Adapting Your Startup's Product for Public Sector Innovation Calls

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Abstract. Recently, GovTech has gained prominence as a novel approach to fostering government-driven innovation by leveraging technology startups, academia, and innovators to develop digital public services. Although it promises more agile, user-centric, and cost-effective solutions, limited research explores how academic-based startups navigate public procurement models. This paper addresses that gap by presenting three cases of an academic-based Brazilian startup engaging in the public procurement process introduced by the Legal Framework for Startups (Marco Legal das Startups). The company proposed solutions adapted from its principal product for three public agencies: Tribunal de Contas da União (TCU), Correios, and Copasa, focusing on remote oversight of construction projects and building maintenance management. The lessons learned underscore the importance of predictable project scope and costs, emphasizing that unclear requirements can undermine competitiveness. Moreover, strong teams and reputable track records significantly enhance success prospects while balancing technological maturity with innovation, which remains critical for meeting specific public sector needs. Additionally, positioning a product at the technological frontier only proves beneficial when addressing actual government challenges. Effective communication, including well-crafted video pitches and presentations, further ensures evaluators grasp the solution's value. These insights aim to guide both aspiring and established academic entrepreneurs in bridging their research-based innovations with GovTech opportunities, ultimately strengthening collaboration between the public sector and academia.

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1. Introduction

Governments have long played a central role in fostering technological development by investing directly in research and development (R&D) and implementing policies encouraging private sector participation. Historically, these efforts have included financial incentives that stimulate private R&D investments, although their effectiveness varies depending on factors such as incentive type, industry characteristics, and policy design (Choi, 2022). In addition to direct funding, governments have shaped innovation ecosystems through intellectual property protection, tax credits, regulatory standards, and public procurement, all of which increase the potential returns on successful innovations (Nemet, 2009).

More recently, a new model for government-driven innovation has emerged with the rise of GovTech. This approach leverages technology startups, academia, and innovators to develop digital solutions for public services. GovTech initiatives aim to modernize government operations, drive economic development, and enhance service delivery efficiency (Silve and Moszoro, 2023). By fostering collaboration between the public and private sectors, GovTech represents a shift toward more agile, user-centric, and cost-effective solutions for digital governance (OECD, 2021). According to the OECD Digital Government Index (DGI) 2023, GovTech is becoming a widespread practice, with 70% of OECD countries implementing digital strategies to collaborate with the GovTech ecosystem, while 55% use it to foster innovation and experimentation. Additionally, 42% of OECD members employ GovTech to test and adopt emerging technologies such as artificial intelligence. Despite its potential, many countries still face challenges in fully leveraging GovTech, with only 40% having dedicated funding for collaborations and 24%

establishing procurement mechanisms to support partnerships. This highlights the need for further investment in digital public infrastructure and strategic frameworks to enable its full potential.

Hoekstra et al. (2023) present an explorative case study of GovTech ecosystems in the Netherlands and Lithuania. They observed differences in ecosystem structure, Lithuania's being more centralized compared to the Netherlands' more scattered setup, and identified success factors such as public-private collaboration, a clear vision and strategy, space for experimentation, and active knowledge-sharing networks. Similarly, Reichardt (2022) analyzes factors influencing GovTech development in Germany and France between 2017 and 2022, employing a realist review method to uncover how procurement frameworks, technical access to the state, and meetup opportunities between startups or SMEs and the public sector can either enable or impede GovTech growth. Nose (2023) investigates the potential of GovTech to improve budget processes and execution efficiency, noting that the introduction of digital budget payments and e-procurement can enhance budget transparency and widen social assistance coverage, particularly benefiting the bottom 50th percentile and female workers in emerging market and developing countries. The study also emphasizes that effective outcomes hinge on supportive policies, regulatory frameworks, robust digital infrastructure, and coordinated efforts facilitated by a dedicated GovTech institution. Meanwhile, Mortati et al. (2023) explore how design thinking can aid in establishing an EU GovTech ecosystem, describing a methodology synthesizing co-design and service design with experiential learning. They conclude that adopting and adapting design thinking principles helps align collaborative efforts and foster organizational learning, ultimately promoting a more cohesive and innovative GovTech environment.

Despite significant advancements in the field and academic efforts to understand the GovTech phenomenon, little research explores how startups from academia can leverage their products and navigate new public procurement models. Moreover, studies examining these challenges from the perspective of startups remain scarce.

This paper presents three cases that highlight key challenges and lessons learned. It examines how Lemobs, an academic-based startup in the Brazilian govtech sector, engaged in the public procurement process introduced by the Marco Legal das Startups (Legal Framework for Startups). Focusing on innovation, Lemobs proposed tailored solutions for three Brazilian agencies: Tribunal de Contas da União (TCU) - (the Federal Court of Accounts), Correios (Brazilian state-owned postal service), and Copasa (Brazilian sanitation company). In the TCU and Copasa calls, the focus was on remote oversight of construction projects, while in the Correios case, the objective was to develop a building maintenance management system for the organization's facilities. Leveraging its mature Sigelu platform, LEMOBS adapted its solution to meet the specific needs of these agencies. We hope these insights will inspire researchers who aspire to become entrepreneurs and, support those who already have a product derived from their academic work and seek to offer solutions to the public sector.

The remaining of text is organized as follows: section 2 provides the background with the necessary content to support this research. Section 3 presents the cases of TCU, Copasa, and Correios and some of the challenges faced. Section 4 presents the lessons learned by Lemobs, and conclusions are established in section 5.

2. Theoretical background

2.1 Marco Legal das Startups (Legal Framework for Startups)

The theme of governmental innovation is increasingly relevant as nations worldwide seek regulatory environments that foster private sector growth and entrepreneurship. Within this context, Brazilian Complementary Law No. 182/2021, the Legal Framework for Startups (Marco Legal das Startups), emerged as a flexible framework encompassing multiple innovation models, including public investment in science, technology, and innovation (de Almeida Veneziani and Vaz, 2023). By aligning with global trends in innovation policy, the law addresses the need for governments to act as catalysts for development, ensuring that technological advancement and public service innovation coexist.

Startups have become indispensable players in the global economy, significantly contributing to job creation and revenue (Anunciação and Fernandes, 2021). Worldwide, multiple governments are revising their legislative structures and cultural perceptions to incentivize emerging entrepreneurs (The World Bank, 2019). This trend is particularly salient among BRICS nations, where high-potential ventures correlate with increased domestic R&D and the rise of formidable unicorns (CB Insights, 2020). The rapid pace of technological change requires an agile regulatory stance, which the Marco Legal das Startups aims to provide by balancing entrepreneurial freedom and state oversight.

The new law fosters startup participation through the Contrato Público para Solução Inovadora (CPSI) - (Public Contract for Innovative Solution)- and regulatory sandboxes. As outlined, CPSI enables startups to collaborate with public entities by proposing innovative solutions to governmental challenges, thus harnessing state purchasing power for technological and economic progress (Batista, 2022). Overall, the Marco Legal das Startups places Brazil

within a global trend that recognizes the impact of innovative enterprises on economic development. Comparable legislative measures have been adopted in Argentina and Chile, highlighting the regional importance of thriving startup ecosystems (Anunciação and Fernandes, 2021).

2.2 Lemobs

Lemobs is a technology startup established by researchers holding master's and doctoral degrees in Systems Engineering and Computer Science from the Federal University of Rio de Janeiro (UFRJ). Its work centers on developing innovative solutions for the public sector. The Lemobs's team comprises 60 professionals, two-thirds specializing in technology, and approximately 44% hold advanced degrees such as MBAs, master's, or doctoral qualifications. This strong background in systems engineering, computing, and knowledge management underpins its drive toward research and innovation.

Operating as a GovTech, Lemobs focuses on creating tools that help cities become more efficient and responsive. Its flagship platform, Sigelu, exemplifies this approach by providing web, mobile, map-based, and business intelligence features that automate and enhance various governmental processes. With over 300,000 development hours and a user base of around 2,400 individuals across more than ten public institutions, Sigelu covers tasks ranging from planning and monitoring public works to inventory control, urban maintenance, and oversight of city operations. Its integrated dashboards and analytics offer decision-makers actionable insights based on real-time data.

Lemobs has also earned notable recognition within the public domain. It was awarded Brazil's first Public Contract for an Innovative Solution (CPSI) by Petrobras, receiving the highest scores for innovation, execution capability, and maturity of its platform. In 2020, it was acknowledged by the Municipal Strategy for Science, Technology, and Innovation of Maricá City for its contributions at the municipal level. Under the Software as a Service (SaaS) model, Lemobs provides licensing, training, support, and software customization. Maintaining a strong commitment to research and development, it continuously refines its product offerings, exploring new methods and technologies to enhance public-sector operations and contribute to the broader field of digital transformation in governance.

3. Cases

The three cases discussed were proposals submitted by Lemobs for calls under the CPSI modality. The solutions described represent the technological tools that would be developed if Lemobs were chosen. It should be noted that in the TCU call, Lemobs was not selected, placing fourth, while three winners were chosen. However, in the calls from Correios and Copasa, Lemobs was selected, though at the time of writing this article, no contracts had been signed, and, in keeping with the CPSI bidding process, the project scope will still be negotiated with these public entities. As a result, the proposed projects and the main challenges encountered in adapting the current Sigelu version to meet the specific demands of these calls are as follows.

3.1 Tribunal de Contas da União (TCU)

The Tribunal de Contas da União (TCU) is the Federal Court of Accounts - the Brazilian supreme audit institution - responsible for overseeing the proper use of public funds and ensuring transparency and accountability in government projects. TCU's main challenge is gathering evidence of public works' execution and progress without requiring an on-site visit. This process involves comparing non-geolocated project and execution data published in various government systems with current realities in often remote municipalities. The objective is to detect potential irregularities cost-effectively and promptly present them on a risk dashboard and in detailed reports, allowing TCU auditors to focus on critical issues without incurring high travel expenses.

We presented Sigelu as a crowdsourcing-based solution with two core components: a cloud-based software platform and comprehensive services covering recruitment, training, and ongoing support, as seen in Figure 1. The software aspect begins by integrating directly with TransfereGov through an API, automatically retrieving key information on public works. This data is then used to plan evidence collection, with artificial intelligence and geoprocessing tools helping TCU technicians identify strategic sampling areas for inspection. Once those areas are defined, a diverse group of collaborators, including roadwork specialists, technical professionals such as architects, engineers, and even laypeople, receives task recommendations via a system that applies different crowdsourcing methods.

In the mobile crowdsourcing approach, individuals with smartphones can capture local evidence in real time. In contrast, drone crowdsourcing employs civilian-operated drones to gather aerial data, reducing the need for costly or cumbersome inspections by TCU staff. The Public Participation Geographic Information System (PPGIS) approach integrates local communities directly into the data collection and decision-making process, enhancing

transparency and inclusivity by allowing residents to contribute spatial information relevant to the projects in their regions. Once participants collect these images, videos, and other forms of evidence, Sigelu processes the material to validate reliability and compare it against official project requirements. Artificial intelligence further refines this process by detecting inconsistencies or anomalies in the collected evidence.

After successful validation, Sigelu authorizes payment to the crowdsourced collaborators and incorporates information on potential noncompliance into a risk management workflow, accessible via reports and data visualization dashboards. These outputs enable TCU auditors to quickly pinpoint areas of concern and determine the level of scrutiny needed. Beyond software, Sigelu also provides services for recruiting the required pool of collaborators, training them on best practices for collecting evidence, and ensuring TCU technicians know how to use the system to optimize their oversight activities. The innovative approach blends the efficiency gains offered by artificial intelligence with the collective expertise of on-the-ground contributors, yielding more context-rich data while refining AI models through domain-specific training. It also pioneers a novel business model in the public sector by compensating citizens and professionals for auditing tasks that were once solely the responsibility of government officials. By integrating technology, human collaboration, and ongoing support services, Sigelu represents a forward-looking solution poised to enhance TCU's capacity to monitor works across vast and varied locations, ultimately improving transparency and accountability in public expenditures.

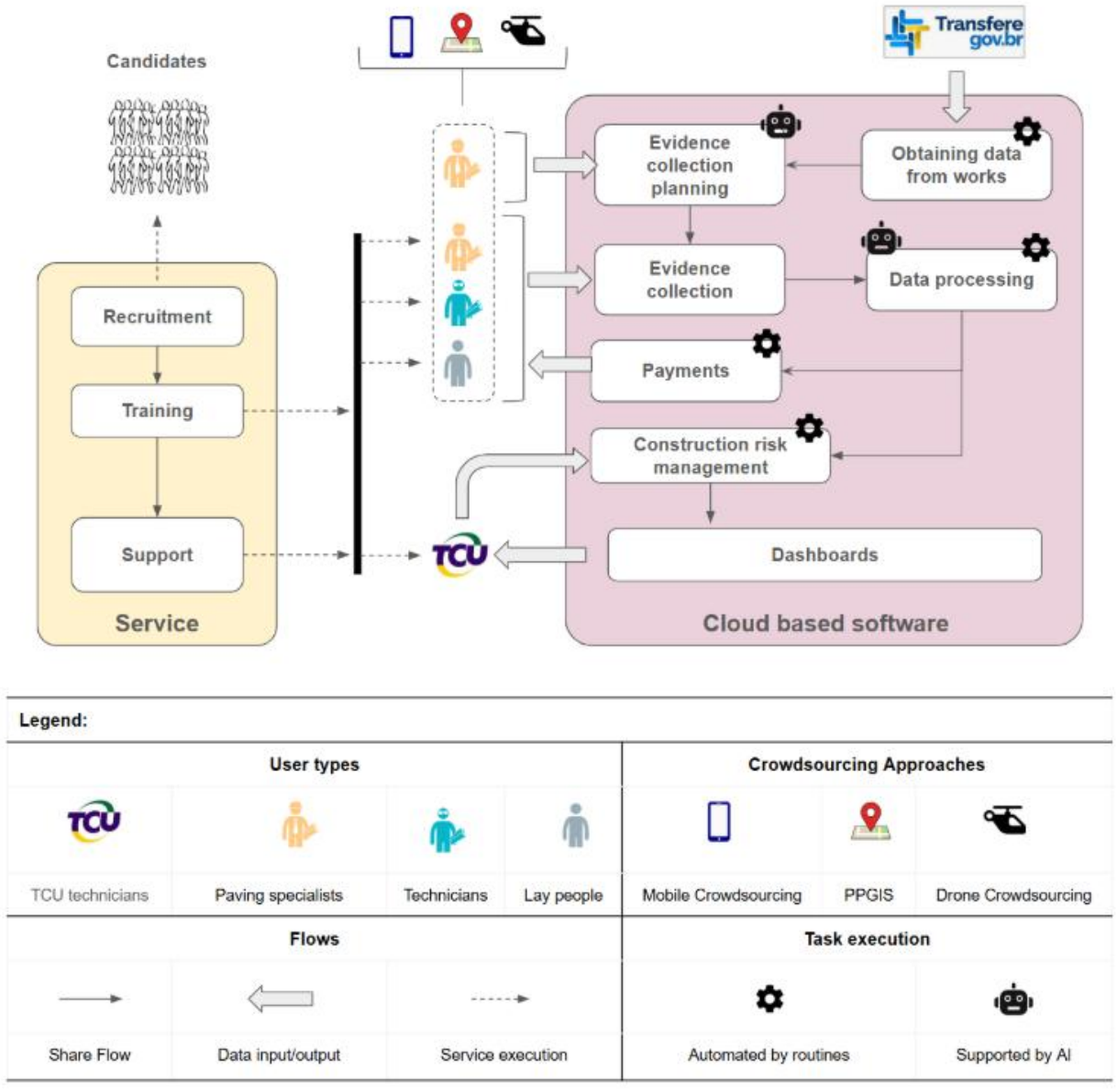

Fig. 1. General Solution Architecture proposed for TCU.

In this project proposal, the main challenges revolved around two primary aspects: first, how to ensure timely evidence collection across Brazil through a crowdsourcing approach, given that some worksites are located in extremely remote areas far from major centers, and second, how to establish predictable costs for paying inspection fees, particularly if multiple inspections become necessary due to substandard task execution. In response to the first concern, the proposed solution involved strategies for recruiting and training inspectors nationwide and providing financial incentives to encourage participation in inspections far from major hubs, thereby compensating for any lack of initial interest. As for the second challenge, the system was envisioned to include functionalities controlling the monthly financial resources allocated to inspections, ensuring cost predictability. However, while this approach might resolve financial forecasting issues, it does not necessarily guarantee the minimum number of high-quality inspections required to maintain consistent standards.

3.2 Correios

Correios is Brazil's state-owned postal service, providing logistics and correspondence solutions nationwide. Within this vast organization, the Regional Engineering Management area is part of the broader support macro process, overseeing building and equipment maintenance, construction and renovation projects, and the upkeep of key systems. As outlined in Correios's 2023–2027 strategic plan, "Digital Transformation" stands as a critical priority. This initiative emerged in response to numerous operational hurdles: multiple non-integrated systems (both internal and external), a reliance on tedious manual routines, fragmented data scattered across varied sources, delays resulting from document processing (including invoices and official records), and limited capabilities for analyzing usage or consumption patterns. These factors create vulnerabilities such as missed deadlines, administrative bottlenecks, and inconsistencies in preventive, predictive, and corrective maintenance tasks. By deploying innovative technological solutions, Correios aims to modernize and streamline engineering processes in light of these challenges. The goal is to consolidate information, reduce human error, expedite service management, and ultimately fortify the reliability of building and system maintenance. By doing so, Correios hopes to strengthen operational efficiency and elevate the quality of services, paving the way for smoother, more cohesive engineering workflows across its extensive network of facilities and equipment.

Sigelu, proposed by Lemobs, was presented as a robust software platform designed to handle the full spectrum of Correios maintenance workflows, from initial request creation to post-service analysis and payment. When a maintenance need arises, whether it involves plumbing, lighting, generators, elevators, or specialized equipment, users can register a request through a mobile application or a web-based interface. This flexibility suits diverse operational scenarios, allowing on-site staff or remote personnel to initiate new tasks, attach supporting documents and images, and even set up recurring maintenance schedules. Once requests enter the system, they appear on customizable dashboards that organize them by priority, location, or type of service. Administrators can then triage, assigning tasks based on team expertise, workload, or geographic proximity. The mobile app assists technicians by displaying request details, offering integrated map views for route optimization, and enabling real-time progress updates, even in areas with limited connectivity, which are later synced when the device regains network access.

A dedicated inspection feature allows managers or external auditors to create separate verification requests, ensuring that completed services meet quality standards. If discrepancies are identified, they can be documented and automatically sent back to technicians for review or correction. In parallel, Sigelu supports contract management and payment workflows by consolidating all relevant records, such as costs, service dates, and performance metrics, into a unified environment. This integration ensures a clear audit trail, simplifies invoice validation in the ERP system, and reduces the risk of inconsistencies or delayed payments. Across the entire maintenance lifecycle, Sigelu's analytical capabilities provide insights through visual dashboards and performance indicators, helping decision-makers identify trends, allocate resources more efficiently, and address recurring issues proactively. By merging powerful field tools with seamless back-office processes, Sigelu delivers a comprehensive solution that advances Correios's digital transformation goals and empowers the engineering division to manage complex maintenance operations with greater agility and transparency.

In this project proposal, the primary challenge lies in determining how Sigelu would be integrated with the numerous applications already in use by Correios. We observed that Sigelu could replace many existing systems by functioning as a central platform while allowing integration with other tools. The features included in this project demonstrate a high level of technological maturity and flexibility, as they have been successfully employed in both urban and building maintenance contexts. Due to its high technological maturity and its ability to support a wide range of operational processes, Sigelu gave us the confidence to present it as a viable alternative to the technological patchwork developed by Correios over the years.

3.3 Copasa

Copasa is a Brazilian sanitation company responsible for expanding and maintaining water supply and sewage systems across more than 640 municipalities in the State of Minas Gerais. Its current investment program, valued

at approximately R$1.67 billion in 2024, drives the construction and enhancement of pipelines, water and sewage treatment facilities, and associated infrastructure. These projects can be highly diverse: some are linear, like pipelines laid in densely populated urban areas or remote forests, while others involve the erection or refurbishment of large-scale treatment stations. Because the work is spread over wide geographical areas, Copasa faces logistical hurdles in delivering timely and detailed oversight. Engineers and technicians cannot always be present on-site, so there is a risk of undetected irregularities, such as delays, subpar materials, noncompliant safety measures, and poorly executed construction techniques. As Copasa seeks to meet its universal sanitation goals and ensure its contractual commitments, it aims to integrate advanced technologies that enable remote tracking, monitoring, and analysis of the progress of these simultaneous works.

Sigelu was presented as a smart, data-driven platform designed to centralize Copasa's project oversight while enabling remote and automated inspections. The solution begins by streamlining the registration and management of ongoing projects within an integrated environment that uses georeferencing to locate each work site. A unified dashboard organizes daily logs, comments, and documents, linking them to a Gantt chart that displays timelines, milestones, and deadlines. By importing schedules directly from MS Project, Sigelu creates a coherent list of deliverables and tasks, all updated in real-time whenever field data is recorded during inspections. Whether images and videos are gathered via smartphones, 360-degree cameras, or drones, the system continuously populates its database with fresh visual evidence. It generates time-lapse sequences of particular work sites to document progress over days or weeks.

Sigelu applies artificial intelligence from these data sets to analyze inconsistencies or highlight potential risks. The AI system draws upon Copasa's historical records to refine its model through supervised machine learning. Comparing current imagery to baseline plans can detect deviations from proposed designs, estimate earthwork volumes, calculate distances, and measure surface areas. All these insights contribute to creating a live picture of the works' development, allowing Copasa's engineers and auditors to make decisions based on near real-time data without sending personnel to each location. If issues arise, such as inadequate safety compliance, Sigelu provides instant notifications to help teams address them quickly.

In addition to the technical components, Sigelu supports remote inspections through video calls, geolocation services, and other collaborative tools. Engineers can schedule virtual site visits, specify inspection parameters, and rely on the platform's AI to suggest priority checks based on risk indicators. By collecting and processing information efficiently, Sigelu generates comprehensive reports detailing each project's quality and safety and adherence to schedule and budget. These findings are visualized in interactive management panels that synthesize performance metrics across multiple works. Through this intelligent approach, Copasa can ensure greater oversight and accountability in its construction activities, maximizing the value of its investments and strengthening the reliability of its services for communities throughout Minas Gerais.

In this project proposal, the main challenges involve adapting three essential features within Sigelu. First, the system must support synchronous remote inspections through videoconferencing, for which we plan to provide mobile data packages as part of the contract, as well as offline functionality for emergency scenarios that lack full connectivity. Second, integrating multiple inspection methods, drones, fixed cameras, and smartphones into a cohesive workflow is critical. For example, orthophotos generated from drone images can detect earth movements; fixed cameras at the construction site can capture occupational safety anomalies; and smartphone-based records collected by the supervising engineer can provide detailed information on work progress. Finally, the third element centers on generative AI to consolidate notes recorded during remote inspections. This AI-generated report organizes the data by key managerial concerns such as workplace safety, the quality of executed services, and overall project progression according to the established schedule.

4. Lessons Learned

Predictability is essential in public-sector sales processes, providing clear expectations regarding outcomes and costs. One of our key insights from participating in the TCU CPSI bidding process is that the absence of predictable parameters can negatively impact how advantageous a proposal appears to public managers. Although CPSI contracts are designed to test market-based solutions for public-sector issues, thereby sharing risks, unpredictability can make a project appear less competitive than other proposals.

Building strong teams and a solid reputation is another critical factor. Originating in academia, Lemobs boasts a highly qualified technical staff with experience in both industry and government. Over time, we have earned multiple awards in the govtech and smart cities sectors and worked with major national clients. Such credentials and demonstrated market experience have consistently placed Lemobs among the top-rated companies in CPSI calls, influencing our successful selection by Correios and Copasa. For startups, it is advisable to strengthen teams

with qualified personnel and establish a continuous process of gaining credentials, such as certifications, awards, intellectual property, and reputable clients, to enhance credibility.

Balancing the introduction of new functionalities with leveraging existing strengths is another lesson learned. CPSI calls often consider a solution's technological maturity and innovative potential to address the presented challenge. In practice, the public-sector issue rarely aligns perfectly with an existing solution, resulting in a gap between the agency's needs and the startup's current offerings. When a proposal emphasizes many new features that deviate significantly from existing functionalities, it may gain points for innovation but risk losing points for technological maturity. Thus, an optimal balance is needed to demonstrate that the startup has a sufficiently mature solution while accommodating the organization specific requirements.

Positioning a product at the technological frontier can be equally important, particularly when the public sector explicitly seeks solutions involving cloud computing, artificial intelligence, machine learning, the Internet of Things, blockchain, etc. However, incorporating the latest technologies does not guarantee success; the chosen technology should genuinely address a pain point for the client. In other words, integrating cutting-edge tools must clearly deliver value to the public agency.

Finally, every CPSI call we have participated in has required a video pitch of the solution, followed by a live presentation. Developing a concise, easily understandable presentation highlighting the solution's core aspects is relevant. Evaluators often review dozens of proposals, and while they may have notes or specific questions, they may still struggle to grasp the fundamental points of a project when it is time for the live presentation. It can be frustrating for the solution developers, who may have well-thought-out answers for various detailed aspects. As a result, clear communication is key to ensuring that the agency fully appreciates the merits of the proposed solution.

5. Conclusion

In this study, we examined the participation of Lemobs, an academic-based startup in the Brazilian govtech sector, in the CPSI public procurement process established by the *Marco Legal das Startups*. Through three cases, we analyzed the challenges encountered and the lessons learned as Lemobs proposed innovative solutions for three public agencies: the Tribunal de Contas da União (TCU), Correios, and Copasa. Each case provided insights into how startups emerging from academia can adapt their solutions to public-sector demands while navigating the complexities of government procurement processes. This research underscores the growing role of govtech companies in fostering digital transformation within public administration and highlights the strategic approaches required for startups to engage with government clients effectively.

From our findings, several key lessons emerged. First, predictability in project scope and costs is crucial in public procurement, as the lack of clear expectations can hinder competitiveness. Second, building strong teams and a credible reputation significantly enhances a startup's chances of success, as demonstrated by Lemobs' high ratings in CPSI calls due to its academic expertise, industry experience, and prior achievements. Third, balancing technological maturity with innovation is essential, startups must bridge the gap between their existing solutions and the specific needs of public agencies without compromising reliability. Additionally, positioning a product at the technological frontier is valuable, but only when the selected technologies genuinely address government challenges. Finally, effective communication is critical, particularly in CPSI processes that require video pitches and live presentations. A well-structured presentation ensures that evaluators fully understand the solution's value, preventing misinterpretation and strengthening the proposal's competitiveness.

These contributions are intended to support researchers who seek to transition into entrepreneurship and those who already have a product derived from their academic research and wish to engage with the public sector. A key limitation of this study is the limited discussion on how the specific adaptations of Sigelu were presented in each proposal, as word constraints prevented a deeper exploration of these details. Future research will incorporate feedback from CPSI evaluators, providing insights into how they perceive the main challenges faced by startups and identifying strategies that could enhance their competitiveness in public procurement calls under the *Marco Legal das Startups*.

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