great deal of information and analysis of implemented practices. Subsequently, longitudinal research was conducted throughout the remainder of the observed project. This approach allowed for a deeper understanding of changes and developments over time, offering valuable insights into the impact of initiatives adopted by the government on the economy (Patton, 2015).

As the inaugural phase of the study, a case study was initiated to comprehend and map the current economic and technological scenario of the government in focus. This case study

served as a foundational step towards identifying gaps and opportunities in harnessing digital data to propel economic growth. During this phase, Semi-structured interviews were conducted with representatives from different government bodies, financial institutions, and private sector companies. The aim was to gain an in-depth look at the needs, challenges and expectations related to using digital data to drive the economy.

Through the initial case study phase, the research actively contributed to the project's advancement by furnishing essential insights to the digital government platform stakeholders. Engaging key stakeholders through interviews provided an intimate understanding of their unique needs and challenges, guiding the strategic direction of the project. Furthermore, international benchmarking efforts contributed a comparative dimension, enriching the local approach with insights from successful implementations in analogous jurisdictions. Collectively, these actions equipped stakeholders with a robust understanding, significantly influencing the project's trajectory and ensuring a strategic approach towards the realization of the digital data platforms.

The longitudinal research approach, adopted as the second phase of this study, was based on theories established in qualitative methodology. Authors such as Creswell (2013) and Patton (2015) highlights the importance of this approach for an in-depth understanding of complex phenomena over time. By extending the investigation period from 2022 to 2023, this methodology allowed a thorough analysis of the dynamics, trends and nuances that emerged during the evolution of the project.

As highlighted by Stake (2010), qualitative longitudinal research is particularly valuable for exploring the complexity and dynamics of change in complex contexts, such as implementing a digital data platform in a government sphere. Over time, this approach made it possible to capture subtle nuances and patterns that might otherwise go unnoticed in a short-term analysis. The application of this methodology is also aligned with the recommendations of Denzin and Lincoln (2018), which emphasize the importance of using qualitative methods in studies that seek an in-depth understanding of social and organizational processes. Longitudinal research allowed for a more complete immersion into the operational context, providing a rich and multifaceted perspective on the transformations and impacts resulting from the implementation of the digital data platform.

Through the application of these methods and theoretical perspectives, qualitative longitudinal research provided an in-depth and holistic view of the changes and impacts related to the implementation of the digital data platform. This allowed for an understanding of the complexities inherent to the process and contributed to a robust analysis of the study results. This encompassing procedure involved a harmonious interplay of three distinct yet interrelated data collection procedures: "**Semi-structured Interviews and questionnaires**", "**Participant Observation**", and "**Document and Report Analysis**". Each of these methodologies served distinct purposes within the data collection process yet shared a common thread of meticulous organization and systematic execution. The seamless integration of these methodologies allowed for a holistic and multifaceted understanding of the project's intricacies. The chronological depiction in the forthcoming Figure 3.1 illustrates the parallel progression of these methodologies, providing a visual representation of the synchronicity that permeated various stages of the data collection process.

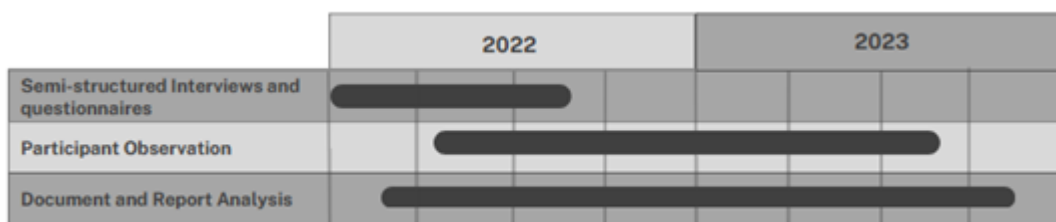


Figure 3.1 - Research Timeline and data collection procedures

The selection of participants was carried out carefully, aiming to ensure a comprehensive representation of the various stakeholders involved in the digital data platform. The sample included representatives from government agencies, technology experts, economists, as well as members of the private sector (startups and other data science enterprises, for instance) who collaborated in the implementation and use of the platform.

3.3.3 *Data collection procedures*

Our data collection was carried out using three distinct and complementary tools within the scope of a case study. Initially, semi-structured interviews and questionnaires were carried out for key participants in governance and potential consumers of the business models and then reports were carried out. Finally, observant participation was used to obtain data

regarding the actions taken by the project and its results. However, as we can see in Figure 3.1, it is necessary to emphasize that the procedures occurred concurrently and not linearly.

3.3.3.1 Semi-structured Interviews and questionnaires

In-depth interviews were conducted with selected participants to delve into their perceptions, challenges, and benefits regarding the implementation of the digital data platforms. The questionnaire, outlined in Appendix A, was used in this data collection process. It facilitated the exploration of the representative needs, activities related to proposed institutions, and challenges faced (Harris & Brown, 2010). Data were collected from 28 interviews where representatives from different segments were interviewed, both from the public and private sectors. In Table 3.1 we can see the number of each representative broken down by segment and sector.

Table 3.1 - Respondents by Segment

Segment	Sector	Representative
Incubator/Accelerator	Private	2
Business Association	Private	3
UNIONs	Public	2
University	Public	2
Government	Public	9
Banking	Private	4
Entrepreneurship	Private	6

The questionnaire was structured to investigate issues such as customer challenges, data requirements, tasks performed, and obstacles faced, providing a comprehensive understanding of the subject matter. It aimed to gather insights into potential benefits, desired access to data services, and factors influencing the adoption of proposed solutions. This systematic approach served as a base for developing and validating value propositions. In addition to qualitative methods, the questionnaire method was employed to capture a diverse range of perspectives. Tailored to extract specific insights from stakeholders, the questionnaires

delved into aspects of the testbed project, including stakeholder engagement, data needs, challenges, and anticipated outcomes (Harris & Brown, 2010).

Appendix A questionnaire covered various domains relevant to the testbed project, including:

- **Introduction and Background:** Gathering fundamental information about participants, including their affiliations, roles, and backgrounds;
- **Data and Government Resources:** Investigating the utilization of internal government data, its sharing practices, and barriers hindering its exploration in innovative ways. It also explored participants' competencies and aspirations regarding data monetization and future utilization;
- **IT Infrastructure:** Evaluating the adequacy of IT infrastructure and knowledge concerning data usage, with a focus on identifying any existing gaps or training requirements.

3.3.3.2 Document and Report Analysis

In addition to collecting data through other means, we thoroughly examined internal documents, progress reports, and official records concerning the implementation of the digital data platform. This analytical process provided supplementary data and valuable insights into operational practices and outcomes achieved (Bowen, 2009). By carefully reviewing these authoritative documents, we obtained comprehensive information on key milestones, challenges, and achievements related to the platform's deployment. This methodological step deepened our understanding and strengthened the credibility of our findings by confirming insights obtained through other research methods (Bowen, 2009). Incorporating document and report analysis in our methodology was necessary for reinforcing the comprehensiveness and rigor of our research objective.

3.3.3.3 Participant Observation

Furthermore, to the methods previously mentioned for data collection, participant observation was utilized as a valuable technique to enhance our comprehension of project dynamics. This approach involved direct involvement by specific members of the research team in various project-related activities such as meetings, workshops, and events (DeWalt & DeWalt, 2002). Through active participation in these settings, our team members gained a distinct viewpoint from which to observe decision-making processes, collaborative endeavors, and interactions among stakeholders. This immersive method enabled a deeper understanding

of the operational context, allowing us to discern implicit nuances and exchanges of tacit knowledge among participants. Moreover, participant observation facilitated the establishment of rapport with key stakeholders, fostering an environment conducive to candid discussions and the discovery of implicit insights (DeWalt & DeWalt, 2002). This hands-on involvement not only enriched the richness of our data but also enhanced the credibility and reliability of our findings by offering an insider's perspective on project dynamics. Therefore, the incorporation of participant observation into our methodology significantly contributed to the thoroughness and strength of our research efforts.

3.3.4 *Data analysis*

In an inductive research, interviews and analyzes are often aligned. Thus, the analysis begins as soon as the first interview ends. Firstly, after an interview, transcripts and notes are converted into a separate file. Interview recordings are reviewed to ensure that no information is lost during the transcription procedure and that the points made in the conversation are correctly understood. After writing notes, the interviews are summarized and then categorized into pre-defined themes.

The themes initially used are refined as the amount of information increases. This type of iteration during analysis is common for exploratory research. With the increase in data collected, the themes used in the interview needed to be refined. During the summarization and categorization of results, coding were used to analyze different interviews. In this codification, different nomenclatures were created. Table 3.2 shows an example of the use of the codes used in this research. Furthermore, it is important to highlight that the information was also perceived when monitoring the progress of the project, not just in the interviews. This continuous monitoring allowed a more comprehensive and contextualized view of the findings, complementing the insights obtained in the individual interviews. Through the application of RBV, we seek to understand how information extracted from interviews can contribute to identifying and improving a company's strategic resources, aligning them with market opportunities.

Table 3.2 – Code example

Code	Description
Tangible Resources	Physical and financial resources of the organization mentioned by participants.
Intangible Resources	Intangible resources such as brand reputation, knowledge, organizational culture, etc.
Capabilities	Codify the organization's distinctive capabilities, such as specific skills, effective internal processes, etc.
Superior Performance	Record any mention of the organization's competitive performance derived from its resources and capabilities.
Entry Barriers	Entry barriers mentioned by participants, such as patents, economies of scale, etc.
Organizational Learning	References to the learning and adaptation process of the organization over time.
Shared Resources	Resources shared between different units or departments in the organization.
Sector-Specific Resources	Resources that are specific to the sector in which the organization operates.
Unique Resources	Resources that are rare and hard to imitate or replace.
IT Resources	Register mentions of information technology resources and their role in the institution's performance.
Human Resources	Capabilities and skills of the organization's human resources.
Financial Resources	References to the organization's financial resources, such as investment capital, public-private partnerships, etc.

The data analysis and display approach can be used in an inductive analysis. Here, data is summarized and simplified, then organized and compiled in a visual format (such as graphs or tables). Saunders et al. (2009) observes that displaying data makes it easier to recognize patterns and relationships in these data, as well as helping to suggest conclusions based on them. Therefore, to understand the role of resources and capabilities in this scenario where different entities operate within a government, different data views can be used. To represent these identified patterns and themes, relevant quotes were selected that illustrated the different

perspectives of the case under study. Additionally, comparisons were performed between different data observations to highlight similarities and differences.

3.4 RESULTS

3.4.1 *Insights and lessons learned from the case study*

The interviews carried out with representatives from different sectors provided valuable insights for the testbed project. The government sector, represented by nine interviews, highlighted the importance of integrating internal systems to optimize operations. As the Head of a Government Department stated, *"Integration of internal systems is crucial for us to optimize operations and provide efficient services. It is the foundation of our data-driven approach."* Likewise, the private sector, especially incubators/accelerators, business associations and banks, has highlighted the transformative impact of access to government data on business operations and innovations. As one External Private Sector Data Consumer highlighted, *"Access to government data has revolutionized our business operations. It's a game changer in how we strategize for business and innovate."*

These interviews demonstrated the collaborative effort required to unlock the full potential of government data, highlighting the crucial role of data integrators in extracting value-generating information. The need to structure the process into three distinct layers was also perceived, both in relation to the resources and capabilities involved and the interactions between the actors. These layers are essential to ensure the effectiveness and security of the government data monetization process. As one Data Analytics Expert mentioned, *"Unlocking the potential of government data requires a collaborative effort. Data integrators play a key role in extracting insights and creating meaningful applications."*

In Table 3.3 we present the resources and capabilities mapped during the observation of the interviews carried out during the case study. From this data, we can observe that the respondents recognize the importance of each resource and capability mapped to the success of the government data monetization initiative. The most cited resources are robust IT infrastructure and data science capabilities, while data governance and a culture of innovation are also considered fundamental by the respondents.

Table 3.3 - Resources and Capabilities Mapped through Case Study Interviews

Resources and Capabilities	Description
Legal and Regulatory Knowledge	Ability to understand and apply data protection legislation (LGPD, GDPR, HIPAA ¹ , and the like) to ensure legal compliance in the management of government data.
Data Science Training	Skill in data analysis, statistics, and computer science to extract insights and develop effective monetization models.
Strong IT Infrastructure	Appropriate technological resources, such as servers and data storage, to support the collection, storage, and analysis of large volumes of data.
Information security	Cyber protection measures and data encryption to ensure the security and confidentiality of information.
Data Governance	Organizational framework and policies for managing data, including anonymization procedures and defined responsibilities.
Innovation Culture	Organizational environment that values innovation and encourages the search for new ways of using and monetizing government data.

3.4.2 Importance of a robust platform to handle multiple sources of data as a backbone of a digital ecosystem

Interviews with representatives from the university and entrepreneurship sectors emphasized the importance of a robust platform capable of handling multiple data sources. Such a platform serves as the backbone of a digital ecosystem, facilitating the integration and analysis of data in a transparent way. A robust platform that can handle multiple data sources and serves as the foundation of a digital ecosystem needs several essential features. Firstly, it must be scalable, capable of growing as the volume of data and the number of users increase, without loss of performance. A modular structure makes it easy to add new components as needed. Interoperability is crucial, allowing integration with different types of data and other platforms through APIs. Security must be rigorous, protecting sensitive data and ensuring compliance with privacy regulations. Reliability is guaranteed by high availability mechanisms and

¹ LGPD = Brazilian General Data Protection Law; GDPR = General Data Protection Regulation; HIPAA = Health Insurance Portability and Accountability Act

redundancy systems for backup and disaster recovery. Transparency is promoted by data traceability and comprehensive documentation that facilitates the use of the platform.

The platform must also be easy to use, with an intuitive interface and integrated data analysis tools. Performance is optimized by high processing capacity and efficient use of resources. Support and maintenance are ensured by regular updates and an available technical support team. Flexibility allows for customization to meet specific needs and rapid adaptation to changes in the business environment or regulations. Thus, a robust platform combines these characteristics to facilitate efficient and secure data integration and analysis, promoting innovation and collaboration between sectors.

As one Data Privacy Expert highlighted, *"The careful balance between data privacy and value creation is paramount. It's about protecting citizens' rights while generating business value."* Additionally, cybersecurity experts have emphasized the need for a secure data ecosystem to protect sensitive information and maintain public trust. According to a Cybersecurity Expert, *"A secure data ecosystem protects not only sensitive information but also public trust. It is the foundation of a resilient government."*

This information is in line with what Table 3.3 presents, so that we can understand the first layer of data processing necessary for a public data monetization project as a fundamental basis for this project to be successful. At the first layer, we understand that government data needs to be processed and anonymized before it can be shared to add value. To achieve this, basic human and technological resources are needed, which will serve as the fundamental basis of the process. This first layer must necessarily be internal due to the sensitive nature of public data and the high levels of confidentiality and data protection required. Among the resources and capabilities, we list below:

- **Expert IT Team:** Professionals trained in information technology, cybersecurity and data management are essential to ensure the integrity and security of data during processing and anonymization;
- **Robust IT Infrastructure:** Robust servers, data storage, and security systems are required to support the efficient and secure processing of large volumes of government data;
- **Legal and Regulatory Knowledge:** A comprehensive understanding of data protection laws and regulations (LGPD, GPDR, and the like) is crucial to ensuring legal compliance during data processing and anonymization.

3.4.3 *Public sector digital transformation: data as enablers of capabilities and monetary sources*

Interviews conducted with representatives of public unions and government departments shed light on the digital transformation underway in the public sector. These interviews emphasized how government data serves as an enabler of capabilities and monetary sources. As one Business Analyst stated, *"Data-driven economic policies drive prosperity. It's about cultivating an environment where both businesses and communities can thrive."* By adopting data-driven approaches, governments can drive innovation, fuel economic growth and improve the delivery of public services. As one Financial Analyst highlighted, *"Understanding the financial implications of policies through data analysis is essential. This allows for sound fiscal decision-making for sustainable growth."*

Continuing the understanding that this digital transformation process occurs in layers, we can understand that in subsequent layers, the processed and anonymized data can be added with value, both internally, by sectors of public governance itself, and externally, by partner companies or services outsourced. These additional value-adding layers may include:

- **Data Analysis and Modeling:** Specialized data science and statistical analysis teams can explore anonymized data to identify trends, patterns, and valuable insights that can inform policy and decision-making;
- **Application and Service Development:** Partner companies or outsourced services can use anonymized data to develop innovative applications, platforms and services that add value to citizens and businesses;
- **Strategic Partnerships:** Collaborations with private sector organizations, academic institutions and other entities can expand the reach and impact of the government data monetization initiative, enabling the creation of more comprehensive and effective solutions.

These subsequent layers of value addition can be both internal (government's own IT sectors, public data management and processing companies) and external (external public-private partnerships, outsourced companies tendered to provide the IT solution, etc.), depending on the specific needs and capabilities of each project and the data monetization strategy adopted by public governance.

3.4.4 *The government's monetization journey considering RBV*

As data monetization can still be considered a recent issue, from a government perspective, it is necessary to have a clear definition of this phenomenon. Baecker et al. (2020) describe this phenomenon as “the conversion of the intangible value of data into real and quantifiable value into economic benefit, be it monetary or any other quantifiable economic benefit” in their research. However, this definition does not recognize the differences between different types of customers for this data in the public data paradigm. Because, in this scenario, monetization is a significantly different process if the customer is an internal actor in another public entity, or if the customer is an entity external to the government.

And this difference comes both from the nature of public data and also from the nature of data monetization. Because it can be seen as an internal service for reusing collected data, or it can be seen as the implementation of an additive in the relationship between customers, partners, and the public administration. Monetization can be implemented in two main ways in a government context. Firstly, it can be incorporated into a service or product that already exists internally within the government, taking advantage of already established infrastructures and processes. Alternatively, monetization may involve creating a new service or product aimed at external customers, which can open up new revenue streams and audience engagement opportunities. This makes data monetization in the public sense a more comprehensive concept, where both the sharing of data and the implementation of resources derived from this data are considered as monetization. The literature lacks this type of discussion when the phenomenon is not strongly defined.

The economic development brought about using data tends to accelerate the use of data by governments with lower digital maturity, where the monetization of this data is one of the paths to be followed more widely. While changes in legislation may encourage companies in the financial sector to use public data, legal frameworks regarding data protection require a heavy investment in the infrastructure for this data and in the resources and human capabilities to process it and make it available for use of third parties. However, in addition to these changes in regulatory frameworks, the market also exerts pressure on governments to make their data available so that there is a disruptive effect on new businesses. As mentioned previously, monetizing public data is not a simple task to do, as it is affected by different demands such as economic attractiveness, organizational culture, data management as well as the definitions of

the legal framework. In this way, the approach we found based on the findings (Table 3.3) of the case study can be demonstrated in some guidelines.

As the government develops a sufficient basis for utilizing the data, it can address the monetization of that data. A strategic partnership ensures that the monetization project has a greater chance of success, as this relationship becomes personalized and the potential value of the data can be explored more easily. As governments need to validate the potential value and use of data before effective monetization, the need for collaboration between entities arises. In the pilot project of the case analyzed, the existence of a government entity that acts as a public company dedicated to processing government data was identified. However, it is important to note that in other governments there may be a different approach, with a business team responsible for this processing. Regardless of the structure adopted, it is crucial that this entity is aligned with the government's legal and regulatory framework to ensure legal compliance and data security.

It is also necessary to analyze the reasons that lead to the need for a strategic partnership and collaboration between government entities. Firstly, it is essential to recognize that governments often deal with a vast amount of data from various sources, such as public records, government services and surveillance systems, among others. This data has significant potential to generate value, whether in making more efficient government decisions, developing more informed public policies or even creating new services and products for society. However, for this value to be effectively achieved, the data must be processed, analyzed and, in many cases, shared with other entities, whether internal to the government itself, the private sector, academia or the third sector. This is where the importance of strategic partnership comes in. By collaborating with an external entity, whether a private company specializing in data analysis or an academic institution with research expertise, the government can benefit from the additional knowledge and resources provided by that partner. This increases the chances of success of the monetization project, as it allows for a more specialized and focused approach to maximizing the value of data.

Furthermore, collaboration between government entities is also crucial. As mentioned in the case analyzed, different governments may adopt varying approaches to data processing and monetization. Some may choose to establish a government entity dedicated exclusively to these activities, while others may designate specific teams within existing government bodies.

Regardless of the structure chosen, close cooperation between these entities is essential to ensure a coordinated and cohesive approach to the use and monetization of government data. Therefore, when considering the reasons that lead to the importance of strategic partnership and collaboration between government entities, it is possible to see that these aspects are fundamental to maximizing the value of government data and ensuring its effective and responsible use. Through well-established strategic partnerships and efficient cooperation between different entities, governments can enable the potential of data, benefiting not only public administration, but also society as a whole.

In the Figure 3.2, we present a conceptual architecture that illustrates both a basic model and an expanded model for monetizing government data based in these findings. In the proposed modular vision, monetization occurs in two main layers, the base being exclusively internal, and the upper layer made up of resources and capabilities that can be internal or external, through partnerships or outsourcing.

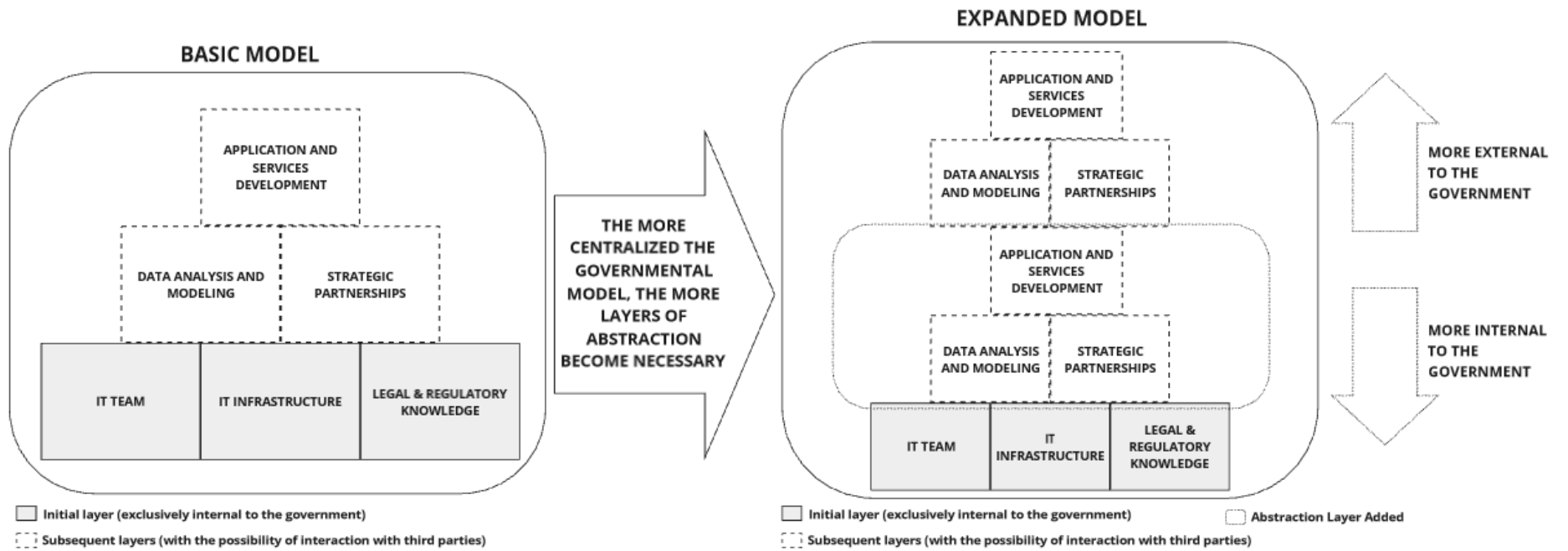


Figure 3.2 - Conceptual Architecture for Government Data Monetization

On the left side of the figure, we find the basic model of the structure. This template is made up of a stack of six text boxes, each representing a fundamental element for monetizing government data. At the base of the stack, we find three boxes that symbolize the essential resources and capabilities inherent to the government:

1. **Information Technology (IT) Team:** This box represents the team responsible for managing and maintaining government information systems, ensuring the availability and integrity of data;
2. **Information Technology (IT) Infrastructure:** Here, we highlight the importance of the technological infrastructure necessary to store, process and make government data available in a secure and efficient way;
3. **Legal & Regulatory Knowledge:** This box emphasizes the need for legal knowledge and compliance with regulations related to data protection and privacy (eg. LGPD, HIPAA, GDPR and such), ensuring that data monetization complies with laws and government guidelines.

Above these three boxes, we find three other boxes stacked:

1. **Strategic Partnerships:** This box highlights the importance of establishing collaborations with public and private organizations to expand the reach and impact of government data monetization;
2. **Data Analysis and Modeling:** Here, we recognize the need for advanced analytical skills to extract valuable insights from data and model scenarios to support informed decision making;
3. **Application and service development:** At the top of the stack, indicating the transformation of insights obtained into practical and accessible solutions for different actors.

On the right side of the image, we see the expanded model of this structure. Here, the top three boxes (strategic partnerships, data modeling and analysis, and application and service development) can be replicated one level higher, representing layers more external to government. Each replication of these boxes indicates an expansion of the scope of data monetization, involving external partners and stakeholders.

The more boxes are stacked, the more external to the government are the resources and capabilities referenced. This reflects the decentralized nature of data monetization, where information can be shared and used by multiple actors, both in the public and private sectors. However, it is important to note that the more centralized the government, the more additional layers will need to be stacked to ensure legal compliance, proper data anonymization, and security before sharing with external clients.

Thus, this conceptual architecture for government data monetization represents a holistic and scalable approach to maximizing the value of government data while ensuring security, legal compliance, and equitable access to information.

3.5 DISCUSSION

3.5.1 *Theoretical contributions*

In examining the findings of this study, it becomes evident that the resource-based view (RBV) framework offers valuable insights into understanding the dynamics of government data monetization. According to RBV, a firm's competitive advantage and performance are determined by its unique bundle of resources and capabilities (Barney, 1991). When applied to the context of government data monetization, this framework underscores the significance of technology infrastructure and data-related capabilities as critical resources for achieving success in such initiatives. The results of this research corroborate the RBV perspective by highlighting the pivotal role played by technology infrastructure and data science training in the effective monetization of government data. Essentially, governments that invest in cutting-edge technology infrastructure and provide adequate data science training are in a better position to extract value from their data assets. The monetization of this data itself can serve as a source of resources, enabling new investments in technology and training. In this way, the investment and return cycle contributes to a continuous improvement of government capabilities in data management and analysis. This aligns with the fundamental tenets of RBV, which emphasize the importance of tangible resources such as technology infrastructure in driving organizational performance (Bharadwaj, 2000).

Moreover, the findings underscore the importance of adherence to data-related legal frameworks, such as data anonymization protocols, in the context of government data monetization. From an RBV standpoint, compliance with legal regulations can be viewed as a crucial capability that enhances the value and sustainability of the firm's resources (Peteraf, 1993). By ensuring compliance with data protection laws and regulations, governments can mitigate legal risks and build trust among data users and stakeholders, thereby facilitating the monetization process. Comparing these findings with existing literature within the RBV framework, we find consistent support for the role of technological infrastructure and data

governance in government data monetization (Anshari & Lim, 2017; Dhanshyam & Srivastava, 2021; Trkman et al., 2023). However, our research also reveals nuanced insights, particularly regarding the relative importance of different resources and capabilities. While prior studies have emphasized the significance of effective data governance, our findings suggest that adherence to legal frameworks, particularly data anonymization, may hold greater sway in driving the success of government data monetization initiatives.

These discrepancies underscore the contextual nuances inherent in the application of RBV principles to government data monetization. It is plausible that variations in institutional contexts, regulatory environments, and methodological approaches contribute to differing emphases on specific resources and capabilities across studies. Nonetheless, the overarching implication remains clear: for governments to effectively monetize their data assets, they must invest in robust technological infrastructure, cultivate data-related capabilities, and ensure compliance with pertinent legal frameworks (LGPD, GDPR, HIPAA and such). When analyzing the results in depth, we observed a clear relationship between technological infrastructure, adherence to data-related legal frameworks and the success of government data monetization. Governments that have robust technological systems and adopt transparent policies are more likely to attract investors and partners interested in using their data. This can lead to greater revenue generation and the development of innovative solutions based on government data.

3.5.2 *Managerial implications*

The implications of our results are significant for both academia and government practice. From an academic perspective, our findings contribute to a deeper understanding of the factors that influence the success of government data monetization. This can guide future research in the area, allowing the development of more robust theories on the topic. In practical terms, our results highlight the importance of governments investing in technology and transparency to maximize the economic potential of their data. This can result in tangible benefits for society, such as improving public services and stimulating innovation and economic growth. We have some recommendations for policy makers, as follows:

- **Investment in Technology:** It is recommended that policymakers prioritize investments in robust and up-to-date technological infrastructure. This includes modernizing data storage

and processing systems, as well as developing secure and efficient digital platforms to facilitate the monetization of government data;

- **Improving Transparency:** It is essential that governments adopt policies and practices that promote transparency in the access and use of government data. This may include implementing open data portals, disseminating information about data monetization processes, and ensuring that citizens have easy and understandable access to government information;
- **Training and Education:** Policymakers should invest in training and education programs for public servants involved in data management and monetization. This can help ensure that best practices are followed, and that necessary resources and capabilities are appropriately developed and utilized;
- **Collaboration with the Private Sector:** It is recommended that governments seek strategic partnerships with the private sector to make the most of the economic potential of their data. This could include collaborating on creating innovative products and services based on government data, as well as exploring joint business models that benefit both parties.

By following these recommendations, policymakers can create an enabling environment for the effective monetization of government data.

3.6 CONCLUSIONS

This research explored the resources and capabilities necessary for the development and implementation of a government public data monetization platform, using a case study of a government project in the southern region of Brazil and adopting an inductive approach. The results of this study offer valuable insights for policymakers and government managers interested in exploring the economic potential of government data. Our analysis highlighted the importance of technological infrastructure and adherence to data regulatory frameworks as fundamental elements for the success of government data monetization. Furthermore, the need for collaborative approaches that involve both internal and external actors in implementing these initiatives was emphasized.

The research faces several limitations that may affect its generalizability and applicability. One of them is the nature of the case study, which may not faithfully represent the diversity of government contexts. Different governments may have unique policies,

structures, and organizational cultures, which can significantly influence how government data is monetized. Furthermore, the inductive approach adopted in this study also has limitations, since the results derive from specific observations and may not be generalizable to other situations. Another important consideration is the need to carry out empirical tests of the model proposed in this study. While the findings offer valuable insights, it is crucial to validate the model in different contexts and conditions to ensure its robustness and broad applicability. Additional empirical testing can help identify potential gaps or limitations in the model, enabling adjustments and refinements to improve its effectiveness.

Furthermore, it is essential to recognize that this study is based on a single case study. Although case studies are useful for exploring complex phenomena in depth, they also have their limitations in terms of generalizing results. A single case study may not capture the full range of relevant situations and variables, which may limit the breadth of conclusions and recommendations derived from it.

As a recommendation for future research, it is suggested that additional studies be carried out that explore different government contexts and adopt more approaches, including comparative analyzes between multiple case studies. This will allow for a more complete understanding of the factors that influence the success of government data monetization and will open new opportunities for developing theories and practices about data monetization in governments.

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3.8 APPENDIX A - DATA BUSINESS MODELS AND PROVISION

QUESTIONNAIRE

1. Introduction and Background:

- Name (Optional):
- Affiliation/Organization:
- Role/Position:

2. Data and Government resources:

- How do you use the internal government data?
 1. Do you provide analysis for others?
 2. Do you utilize it in some other ways?
- Do other entities/actors use your data for something?
- Is your data shared with other institutions in any ways?
- What should happen that you could use your data in new ways? What prevents this kind of action?
- Tell me about your competences:
 1. How realistic do you think it is to utilize the data in new ways?
 2. How realistic it is to share the data with others?
 3. How do you see your data utilization and know-how compared with other institutions?
 4. What kind of goals do you have for data monetization or utilization?
 5. How do you prepare yourselves for future uses regarding data utilization?

3. IT Infrastructure:

- How do you see the IT infrastructure regarding the use of data?
 1. Do you see infrastructure gaps regarding the management of data?
- How do you see the IT knowledge regarding the use of data?
 1. Do you see yourselves having the proper training to deal with data?

4 FINAL REMARKS

This section provides a summary and reflection on the research presented in this dissertation. It encompasses the main conclusions drawn from the study and outlines potential avenues for future research.

4.1 THEORETICAL CONTRIBUTIONS

In this section, it was synthesized the key findings and conclusions arising from a thorough examination of two interconnected research papers. One paper focuses on the digital government landscape and data monetization models, while the other examines which resources and capabilities are essential for creating an enabling environment for the use and monetization of public data. The objective is to offer a cohesive understanding of the challenges and opportunities associated with using government data for value creation through new ways of revenue.

Initially, it was conducted a systematic literature review, understanding the digital government and data monetization models. This analysis showed the fragmented evolution of research in digital public governance, highlighting the link between the challenges of implementing digital government (e-Gov) and the data monetization models. It became apparent that while data monetization in the industry is well-established, its application to public data demands a nuanced approach. The research identified critical areas for further exploration, such as the standardization of nomenclatures, sociological considerations, and metrics for assessing government digitization.

Subsequently, the dissertation delved into the intricacies of data ecosystems in the public sector, accentuating the contrast with centralized data management in the private sector. The study underscored the necessity to understand the resources and capabilities to harmonize operations across diverse public entities and proposed solutions, including the establishment of a unified database and data cooperation agreements. The research underscored the strategic importance of government data, advocating for a well-defined legal framework and data centralization to create a governmental data platform. Additionally, it emphasized the role of data analytics capabilities and the careful consideration of operational costs associated with data anonymization.

Collectively, this research significantly contributes to our understanding of the challenges and opportunities in the realm of government data. The first research identifies critical research gaps and suggests future directions, encompassing the exploration of diverse information sources, analysis of key inputs to monetization models, and empirical testing of proposed models. The second paper furnishes a comprehensive framework for leveraging government data, acknowledging its strategic importance, and offering solutions for developing data platforms. Consequently, the dissertation integrates these findings to propose a holistic approach to the effective and responsible use of government data to generate revenue. This dissertation recommendation includes a unified understanding of digital government, exploration of diverse information sources for research, identification of critical data for monetization models, and emphasis on the necessity for a well-defined legal framework. By addressing these aspects, the dissertation contributes to the ongoing dialogue on the potential of government data, recognizing its dual role in serving society and government interests. As technology and regulations evolve, the proposed framework establishes a foundation for future endeavors, ensuring continued relevance and effectiveness in unlocking the full potential of government data for value creation.

4.2 PRACTICAL IMPLICATIONS

The findings resulting from the analysis of digital government scenarios, data monetization models, and data ecosystems in the public sector offer valuable insights for governments looking to harness the potential of government data to value capture. Below, we present some implications and recommendations that aim to guide policymakers and government agencies in navigating the challenges and opportunities identified in the research.

Firstly, one of the main challenges highlighted is the lack of standardization in nomenclatures related to digital government and data monetization. It is recommended that governments establish standardized terminologies and definitions to create a common language within the public sector. This standardization will improve communication, facilitate collaboration, and contribute to a more cohesive understanding of the digital government landscape. Furthermore, it is crucial to recognize the social aspects of implementing digital government initiatives. Governments must conduct detailed social assessments to understand public perceptions, concerns and expectations regarding the use of government data. This

proactive approach will enable the development of policies and practices that are aligned with society's values, fostering trust and acceptance among citizens.

Using comprehensive metrics to assess the progress and impact of government digitalization efforts is essential. Governments are encouraged to establish measurable indicators that go beyond traditional efficiency measures, covering aspects such as citizen satisfaction, inclusion and the socioeconomic impact of digital government initiatives. These metrics will provide a more holistic understanding of the effectiveness of digital government models. To address the complexities of data ecosystems in the public sector, governments must prioritize internal systems integration. This involves harmonizing operations between various public entities through the establishment of a unified database. Such integration improves data accessibility, reduces redundancies, and promotes more efficient decision-making processes within government.

Furthermore, policymakers are urged to develop a well-defined legal framework for government data, recognizing its strategic importance. This framework should address issues related to data ownership, privacy, security and accessibility. Clear regulations will provide a foundation for responsible data governance, instilling trust among both citizens and potential data users. To maximize the value generated from government data, governments must actively promote collaboration between public entities and external stakeholders. Establishing data cooperation agreements can facilitate the fluid sharing of information, fostering innovation and creating new opportunities for value creation. It is recommended that governments leverage public-private partnerships and engage external value integrators to improve the effectiveness of data utilization efforts.

When emphasizing the importance of data anonymization, governments must carefully consider the operational costs associated with this process. It is crucial to balance the need for data privacy with the financial implications of anonymization. Policymakers must conduct cost-benefit analyzes to make informed decisions about the level of anonymization needed for different types of government data. Additionally, it is recommended that governments continually explore diverse sources of information, analyze the main inputs for monetization models and empirically test the proposed models. This iterative approach ensures that government data initiatives remain adaptable to changing technological and regulatory landscapes. Encouraging research and development activities within the public sector will contribute to continued innovation and improvement in data utilization strategies.

Thus, as technology and regulations evolve, governments must actively participate in discussions about the potential of government data. Governments that invest in advanced technological infrastructure (resources) and provide adequate data science training (capabilities) are better positioned to extract value from their data assets. Monetizing this data can itself provide additional resources for these investments, creating a continuous cycle of improvement.

Furthermore, effective use of data can be crucial in crisis or calamity situations. Data-driven decision-making allows governments to respond more quickly and accurately, allocating resources where they are most needed and optimizing emergency management. The data can also be used to optimize production and supply chains in local industry. By analyzing demand and supply patterns, governments can identify bottlenecks and opportunities for improvement, promoting a more efficient and resilient economy.

Therefore, by investing in data science resources and capabilities, governments not only increase their ability to manage and respond to crises, but also boost local economic development. It is essential that governments remain engaged in conversations about data use and regulation, ensuring they can make the most of the opportunities offered by technological developments. The proposed architecture serves as a foundation, but it is essential that governments remain adaptable and responsive to emerging challenges and opportunities. Regular reviews and updates to policies and models will ensure continued relevance and effectiveness in unlocking the full potential of government data for value creation.

4.3 FUTURE STUDIES

In this subsection, potential areas for future research are outlined based on the insights gained from this study. These suggestions aim to further current research and address remaining gaps or emerging trends in the field.

Future research could further explore the legal and regulatory aspects of data monetization in e-Gov. This would involve examining the implications of different legislative frameworks on implementing data-driven models. With the growing importance of data governance, understanding how laws and regulations influence these practices is critical. Furthermore, understanding how citizens perceive and interact with data monetization in the

public sector is crucial. Future studies could investigate public attitudes, concerns, and expectations regarding the use of personal data for government services. This line of research is essential to ensure that e-Gov initiatives are well received and transparent to the population.

Conducting comparative analyzes of data-driven models and implementation of e-Gov in different regions or countries could also provide valuable insights. These comparisons would help to identify contextual factors that influence the success of these initiatives, allowing the adaptation of best practices according to regional specificities. Given rapid technological advancement, future research could focus on emerging innovations, such as artificial intelligence and blockchain, and their potential impact on data integration and monetization in e-Gov. The adoption of these technologies could significantly transform the way data is managed and used.

Longitudinal studies that follow the development and evolution of data-based ecosystems in the public sector are also of great relevance. Through these studies, it would be possible to identify key success factors and challenges over time, contributing to the dynamic understanding of data ecosystems. Another important point for future research is the ethical implications of data monetization in e-Gov. It is imperative to explore how to safeguard privacy rights and ensure transparent data practices. This ethical focus would help balance the benefits of monetization with the protection of individuals.

Finally, impact assessments could be conducted to assess the tangible benefits and outcomes of data monetization initiatives in terms of service quality, efficiency and economic returns in different scenarios. These evaluations are essential to measure effectiveness and justify the model adopted. By addressing these potential areas of research, scholars can contribute to a more holistic understanding of the complex interplay between data, business models, and public administration in the digital age. This will ultimately promote more informed and ethically grounded approaches to using data in the contemporary world.