



ARTIFICIAL
INTELLIGENCE
FOR
TRANSPARENT
PUBLIC
FINANCE

*THE PROMISSE
OF CHATBOTS
IN BRAZIL*

Policy question

- How can the gap between the complexity of fiscal reports and the need of the public for clear, comprehensible information be bridged?
- Can artificial intelligence provide a viable solution to the challenge of rendering complex fiscal reports more accessible to the Brazilian public?

The issue

Brazil has achieved notable success in enhancing fiscal transparency in recent years, marked by the progress in making crucial financial data publicly available through government portals. This step is pivotal, as evidence suggests that heightened fiscal transparency significantly improves budgetary efficiency. Indeed, when citizens have access to transparent, intelligible information, their capacity to comprehend governmental budgetary practices expands, fostering a more informed citizenry capable of holding public officials accountable and optimizing societal resources.

Nonetheless, achieving complete transparency remains a complex task. Despite the availability of data within the Brazilian context, the complexity inherent in these fiscal reports—often riddled with technical jargon and intricate details—renders them largely inaccessible to the layperson. Herein lies the potential of Artificial Intelligence (AI). The advent of chatbots, powered by advanced Large Language Models, heralds a transformative era in data analytics. These technologies have the capacity to translate complex financial narratives into simpler, more digestible content, accessible via user-friendly conversational interfaces.

However, the integration of this promising technology in Brazilian public administration is not without its challenges. Several critical issues persist, including: i) the reliability of chatbots in accurately interpreting and conveying sensitive fiscal data, ii) the apprehension among civil servants regarding the initiation of AI chatbot projects, attributable to gaps in technical expertise and resources, and iii) the absence of a comprehensive framework within the public sector for the sustained maintenance and refinement of these AI systems.

Addressing these challenges is imperative for enhancing fiscal transparency in Brazil. In response, this policy brief¹ presents four key recommendations to effectively navigate these complexities.

¹ This policy brief was authored by Eduardo Araujo, under the supervision of Filipe Recch, as part of the Summer Project at the Blavatnik School of Government, University of Oxford. It is based on a series of online interviews conducted from July to October 2023 with experts and representatives from specific government transparency bodies, academic institutions, and research organizations in Brazil and Europe. We wish to acknowledge the invaluable support and encouragement provided by Professor Anna Patrick, Director of the Lemann Foundation Programme, and extend our gratitude to all contributors, interviewees, and colleagues for their insights and guidance.

Key recommendations:

- **Establishing an Internal Pilot for Chatbot:** The first recommendation emphasizes the importance of initiating a chatbot project with an internal pilot. This phase serves as exploratory research to validate the chatbot's feasibility and effectiveness in enhancing fiscal transparency within a controlled environment before committing extensive public resources. It involves a recruitment process to develop a cost-effective Proof of Concept (PoC). The success of the pilot is assessed through rigorous performance evaluations, ensuring the chatbot meets predefined criteria of accuracy and cost-effectiveness before proceeding to community testing.
- **Expanding Chatbot Testing to the Community:** The second recommendation outlines the transition from an internal pilot to broader community testing, a critical progression in the chatbot implementation. This phase encourages public sector innovation by financially supporting companies during testing, governed by Brazil's "Public Contract for Innovative Solution". The process involves a public call for solutions, a streamlined selection process, and community feedback mechanisms to gauge the chatbot's performance and user satisfaction. Key considerations during this phase include data security, scalability, usability, and transparent proposal evaluation. Successful community testing is crucial for advancing to the formal procurement stage.
- **Ensuring Sustained Chatbot Operations:** The third recommendation focuses on the transition to the formal procurement and maintenance phase, essential for the chatbot's sustainable implementation. Tailored strategies are required to meet the specific needs and transparency obligations of public administrations. The procurement process, guided by Complementary Law 182/2021, demands a comprehensive approach, including risk management, continuous system improvement, broad accessibility, active promotion, and stakeholder engagement. Regular performance evaluations are crucial, guiding contract renewals and ensuring the chatbot's alignment with its primary goal of enhancing fiscal transparency.
- **Safeguarding Privacy and Ensuring Security:** The fourth recommendation addresses the critical privacy and security considerations that arise from the deployment of AI chatbots. It highlights the potential risks, including the inadvertent disclosure of sensitive information, susceptibility to cyber-attacks, and the possibility of disseminating erroneous fiscal data. To mitigate these risks, the recommendation calls for the implementation of robust protective protocols, engaging cybersecurity experts, and establishing clear operational guidelines to prevent data misuse.

Overall, the nascent state of AI chatbots in Brazil's public sector necessitates a cautious yet proactive approach. This policy brief recognises the existing challenges and advocates for a strategic adoption of third-party Large Language Models to simplify complex fiscal data for the public. The recommendations delineate a path forward, focusing on initial internal pilots, expansive community testing, and ensuring safe and sustained operations, all aimed at enhancing fiscal transparency in an accessible and understandable manner.

1. Introduction

Over the past decade, Brazil has made significant strides in expanding governmental transparency. Pivotal legislation including the Transparency Law and the Access to Information Law compelled all levels of government to establish online Transparency Portals [1,2,3]. This initiative has led to the establishment of over 11,000 such portals, propelling Brazil to the 7th position globally on the Open Budget Index [4,5]. While commendable, this proliferation of portals has yet to sufficiently translate into meaningful public engagement and accountability.

The Open Budget Survey reveals that Brazil falls short in furnishing readily understandable budget summaries to citizens [5]. Independent research confirms this deficiency, with approximately 34% of portal users reporting difficulties comprehending disclosed fiscal data [6]. User feedback further pinpoints complex language, clumsy search tools, and lack of informational support as primary obstacles [6]. It is also noteworthy that only 31% of citizens use these portals for overseeing public expenditure, suggesting comprehension may be affecting public engagement in budget monitoring [6].

Consequently, underutilisation of portals resources carries significant repercussions for governance and accountability. Extensive literature demonstrates that impenetrable fiscal data prevents citizens from fully harnessing portals for oversight [7,8]. Although portals provide exhaustive data, understandability of complex and specialised terminology in financial reports pose as a relevant barrier to public engagement [9,10].

Recent advancements in artificial intelligence, especially chatbots powered by large language models (LLMs), offer promising opportunities to dismantle these barriers by simplifying opaque fiscal terms and enabling real-time query functionality [11,12,13]. Despite the novelty of applying these technologies to public finance contexts, initial implementations in related domains highlight their potential [14,15,16].

However, thoughtfully incorporating such trailblazing solutions into the unique context of Brazil poses complex challenges. Socioeconomic disparities contribute to uneven digital literacy and access. Politically, principal-agent dilemmas imply politicians may resist transparency-enhancing tools [17]. Competing legal and compliance demands on public administration further complicate matters [18]. Moreover, cultural tendencies to delegate fiscal oversight to specialized entities persist.

Recognising these intricacies, this study explores AI-powered chatbots as instrumental avenues for elevating fiscal transparency and reinvigorating public engagement within Brazilian governance. It examines alternative complementary policy options and concludes with tailored recommendations designed to overcome contextual barriers. Ultimately, this policy brief advocates for judiciously leveraging AI's possibilities to actualize the vision of participatory democracy in the realm of public fiscal management in Brazil.

2. Evidenced-based benefits of Fiscal Transparency

Fiscal transparency is generally defined as the public availability and dissemination of information about government budgets and fiscal activities [19]. Advocates argue fiscal transparency offers several key advantages, including preventing corruption [20], maintaining fiscal discipline [21], improving financial performance [22], and promoting economic development [23]. Some theoretical arguments suggest transparency reduces the ability of politicians and bureaucrats to pursue rent-seeking behaviours under asymmetric information [24, 25].

In conjunction with the aforementioned observations, Figure 1 encapsulates the findings from 38 studies [26]. These studies explore the multifaceted benefits associated with heightened transparency in public finances. The graphical representation elucidates the implications of transparency in augmenting fiscal discipline, diminishing borrowing costs, mitigating corrupt practices, and stimulating accountability mechanisms. Cross-country studies also underline the tangible impact of fiscal transparency in both deficits and debt, an enhancement in credit ratings, and the fortification of public service provision.

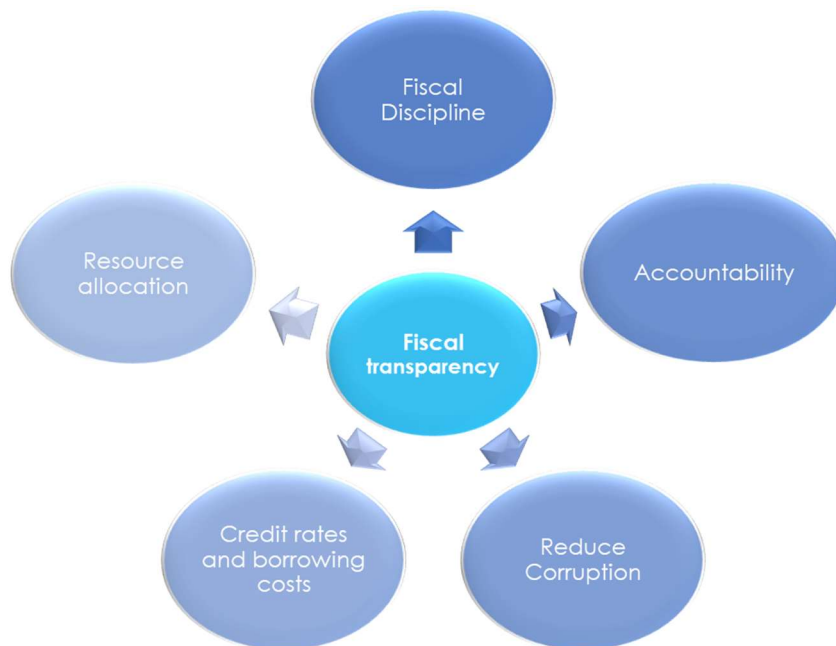


Figure 1. Impacts of fiscal openness
Source: author

More recent studies provide evidence on causation, shedding light on the direct effects of transparency on fiscal matters. An experiment conducted by Jung [27] in South Korea illustrates this point. The author compared budget projects affected by a new online open budget system reform (the treatment group) to unaffected projects (the control group). Utilising a difference-in-differences estimation method, the study found that the introduction of the online budget system reduced unused budgets in the treatment group (national subsidies) by 22-23% compared to the control. This result signifies that, under specific conditions, an increase in fiscal transparency through online open budgeting

can lead to substantial improvements in objective measures of budget efficiency.

In Brazilian context, insights from the domain of budget openness suggest a mutually beneficial relationship between enhanced budget disclosure and improvements in governance [28]. For instance, a study focusing on local governance in Brazil found that participatory budgeting led to a 16% increase in tax revenues and an 18% reduction in infant mortality rates [29,30]. In summation, findings discussed in this section furnishes strong foundational arguments for justifying policy initiatives aimed at advancing fiscal transparency in Brazil.

3. Limitations of Fiscal Transparency for Effective Accountability

While the benefits of fiscal transparency are evident and significant, as previously discussed, it is essential to consider its limitations. Research indicates that the mere availability of fiscal information does not necessarily engender citizen participation or improved governance, as depicted in Figure 2 [31]. Numerous studies corroborate the idea that transparency initiatives, when considered in isolation, fail to instigate collective action or to empower communities to hold governmental bodies accountable [32]. It means enabling capabilities for civic mobilization, petitioning, and addressing shared public concerns through the platform. This perspective is further substantiated by an analysis conducted by Joshi, which emphasises that positive outcomes are only likely when citizens possess both the resources and the inclination to utilise disclosed information [33].

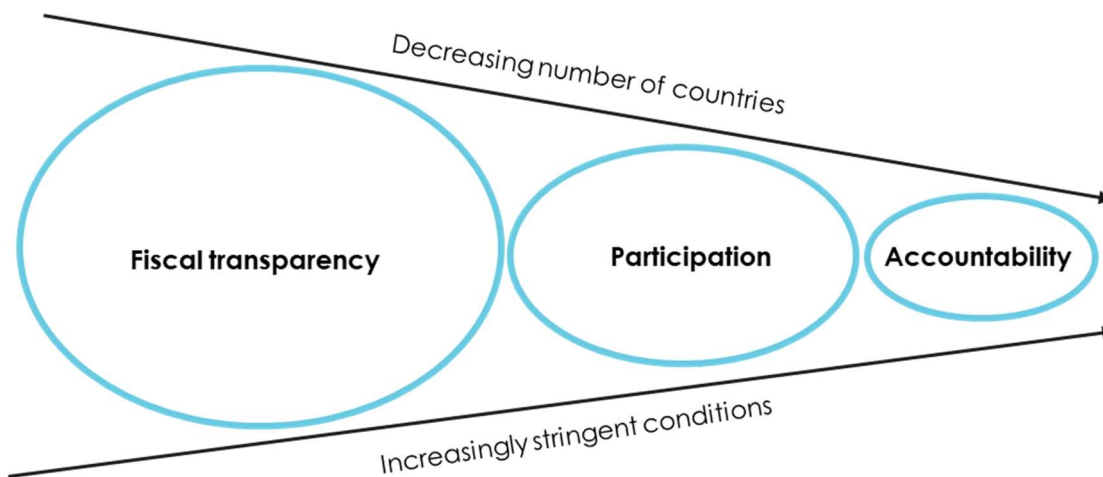


Figure 2. The Transparency, Participation, and Accountability Funnel
Source: Khagram, S.; de Renzio, P.; Fung, A., 2013

A critical analysis of these findings enhances their relevance within the context of this policy brief. While fiscal transparency is undeniably crucial, it must exist within a broader ecosystem that also encourages active citizen engagement and incorporates effective accountability mechanisms. Carlitz and Bräutigam's works further elaborate this point by indicating that many transparency efforts often do not include corresponding mechanisms for public participation or accountability [34,35]. Consequently, the evidence strongly advocates for a more nuanced approach that not only prioritizes fiscal transparency but also

actively mobilizes and provides enabling conditions for citizens to hold governments accountable.

4. Transparency Portals in Brazil: Disparities and Regional Context

Portals or platforms for governmental expenditure transparency are vital instruments of public transparency. Numerous institutions have outlined guidelines for fiscal disclosure [36,37,38], yet disparities in digital representation persist. These variations not only affect the aesthetic but also profoundly impact public engagement and accountability. Comparing transparency Agency efforts across nations is insightful. For instance, the United Kingdom emphasizes straightforward functionalities [39], whereas the Transparency Portal of Brazil focuses on detailed data visualizations and infographics [40]. This variance extends to subnational governments within Brazil, with states such as Espírito Santo and São Paulo displaying distinct contrasts [41,42].

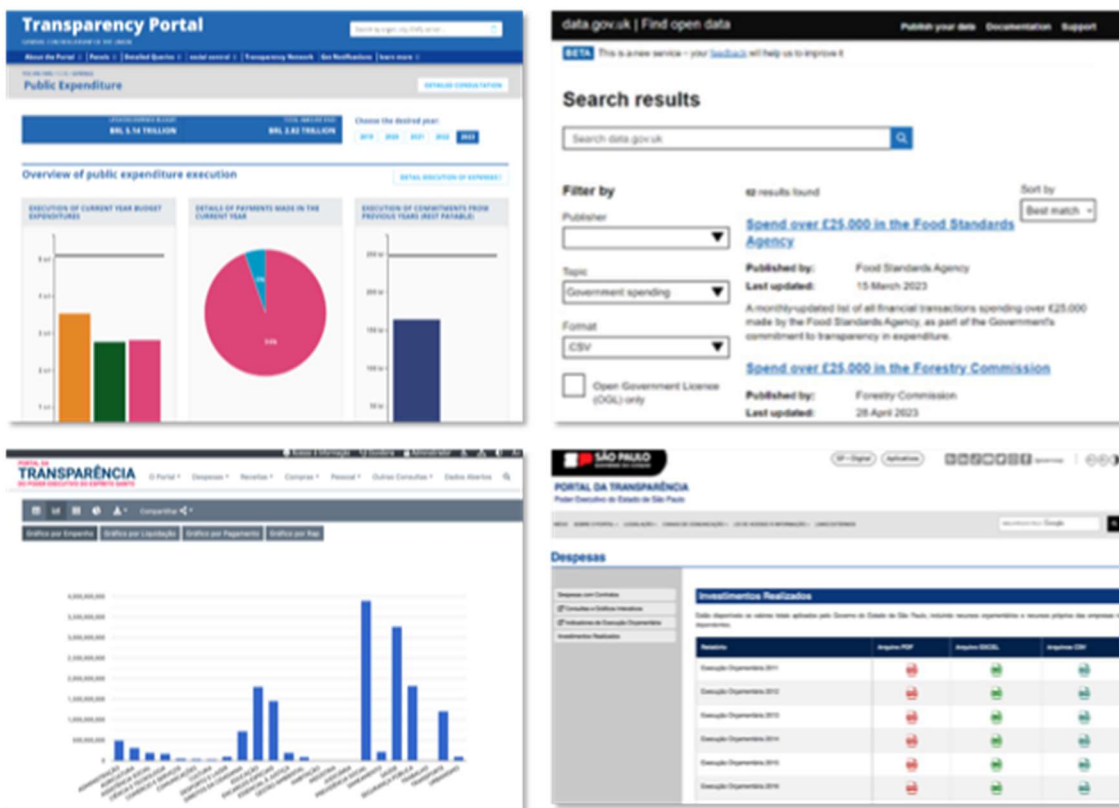


Figure 3. Portal Features Comparison: UK, the Central Government of Brazil, Espírito Santo, and São Paulo.

An exploration of the scholarly literature provides a comprehensive understanding of transparency portal efficacy. Lämmerhirt et al. accentuate the importance of usability, suggesting that the portal design directly impacts the ability of the public ability to interact with the data [43]. In a similar vein, Srimarga, and Davies & Fumega voice concerns regarding data quality [44,45]. Furthermore, Bauhr & Grimes introduce the concept of public finance literacy and the indispensable role of oversight bodies [46]. Additionally, the principal-

agent dilemma, in which government officials may act in self-interest rather than citizens' interests, presents a key challenge that transparency initiatives aim to address by empowering citizens to monitor public spending [46]. These findings collectively highlight that the efficacy of transparency portals extends beyond mere technological capabilities, encompassing multiple intertwined factors.

The Brazilian context introduces specific challenges that reflect these global observations. While Brazil has taken laudable steps, introducing 11,300 transparency portals, inconsistencies in data quality and depth across different regions remain evident [47]. A revealing statistic supports this assertion: only 22% of state agencies consistently display high transparency levels, suggesting varied portal quality across regions [48]. Recent assessments about Covid-19 pandemic data disclosure illustrate this argument revealing stark contrasts in transparency across Brazilian states [49,50]. This pattern emphasizes the need for region-specific strategies and interventions.

Amidst these regional nuances, another layer of disparity emerges when analysing resource disclosures on Brazilian online platforms. The federal government stands out, handling 67% of resources of the national public, in contrast to the significantly more numerous municipal portals, which manage only 15% [51]. Given this disproportionate fiscal responsibility, optimizing the federal government's transparency measures becomes imperative.

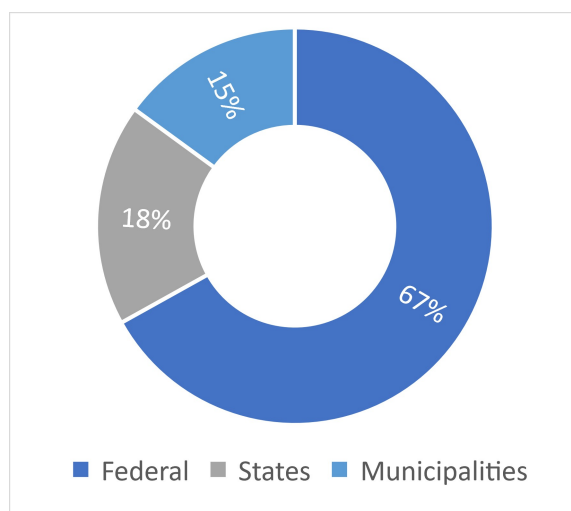


Figure 4. Budget execution by transparency portals level
Source: National Treasury Secretariat, 2023

Supporting this imperative, a study involving 1,158 users of the Brazilian central government transparency portal highlighted the interaction and usability challenges [52]. Whether it is the clarity of language complexity or the efficiency of search tools, user feedback underlines the broader challenges faced by these platforms, as depicted in Table 1. But more strikingly, same study shows that only one-third of the users employ the portal for government oversight, emphasizing the need to prioritise user experience.

Table 1. Users Recommendations for Enhancements in the Transparency Portal

Issues / Suggestions	Proportion (%)
Language complexity, search mechanisms and information support	22

Suggestions outside the Portal's scope	19
Unsure / Did not answer	16
More detailed information and expenses	15
Other improvements	13
Raising awareness of the Portal	13
Interaction and portal enhancements	13
Navigation / accessibility / design	12
Cross-referencing of information	5
Data download	4
Improvements in civil servant earnings query	4
Graphic presentation of information	4
Information updates	4

Source: Adapted from Freire & Batista (2016)

In conclusion, this section emphasized the nexus between technology, user experience, and the efficacy of transparency portals. Challenges identified within the central government portal of Brazil serve as a microcosm of larger issues impeding public engagement in governmental oversight. Addressing these complexities requires comprehensive solutions that cater to regional distinctions and individual user preferences. Setting the stage for subsequent discussions, the next section will explore policy alternatives designed to address these multifaceted challenges.

5. Policy Options for Enhancements in Transparency and Participation

Expanding on the challenges presented in the previous section, Table 2 presents policy options to enhance governmental transparency in Brazilian context, recognizing the importance of usability and public engagement. The table encapsulates a range of innovative interventions, which not only addresses the immediacy of improving portal functionalities but also aims to resolve broader issues around public engagement and accessibility. While the focal point of this study remains the implementation of an AI chatbot (Policy 1), the proposed solutions offer a holistic framework that enables policymakers to contemplate a broad spectrum of complementary strategies.

Table 2. Issues and Policy Alternatives for Brazilian Transparency Portals

Policy Option	Description / Rationale
1) AI Chatbot Utilising Language Learning Models (LLM)	In response to the growing utilization of AI in the Public Sector and the increasing demand for instantaneous services by citizens, this policy integrates an AI-driven chatbot, powered by advanced Language Learning Models, into the transparency portal. This solution intends to simplify intricate fiscal terminology and deliver instantaneous government expenditure data. In scenarios where specific queries are unanswerable, the system will maintain compliance with legal requirements by reverting to passive transparency measures.
2) Enhanced Financial Transparency (EFT) Interface	Given the rapid digital transformation of Brazilian society and the evolving demands of its users regionally, this initiative envisions a revamped transparency portal that pivots towards adaptability and user-centric design. It

Policy Option	Description / Rationale
	encompasses elements such as intuitive infographics, concise financial overviews, and dynamic glossaries. A cyclical, data-driven approach, incorporating periodic user feedback, comprehensive website analytics, and open public dialogues, ensures sustained advancement [53].
3) Literacy Initiatives	Recognising the shift towards improved financial literacy as an empowerment tool for Brazilian citizens, this policy cultivates a dual-faceted educational blueprint. The transparency portal will curate online tutorials and webinars, positioning itself as the epicentre for fiscal information and learning. Concurrently, a specialized financial literacy syllabus will be integrated into national high school curriculums, encapsulating modules like budget management, taxation dynamics, and public expenditure doctrines [54].
4) Citizen's Report and Social Media Outreach	Capitalizing on the escalating role of social media platforms in Brazilian communication patterns, this strategy transmutes intricate financial documents into a comprehensible "Citizen's Financial Report", enriched with layman-friendly verbiage and visual aids. Exploiting pervasive of the Instagram reach in Brazil, an engaging, culturally resonant persona, "Sr. Fiscal", will elucidate fiscal complexities, thereby amplifying public participation in fiscal oversight activities [54].
5) Social Accountability Units for Financial Oversight (SAU)	Considering the diverse regional governance structures of Brazil, this policy recommends establishing Social Accountability Units comprised of community volunteers equipped with financial literacy training [55, 56]. These units would scrutinize budget execution, a process distinct from participatory budgeting, which focuses on budget formulation. A designated online platform complete with educational material and forums would be launched to underpin SAU activities. This community-based approach seeks to deepen financial scrutiny at a grassroots level, thereby enhancing overall transparency and governance outcomes.

Source: Author

Following the presentation of policy alternatives, Table 3 elucidates the advantages and concerns associated with each option. The AI Chatbot, for instance, stands out for its potential in promoting high levels of public engagement and accessibility, despite the potential high-costs, technical complexity and accuracy mistakes associated with system development. The Enhanced Financial Transparency (EFT) Interface is lauded for its user-centric and data-driven design, yet its immediate impact on public engagement may be moderate. Literacy initiatives offer long-term educational value but might not provide immediate widespread accessibility. The Citizen's Report gains points for immediate impact and ease of implementation but may lack depth. Finally, the Social Accountability Units (SAUs) are noteworthy for community involvement but could be hindered by the necessity for offline infrastructure.

Table 3. Comparative Analysis of Policy Options: Advantages and Contextual Concerns

Policy Option	Advantages	Concerns
1) AI Chatbot	High Public Engagement, Accessibility	Cost, Technical Complexity, Hallucination (Accuracy mistakes)
2) EFT Interface	User-Centric, Data-Driven	Moderate Public Engagement
3) Literacy Initiatives	Educational, Long-Term Impact	Limited Immediate Accessibility
4) Citizen's Report	High Public Engagement, Easy Implementation	Limited Depth of Information
5) SAU Units	Community Involvement, Democratic Scrutiny	Requires Offline Infrastructure

Source: Author

When examining the policy options provided, it is clear that the suitability of each depends on the specific circumstances in which it will be applied. Every policy option has distinct advantages and potential concerns, and each is designed to address particular regional challenges and constraints. Among these options, this study gives special attention to Policy Option 1 (AI Chatbot). This choice stands out because of its potential benefits in Brazilian urban areas where more people use the internet and are familiar with digital tools. Furthermore, since this policy area is relatively new, discussions surrounding its implementation can shed light on ways to address issues such as technical challenges and cost. The following section will delve into an in-depth analysis of the AI Chatbot solution, aiming to highlight crucial aspects that need consideration for successful rollout.

6. AI Chatbots as a Promising Solution

Chatbots, as a software application designed to simulate interactive human conversation, has emerged as a compelling tool for enhancing public engagement in governmental transparency portals. The term originates from 'chatting robot,' capturing the essence of these systems that can conduct text, audio, or voice-based exchanges [57]. Chatbots can be broadly categorized into three primary types based on technological capabilities. Rule-based chatbots operate on predefined scripts and offer limited flexibility [58]. Natural Language Processing (NLP) chatbots leverage linguistic algorithms to better comprehend user queries [59]. Lastly, cutting-edge chatbots, employing Large Language Models (LLMs), can generate remarkably human-like responses [60]. All three types continue to evolve and find specific use-cases [61].

The implementation of chatbots in public administration necessitates a careful evaluation of both potential of both potential benefits and drawbacks. On the positive side, research supports the notion that chatbots can provide around-

the-clock service at a reduced operational cost [62]. Conversely, the financial gains from such low operational expenses may be offset by substantial initial development costs, with overall cost-effectiveness being dependent on user engagement levels [63]. Chatbots excel in addressing large volumes of routine queries with uniform responses [64], but their limitations emerge when confronted with complex or ambiguous questions. Some individuals find those interactions with less intimidating [65], while there are also frustrations associated with their relatively limited capabilities [66]. Overall, while scholarly evidence indicates potential benefits of chatbot deployment in public services, challenges such as high initial costs, limited conversational skills, and over-automation must be judiciously considered.

It should be noted that the extent of these limitations often depends on the technological sophistication of the chatbot and the quality of its training for query resolution. The landscape of this technology has been profoundly influenced by the advent LLMs [67]. These advanced technologies have the capability to generate free-form text, allowing virtual agents to manage complex, open-ended inquiries more effectively than their rule-based or basic natural language processing counterparts [68]. This sophistication in conversational skills potentially reduces the likelihood of user dissatisfaction commonly associated with more rudimentary chatbots [69]. Moreover, the pre-trained nature of these models may economize on development expenses by diminishing the need for extensive, task-specific training data [70].

Box 1: Glossary of Technical Concepts

- **Large Language Models (LLMs):** LLMs are advanced machine learning algorithm trained on massive datasets. It has the capability to generate coherent and contextually relevant text across a multitude of tasks. LLMs are to textual data what advanced statistical models are to numerical data: tools for generating insights, making predictions, and facilitating complex tasks [71].
- **Generative Pre-trained Transformer (GPT) and Claude Anthropic:** These are specific types of LLMs, developed by OpenAI [72] and Anthropic [73], respectively. Both serve as pinnacle examples of machine learning algorithms for natural language processing. These models function like advanced digital libraries that not only understand but also generate coherent and contextually relevant text.
- **Chatbots Powered by LLMs:** These are specialized conversational agents that leverage the capabilities of LLMs to facilitate more dynamic and contextually sensitive interactions. While traditional chatbots could be likened to automated FAQs, chatbots powered by LLMs are akin to virtual consultants, capable of navigating complex inquiries and providing more nuanced responses [74].

As we navigate the intricacies of chatbot applications in public administration, a concrete example can serve to illuminate the theoretical discussions. To this end, a recent pilot programme in the state of Espírito Santo in Brazil offers valuable insights. The *Transparenc.IA chatbot* aimed at facilitating citizen queries concerning fiscal expenditures, utilising LLMs for this purpose. Figure 5 shows the

Application Frontend, while Figure 6 presents the architecture of the system. Despite the inherent technical complexity, the focal point to underscore is that Artificial Intelligence is employed here to translate general user queries into filters. Once these filters are applied to government data spreadsheets, they return the desired information in a language comprehensible to the user [75].

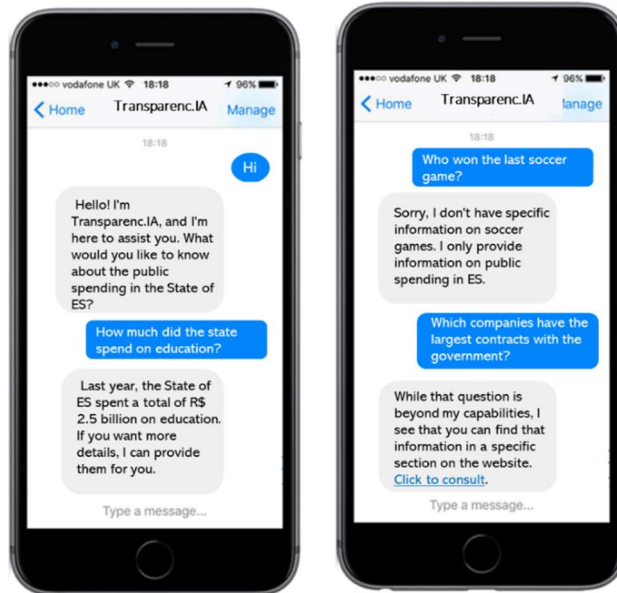


Figure 5. Frontend of Transparenc.IA Chatbot

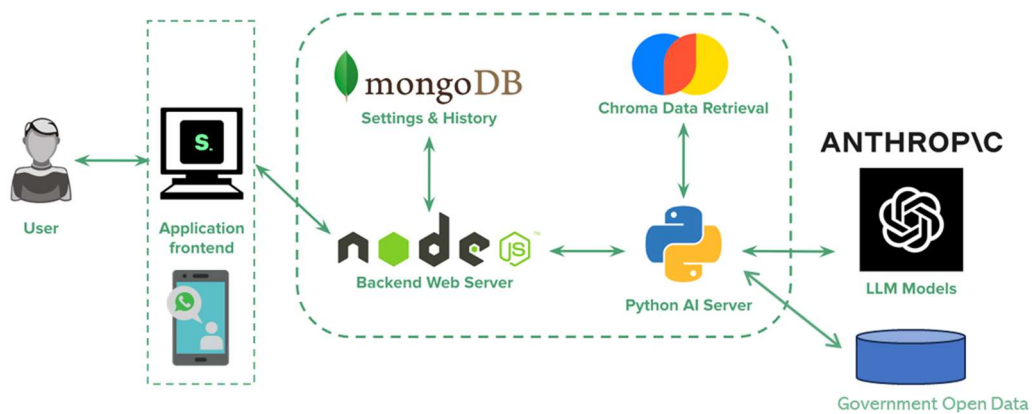


Figure 6. Architecture of Transparenc.IA Chatbot

Considering the challenges of high costs and technical complexity, the government of Espírito Santo sought out a readily available technological solution in the market and assessed the efficiency of using commercially available LLMs. In a comprehensive evaluation, the government of Espírito Santo employed a methodology that included a set of 50 questions to assess the capability of the LLM models to apply the correct filters to retrieve accurate information from the complex government spending records. Table 1 indicates that, among the models evaluated, GPT 3.5 emerged as the most cost-efficient choice. While its accuracy rate was 75%, lower than its competitors, it had the advantage of initiating responses in fewer than 5 seconds and incurred a modest

monthly cost of 2,000 USD. Consequently, it was deemed the optimal selection for a project expected to cater to 20,000 users per month [76].

Table 4. Comparative Analysis of Large Language Models for Transparency IA Chatbot

Large Language Model (LLM)	Monthly Operational Cost (USD)	Accuracy in Fiscal Queries (%)	Time to Initiate Response (seconds)
GPT 3.5	2,000	75	<5
GPT 4	21,000	90	>20
Claude 2.0	13,000	83	<10

Source: Espírito Santo Government & Superdash Software. (2023)

The selection of GPT 3.5 for the project pilot of the government of Espírito Santo underscores the promise of employing AI Chatbots for civic engagement in fiscal matters. The efficiency of the model in initiating quick responses, coupled with its cost-effectiveness, positions it as a feasible tool for bridging the informational gap between government and citizens. Nonetheless, while case study offers technical promise, detailed evaluation data is needed to determine its real-world effectiveness, involving risks as data bias, ethical safety, and model transparency loom large as potential roadblocks to widespread adoption. As policymakers contemplate scaling these technologies, a nuanced understanding of these concerns becomes imperative. In the forthcoming section, this study delves into some implementation issues by offering a set of recommendations for implementing AI Chatbots in the context of Brazilian governance.

7. Policy Recommendations

The recommendations within this policy brief stem from a detailed investigation conducted from July to October 2023. It included monitoring initial steps in the the design of a chatbot for the state of Espírito Santo, Brazil and interviews with experts from academia, government, specialists in AI. Key participants involved representatives from the Court of Accounts, the Comptroller General of the Federal Accounts, heads of federal transparency portals, and professionals in AI transparency initiatives in Brazil and Europe. These diverse insights significantly influenced the comprehensive guidance offered in this brief.

7.1 Establishing an Internal Pilot for Chatbot

The integration of a chatbot for fiscal transparency commences with an internal pilot project. This initial phase, distinct from the formal bidding processes described in subsequent recommendations, serves primarily as an exploratory research initiative. Its purpose is to internally ascertain the feasibility and potential effectiveness of the chatbot in a controlled environment before the allocation of substantial public resources. Furthermore, it serves to demonstrate the practicality of the chatbot and to secure support from internal stakeholders. If similar successful implementations were to be identified in other governments, this phase could potentially be streamlined [77].

This stage requires the strategic involvement of professionals with expertise spanning AI, finance, and public policy. The recruitment for this phase diverges from standard procurement procedures, favouring a more direct, personalized approach. This method, involving targeted outreach and comprehensive discussions with potential participants, allows for a thorough assessment of each candidate's skills and their commitment to contributing to a Proof of Concept (PoC) [78].

A unique aspect of this phase is the potential for a cost-neutral PoC, achieved through a symbiotic partnership between the government and AI service providers. The government offers its intricate expertise in public finance, providing a real-world testing environment, while the AI service provider gains a valuable opportunity to refine their solutions in a practical context. This mutually beneficial arrangement is particularly advantageous considering Brazil's extensive network of over 11,000 transparency portals, as presented in section 4, representing a substantial future market for successful AI solutions.

The primary objective here is to develop a PoC to showcase the potential of the chatbot without incurring substantial initial costs. The PoC should utilize a detailed dataset, derived from prevalent inquiries on the transparency portal. While this data is publicly available, the integration of technical glossaries and additional explanatory materials is crucial for the preliminary training of the chatbot. Collaborations with academia and industry experts at this juncture can amplify the chatbot's foundational knowledge and enhance the project's overall credibility.

The evaluation of the chatbot's performance demands a meticulous methodology. The PoC's duration is typically concise, ranging from a few days to a couple of weeks, providing a rapid assessment. A set of diverse questions, representative of public interest, should be compiled and used to assess the chatbot's responses, with an expectation of high accuracy. The indicative accuracy rate of 95-100% serves as a guideline, with the understanding that specific figures may be adapted based on the project's unique needs and findings from the pilot tests. This iterative process of testing and refinement is essential to fine-tuning the chatbot's accuracy and relevance [79].

Advancing from this internal pilot to expansive community testing is contingent upon the achievement of predetermined success criteria, established during the PoC. These criteria, which include mainly accuracy and cost-effectiveness, must be explicit, measurable, and in harmony with the long-term objectives of the project. Upon meeting these standards, the project can progress to the community testing phase, as elaborated in the following recommendation. This stage not only demonstrates AI's potential but also critically evaluates its practicality and value in real-world applications, serving as a "trial run" before any large-scale implementation.

7.2 Expanding Chatbot Testing to the Community

The transition from internal pilot testing to broader community engagement is a critical step in the chatbot implementation process. This expansion is governed by Brazil's innovative legal framework, specifically the "Public Contract for

Innovative Solution" (CPSI), part of the Legal Framework for Startups and Innovative Entrepreneurship (Complementary Law 182/2021). This framework encourages technological innovation in the public sector by providing financial support to participating companies during the testing phase, thereby promoting stability and growth in this sector [80].

The process begins with the government agency issuing a public call for innovative technological solutions, with a clear emphasis on the chatbot project's goals. This call invites startups to propose how AI chatbots can enhance fiscal transparency. The selection process is streamlined, with a focus on choosing proposals that offer the most value. This assessment goes beyond cost and includes factors such as technical excellence, feasibility, and potential benefits to the public.

The law allows for flexibility in the selection process, with the possibility of choosing more than one proposal for further development. This approach is designed to spur a range of innovative solutions. Once selected, these proposals enter a contractual phase, known as the CPSI, which defines the project's goals, evaluation methods, and financial aspects. The contract includes a clear financial ceiling and allows for different forms of remuneration, which can cover various operational costs, including those specific to AI services.

Community involvement is central to this phase. The public's feedback, gathered through surveys or interactive sessions, provides valuable insights into the chatbot's performance and user satisfaction, thereby building public trust. To ensure a wide range of feedback, users might be randomly assigned to interact with different chatbots.

However, this phase requires careful consideration of several key factors:

- Scalability: The chatbot should be able to expand its capabilities to accommodate increased user traffic or more complex queries.
- Usability: The chatbot needs to be user-friendly across various platforms, including mobile apps and official websites.
- Evaluation of Proposals: Proposals should be assessed transparently, with a committee of experts evaluating each chatbot based on predefined criteria, including user feedback and accuracy of responses.

Successful community testing paves the way for the next phase, moving the project closer to full-scale implementation. The agency will have valuable data on user preferences, technical performance, and cost, ready to proceed to the formal contractual stage, detailed in the next subsection. This progression is crucial, but it's also vital to avoid investing in a solution that fails to maintain public interest over time. Past instances have shown that even promising projects can falter if they don't engage users effectively, highlighting the importance of this community testing phase. The subsequent recommendation will explore how to transition from a successful pilot to a sustainable, full-scale program.

7.3 Advancing in the Procurement Stage and Ensuring Chatbot Maintenance

The transition from community testing to the formal procurement and maintenance phase is pivotal for the sustainable implementation of chatbot technology. This stage requires a strategy tailored to the unique operational needs and transparency obligations of each public administration. Smaller entities with limited resources and less stringent transparency requirements might find a pay-per-use service more economical and manageable, reducing the need for significant initial investments and simplifying system maintenance, especially when specialized expertise may not be readily available. In contrast, larger public bodies could benefit from a comprehensive solution, potentially shared among several agencies, to optimize cost-efficiency and resource utilization.

Upon concluding the initial bidding process and fulfilling the Contract for Innovative Public Solution (CPSI) conditions outlined in Article 14 of Complementary Law 182/2021, the administration can proceed with the procurement stage under Article 15. This stage allows for a supply contract with the initial contractor without a new bidding process, contingent upon the CPSI's successful outcome. The supply contract's duration is capped at 24 months, extendable by another 24 months. The contract value cannot exceed five times the CPSI's maximum value, ensuring fiscal prudence while accommodating necessary adjustments for price changes or unforeseen needs.

Navigating the procurement process involves addressing complexities, especially regarding legal compliance and information accuracy. A comprehensive risk management strategy is essential, pinpointing potential operational, security, and legal challenges, and formulating preemptive solutions. The system must also ensure information accuracy, incorporating a disclaimer feature to help users understand the data's source and context, thereby minimizing misinformation risks.

Integrating a back-office system is crucial for continuous improvement and maintenance. This system facilitates real-time monitoring of user interactions and chatbot responses, providing valuable insights for iterative refinements. Establishing a dedicated curation team, which includes staff from departments accustomed to handling public inquiries, is recommended. This team will regularly review interactions, making necessary adjustments to preserve response relevance and accuracy.

Extending the chatbot's reach beyond the government portal is critical. Integration with popular social platforms like WhatsApp can increase accessibility and user familiarity with fiscal data, encouraging more interaction. However, such expansion requires strategic promotion. Evidence from the Court of Accounts underscores the effectiveness of promotional campaigns in enhancing user engagement, necessitating sustained marketing efforts. The risk of project discontinuation due to low user engagement is significant, highlighting the need to keep users interested.

In summary, this phase requires a comprehensive approach that integrates formal procurement procedures, rigorous system maintenance, broad

accessibility, and dynamic promotion. Continuous engagement with key stakeholders, including government agencies, technology partners, and user representatives, is crucial for maintaining the chatbot's relevance and credibility. Regular assessments, pivotal for guiding decisions on contract renewals and adjustments, ensure the chatbot consistently promotes informed public participation and enhances fiscal transparency [81]. It's important to acknowledge that, in addition to these operational strategies, safeguarding user privacy and ensuring system security are fundamental to the chatbot's functionality. The subsequent section explores the complexities of addressing these risks.

7.4. Safeguarding Privacy and Ensuring Security in AI Chatbot Deployment

In the wake of the preceding recommendations focusing on the implementation and expansion of AI chatbots for fiscal transparency, it becomes imperative to address the consequential privacy and security considerations. The utilization of AI chatbots, while a transformative approach to democratizing access to fiscal data, brings to the fore significant privacy and security challenges that necessitate strategic management.

The concern of paramount importance is the potential disclosure of sensitive information through the analysis of accumulated user queries. Such a scenario could inadvertently unveil societal trends or localized anxieties, particularly if inquiries about certain fiscal matters are recurrent within a specific demographic or region. Mitigating this risk calls for the implementation of measures like the anonymization of user data and stringent controls on data retention periods.

Moreover, the susceptibility of chatbots to cybersecurity threats, common to all online platforms, underscores the necessity for robust protective protocols. These digital systems, accessible to the public, are potential targets for cyber-attacks, unauthorized access, and other forms of digital disruption. Engaging cybersecurity experts from the initial stages of development is crucial to embed resilient security safeguards, thereby preserving system integrity and maintaining public confidence.

Additionally, the possibility of chatbots providing erroneous or incomplete information poses a risk of fiscal data misrepresentation. While the complete eradication of inaccuracies is unfeasible, the transparency and reliability of the system can be bolstered by incorporating features such as citations for data sources and explicit disclaimers regarding the chatbot's limitations. These elements aid users in correctly interpreting the responses, fostering an informed citizenry.

Furthermore, the interaction dynamics between users and chatbots could lead to unintentional sharing of personal information, thus raising privacy concerns. It is essential to establish clear guidelines within the chatbot's operational framework to prevent unauthorized data collection or misuse. Adherence to existing data protection legislation and standards of digital governance is crucial in this regard, ensuring compliance and safeguarding data integrity [82].

In conclusion, while the current legal frameworks provide a substantial basis for navigating these challenges, the integration of AI chatbots in the public sector mandates continuous dialogue to ensure that technological advancements align with civic values. A commitment to purpose-driven design, coupled with prudent data management practices, is essential in maintaining public trust and maximizing the benefits of AI chatbots in fiscal transparency. This commitment guarantees that the deployment of AI chatbots adheres to the highest standards of data privacy and system security, thereby enhancing the public's confidence in these digital initiatives.

8. Conclusion

This policy brief has illuminated the profound challenges hindering fiscal transparency and active citizen engagement in Brazil, notably the intricate nature of budgetary data and the public's detachment from fiscal governance. Despite Brazil's significant progress in digital transparency, the brief underscores a critical disconnect: the expansion of information availability has not translated into genuine public comprehension or engagement. Herein lies the potential of AI-powered chatbots. By demystifying complex fiscal terminology and facilitating real-time interactions, chatbots stand poised to bridge this divide, transforming passive data into an active dialogue with the citizenry.

However, the deployment of such technology is not without its intricacies. This brief recommends a cautious, phased introduction of AI chatbots, emphasizing the need for exploratory pilots, extensive community testing, and context-sensitive implementation strategies. These strategies must be meticulously crafted to navigate the nuanced terrain of legal compliance, data security, and user privacy. Furthermore, they should promote inclusivity and continuous stakeholder engagement, ensuring the technology remains accessible and relevant to all sectors of society.

In conclusion, while AI chatbots are not a universal remedy, they herald a significant shift towards more transparent, accountable, and participatory fiscal governance in Brazil. This policy brief serves as a compass for policymakers, offering evidence-based guidance for harnessing AI to empower citizens, thereby nurturing a more informed public sphere. The conscientious integration of AI chatbots could mark a pivotal moment in Brazil's democratic journey, turning the ideals of participatory democracy into tangible realities and positioning citizens as informed overseers in the public finance landscape.

9. References

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