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Conceptualizing Chatbots in the Public Sector: A Socio-Technical Assessment of their Dark Side through a Systematic Literature Review

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Abstract: Chatbots have emerged as a new communication tool adopted by public sector organizations, yet their conceptualization remains overwhelmingly shaped by technological determinism. This study reconceptualizes chatbots as socio-technical artifacts through a PRISMA-based systematic literature review of 76 peer-reviewed articles. The findings expose a structural imbalance in the literature, where technical development is prioritized while organizational embedding, institutional dynamics and public value implications are largely overlooked. Drawing on sociomateriality, the paper foregrounds imbrication as a critical condition for successful integration, emphasizing the inseparability of technological systems and organizational contexts. The analysis identifies key tensions, including the gap between prototyping and institutionalization, the need to restructure public sector workflows, the growing dependence on private sectors, and the risks of anthropomorphic design biases and service dehumanization. By moving beyond technology-centric accounts, this study positions chatbot adoption as a contingent and governance-sensitive process, examining its dark side, and advancing a research agenda centered on socio-technical alignment, institutional capacity and the protection of core public values.

Keywords: Chatbot, artificial intelligence, socio-technical, gender bias, dark side, PRISMA

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1. Introduction

The notion of chatbot is not new. Its origins date to computer-science studies that took place last century. Among them, it is worth mentioning the design of the Turing Test in 1950, and the launching of the ELIZA program in 1966 (Weizenbaum, 1966), PARRY in 1981 (Colby, 1981) and ALICE in the 1980s (Wallace, 2009). More recently, we have witnessed significant advances in the artificial intelligence (AI) field — such as machine learning (ML) and natural language processing (NLP) technologies — which led to the launch of ChatGPT in 2022, catalyzing a paradigm shift within our contemporary democracies (Roskoshnyi, 2024). Accordingly, the utilization of generative AI is increasingly being examined by public sector institutions (Schneider, 2020; Toll et al., 2020), even the U.S. government has considered the use of ChatGPT, raising recent and serious concerns regarding the boundaries between the public and private sectors in the provision of public services (Descant, 2025). Furthermore, cases such as the Albanian 'AI Minister' illustrate a key issue for the public sector on how these AI conversational systems are integrated into public service settings and reshape administrative practices (Battista and Rivas-de-Roca, 2025).

However, the public sector's interest in adopting innovative technologies is not new either. Public administrations have already started to explore multiple AI applications (Criado et al., 2025; Wirtz et al., 2019; Wirtz et al., 2020) such as automation services and streamlining of certain bureaucratic tasks (Roehl and Crompvoets, 2023) or developing citizen recommendation systems (Cortés-Cediel et al., 2017), among others (Yulu, 2021). This completely new wave of applications for data analysis and automatization of tasks has modified the traditional work dynamics and the interactions established with citizens in the context of the public sector (Androutsopoulou et al., 2019), which led to scholars in the field labeling this emerging phenomenon as "algorithmic bureaucracies" (Vogl et al., 2020). Throughout this study, we will focus on the conceptualization of 'chatbots' as one of the areas of application of (AI) technologies that is receiving increasing attention in the public sector (Wirtz et al., 2019).

Accordingly, chatbots are defined as "intelligent agents which have the ability to understand a spoken language and use speech communication as user interface" (Androutsopoulou et al., 2019). Previous literature in the public administration field has envisioned chatbot technology to be a communicative device offering multiple opportunities for supporting public service delivery. Externally oriented, chatbots may be able to achieve a 24/7 administration for information provision and managing citizen tasks. Within governmental agencies, its adoption entails the potential of streamlining repetitive processes and relieving the workload of public employees (Chen et al., 2024; Van Noordt and Misuraca, 2019), which may result, for example, in positive implications in citizen satisfaction with public services (Larsen and Følstad, 2024; Scutella et al., 2024).

But the adoption of chatbots in the public sector also raises important questions that must be considered, although most of the existing focus has been placed on their anticipated benefits. This

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techno-optimistic perspective has permeated research in the field for decades (Orlikowski and Gash, 1994), and recent studies on AI in government have clearly noted the need to examine the dark side of these systems (for example, Valle-Cruz et al., (2024) or Wirtz et al. (2020)). In addition, research on chatbots in the public sector focus separately in technological or in social aspects (Chen et al., 2024; Makasi et al., 2021; Maragno et al., 2023; Senadheera et al., 2024). This research sectorization is crystallized by existing systematic literature reviews (SLR) on the topic, which focuses exclusively on the local layer of government (Senadheera et al., 2024) while prioritizes technological aspects (Cortés-Cediel et al., 2023; Ramíres-Hernández et al., 2023). This research gap calls for the application of socio-technical approach in chatbot research for better understanding the interplay between the technical and social dimensions and enhance our understanding of the pitfalls of these initiatives (Orlikowski and Barley, 2001; Tangi et al., 2025).

From this perspective, socio-technical approaches favor the reflection on how the design of machines may challenge organizational and individual capabilities and understanding (Mumford, 2020), while generating both new and original knowledge for the public administration field (Orlikowski and Barley, 2001). As has been robustly demonstrated previously, related theories provide a comprehensive background for examining effective technology adoption as a complex organizational phenomenon (Luna-Reyes et al., 2005). Firstly, socio-technical theory addresses public administrations as systems composed of interdependent social elements (such as roles, norms, and culture) and technical components (such as tasks and infrastructure), emphasizing the need for their joint optimization in transformation processes (Bostrom and Heinen, 1977a; Bostrom and Heinen, 1977b). This approach has been complemented with the notion of sociomateriality by highlighting the material properties of technological artifacts and the process of imbrication, through which human and technological agencies become intertwined in shaping organizational structures (Leonardi, 2011). Ultimately, the combination of both approaches moves beyond technological determinism, arguing that technologies gain organizational significance only when their material capabilities are effectively integrated with and enacted through situated social practices (Orlikowski et al., 2021).

Viewed through a socio-technical lens, chatbots are therefore better understood as organizational arrangements than as standalone technological artifacts. Their implementation requires the continuous alignment of technical infrastructures with organizational routines, professional practices, and institutional values, while their effects emerge from the reciprocal interaction between these elements (Bostrom & Heinen, 1977a, 1977b; Leonardi, 2011). As conversational AI becomes increasingly embedded in public organizations, this interplay raises a set of interconnected socio-technical challenges concerning not only data and technological infrastructures, but also the redistribution of administrative work, evolving governance relationships between public agencies and technology providers, and the social design of chatbot interactions with citizens (Dunleavy, 2006; Maragno et al., 2023). Ultimately, the adoption of chatbots generates a new type of interaction with citizens but the interplay between the technical and organizational factors will condition the final direction and nature of this transformation.

Taking stock from these ideas, this study is framed within an emergent research trend on AI in the public sector that advocates for the integration of both social and technical approaches. For example, the empirical study of Tangi et al. (2025) proposes the concept of AI-augmented government

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transformation and explains how these technologies when integrated in public agencies reshape both routines and institutional arrangements. Another great example in the application of this approach is provided by Tsarouhas and Grigoriadis (2025), who conducted a SLR to better understand under a socio-technical lens how technical mechanisms and socio-political structures interact and influence public trust in AI within public administration. Among these lines, Valle-Cruz et al. (2024) followed the PRISMA steps for developing an analytical framework on the socio-technical challenges posed by AI in government. Despite these advances in AI research, the socio-technical conceptualization of public sector chatbots remains largely unexplored.

Accordingly, this study aims to achieve the following research objectives: i) to describe the main research trends of chatbot technology in the public sector domain; and ii) to identify the core conceptual dimensions of chatbots in the public sector under a socio-technical approach. For these purposes, a SLR has been conducted on chatbot analysis and conceptualization in the context of the public sector. This review is based on the PRISMA protocol (Preferred Reporting Items for Systematic reviews and Meta-Analyses) to guarantee the systematicity and reproducibility of the identification, screening, eligibility and inclusion of studies on the subject. 76 peer-reviewed articles published in the areas of Social Sciences and Computer Science up to 2023 constitute the total sample of the study.

This paper contains different contributions. On the one hand, it develops the state of the art around chatbots in the public sector, by systematically identifying research practices by scholars in the field. On the other hand, the study addresses the interplay between technological and social dimensions of chatbots and identifies its dark side in the form of emerging challenges for the public sector. In doing so, we move beyond the mere identification of chatbot benefits and technologically deterministic accounts, positioning the analysis at an earlier and more critical stage of inquiry, especially relevant in light of the public management challenges posed by citizen-facing AI systems, including issues of trust, legitimacy, equality, and dehumanization in public administration. In addition, we outline directions for future AI development and research in public administration from a contingency perspective, with particular attention to adoption, design, and implementation processes, recognizing that technology–organization synergy is a critical factor in the success of technological initiatives in the public sector.

The paper is structured as follows. The next section presents the research design, outlining key aspects of the PRISMA protocol and describing the two dimensions of the analytical framework adopted for this study. Section 3 provides an overview of the included studies and their overall research characteristics. Section 4 presents the main findings of the SLR, focusing on theoretical and empirical conceptualizations of chatbot research through descriptive and inferential analyses, supported by tables and figures. Section 5 synthesizes and discusses the results, addressing key socio-technical issues identified in the conceptualization of public sector chatbots. Finally, Section 6 concludes the paper with a summary of the main findings, highlights limitations, and outlines avenues for future research.

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2. Research Approach: Systematic Literature Review Using PRISMA

In this section, we outline the main steps of the SLR on chatbots in the public sector. Our approach is significantly influenced by the research methodology developed by Zuiderwijk et al. (2021) in their SLR on AI governance. Following this model, we also adopted the SLR protocol recommended by Kitchenham (2004), focusing on the following key stages: (1) study identification, (2) study selection, (3) assessment of study relevance and quality, (4) data extraction, and (5) data synthesis. To enhance research transparency and accountability, we adapted the structure of this model to align more closely with the PRISMA framework, which we describe in detail in the following subsections.

2.1. Step 1: Identification of Studies

During the study identification step, we first determined the main research questions and objectives that guided our study. We aim to address the main gaps related to chatbot contextualization in the public sector domain reviewed in the literature on the topic. For this reason, we posed the following research objectives: a) to describe the main research trends of chatbot technology in the public sector domain, and b) to identify the core conceptual dimensions of chatbots in the public sector under a socio-technical approach. From these aims, we inferred the following research questions: i) what are the key research trends in the existing literature on chatbots within the context of the public sector? and ii) what are the core socio-technical dimensions of chatbots in the public sector?

From now on, we adopt two working definitions for the methodological purposes of the SLR. We understand by chatbots "intelligent agents which have the ability to understand a spoken language and use speech communication as user interface" (Androutsopoulou et al., 2019). At the same time, we define public sector in accordance with OECD (2008): "The public sector comprises the general government sector plus all public corporations including the central bank". To address the research questions and achieve the stated objectives, our SLR began by identifying studies in three complementary sources: Scopus, Web of Science (WoS) and ScienceDirect. This initial search resulted in over 2,000 publications. Google Scholar was not included, based on the assumption that any additional relevant studies not captured in these databases could be identified through snowballing while consulting existing SLR on the topic. The following is a detailed description of the selection process for the articles included in the review.

2.2. Step 2: Selection of Studies

The study selection process began by defining the search terms and establishing inclusion and exclusion criteria. Following the strategy outlined in Table 1, we limited our search to peer-reviewed journal articles, written in English, and published online up to December 2023. The final search terms were refined through iterative testing to optimize the balance between study quantity and quality. Given the differences in search filters across databases, minor adjustments were made to harmonize the search criteria. In Scopus and ScienceDirect, we restricted the search subareas to 'Computer Science' and 'Social Science.' In Web of Science, we limited the search to the disciplines of 'Political Science,' 'Public Administration,' 'Computer Science,' 'Artificial Intelligence,' 'Information Systems,' and 'Information Science & Library Science.' To ensure accuracy and robustness in our selection

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criteria, our research query was also inspired by previous SLRs on AI in government, finding the following combination to be optimal for the study.

Table 1: Databases search strategy

Database	Search strategy
Scopus	(TITLE ("chatbot*" OR "virtual assistant" OR "virtual agent" OR "conversational assistant" OR "conversational agent" OR "digital assistant") AND TITLE-ABS-KEY (public OR govern* OR city OR region OR state OR administrat* OR policy)) AND PUBYEAR > 2001 AND PUBYEAR < 2024 AND (LIMIT-TO (SUBJAREA , "comp") OR LIMIT-TO (SUBJAREA , "soci")) AND (LIMIT-TO (DOCTYPE , "ar")) AND (LIMIT-TO (LANGUAGE , "english")) AND (LIMIT-TO (SRCTYPE , "j"))
WoS	"chatbot*" OR "digital assistant" OR "virtual assistant" OR "conversational agent" (Title) AND public OR govern* OR city OR region* OR state OR administrat* (Topic) and Political Science or Public Administration or Computer Science Artificial Intelligence or Computer Science Information Systems or Information Science Library Science (Web of Science Categories) and 2023 or 2022 or 2021 or 2020 or 2019 or 2018 or 2017 or 2016 or 2015 or 2014 or 2011 or 2010 or 2009 or 2007 or 2006 or 2005 or 2004 or 2003 or 2002 (Publication Years) and English (Languages) and Article or Book Chapters (Document Types) and Article (Document Types) and Early Access or Proceeding Paper or Book Chapters (Exclude – Document Types) and Article (Document Types)
ScienceDirect	Year: 1999-2023 Title, abstract, keywords: "public" OR "government" OR "governance" OR "city" OR "region" OR "state" OR "administration" OR "administrative" OR "policy" Title: "chatbot" OR "chatbots" OR "virtual assistant" OR "virtual agent" OR "conversational assistant" OR "conversational agent" OR "digital assistant" Research articles Computer science Social science

The initial search took place in May 2024 and retrieved a total of 2093 studies. Subsequent application of the filters identified in Table 1 limited the screening process to 393 studies. As shown in Figure 1, 81 duplicate studies were excluded, resulting in 312 valid articles for title, abstract and keywords screening. The reason that such many articles reached the screening phase is because a high percentage of the studies that addressed the introduction of chatbots did not specify in which sector they were taking place (i.e. it is not specified whether the hospital in which a chatbot is being tested is public or private). As indicated in the next section, most of these articles relate to computer science. We made a final assessment of each article with these characteristics, addressing the inclusion and exclusion criteria outlined below.

2.3. Step 3: Study Relevance and Quality Assessment

A series of inclusion and exclusion criteria were formulated. Previous SLRs on chatbots in the public sector (i.e. Senadheera et al., 2024) included AI studies which focus is not placed mainly on chatbot

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technology. That strategy could be problematic as it might considerably increase the number of studies for review without a clear impact on the research results (i.e., including articles that discuss multiple AI technologies adoption in the public sector that do not focus essentially on chatbot application). Therefore, we designed the following inclusion and exclusion criteria for the title, abstract and keywords screening of the 312 studies. Due to the lack of contextualization of many of these studies, scope or sector in which the chatbot was being applied, we also screened the text if required:

1) The study focuses specifically on chatbot technology, as reflected in the research questions, purposes, and results. Studies that discuss AI in general but do not focus on chatbots were excluded, as were studies addressing other types of conversational technologies, such as personal digital assistants (PDAs).

2) The adoption, implementation or development of the chatbot takes place in a public domain or, at least, to address an identified public need or achieve a certain social benefit. The literature reviewed includes not only chatbots development by public organizations but also those designed for use in public settings, such as testing a conversational agent in a public hospital and for public health purposes, in example. Articles that do not focus on chatbot development, adoption or implementation in the public domain, neither emphasize a public benefit nor do not highlight the central role of the public sector were excluded.

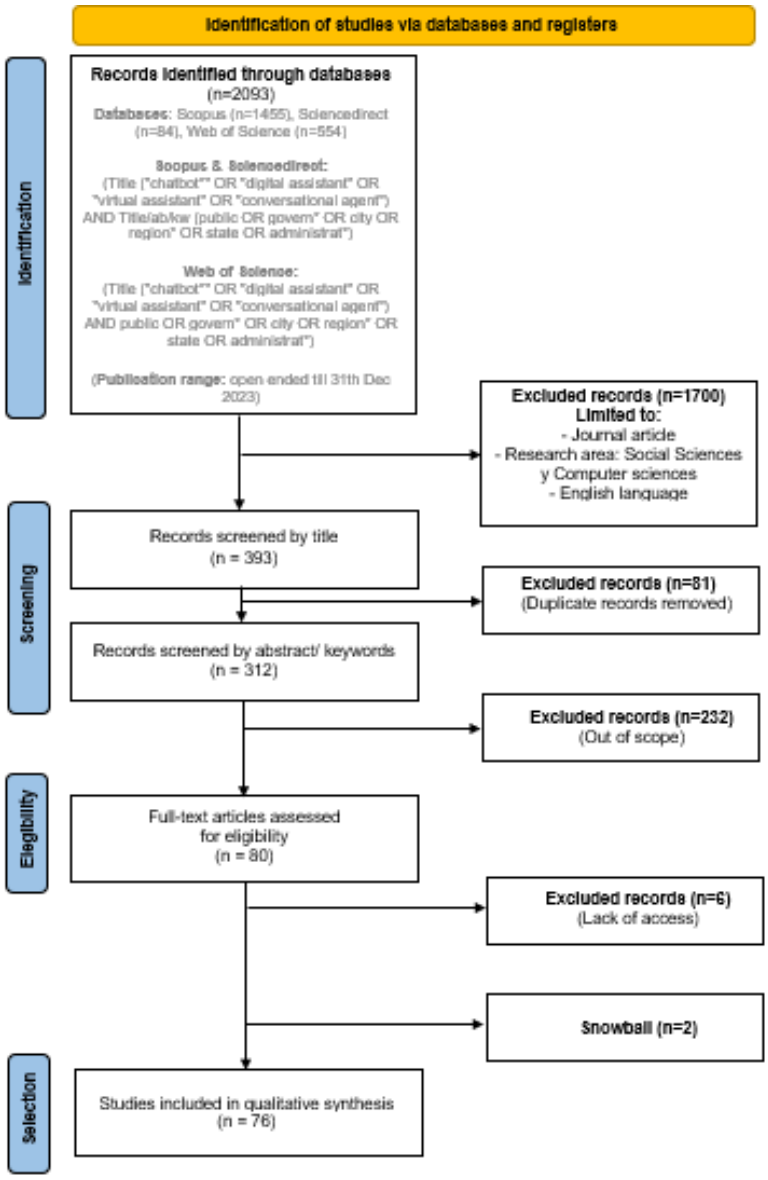
3) Studies that focused on chatbot development, adoption and implementation across different government layers are included. Studies were excluded if the overall context and purpose of their adoption refer to the private sector realm.

4) Both empirical and non-empirical articles are included due to the potential for diversity of contributions. Articles that, regardless of their approach, do not provide enough quality information about the data or the techniques applied in the study, are excluded.

After the eligibility process, the sample selection consisted of 80 studies that directly address the application of chatbots in the context of the public sector. We excluded 6 articles to which we did not have access. During this final step, we decided to conduct a snowball process attending to the bibliography of the reviewed research and we found two more articles that met previous criteria. Hence, the final sample selection consists of 76 journal articles. In Figure 1 we attached the PRISMA flow diagram that consists in the four steps addressed in this section: i) identification, ii) screening, iii) eligibility, and iv) selection. To the best of our knowledge, our study considers the greatest number of research papers on chatbot application in the context of the public sector.

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Figure 1: PRISMA flow diagram



2.4. Step 4: Data Extraction

The entire management process of the identified records was carried out using Zotero software. After finalizing the selection of 76 studies, we extracted metadata (see Table 2) related to them through a spreadsheet format according to two broad dimensions: a) descriptive overview of the reviewed studies, and b) trends on chatbot conceptualization, regarding both theoretical notions (terminology, definitions and typologies) and empirical practices (adoption arrangements, social design and embeddedness phase). Previous evidence in socio-technical approaches and their key dimensions in the field of AI and public administration support the adoption of this analytical approach (Tangi et al., 2025; Tsarouhas and Grigoriadis, 2025) which allows for subsequent engagement with timely debates in the field. Metadata related to the first dimension address the most relevant characteristics of the research literature reviewed, such as the context of the public sector across geographic, organizational, and policy implementation levels. By its part, the second

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dimension relates to the chatbot conceptualization metadata, which has been interpreted and used to describe these communication devices under a socio-technical approach.

Table 2: Extraction materials

Categories	Explanation
Basic information	For each journal, we gathered information on its name, disciplinary area, rank, and indexation. For each article, we documented the author(s), year of publication, and title.
Research strategies	For the methodological section of the empirical articles, we extracted information regarding the empirical nature of the study, then the methods employed and the techniques of analysis used.
Geographical context	The geographic context was determined based on the selected chatbot case analysis and/or proposal of each article
Policy field	The specific policy field of the chatbots addressed in the reviewed studies was classified as health, education, mobility, immigration, economy, administrative procedures, politics, journalism, safety, culture and leisure.
Terminology	Building upon the variety of terminologies and synonyms used to denote "chatbots," such as virtual assistant or conversational agent, we extracted and coded article titles to examine how this concept is labelled.
Definition	We identified from the introduction and the theoretical sections of each article the definition of chatbot and extracted its main shared and differentiating features.
Typology	All included articles were examined, and original typologies of chatbots proposed in the literature were identified and extracted.
Adoption arrangements	Each article was analyzed to capture key patterns in how chatbot development is approached in the reviewed studies.
Social Design	Reading the full text allowed us to identify recurring design topics (e.g., anthropomorphism) and related implications.
Embeddedness phase	We identified and classified the chatbots addressed by the surveyed articles according to three main stages of implementation: conceptual, prototype and institutional.
Dark side	We located and summarized the main challenges and risks associated with chatbot adoption.

2.5. Step 5: Data Synthesis

Data synthesis process aims to gather, compile and analyze all the metadata extracted in the previous step, while following the structure of the two dimensions outlined by our analytical

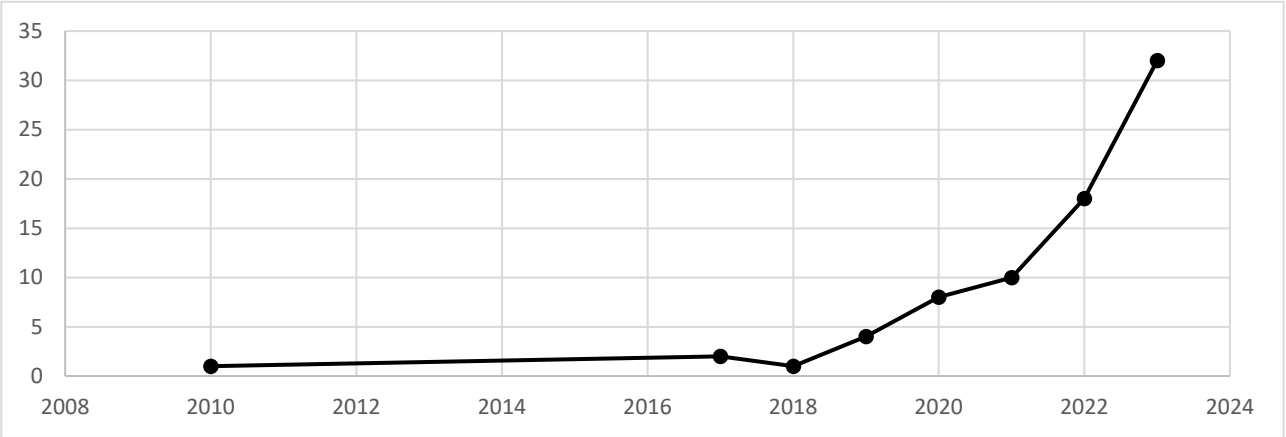
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framework. The aim of this whole previous process was to ensure a systematic and replicable approach to offer an interpretation of the results aligned with the study's objectives. This suggests that variations in synthesis, analysis and interpretation may arise depending on the specific focus of each research project. According to Kitchenham (2004), there are different ways of synthesizing the data of a SLR. In this study, we decided to elaborate a descriptive synthesis due to the novelty of the research topic and the exploratory character of our research questions and objectives. Nevertheless, in the discussion section we offer deeper insights on how our findings are interconnected and engage with wider and contemporary debates in the public administration literature.The final results of the analysis are presented in the next section of the study.

3. Overview of Selected Studies

Although chatbots are not a recent technology, year of publication shows a novel trend of its utilization in the context of the public sector. More specifically, Figure 2 shows a relevant growth in the number of publications from the 2018 to 2023 period. This process is even higher from 2021 with the publication of 10 articles until 2023, when the number of published studies reaches 32. It is noteworthy that, according to our sample, the first article published was in 2010, with a certain gap in the following years until 2017. This indicates that research on chatbots in the context of the public sector is a timely and relevant topic which increasing interest coincide with the launch and popularization of commercial chatbots within the post-pandemmic scenario.

Figure 2: Year of publication



The 76 articles included in the SLR were published across 55 peer-reviewed academic journals (view Table 3). Eleven of these journals have published at least two articles, while there are 44 outlets with one single article on the topic. Likewise, the variety of areas covered by the publication list is substantive. Those with a major number of research articles published are related to public policy and administration (i.e. Government Information Quarterly), health (i.e. JMIR Human Factors, Digital Health), and computer science areas (i.e. International Journal of Human-Computer Interaction, Applied Sciences). Among the public policy and administration related journals in which the reviewed articles were published, the following were identified: Government Information Quarterly (5), Public Management Review (1), Public Money and Management (1), and The American Review

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of Public Administration (1). Although these publications reflect a strong multidisciplinary orientation, the dispersion across journals combined with the prevalence of Computer and Information Science outlets highlights the need for deeper engagement with Social Science approaches and debates.

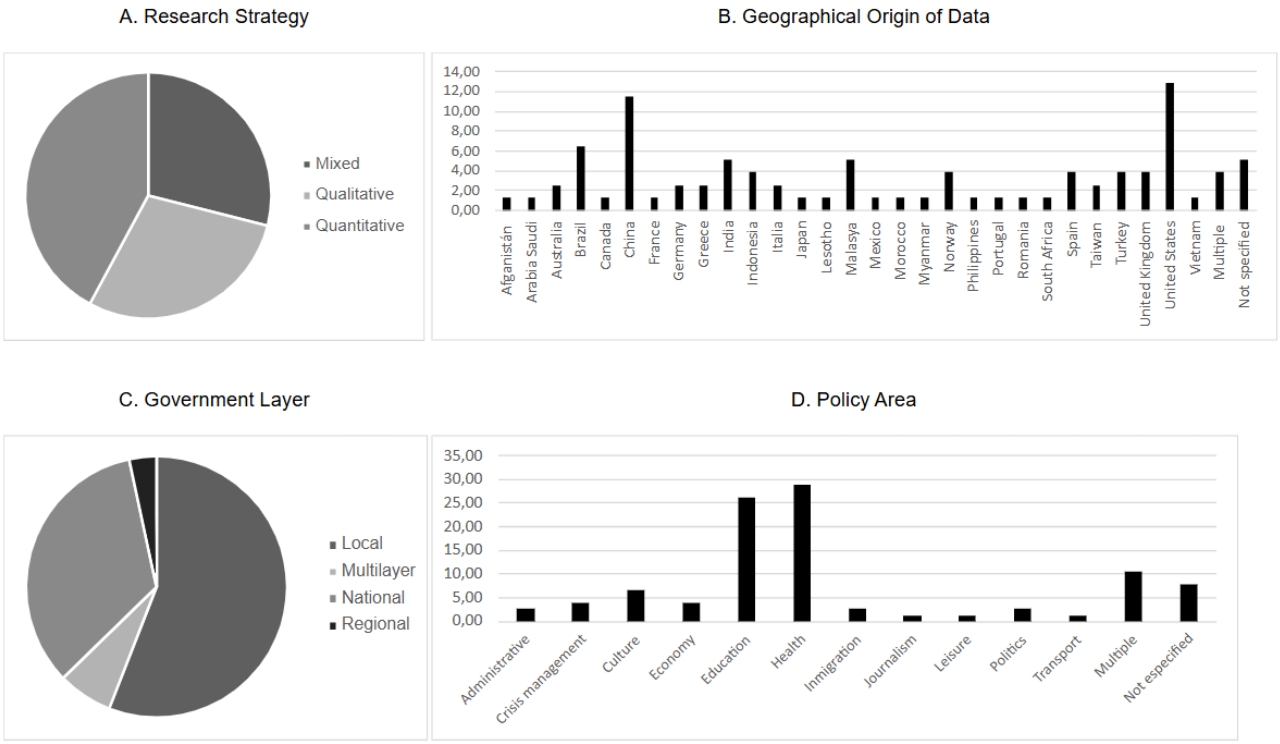
Table 3: List of academic journals

Journal	**Nº studies**
Government Information Quarterly	5
JMIR Human Factors	5
Applied Sciences	3
International Journal of Emerging Technologies in Learning	3
International Journal of Human–Computer Interaction	3
Sustainability	3
Digital Health	2
Education and Information Technologies	2
International Journal of Advanced Computer Science and Applications	2
International Journal of Medical Informatics	2
Social Science Computer Review	2
Others (44 journals-with one article each)	1

Reflecting the notable diversity of chatbot insights in the public sector, Figure 3 summarizes the main research and methodological characteristics of the reviewed articles. Panel A shows that among these studies, those employing quantitative (42.11%) and qualitative (28.95%) research strategies are predominant. A total of 28.95% of the surveyed articles developed a mixed research strategy, regarding the use of multiple qualitative and/or quantitative methods. Quantitative studies often emphasize design science techniques, where chatbots are developed in public service delivery scenarios and evaluated through surveys, questionnaires, and computer-based performance metrics. For studies employing a qualitative strategy, the predominant methods include semi-structured interviews, focus groups, and literature reviews. Nevertheless, the variety of research strategies and techniques in social science remains underexploited. Furthermore, triangulation of data sources and the utilization of multiple methods may reinforce scholarly insights while offering relevant contributions to both research and practice within the field.

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Figure 3: Research characteristics of studies



The geographical distribution of the reviewed studies reveals a certain predominance of Western contexts over Eastern ones, with a particularly strong representation of Europe and North America, and the exception of China. More specifically, according to Panel B, many studies are conducted in the context of the United States (12.82%) and China (11.54%), as leading countries in governmental technology adoption. We also find a greater dispersion in the rest of the countries, highlighting among them Malaysia (5.13%), Norway (3.85%), Spain (3.85%), and those that adopted an international approach (3.85%), for example, addressing the European context (Machidon et al., 2020; Maragno et al., 2023). Looking ahead, as European governments expand their AI strategies and citizen-facing digital services, a growing number of studies can be expected to emerge from this context, with a stronger focus on governance, accountability, public value and cross-country comparative trends.

According to the reviewed literature, chatbots are developed, adopted and implemented across multiple government layers. Interestingly, Panel C shows that most of the studies cover the local level of government (43.42%) such as municipalities or councils related competencies. This is due to the large amount of empirical research that takes place in the environment of a specific local organization such as a public hospital or university. To a lesser extent, the chatbots analyzed in the literature have a national (26.32%), regional (2.63%) or mixed scope (5.26%). It is worth noting the existence of articles that, despite their empirical nature, do not identify the government layer neither the specific organization in which it's developed. However, given that the chatbots examined in the reviewed literature mainly aim to support public service delivery, it is consistent that research has focused more on the local level, where service provision is closer to citizens. In contrast, chatbots

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analyzed at higher levels of government tend to respond not only to citizen-oriented uses, but also to internal applications involving public servants.

The SLR findings highlight a wide range of policy areas where chatbots have been applied. It is not a coincidence that several studies are located at the local level while the predominant government domains (Panel D) refer to education (26.32%) and health (28.95%). As noted above, many studies analyze the application of chatbots in specific educational or healthcare institutions. The contrast with other policy areas where the provision of information could be very useful, for example, in transportation (1.32%) or general administrative procedures assistance (2.63%), is noteworthy. Chatbots that provide information on further topics have also been analyzed, and the connection between these conversational agents and the provision of information in crisis management scenarios (3.95%) is an emergent and prominent application (Boné et al., 2020; Stieglitz et al., 2022; Tsai et al., 2021). These results point to a widespread need to address the growing pressure on welfare states, particularly in highly demanded public services such as healthcare and education, where citizen demands and service needs are especially concentrated.

4. Core Dimensions of Chatbot Conceptualization in the Public Sector

4.1. Theoretical Notions: Framing Chatbot Terminology, Definitions and Typologies

To assess how chatbots are theoretically conceptualized in the literature, we begin by analysing the terminology employed by scholars in article titles and keywords. As showed in Table 4, the predominant terminology refers to "chatbot" (80.26%). while only 9.21% of studies refer to "conversational agent" and 7.89% to "virtual assistant". The limited use of the term "digital assistant" (2.63%) may stem from attempts to avoid conceptual ambiguity with the notion of "personal digital assistants". This suggests an academic consensus on using the term "chatbot" for referring to these devices within the public sector context. In addition, it should be noted that the term "chatbot" is itself an Anglicism. In this sense, its widespread nomination may be driven, on the one hand, by the public sector's intention to project innovation and technological modernization across countries, and on the other, by its usefulness as a transferable label across different linguistic and administrative contexts, facilitating diffusion and broader uptake. Nevertheless, equivalent terminology adapted to each country's language may also be employed.

Table 4: Main terminology employed in the reviewed studies

Terminology	**Percentage (%)**
Chatbot	80.26
Conversational Agent	9.21
Virtual Assistant	7.89
Digital Assistant	2.63

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There exists a certain consensus on the terminology employed, but there is no such alignment on how chatbots are described in the examined literature. In most surveyed articles, chatbots are generally defined as software applications designed for human interactions, carrying natural language conversations by text or voice-based dialogue. Delving into this technological approach, differences arise when specifying if chatbots use AI or not. There is a research trend that defines chatbots as AI machines (Malik et al., 2021; Haristiani et al., 2022; Santos et al., 2022; Wang et al., 2022b; Zhu, Wang, et al., 2022; Alqahtani and Alrwais, 2023; Fadili, 2023; Vassilakopoulou et al., 2023) that use AI technologies such as NLP (Annamalai et al., 2023a; Aoki, 2020; Deveci Topal et al., 2021; Makasi et al., 2021; Mendoza et al., 2022; Stieglitz et al., 2022; Wang et al., 2022b;) or ML (Følstad and Bjerkreim-Hanssen, 2023; Wang et al., 2022b). From an organizational perspective, it is notable that some definitions emphasize the role of chatbots within government agencies as devices providing digital services to citizens (G2C) (Cortés-Cediel et al., 2023; Ju et al., 2023; van Toorn, 2024). Nevertheless, this framing of chatbots as citizen-facing public service tools is expanded in other studies, in which chatbots are envisioned as assistants for public employees' utilization (G2G), enabling further forms of support in public service delivery.

As a consequence of the variety of definitions presented in the reviewed studies, a wide range of chatbot typologies has been identified, which reflect both technological and social properties. Although there are numerous chatbot classifications in the articles reviewed, we have selected those we consider most significant, as they offer original frameworks that, in many cases, serve as a foundation for subsequent studies. In this line, five studies have proposed novel classifications, each framed within different contexts and aimed at specific research objectives (see Table 5). A first typology refers to the medium of communication between the chatbot and the user, regarding voice or text-based interactions (Nirala et al., 2022). Also, Nirala et al. (2022) points to the technologies employed in its design and distinguished between linguistic chatbots, which are algorithm and rule-based, and AI-chatbots, that employ AI technologies such as ML or NLP. By its part, Makasi et al. (2021) addressed the information management and the chatbot database, pointing to personalized conversations when advanced chatbot has the capacity of processing user personal data. Hadfi et al. (2021) classification relates to the level of the proactivity of the chatbot and its goal-oriented interaction. Finally, Makasi et al. (2020) connects technical characteristics of chatbots to their ability for generating different types of public service value. This may reflect an overemphasis on classifications based on the technological characteristics of these systems, with a notable lack of studies developing typologies tailored to social or public sector performance dimensions.

Table 5: Typologies of chatbots in the public sector

Typology	Focus	Reference
Voice and text	Interaction modality	(Nirala et al., 2022)
Linguistic (rule-based) chatbots and AI-Chatbots	Language processing	(Nirala et al., 2022)
Basic and advanced	Data analysis	(Makasi et al., 2021)

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Conversational agent and Proactive agent	Goal oriented	(Hadfi et al., 2021)
Information provisioning, Targeted assistance and Service negotiation	Public service delivery	(Makasi et al., 2020)

4.2. Unpacking Empirical Practices: Adoption Arrangements, Social Design and Organizational Embeddedness

Drawing exclusively on the subset of empirical studies, a qualitative analysis reveals four dominant trends in how chatbots are developed and operationalized across institutional contexts. In particular, Table 6 synthesizes the relationship between chatbot development and implementation by mapping the respective roles of public and private sector actors while reflecting diverse governance arrangements and evolving patterns of public–private collaboration, which is an increasingly salient dimension in AI research and practice. The matrix, highlights distinct configurations of sectorial involvement. A first application avenue involves chatbots developed and implemented within the public sector, often through inter-institutional collaboration (Maragno et al., 2022). A second configuration refers to chatbots developed by private actors and deployed in public sector contexts, typically through outsourcing arrangements (Følstad and Bjerkreim-Hanssen, 2023). While no cases were identified in which public sector-developed chatbots are implemented in the private sector, some studies report the use of publicly available institutional data to support chatbot functionalities (Sperlí, 2021). Finally, a fourth avenue concerns the adoption of privately developed and implemented chatbots within public sector settings, as illustrated by the use of Duolingo in public educational institutions (Annamalai et al., 2023).

Table 6: Matrix of chatbot development and implementation across sectors

		Sector in charge of the chatbot development	
		Public sector	Private sector
Sector in which the chatbot is implemented	Public sector	A chatbot developed BY the public sector and implemented IN the public sector	A chatbot developed BY the private sector and implemented IN the public sector
	Private sector	A chatbot developed BY the public sector and implemented IN the private sector	A chatbot developed BY the private sector and implemented IN the private sector

Beyond implementation arrangements, the chatbots addressed in the selected studies also exhibit systematic design patterns related to anthropomorphic representation. Given that not all systems

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provide a visible interface and direct access to each chatbot was not always possible, the analysis focused on observable proxies of anthropomorphism, particularly naming conventions as a primary design indicator. Specifically, two dominant patterns were identified: (i) the use of human names, and (ii) the adoption of ad hoc labels, such as names derived from the hosting institution or the public service in which the chatbot is embedded, as well as more generic, robotic-inspired denominations. The results showed that 61.43% of the referenced conversational agents exhibit ad hoc or neutral names (see Table 7). In addition, we also notice a considerable utilization of female names, voice or iconography in chatbot anthropomorphism, which is the case of 38.57% analyzed chatbots. We did not recognize reviewed chatbots with male name. This observation led us to induce a strong gender bias in the design patterns of chatbots applied in the public sector, in line with other dimensions of AI development (Guevara-Gomez et al., 2021), in which assistance and service tasks are assimilated to female roles.

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Table 7: Anthropomorphic design features and gender attribution of chatbots reported in the reviewed literature

Gender	Name	Percentage (%)	References
Female	Alex, Amazon Alexa, Amelia, Ana, Andy, Anna, Apple Siri, AsasaraBot, bot-Maria, CulturalERICA, EMMA, Emma the MPL Catbot, Evatalk, Gabby, Google Assistant, Jingjing, Kara, Mandi, MedPlantBot, Microsoft Cortana, Nadia, Real-time Intelligent Transport Assistant (RITA), Replika, Sandi, TeleCOVID or ANA, Vira, Yukti	38,57	(Annamalai et al., 2023; Çakmak, 2022; Chagas et al., 2023; Chagas et al. 2021; Duguleană et al., 2020; Ju et al., 2023; Machidon et al., 2020; Mageira et al., 2022; Makasi et al., 2020; Montenegro et al., 2023; Nkabane-Nkholongo et al., 2023; Ojeda 2021; Santos et al., 2022; Vera and Palaoag 2023; Verne et al., 2022; Vincze, 2017; Weeks et al., 2023; Yadav et al., 2019)
Neutral	Babylon GP at hand, BBC Uzbek Bot, Bing Chat, Buoy Health, Chatbot4Heritage, CoronaAI, DisBot, Duolingo, EU Ref Bot 2016, Gengobot, Government waiter, Gramabot, HarborBot, Hawkeye Fact-Checking, Healthily, Hound, Infinity®, Kamu, Kibot, KommuneKari, LOGOBOT, Memrise, Minfin, Mondly, MTR Mobile chatbot, Multiple, Mundo Bot, Mycroft, Newsbot, Patrek, Quiz Bot, Rammas, Taylor, TravelBot, UK Election Bot 2015, UK Election Bot 2017, US Election Bot 2016, Verobot, Vwise, Xiao Bing BabyQ, Xiaolv, XiaoNan, Zuoshouyisheng	61,43	(Abonizio et al., 2023; Androutsopoulou et al., 2019; Annamalai et al., 2023; Baglivo et al., 2023; Boné et al., 2020; Cortés-Cediel et al., 2023; Fadili, 2023; Følstad and Bjerkreim-Hanssen, 2023; Haristiani et al., 2022; Jones and Jones, 2019; Ju et al., 2023; Khariset al., 2022; Langevin et al., 2023; Lister et al., 2021; Liu et al., 2022; Makasi et al., 2020; Nguyen, 2022; Ojeda 2021; Plau et al., 2019; Powell et al., 2023; Shan et al., 2022; Sperlí 2021; Xu, 2018; Zhao et al., 2023; Zhu et al., 2022a)

Finally, the analysis reveals that chatbots documented in the literature exhibit distinct levels of organizational embeddedness. Table 8 addresses this idea while identifying three different stages of technological maturity and institutional adoption. Accordingly, most of the analyzed chatbots in the reviewed literature relate to the prototype level (37.66%). In this stage, there is a trend toward developing a chatbot pilot through design science approaches, which is tested in a public service delivery scenario with potential users under technology acceptance models. On the other hand, 31.17%

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of the articles examine fully deployed chatbots that have been institutionalized within the public sector or, if developed by the private sector, are applied in public sector contexts, as noted above. There are also 7.79% of studies that addressed conceptual chatbots, in which software development and/or management framework is proposed, while a technical performance assessment is conducted. These results point to the existence of a research trend towards chatbot prototyping, highlighting a progressive shift from pilot phases to more institutionalized devices across various contexts. The findings are also consistent given the recent stage of implementation of these technologies in the public sector and the increasing need to understand socio-technical functioning issues before achieving its final institutionalization.

Table 8: Maturity level of chatbots reported in the reviewed literature

Level of embeddedness	**Percentage (%)**
Conceptual	7.79
Prototype	37.66
Institutional	31.17
Not specified	23.38

4.3. The dark side of chatbots. Risk and Challenges of adoption

Table 9 synthesizes the principal risks and challenges associated with chatbot adoption identified in the surveyed studies. The largest dimension is Response Quality and Interaction (1), with response accuracy and relevance emerging as the most frequently reported topic. The literature consistently shows that chatbot performance is often constrained by the inability to provide precise, complete and contextually relevant information. Several empirical studies report inaccurate or incomplete answers, hallucinated content, poor understanding of users' intentions and a lack of domain-specific knowledge (Baglivo et al., 2023; Duguleană et al., 2020; Maragno et al., 2023; Montenegro et al., 2023; Zhao et al., 2023). These shortcomings are particularly problematic in the public sector, where users expect reliable information and where erroneous responses may affect administrative procedures or citizens' rights. Likewise, interaction mechanics represents another recurrent challenge, encompassing rigid conversational structures, delayed or excessively rapid responses, difficulties maintaining coherent dialogues and failures to support natural interactions (Alonso-Mencía et al., 2023; Deveci Topal et al., 2021; Yadav et al., 2019).

Table 9: Challenges associated with chatbot adoption

Category	Sub-category	N
Response Quality and Interaction	Response accuracy and relevance	18
	Interaction mechanics	5
User Readiness and Access	Familiarity gaps	7
	Literacy	6
	Language and bureaucratic register	5

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	Availability and accessibility	3
Affective and Relational Trust	User affective response	7
	Trust perceptions	2
	Anthropomorphic iconography	1
Technical and System Capability	Algorithmic limitations	5
	Model training dynamics	3
	Interoperability constraints	2
Organizational capacity	Lack of skills	3
	Workload increase	2
	Unrealistic expectations	1
	Environmental engagement	1
	Financial sustainability	1
Ethics	Security concerns	1
	Censorship	1
	Privacy	1

The second most prominent dimension, User Readiness and Access (2), highlights the existence of challenges related to the citizens' ability to engage effectively with chatbots. Familiarity gaps reveal that older adults, first-time users and visually impaired citizens frequently face difficulties understanding chatbot functionalities or formulating effective requests (Gbollie et al., 2023; Moldt et al., 2023). Likewise, user literacy emphasizes that limited digital competencies constrain the effective use of chatbots (Mendoza et al., 2022; Plau et al., 2019). Language and bureaucratic register further illustrate that many chatbots struggle to operate in multilingual contexts or continue to reproduce complex administrative language, making communication less accessible and more difficult for diverse groups of users (Maragno et al., 2023; Nkabane-Nkholongo et al., 2023; Wang et al., 2022). In addition, availability and accessibility indicate that technological inequalities, including limited smartphone ownership, connectivity constraints and inaccessible interfaces, continue to restrict the use of chatbot services among vulnerable populations (Chagas et al., 2023; Nkabane-Nkholongo et al., 2023). Complementing these findings, there stands the Affective and Relational Trust dimension (3). Negative user emotions include feelings of frustration, anxiety, discomfort and dissatisfaction resulting from impersonal interactions or unsuccessful conversations (Annamalai et al., 2023; Asquer and Krachkovskaya, 2022; Çakmak, 2022; Montenegro et al., 2023; Powell et al., 2023). Similarly, trust perceptions reveal that citizens remain reluctant to rely on chatbot recommendations, particularly when interacting with sensitive public services, whereas anthropomorphic iconography suggests that certain visual representation of chatbots shape users' engagement and perceived trustworthiness (Aoki, 2020; Zhao et al., 2023).

Within Technical and System Capability (4), algorithmic limitations refer to the inability of basic conversational models to process complex requests, maintain contextual awareness or provide sophisticated interactions. These limitations are reinforced by model training dynamics, where insufficient or poor-quality training data reduce chatbot performance, and by interoperability constraints, reflecting the persistent difficulties of integrating chatbot solutions with existing governmental information systems (Maragno et al., 2023; Moldt et al., 2023; Rubin et al., 2010; Tsai et al., 2021; Zhu et al., 2022). Organizational Capacity (5) further highlights that implementation challenges extend

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beyond technology. Lack of skills reflects shortages of technical expertise required to design, implement and maintain chatbot solutions, while workload increase indicates that chatbot deployment may unexpectedly intensify employees' responsibilities rather than reduce them. Additional shortcomings include unrealistic expectations, environmental engagement and financial sustainability, emphasizing that organizational commitment, institutional readiness and long-term investment are essential for successful implementation (Chen et al., 2024; Plau et al., 2019; Wang et al., 2022). Finally, Ethics (6) connects with security concerns, censorship and privacy (Chen et al., 2021; Xu, 2018; Yadav et al., 2019). Protecting citizens' personal data, ensuring secure interactions and preventing inappropriate or biased outputs are fundamental. Accordingly, in the next section we take stock from these findings and delve into the socio-technical implications for research and practice.

5. Synthesis and Discussion. New Avenues on the Study of Chatbots in the Public Sector

5.1. The Chatbot as a Socio-Technical Artifact Beyond Technological Determinism

Throughout this study, chatbots have been conceptualized not merely as technological devices, but as organizational assets embedded within the functioning of public sector organizations. This dual perspective has been developed through a systematic examination of both the theoretical foundations of chatbot research and the empirical evidence provided by 76 reviewed studies. When integrating these two strands, a clear imbalance becomes evident: the field remains predominantly shaped by a technology-centred framing of chatbots. This dominance can be partly attributed to the early stage of adoption of these devices, where research and practice are primarily driven by concerns over accurate technical development, often at the expense of a deeper understanding of organizational embedding and institutional transformation within public administrations.

This prevailing bias underscores the urgent need to move beyond siloed perspectives and to actively promote the articulation between technological and social systems in public sector chatbot research. This alignment is captured by the concept of imbrication, understood as the recursive intertwining of human and material agency in organizational life (Leonardi, 2011). Effective imbrication constitutes a precondition for the successful integration of chatbots and related AI devices into public organizations (Tangi et al., 2025; Tsarouhas and Grigoriadis, 2025). Failure to achieve this alignment risks generating not only technical inefficiencies but also broader organizational disruptions and unintended governance consequences (Bostrom and Heinen, 1977a; Bostrom and Heinen, 1977b). Attending to this fracture landscape, the following remarks critically discusses the findings of the study by engaging with key debates in AI literature, explicitly aiming to connect technological and organizational logics in the analysis of public sector chatbots.

5.2. Institutional Embeddedness and the Gap Between Promise, Practice and Research

Data and infrastructure constitute crucial elements of chatbot materiality. Results showed that a great part of the previous analyses has been performed addressing chatbots that are not yet in fully

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operation with clear technological shortcomings, while a minority of the chatbots examined are embedded in the public sector. Since this may suggest some dealignment between a growing literature in the field and the still emergent level of adoption and use in real public administration settings, relevant insights regarding their technical characteristics should be derived. Data governance and the overall chatbot infrastructure arises as a key technological characteristics of the IT system dimension. It involves the capability of the public agency for connecting the organization databases and systems already in use to the chatbot (Stieglitz et al., 2022), the availability of a cloud computing instance or other computer that is configured to accept incoming data (Lia et al., 2023) and easier integration into existing networks (Plau et al., 2019). By its part, algorithms and dialog models could be training making use of open domain corpora but attention to dialog safety should be taking into account (Chen et al., 2021). The accuracy of this area is key for avoiding the emergence of the so-called "hallucinations" (Baglivo et al., 2023). Among these lines, future research should focus on data governance issues when chatbots are integrated in public administrations while identifying the key factors that explain the successful progression from one stage of development to another, especially when technological maturity in e-government services relates to perceptions of citizen legitimacy of the public sector (Jansson and Erlingsson, 2014).

5.3. Rationalizing Workflows for Better Algorithmic Synergy

The results of the study are in line with previous work and indicates great efforts in analyzing the implementation of chatbots at the local government layer (Senadheera et al., 2025) while mainly focused in administrative, health and education policy areas. According to the reviewed literature, one of the main reasons why public administrations adopt chatbots is to reduce the workload of public employees so that they can focus on higher priority tasks (Maragno et al., 2023; Moldt et al., 2023; Santos et al., 2022; Wang et al., 2022b). This highlights the need to identify and rationalize which specific tasks will be carried out by the chatbot and which will be reassigned to the group of displaced public servants (Tangi et al., 2025). This is important given that public employees' perceptions can impact their well-being as awareness of being replaced by these technologies can lead to a lack of trust and job insecurity (Brougham and Haar, 2018) and, even when this does not occur, it may generate stress and burnout due to an unforeseen increase in administrative burdens and workload (Chen et al., 2024; Chen and Gasco-Hernandez, 2025; Plau et al., 2019). Furthermore, task structures do not merely shift but also expand, as public agencies assume new responsibilities closely associated with chatbot maintenance, data creation and curation, as well as system training (Maragno et al., 2023; Tsai et al., 2021; Zhu et al., 2022). In this regard, future research should examine which tasks chatbots begin to perform, the updated tasks of displaced public employees, the new responsibilities in terms of technical maintenance, and how all these aspects vary depending on chatbot typologies and the policy areas in which they are applied.

5.4. The Public-Private Entanglement as a Critical Tension

A significant tension in chatbot structure and governance is the heavy reliance on the private sector for development and hosting. A great part of the reviewed studies rely on chatbots deployed by the private sector that are consequently implemented or applied in the public sector. This entanglement creates a risk of "algorithmic digital cages" (Nouws et al., 2022) in which algorithms can exert control

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over public servants. Specifically, in a scenario where chatbot deployment and management are outsourced, private sector code could dictate public sector interactions and negatively impact citizen perceptions of legitimacy, efficacy, trust, and other related public values (Dunleavy, 2006). From a structural standpoint, many administrations lack the in-house expertise (e.g., data scientists and AI auditors) to manage these systems independently, leading to a loss of technological sovereignty (Maragno et al., 2023). This dependence can hinder the alignment of the technology with the organizational mission, especially if the "black box" is controlled by external entities. Consequently, future research could usefully examine the decision-making frameworks employed by public administrations when selecting private vendors for chatbot development, as well as analyze issues such as data ownership and the degree of public sector control over privately developed solutions.

5.5. Chatbot Social Design and the Transformation of Administrative Culture

The design of chatbots frequently incorporates anthropomorphic cues, which, while intended to enhance user trust and engagement, may simultaneously reproduce underlying design biases. Evidence shows a strong inclination toward female names and iconography reinforcing stereotypes that associate assistance and service roles with women, as stated in previous research in the field (Guevara-Gomez et al., 2021). Also, the utilization of ad hoc chatbot personification (robotic name, voice and iconography) entails a risk of dehumanizing the public service (Duguleană et al., 2020; Kraemer and Danzinger, 1984), especially when mismatches between citizen input and chatbot outputs employing a bureaucratic language take place (Chagas et al., 2023; Maragno et al., 2023). Additionally, relying on previous literature on technology frames (Criado and de Zarate-Alcarazo, 2022; Orlikowski and Gash, 1994) perceptions of public servants are key for understanding more than the technological artifact design. In the case of chatbots, factors such as the organizational culture and mindset (Maragno et al., 2023) and the openness of public employees to adopt new technologies (Chen et al., 2024; Duguleană et al., 2020), as well as the digital literacy of the public agency (Mendoza et al., 2022; Wang et al., 2022b) helps to create a culture of acceptance. In this line, future research could explore how chatbots may contribute to the dehumanization of administrative processes and reshape bureaucratic culture, with particular attention to public employees' perceptions and attitudes toward these technologies across different contexts.

6. Conclusion

The study of chatbots in the public sector is still in its early stages. Our interest in this type of technological devices emerges from the fact that they have become one of the most adopted and used AI-related tools in public organizations all over the world. At the same time, we need to take stock from the actual literature in the field. First, we aimed to answer what are the key research trends in the existing literature on chatbots within the context of the public sector? Our overview of the studies showed an increasing scholarly attention toward analyzing these devices within the local layer of government addressing health and education-related services. Second, we also aimed at answering what are the core socio-technical dimensions of chatbots in the public sector? To this aim, we conceptualized the theoretical aspects of previous literature, identifying different visions on how chatbots are defined and classified. Here, technical approaches have been employed over the social

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ones. Additionally, we unpacked previous empirical findings, focusing on adoption arrangements, social design and levels of embeddedness. Finally, we have examined their dark side accounting for the main challenges that these systems pose to public sector organizations in terms of digital, social and institutional threats for legitimacy, accountability, and public value generation.

Nonetheless, this study is not without limitations. Our approach to the analysis of chatbots in the public sector is directly connected to the somewhat limited number of articles in existing literature, making our conclusions subject to future advancements in the same field. At the same time, utilization of a SLR based on peer-reviewed journal articles, written in English, and published in international databases, might put aside some additional contributions from less developed countries conducing to making less visible the situation of Global South nations, public institutions, and languages. Finally, this study debates with previous literature in the area, but fieldwork focused on the socio-technical side of these devices may shed light to dismissed aspects.

Precisely, future studies on chatbot adoption and uses in the public sector need to deepen their theoretical and analytical roots to promote comparative studies across countries and different regional areas. At the same time, we might empirically examine socio-technical entanglements in chatbot adoption across different contexts, for example, assessing to what extent they can replace human tasks in sensitive policy and service areas, including health, education, or social care, or just support humans with the most repetitive activities. Finally, as public values might be at stake in deploying AI technologies in the public sector, this can make studies on chatbots in the public sector of great interest, as we could assess the implications of their generalization in previously human-based services of citizens' attention, and how they perceive their own experience interacting with non-human devices to access public services. All in all, the next steps of chatbots adoption and use in the public sector will deserve close attention by scholars and practitioners alike.

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