

A critical analysis of the bank Caixa's digital social savings account from the perspective of coproduction

Uma análise crítica da conta Poupança Social Digital desenvolvida pelo banco Caixa sob a ótica da coprodução

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Abstract: The COVID-19 pandemic has led public service providers to realize innovations supported by the digitalization of their services, aiming to increase efficiency and ensure their responsiveness. In this context, the study analyzes the emblematic case of the social savings account of the bank Caixa for payment of emergency aid that enabled broad and fast access to millions of beneficiaries. This new service required a more active role from its users, making them co-producers of this process. The co-production in this service was critically analyzed by the Process-Chain-Network Method (PCN), comparing the digital service implemented with the previous similar service performed in person. This study identified some difficulties in the involvement and participation of customers, pointing out the existence of gaps in the adoption of this strategy by Caixa bank, such as operational failures in the access and use of digital tools, high demand for face-to-face services and users' difficulties in understanding the digital service. The data collected in the study pointed out several challenges present in implementing this strategy in services of this nature that meet a large and diverse contingent of users.

Keywords – Co-production; PCN Analysis; Digital Social Savings; Service Innovation.

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Resumo: A pandemia COVID-19 fez com que muitos prestadores de serviços públicos realizassem inovações apoiadas na digitalização dos seus serviços, com o objetivo de aumentar a eficiência e garantir a sua capacidade de resposta. Neste contexto, o estudo analisa o emblemático caso da conta poupança social digital do banco Caixa para pagamento do auxílio emergencial que possibilitou um acesso amplo e rápido a milhões de beneficiários. Este novo serviço exigiu um papel mais ativo dos seus usuários tornando-os coprodutores deste processo. A coprodução existente neste serviço foi analisada criticamente pelo Método *Process-Chain-Network* (PCN) comparando o serviço digital implementado com o serviço similar anteriormente realizado de modo presencial. Este estudo identificou algumas dificuldades no envolvimento e participação dos clientes, apontando a existência de falhas na adoção desta estratégia pelo banco Caixa, como falhas operacionais no acesso e uso das ferramentas digitais, alta procura dos serviços presenciais e dificuldades dos usuários na compreensão do serviço digital. Os dados coletados no estudo apontaram vários desafios que se fazem presentes na implementação desta estratégia em serviços desta natureza que atendem a um grande e diverso contingente de usuários.

Palavras-chave – Finanças Coprodução; Análise PCN, Poupança Social Digital; Inovação de Serviços.

Introduction

Behavioral The exceptional circumstances of COVID-19 in the early 2020s brought several challenges to the continuity of service delivery in many public organizations. One of the alternatives found by several organizations was to use the co-production of the public service that underwent a significant impulse toward its digitalization. In this context, the role of online applications has become critical to ensure service continuity (Surva, 2022). This trend was also present in the Brazilian context, and an emblematic case was the introduction of Emergency Aid by the Federal Government. The social benefit payment, called Emergency Aid, was established by Law No. 13982 of 2020 to minimize the economic and social impacts of this international health crisis. It was one of the significant impact actions among the federal government's several initiatives to deal with this crisis and the harmful effects of low economic growth rate following this health crisis.

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The Emergency Aid targets the most unprotected part of the population, including beneficiaries of the Family Grant Program (PBF), those enrolled in the federal government's Unified Registry for social programs (CadÚnico), and citizens who already had some relationship with social assistance policies. In addition, this benefit also embraces informal workers, the self-employed, and individual microentrepreneurs (Cardoso, 2020).

According to data released by Caixa, the payment of emergency social benefits, such as emergency aid, represented the most extensive social benefit payment in Brazilian history, with R\$ 294.1 billion paid in 2020 and R\$ 58.5 billion accumulated until October 2021 (CAIXA, 2022a). In 2020 the social benefit could reach more than 120 million Brazilians (CAIXA, 2020a), and in the accumulated until October 2021, it reached 39.2 million beneficiaries (CAIXA, 2022a).

To provide more inclusive access to citizens and also to attend the social distancing policies, the Provisional Measure MP 982/2020, published on 13/06/20, set the establishment of digital savings accounts for the payment of social benefits during the coronavirus pandemic and for some possibilities of withdrawals from the FGTS (Employee's Time Guarantee Fund).

The digital social savings account was a relevant initiative for the public banking sector, especially in social program payments. It allowed broad and fast access to beneficiaries through CAIXA's website or by its app (CAIXA, 2020a). On the other hand, accessing and using this new service requires a more active role from its customers, who have become co-producers. The solution introduced by CAIXA was based on a co-production facilitated by technology that has been widely used in various public services through the digitalization process enabling traditional forms of services to be replaced or supported by digital options (Young, 2022).

Co-production can be understood as the process by which the inputs used to provide a good or service are delivered by individuals who are not in the same organization (Ostrom, 1996). As firms intensify co-production in their services, several benefits can be achieved. Significant cost savings are obtained by transferring work previously performed by the organization to customers (Mills & Morris, 1986). Also, greater customer satisfaction derived from self-determination can be obtained (Honebein &

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Cammarano, 2005). Additionally, the inclusion of customers in the production and delivery phases of the service improves the perception of service quality, favors repurchases, and promotes the indication of services by customers (Cermak et al., 2011; Dabholkar, 1990). Despite these gains, co-production also requires several managerial actions and presents several challenges to be successful (Honebein & Cammarano, 2005). Regardless of the growing adoption of co-production, our understanding of co-production is still limited. We should consider that co-production can fundamentally reorganize the relationships between citizens and government, challenging essential values such as transparency, accountability, equality, and proportionality (Meijer, 2016).

Undoubtedly, co-production can improve operations efficiency by reducing production resources on the provider's side. However, it also involves considerable expense for its implementation. For example, users must be selected, recruited, and trained to perform at the required level of professionalism in service delivery. Providers must modify or redesign their organizational structures, processes, and procedures to incorporate users into their processes. In addition, we must consider that citizens may incur costs while coproducing (Garlatti et al., 2020).

Digital services undertaking initiatives (such as CAIXA's digital social savings account presented in this paper) are usually associated in the management literature with economic savings, higher productivity, increased transparency, better service quality, access to services, customer satisfaction, citizen participation, and empowerment (Surva, 2022).

Considering what has already been exposed, the co-production and digital service delivery present in CAIXA's social digital savings account can be caught as innovative strategies to improve public services that must be better understood from the operations management point of view. For this purpose, this paper critically compares the digital social savings account with the payment service of the federal government social programs traditionally performed by CAIXA face-to-face. This critical analysis uses the Process-Chain-Network (PCN) method, which positions the service steps and the entities involved in specific regions or process domains. These regions follow a structured logic in the light of various principles of service operations management, which enables an analysis of the existing process taking into account the

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way the operation interacts with the customer and the implications of this form of interaction for operational efficiency and service quality. These characteristics contribute to the visualization and analysis of the necessary process improvements (S. Sampson, 2014; S. E. Sampson, 2012).

Given the scenario and innovative implementation in public banks in Brazil, social, digital, and financial inclusion carried out in a single service, this study is important for better understanding the phenomenon and its relations, as it determines new practices in the banking transaction.

The research has substantial theoretical and practical relevance because it analyzes the inclusion of a digital service aimed at beneficiaries of social programs through a tool in which all natures of interactions are visualized, facilitating the identification of improvements in the process and allowing the analysis of efficiency and responsiveness, and explore the understanding of co-production with specific audiences.

This study identified several obstacles present during this service's implementation. Many of them revealed that the organization failed to adopt strategies recommended in the literature for its customers' adequate co-production. Despite the great success of this nature's services, several challenges are still present and must be addressed by this sector.

The remainder of this paper is structured on the following topics. First, in the theoretical framework section, the authors discuss the influence of customer participation in service processes, the characteristics, and strategies for implementing co-production and point out service innovations in the banking sector. Next, the methodological strategy employed is described in the research methods section. This section describes the PCN method used in the critical analysis of the two cases addressed. This section is followed by the field research results, which describe the services analyzed and their characteristics. Finally, the final section discusses the results and their implications.

Theoretical Foundation

This section addresses some critical concepts to better understand the occurrence and challenges of co-production in services.

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Customer participation in services

Services are characterized by the existence of significative customer inputs in the production processes (S. E. Sampson & Froehle, 2006). Under this logic, customer participation is always present to greater or lesser intensity (Jo Bitner et al., 1997). Therefore, it becomes essential to understand the influence of customer participation in services.

An immediate consequence of customer participation in service processes is the introduction of uncertainty to the service delivery system. This uncertainty manifests itself in different types of variability:

- Arrival variability: Not all customers want the service simultaneously or at times that are necessarily convenient for the company. Customers want service at different times.
- Request variability: Not everyone asks for the same thing. Customer requests vary from person to person.
- Capacity variability: Customers' capabilities differ. Whether because of greater knowledge, skill, physical aptitudes, or resources, some customers perform tasks quickly, and others need help. This capability variability becomes critical when customers are active participants in delivering process.
- Effort variability: When customers play a role, it is imperative to spend a certain amount of effort on this task. However, they differ in how much effort they apply to the task. Such variability has an impact on the quality and cost of the service.
- Subjective preference variability: Customers have different opinions about the appropriate treatment in service. These personal preferences make services much more difficult to satisfy a broad customer base (Frei, 2006; Frei & Morriss, 2013).
- Communication variability exists because customers often describe their desires unclearly (Yang, 2011).

These different forms of variability can be seen sequentially in the service process because they reflect the flow of the vast majority of service processes. The customer arrives, makes a request, plays a role in the process requiring some skill and effort, and evaluates the experience according to their preferences. The lower the variability at any of these steps, the easier it becomes for the organization to achieve operational efficiency. However, one way to address customer variability without compromising the efficiency of the process is by adopting co-production practices (Frei, 2006; Frei & Morriss, 2013).

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Coproduction in Services

Many companies are shifting some existing tasks in service delivery to their customers. This process can be understood as co-production. The prefix "co" indicates that the company and the customer find a certain equilibrium in allocating responsibilities for the tasks that both must perform to create the service. Moreover, we should consider that this process depends on the customers' acceptance and willingness to fulfill the co-production function adequately (Honebein & Cammarano, 2005).

Co-production may occur in different manners (individual, group, or collective) and during different phases of the service cycle (commissioning, designing, delivering, and assessing). Given the wide variety of empirical contexts in which co-production can occur, it is challenging to provide a common definition for this term (Farooqi, 2016; Young, 2022).

The success of co-production depends on the extent to which clients are ready to accomplish their roles. This includes the customer's willingness, role clarity, and ability to play their role (Auh et al., 2007). In this direction, organizations should develop specific expertise of their customers to handle the service process. Therefore, the term expertise means that the customer can perform service-related tasks successfully. The expertise also depends on the level of familiarity of the customer with the service. Thus, a customer with more expertise spends less effort performing service tasks. Developing this expertise, however, is not easy or low-cost. Companies must invest significantly to discover their customers' learning needs, organize the content customers need, and deliver it appropriately. On the other hand, customers must invest time to learn new knowledge and acquire new skills (Honebein & Cammarano, 2005).

Co-production requires structuring a program that involves several managerial actions so that customers have the necessary expertise to perform their tasks. In this sense, the authors Honebein and Cammarano (2005) suggest six actions to be developed by the organization. These are:

- Recruit - Select customers based on the compatibility of the competence and resources to achieve success with the services.
- Orient - Ensure that clients are appropriately acquainted with the company and the range of services offered.

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- Train - Teach clients the skills they need to succeed with services. This can include support structures that complement training in real-world contexts.
- Recognize - Inform clients personally or publicly when they are meeting expectations.
- Reward - Provide tangible incentives when clients achieve specific goals.
- Retain - Have a program that recovers defections and a process for collecting ideas to improve customer retention.

Co-production has a company-centered vision for customer involvement during service production because it seeks to improve productivity and greater customer satisfaction. In this direction, the literature points to co-production as having the following characteristics: the company as the center of value creation, disregarding the importance of reciprocity between the company and consumers and ignoring the company's mutual dependence and the consumer as an element for more significant value creation (Chathoth et al., 2013).

Co-production and co-creation cannot be understood as synonyms. Co-production has a smaller scope than co-creation because it deals with the customer's involvement in the service delivery system in a broader way that includes the various stages and functions of its value chain. Moreover, customer involvement can extend throughout the entire innovation process, from idea generation to end-use. In co-production, the customer's role is relatively passive. In co-creation, customers play a more significant role in both the creation and delivery of a service, which increases the value to the customer (Chathoth et al., 2013; Prahalad & Ramaswamy, 2013).

The vast majority of papers assert that co-production can improve the efficiency of service processes, specifically by reducing labor-related production factors. However, these labor-related costs are transferred to customers. This fact should not be ignored or not calculated by the organization since co-production boosts concerns in terms of equity of access to service for different customers who have different skills and resources of their own to play their role as co-producers. In other words, co-production may disadvantage the most vulnerable groups of customers who are least able to support this relocation of activities through co-production (Garlatti et al., 2020). For example, some studies highlight problems

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with introducing public digital services for elderly and low-income people who cannot perform co-production activities properly (van Deursen & van Dijk, 2014; Young, 2022).

The individual abilities and characteristics of the users are mentioned as facilitating elements of co-production. Thus, physical and mental health, age, and educational background can foster people's ability to play a better co-production role (Amorim Lopes & Alves, 2020).

We must also consider that the user's perception of effectiveness is critical to the success of co-production. Thus, technological solutions perceived as unfamiliar by users face problems in their adoption (Surva, 2022).

Another relevant aspect is that an abrupt shift to a digitalization of the service can significantly decrease the quality of the interactions between the provider and its customers. In order to preserve the quality of the co-production process, the service provider must supply a safe environment for interactions to take place with genuine discussions and where the customer can talk and listen without interruptions (Surva, 2022).

Innovation in Banking Services

The provision of banking services has undergone significant changes with disruptive innovations in the financial market, benefiting from the development of the internet in the treasury system by improving the offer of value to the end customer with more complete, assertive, and fast services (Lee & Shin, 2018).

Banking institutions in Brazil have been updating for a long time, seeking more technological resources (Mainetti Junior et al., 2014). ATMs were initially installed inside branches and, with their acceptance, spread to outside environments, with the advantage of operating beyond physical banks' hours. Electronic collection systems, automatic payments on account, debit cards, credit cards, payment transactions, and bank transfers through the internet are innovations in the banking sector (Appio Frizon et al., 2020).

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In recent years, the banking system has expanded several electronic services. This industry uses home banking as an essential service because it meets both the consumer's and the Bank's needs due to its convenience and by providing cost savings in providing services. Also, the sector has increased the use of mobile banking as a strategy for financial inclusion in the country since the Brazilian population is still very deficient in banking services (Lima, 2016).

The experiences of innovation carried out by managers of the federal public sector play an essential role in modernizing the public sector. They consist of the adoption and use of technologies and the development of knowledge and training of service providers, users, and partners of federal public institutions. Many of these innovations use the co-production strategy (Dos-Reis & Isidro-Filho, 2019).

Methodology

This paper aimed to critically compare the digital social savings account with the payment service of the federal government social programs traditionally performed by CAIXA face-to-face. To meet this objective, the authors opted for a qualitative and descriptive approach developed through a case study in which data were collected in the field through observation and through documentary research. This data was used to construct the PCN diagram that critically portrayed the two services.

This study is descriptive because its main objective is to describe a financial institution's banking services' characteristics. The case study methodology was used to identify the digital social savings account characteristics and the payment service of the federal government social programs traditionally carried out by Caixa's Bank in face-to-face mode.

The single case can represent a significant contribution to knowledge and theory building by confirming, challenging, or extending the theory besides having the objective of capturing the circumstances and conditions of an everyday situation for some theoretical interest (Yin, 2018). In this research, the case study is of the embedded type. The main unit is the Caixa bank, but with units of analysis at more than one level since it involves several bank branches and other agents. The construction of analysis was carried out through data from different sources of evidence, enhancing the investigation and

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allowing more profound insights into the case. This approach is appropriate when a particular behavior cannot be manipulated, and the boundaries of the phenomenon of interest and its context are unclear. The case study approach allows for extracting evidence from more than one unit of analysis, aiming to add depth and breadth to the data collected (Yin, 2018).

The case study allows a deeper understanding of a phenomenon as it enables the adoption and combination of different forms of data (McCutcheon & Meredith, 1993). Therefore, this study performed the combination of more than one data collection, thus performing a triangulation of the data. The constructs are considered valid when the researcher uses some fundamental principles: employ multiple sources of evidence (perform triangulation), create a case study database; maintain the linkage of evidence; and be careful when using data from electronic sources (Yin, 2018).

The study was conducted in three stages, the first being a documentary analysis. Documentary research uses more diverse and dispersed sources without analytical treatment, such as statistical tables, newspapers, magazines, reports, official documents, letters, films, photographs, paintings, tapestries, company reports, and videos of television shows (Gil, 2010).

The first stage of the research was performed with the capture of documents and official reports of the institution for identification, analysis, and understanding of the phenomenon studied. Appendix 01 of this paper contains the list of official documents analyzed in the documentary research and their respective research sources. It was also performed in this stage documentary analysis of websites, laws, and provisional measures edited by the Brazilian federal government on the theme of the study.

The second stage comprised the method of direct observation of events, in which one of the study's authors conducted visits at a bank branch of Caixa during the pandemic in 6 weeks between October and November 2020. Direct observation plays an essential role in the case study (Godoy, 1995). As a spectator, there was passive observation in the self-service room of the bank branch, this strategic location because it is where the first contact of the Bank's employees with the customers occurs, in which the demands are directed.

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Thus, during the observation period, it was possible to identify the needs of customers and the reasons that led to the face-to-face search for services now transferred to the digital environment, and problems occurred in the interactions carried out in the digital service.

Table 1 shows the methods of data collection adopted in the research.

Table 1.

Data collection method

Data collection method	Description
Direct observation of the events	Visit a branch of the institution and observation in the self-service room where the first contact of employees with customers takes place, directing these customers' demands.
Documentary research	Analysis of websites, laws, and provisional measures published by the federal government, instruction booklets, institutional reports, and the Caixa's institution's official documents.

As additional documentation, it was analyzed information published in the institution's social media and other vehicles, such as news sites and banking unions, published issues about the analyzed service.

Understanding the service process to be analyzed. In this study, the authors analyzed digital social savings.

Identifying multiple entities involved in this process. Two entities are involved in the service process: the user and the Bank.

Analyzing the starting and ending steps of the process and depicting them in the PCN diagram.

All intermediate steps are listed in the PCN diagram. An arrow represents the order and dependency relationship between the two steps, according to the order of each step in the service process and the process region to which the step belongs.

The PCN can be understood as a graphical tool that makes it possible to visualize the way in which the activities of a process are executed, taking into account the region of interaction utilized. Regarding the interaction region, the operations literature has identified three major regions:

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- Direct interaction region - includes process steps that involve person-to-person interaction. This direct interaction means that people of one entity are interacting with other people of another entity somehow.
- Surrogate interaction region - includes process steps in which one entity acts on another entity's non-human resources, such as its belongings, information, or technologies.
- Independent processing region - includes steps in which an entity acts on resources owned and controlled by that same entity (S. Sampson, 2014).

To construct the diagram, the regions are arranged in five distinct columns. The side edges' columns have positioned the regions of independent processing, being on the left side the provider domain region and the right side the customer domain. Next is the surrogate interaction region, each column corresponding to a domain quadrant. The middle column is directed to the direct interaction region, where the domains meet, performed by both the provider and the customer. Figure 1 shows the existing process regions in the PCN diagram for a provider and a customer. Each of the five regions has management implications for the operation of the service.

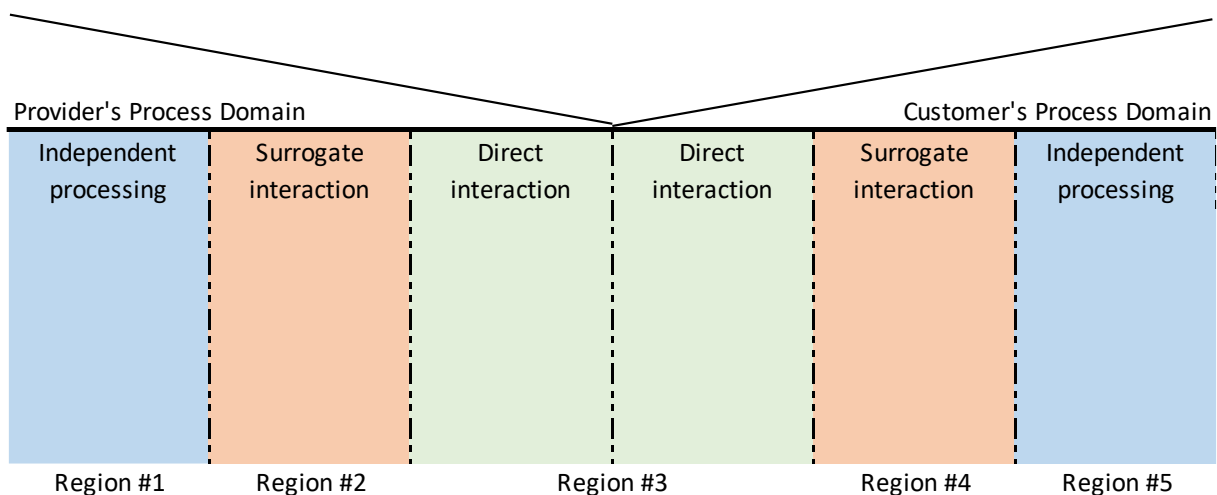


Figure 1. PCN regions

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Region #1 (independent processing of supplier) includes steps in which the provider acts independently of the customer and has a great deal of control over the process. The provider can perform the activities present in Region #1 when, where and how it wants. In this region, the producer can stock his products. It is the region of the maximum economy of scale, making it ideal for process steps that require expensive equipment or hard-to-obtain expertise. It is also a region of high efficiency. Usually, the quality of services in this region is defined by detailed specifications created by the company's technical staff (S. Sampson, 2014).

Region #2 (surrogate interaction of supplier) is what service literature refers to as the back office. Even if the customer is not physically present in this region, its information or assets may be present. Region #2 has lower operational efficiency than Region #1. This region also has lower capacity utilization due to its dependence on customer inputs to perform activities. The performance of employees and systems operating in Region #2 focuses on the speed and accuracy of the service response in meeting customer requirements (S. Sampson, 2014).

Region #3 (direct interaction) is also called the front office, as opposed to region two, which is called the back office. The high intensity of interaction between the two makes it the region with the lowest operational efficiency. On the other hand, the more significant interaction in Region #3 allows for greater customization than in Regions #1 and #2. However, this more significant interaction between the parties may cause variation in the processes, reducing the scale economy. The performance of employees involved in Region #3 is typically based on the ability to verify and respond to customer needs, but this also depends on customers adequately communicating their requirements and accepting the limitations in the supplier's offering (S. Sampson, 2014).

Region #4 (surrogate interaction of customer). In this region, the customer acts using the supplier's resources (information, installation, or other technological resources performed in this region). This region is also called self-service. Also, customers have the opportunity to control the process and customize it as desired. However, the ability to perform in this region is limited by each customer's skills and motivation. Because customers' skills and motivations are very different, there can be problems or failures in service

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execution. Therefore, the processes operating in Region #4 must be robust enough to handle these occurrences. Besides, the provider must work on some strategies that enable clear disclosure and understanding of the customer's expected role in the process (S. Sampson, 2014).

Region #5 (independent processing of customer) is where the client has acquired all the resources needed to perform the service. It is a region characterized as do-it-yourself. In this region, customers have the most remarkable ability to control the process, implying the opportunity for a great deal of customization. However, this customization may be limited by the customer's ability to execute the process's steps, as the customer may have little experience and skills (S. Sampson, 2014).

Each of the five regions has some singularities in terms of operational aspects. For example, the largest economies of scale occur under supplier dominance of processes, i.e., in Regions #1 and #2. Regions #4 and #5 have the most significant potential for customization since they have greater control over the process. Furthermore, leaving the direct interaction region (region #3) increases the process's operational efficiency. However, the direct interaction region presents several benefits since it uses the supplier's experience and competencies, along with the possibility of the customer influencing the process, which favors the customization of the service. Therefore, medical services, education, and counseling usually work predominantly in the direct interaction region. However, seeking better efficiency pushes the various services out of this region (S. Sampson, 2014).

Results

Characterization of the organization analyzed

Based Caixa acts as an operator of the federal government through the Decree-Law No. 759, instituted in 1969, becoming a public company with obligations and duties, focusing on social nature services, promoting citizenship and the country's development and calling itself a social bank (CAIXA, 2020d).

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Caixa is a public company whose mission is to promote Brazil's sustainable development, generate value for customers and society, act as a public financial institution, and be the primary agent of state policies. Its vision is to reference efficiency, trust, and customer satisfaction, ensuring profitability in all its businesses (CAIXA, 2020d). It is a bank with an important social role, being present in all Brazilian regions and being the primary financial agent and executor of social programs instituted by the federal government, which is its sole controller.

Caixa has its sources of funding guaranteed by law. In addition to sources of funds from its typical banking operations, it has the National Treasury as its definitive source of capital contributions, either for purposes of compliance with regulatory minimums (such as adjusting to banking regulation rules such as *Basiléia* rules) or to cover any capital shortfalls, in the event of negative economic results from its activities (Vasconcelos et al., 2018).

It is responsible for Brazil's real estate credit portfolio and the federal lotteries. Among its primary functions is to ensure certain benefits to workers, such as the Guarantee Fund for Length of Service (FGTS), the payment of Unemployment Insurance, the financing of some social programs, such as My House My Life and Family Grant, and to make social identification records, such as the Individual Taxpayer Registry (CPF) (Abrão, 2018).

With the advent of technology, the banking services industry's specialization, and the growth of customer interaction through digital applications and the internet, banking institutions have started to provide their services in these new channels, expanding and innovating the service to their customers. Currently, some financial institutions, known as digital banks, offer only digital services.

Caixa followed this market innovation and provided its account holders, workers, and federal lottery players with digital services. However, face-to-face service provision is still predominant, especially in activities related to the federal government's social programs.

Social Benefits - pre-pandemic

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Caixa has been expanding new service forms, implementing self-service through internet banking, thus increasing its service capacity. However, it still has a high demand for face-to-face service. Practically all the services related to social programs were performed in the direct interaction region, except when the beneficiary opens a savings account at Caixa's Bank, and his benefit is credited automatically to this account. Also, the customer can perform several banking transactions (Examples: online payments, bank transfers, and withdrawals in the various self-service networks).

Suppose the beneficiary does not have a savings account. In that case, every month, he/she must go in person to a Caixa branch or one of its service channels (lottery stores or banking correspondents) with his/her citizen card issued by Caixa to withdraw the benefit. This withdrawal depends on the client going in person, as it can only be made at the tellers or the self-service tokens in the Caixa branches.

Figure 2 depicts the PCN diagram referring to the registration and receipt of any social benefit, such as the Family Grant (Bolsa Família), demonstrating the actions of all entities involved and the necessary interactions.

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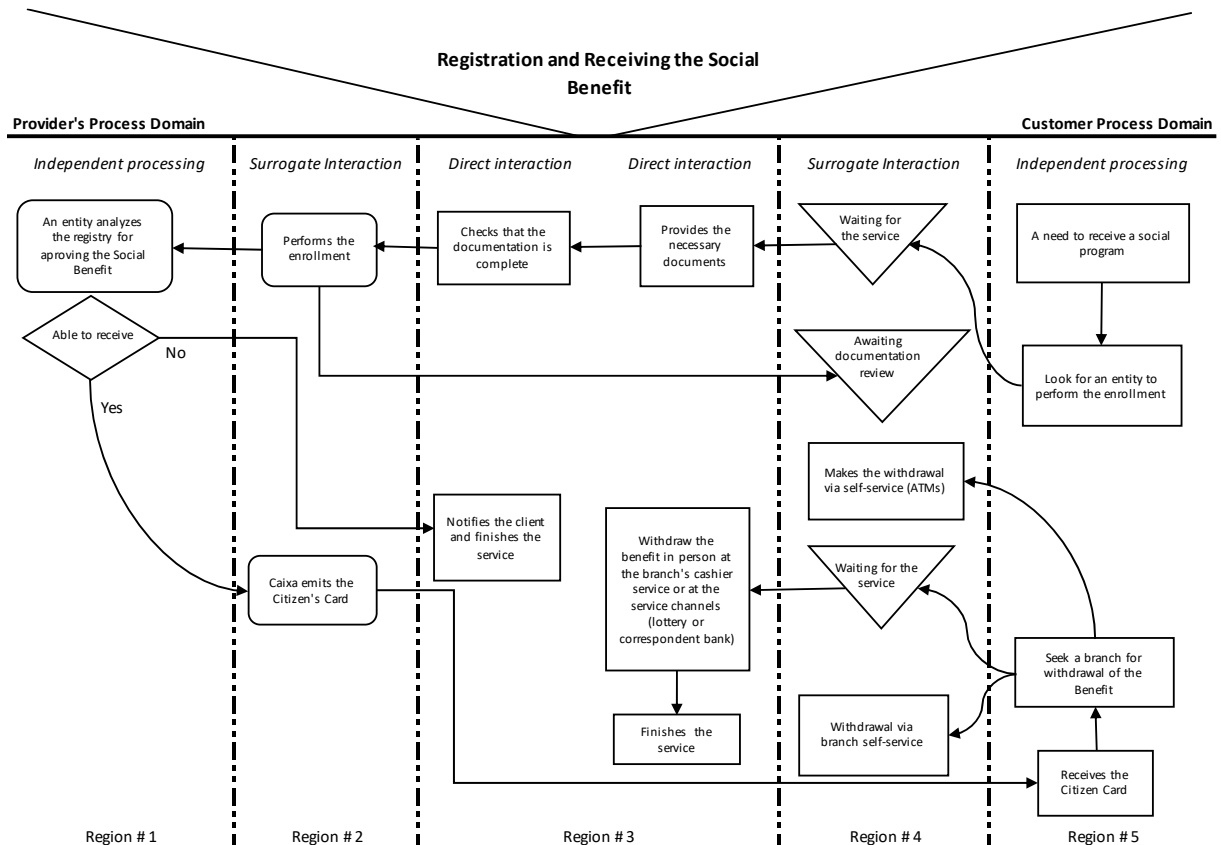


Figure 2. Version of the PCN Diagram for registering and receiving a social benefit paid by Caixa before the COVID-19 pandemic

As An analysis of Figure 2 reveals a need for the customer to go to a cashier agency or one of its service channels to receive the benefit. Thus, most of the activities were performed in Region# 3. Therefore, there was a dependency on direct interaction between the provider and its clients to execute this service. This dependency severely limited the capacity and affected the quality of the service provided by Caixa.

The digital social savings account - designed version during the pandemic

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Many Brazilians have lost or reduced their income because of the pandemic and the restrictive measures to prevent the contamination and spread of the disease. As a protective measure to minimize the economic and social impacts resulting from these restrictions, the federal government implemented in April 2020 the benefit called emergency aid.

The federal government granted this financial benefit to informal workers, individual microentrepreneurs, the self-employed, and the unemployed. The Caixa is the operating agent of this benefit, whose payment occurs through the Ministry of Citizenship (CAIXA, 2020a).

The citizen can request the benefit over 18 years old or a mother under 18 who meets the following requirements: unemployed; microentrepreneur; individual contributor to Social Security; informal worker; belonging to a family whose monthly income per person does not exceed half a minimum wage (R\$522.50); or whose total family income is up to three (3) minimum wages, R\$3,135.00 (CAIXA, 2020a).

The procedure for receiving the aid was that those who were already registered in the Unified Registry (CadÚnico) or received the Family Grant benefit would receive it automatically without registering. However, people who were not registered could register on the Emergency Aid application or website (this registration is analyzed and authorized by the government). After registration, a digital Social Savings account through the "CAIXA TEM" software is created for users authorized to receive this aid (CAIXA, 2020a).

The digital social savings account was created in Law No. 13982 of 2020 and Provisional Measure No. 959/2020, but it had not yet been regulated. These rules dealt with the payment of social benefits during the state of public calamity caused by Covid-19. The digital account was the mechanism for making the payment plausible since many of the beneficiaries did not have a bank account.

The digital social savings account regulation occurred in June 2020 with the publication of Provisional Measure 982/2020, which determines the characteristics of the digital social savings account and its operation by the user. Besides, the provisional measure determines in article 3º, paragraph III, item §6º:

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“§ 6º: It will be incumbent upon the financial institution that performs the automatic opening of a digital social savings account to make available a computerized consultation tool, by means of an electronic site and application, that allows the citizen to verify the existence of a digital social savings type account opened in his or her name, from his or her record in the Individual Taxpayer Registry – “CPF” of the Special Secretariat of the Federal Revenue of Brazil of the Ministry of the Economy and his or her personal data.”

The digital social savings account is free of a monthly maintenance fee and allows the payment of bills through the application and bank transfers. It also allows the user to perform virtual card transactions, such as purchases in physical establishments and card withdrawals at self-service terminals and lotteries. The digital social savings account does not entitle the user to a physical card or check. Hence, the digital social savings account represented an important innovation for the public banking sector, especially in social program payments. It enabled faster access to beneficiaries through digital tools, increasing the value proposition of this service.

Caixa created the “Caixa TEM” software to operate and make the payment of these benefits, which the user can access by computer or phone, requiring only internet access. According to data from bank Caixa, more than 109 million free digital social savings accounts were opened by the end of September 2021, with 6.9 million registered users with devices linked in the App Caixa TEM, performed 1.8 billion electronic and financial transactions, in addition to 66.4 million downloads of the application (CAIXA, 2022a).

Figure 3 shows the PCN diagram for the registration and receipt of the Emergency Aid through the Digital Social Savings account as initially conceptualized.

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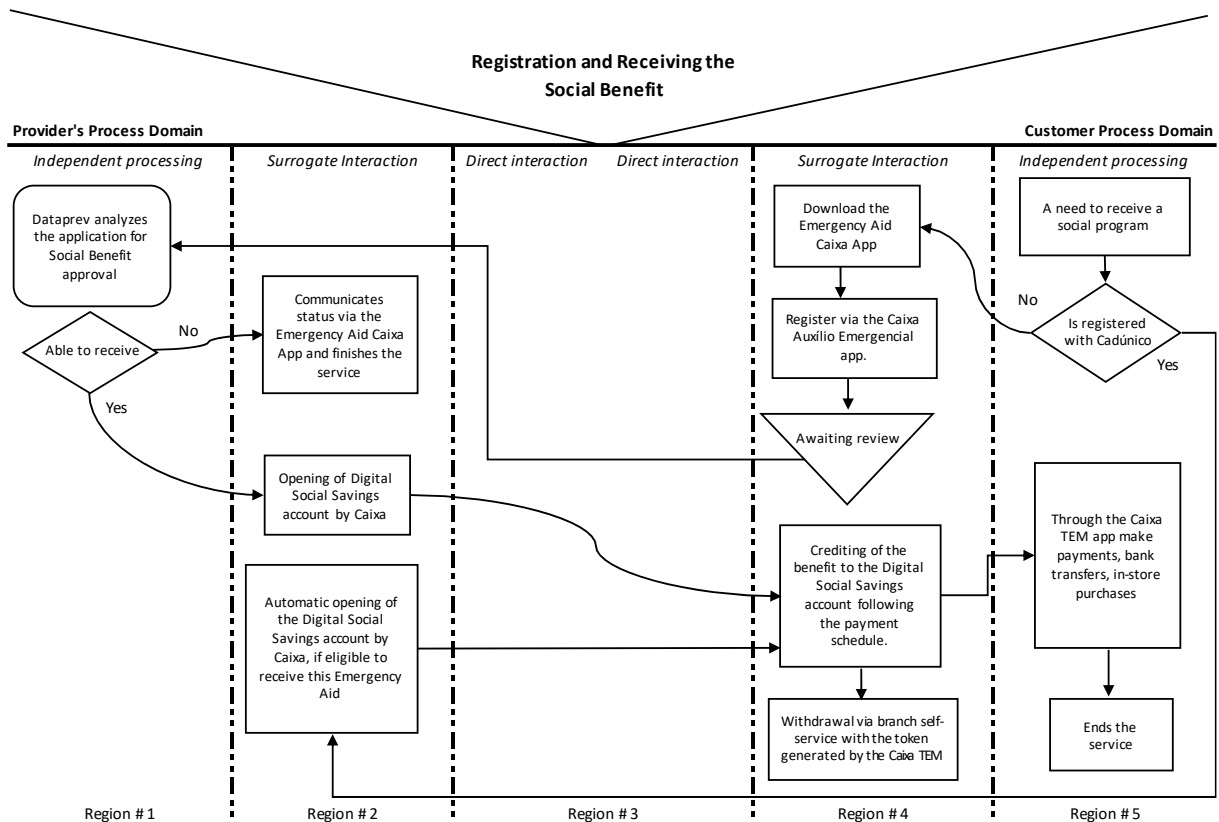


Figure 3. Version Idealized version of the PCN Diagram for the registration and receipt of the Emergency Aid through the creation of the Digital Savings account by Caixa

It is possible to observe a significant simplification of the process compared to the one before the pandemic, as presented in Figure 2. In addition to providing greater responsiveness, the implementation of digital social savings decreased the dependence on the interaction that was required between the customer and the Caixa employee, as well as allowing access to new services (e.g., bill payment via the app, purchases in physical locations only with the app). Moreover, the customer does not have to face queues to be served.

When implemented, this new service reached about 40 million unbanked citizens and 36 million people who were not on any government registry. Caixa also made the most extensive social, digital and

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financial inclusion movement in Brazil using technology through the Emergency Aid application and the Caixa TEM platform (CAIXA, 2020b).

The digital social savings account - In use

However, in use, there were problems in implementing this service. Not all Brazilians eligible for the Emergency Aid had access to the internet or even resources such as a computer or cell phone. The "Caixa TEM" software operational system presented instability and could not support the high volume of accesses, being unavailable at several moments to users. Despite the efforts to digitize the benefit, after the withdrawal authorization, crowds of people lined up at the Caixa branches to withdraw the Emergency Aid (Cardoso, 2020).

Table 2 summarizes the chronology of events that followed the emergency aid implementation and the digital social savings account.

Table 2.

Chronology of events that followed the implementation of the emergency aid and the digital social savings account

Main Events	
March 11, 2020	World Health Organization declares new Coronavirus pandemic.
March 18, 2020	Federal Government announces intention to create a R\$ 200.00 monthly emergency aid for three months for informal workers.
March 20, 2020	Federal Government decrees a state of public calamity for the public health emergency of international importance due to the Coronavirus (Covid-19) by Decree No. 6, 20/03/2020.
March 30, 2020	Congress approves emergency aid in three parcels of R\$ 600.00 for informal workers, the self-employed, individual microentrepreneurs, and the unemployed. Mothers responsible for the family's support will have the right to the aid of R\$ 1.200,00.
April 02, 2020	Publication of Law 13.982, of 04/02/2020, that institutes the Emergency Aid.
April 03, 2020	Caixa is chosen to make the Emergency Aid payments.
April 06, 2020	Launch of the Emergency Aid applicative by Caixa for the enrollment of users who request the aid.

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April 09, 2020	Receita Federal announces automatic regularization of CPFs pending due to registration problems.
April 09, 2020	Beginning of payments via Caixa.
April 29, 2020	Publication of Provisional Measure 959, of 05/29/2020, which establishes the operationalization of the payment of the Emergency Aid.
May 14, 2020	Publication of Law #13.998, of 05/14/2020, promotes changes in the Emergency Aid.
June 13, 2020	Publication of Provisional Measure 982, of 06/13/2020, which provides for the digital social savings account for the deposit of social benefits granted by the government without charging maintenance fees.
July 01, 2020	Publication of Decree No. 10,412 on June 30, 2020, which provides for the extension of the aid by the Federal Government for an additional two months.
September 16, 2020	The President extends the emergency aid for an additional three months by Decree No. 10,488 of September 16, 2020, which regulates the residual emergency aid.
September 18, 2020	Publication of Law 14.058, of 09/17/2020, which establishes the operationalization of the payment of the Emergency Benefit to Preserve Employment and Income and the monthly emergency benefit.
October 22, 2020	Publication of Law no. 14.075, of 10/22/2020, which provides for the digital social savings account. Conversion of MP no. 982, of 06/13/2020.

Not all the activities that were planned to be performed in region 4 came to fulfillment as planned. Figure 4 illustrates the actual service process in the face of instability and a large influx of customers to the branches.

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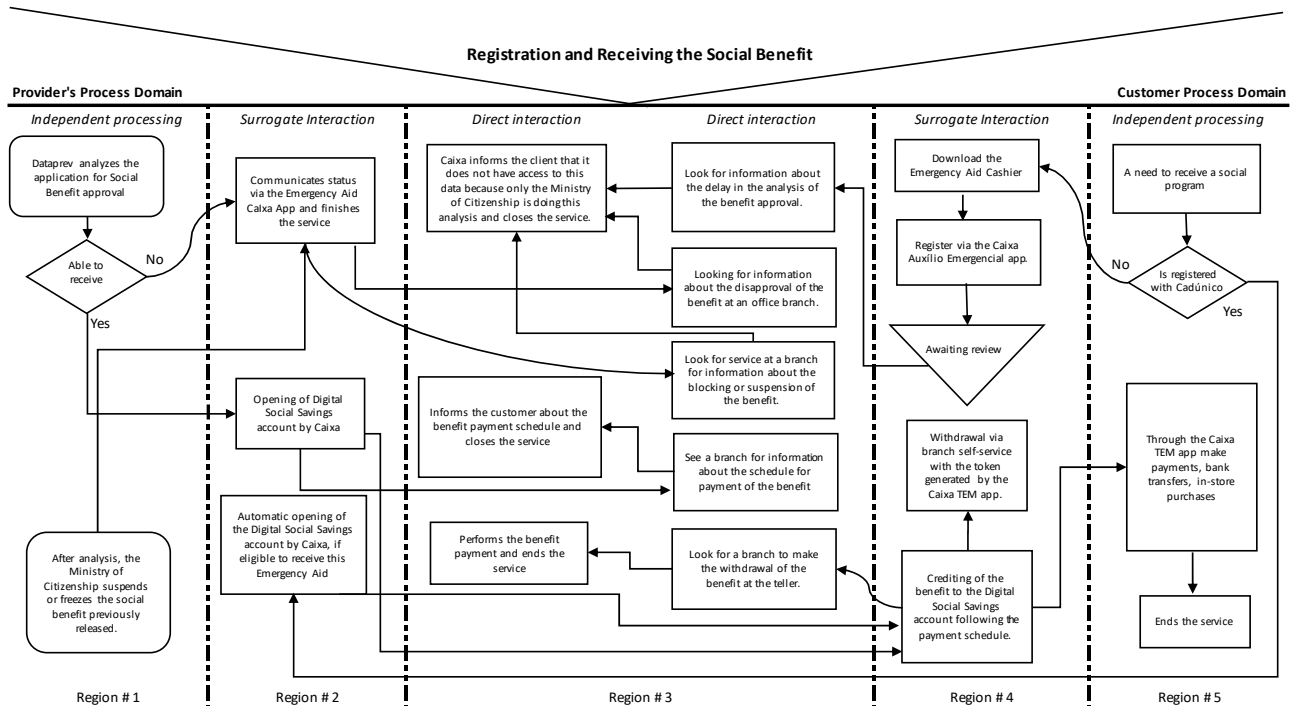


Figure 4. Actual version of the PCN Diagram for the registration and receipt of the Emergency Aid through the creation of the Digital Savings account by Caixa

Regarding Documentary analysis and direct observation conducted at a Caixa branch revealed several problems that have emerged during the implementation of this service (See Appendix B). Some of them are worth pointing out:

- Operational failures in the access and use of the Emergency Aid's digital tools and "Caixa Tem" software operated by Caixa;
- There was a considerable increase in demand in person at the agencies due to the lack of access by part of the population that did not have a proper connection to use the applicative. However, the registration was exclusively digital and, with few exceptions, could be done in person at the agencies;
- Slow and unstable software in the first months with many complaints that it blocked. (Caixa justified that it was due to the number of accesses and that it was continually updating the applications and increasing access capacity);
- Longs time to analyze the registration and authorize the aid;

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- The population's inability to understand the information and steps to register and access the digital tools affected the demand for in-person service at the branches.
- Queues at bank branches due to customers' demand to solve problems such as i) Ask questions and get information about the emergency aid payment schedule; ii) Check why the resource has been denied, blocked, or suspended even though there is a field in software to deal with issue and iii) Regularization of divergent data.
- Problems with making bank transfers via the "Caixa TEM" software.
- Many application rejections and misunderstandings among users exceeded the limit set by the Caixa of two members of the same family for enrollment in the aid program;
- Excessive access to the "Caixa TEM" software by devices other than those registered initially. In these cases, accounts were blocked due to suspicion of fraud. This fact increased the demand in person at the branches to unblock these accounts.

According to Caixa's Ombudsman report for the first half of 2020, the number of complaints registered in this period grew by 83.1% compared to the same period of the previous year, with almost 494,000 occurrences received in the internal and external channels served by Caixa. In this period, the customer base grew by 25.2%. Moreover, 21% of complaints were related to benefits, programs, and social policies, representing one-fifth of all occurrences. The situations related to the payment of the Emergency Aid were responsible for most of the complaints. According to the document, several measures were taken to improve the process and reduce problems (Caixa, 2020c).

Chart 1 reflects the impact of complaints in official service channels with the analysis from the first half of 2019 to the first half of 2022, especially in the first half of 2020 and 2021. In the 1st semester of 2020, compared to the 1st semester of 2019, demonstrated a significant increase in complaints received by the institution that attributed this increase to several factors, most of which are related to the expansion of the customer base (by social benefits) and the role occupied by Caixa in actions to mitigate the effects of the Pandemic (CAIXA, 2020c).

In the first half of 2021, complaints decreased by 7% compared to the first half of 2020. In this period, the customer base increased by 26%. Complaints related to the app and benefits, programs, and social policies represent 15% of the subjects complained (CAIXA, 2021). It is interesting to note the

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significant drop in complaints in the first half of 2022, which represented 44% compared to the first half of 2021, and the customer base remained stable in this period (CAIXA, 2022b).

Evaluating the data, it is observed that the number of complaints in 2022, a period in which the effects of the pandemic have improved, has been balanced in relation to complaints in 2019, a period without the pandemic. This shows that in the years 2020 and 2021, there was a considerable increase in complaints justified by the expansion of the customer base, mainly due to the payment of emergency aid and the role that Caixa occupied in mitigating the effects of the pandemic.

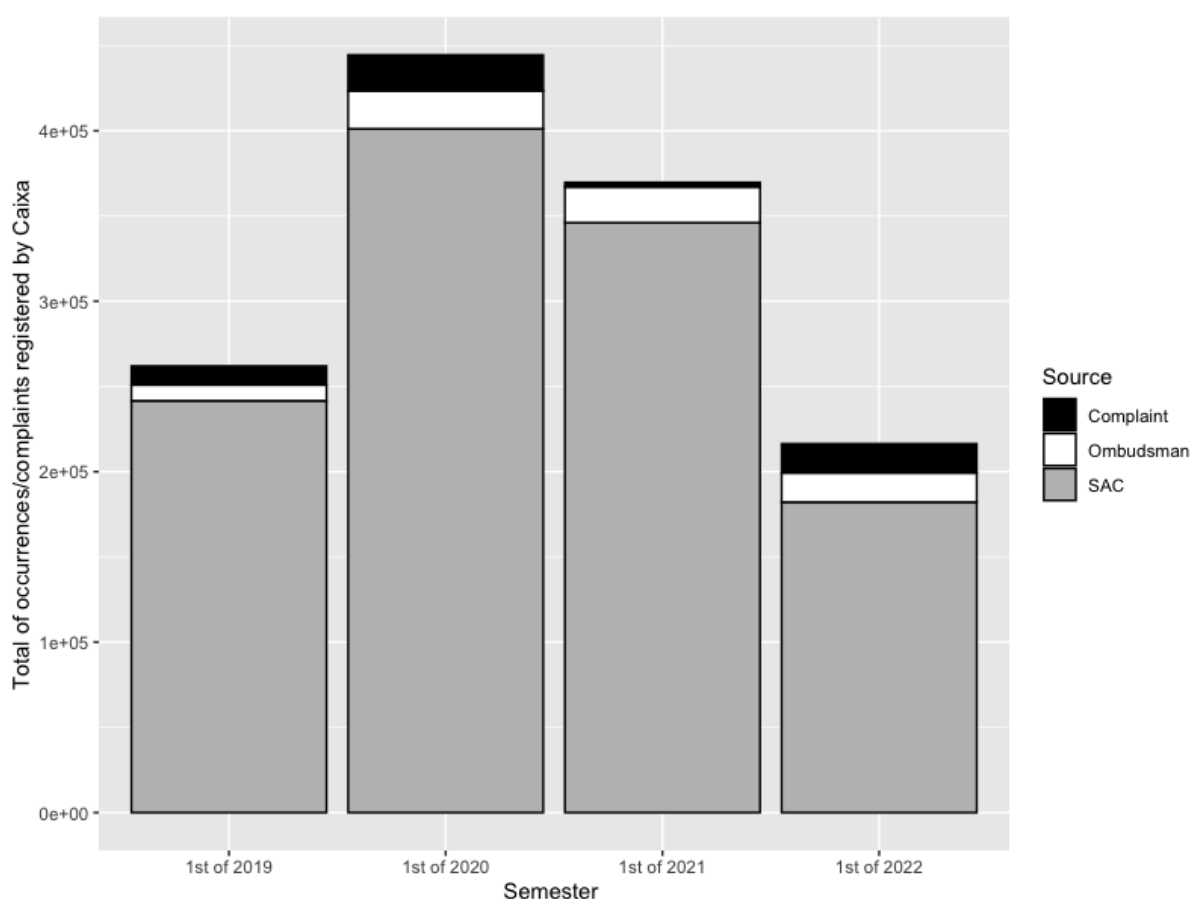


Figure 5 - Number of occurrences/complaints registered by Caixa

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Caixa has taken several initiatives to train its customers to use this new service. It has developed brochures and orientation videos and made several pieces of information available on its website. However, despite these facts, several users sought the on-site service to interact and ask questions, overloading the service in the branches under capacity restrictions due to the pandemic. Also, even aware of the services available via the application, many users went to the branches to make their withdrawals with the tellers' service.¹

Results Discussion

The service designed for the Digital Savings account by Caixa made a strategic change by shifting the activities that occur in the interaction region (Region #3) to the surrogate region (Region #4) (S. Sampson, 2014). See Figures 2 and 3. This shift significantly increased the process's efficiency because it made it possible to work through the various forms of variability introduced by the customer through the low-cost accommodation strategy advocated by Frei (2006). The search for greater efficiency was essential given the urgency and the large contingent of this program's beneficiaries (Cardoso, 2020). However, this increase in efficiency came from transferring labor-related costs to customers (Garlatti et al., 2020). The problems identified in this study pointed out that equity of access to the service was affected by the fact that many users had difficulties playing the role of co-producers that the new service demanded due to their skills and resources.

This change has significantly increased the customer's role, who now acts as a co-producer of this service (Ostrom, 1996). However, to adequately perform the co-producer role, the customer must have the necessary expertise and adequate resources to perform his tasks (Honebein & Cammarano, 2005). Several of the problems found in the documentary analysis and direct observation refer to the clients' difficulty understanding and adequately executing the activities recommended in the service. These

¹ It is noteworthy that the study focused on the implementation of the digitization of the payment service of the social benefits of the emergency aid and its comparison with the previous similar service carried out in person. Hence, data attention concerns the digital service's implementation phase.

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problems shed light on the importance and difficulty of structuring a broad and consistent training program and assisting clients in performing a co-producer role. Especially when the clientele does not have access to technological resources (internet, computers, and smartphones) and has a low education level, these facts demonstrate that some skills and individual characteristics (e.g., age, educational background) of the users are present as facilitating elements of co-production (Amorim Lopes & Alves, 2020) that cannot be neglected when implementing digital innovations of this kind.

The direct consequence of the problems reported by the customers led to the existence of an undesirable new process (Figure 4) executed primarily in the direct interaction Region (Region #3). This fact exemplifies one problem of a complex solution and demonstrates that IT's solutions depend strongly on its users' expertise.

Furthermore, the study also portrays that an abrupt shift to a digitalization of the service significantly decreased the quality of the interactions between the provider and its customers (Surva, 2022), generating significant demand for complaints and capacity problems for user service at Caixa's branches (Surva, 2022).

Conclusion

The banking system has expanded the number of electronic services, increasing customer participation considerably. This study has provided evidence that expanding this strategy to the low-income population segments will require more significant effort for the industry to succeed. Innovations of this type are increasingly gaining a presence in providing services to increase organizations' efficiency and performance and offer a better value proposition to customers. It is essential to analyze the resulting processes in this type of innovation and the roles that each entity develops to ensure the expected goals. The authors of this paper believe that using the PCN tool can be helpful in this analysis.

This work presents some limitations. Data collection relied heavily on secondary data sources. Under this issue, it is important to register that the authors contacted some branch managers of the

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institution and some service channels to conduct interviews. However, they did not consent to conduct them. We should consider that the pandemic imposed severe limitations on the services provided by Caixa, negatively impacting the institution's strength to respond to the problems reported in this text.

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Appendix B - List of official documents analyzed in the documentary research and their respective research sources

Problems	Source	Research Sources
Operational failures in the access and use of the Emergency Aid's digital tools and "Caixa Tem" software operated by Caixa.	a) documental analysis b) direct observation	https://spbancarios.com.br/05/2020/caixa-auxilio-emergencial-pandemia-coronavirus-populacao https://www.gov.br/casacivil/pt-br/assuntos/noticias/2020/junho/auxilio-emergencial-governo-federal-firma-acordo-para-aperfeicoar-analises http://conselho.saude.gov.br/ultimas-noticias-cns/1204-auxilio-emergencial-cns-participa-de-reuniao-sobre-problemas-no-repasse-do-beneficio
Lack of access by part of the population to a connection to use the applications impacted the increase in demand in person at the agencies.	a) documental analysis	https://contrafcut.com.br/noticias/em-meio-a-maior-operacao-bancaria-da-historia-empregados-da-caixa-reforcam-nao-va-ao-banco/ https://spbancarios.com.br/05/2020/bancarios-cobram-providencias-da-caixa-para-acabar-com-caos-das-filas https://www.fenae.org.br/portal/fenae-portal/noticias/pagamento-do-auxilio-emergencial-tem-filas-reduzidas-em-agencias-da-caixa-8A19A3047431C6A6017435A56B6A5DC5-00.htm https://www.procon.sp.gov.br/caixa-responde-sobre-pagamento-do-auxilio-emergencial/ https://www.sindbancarios.org.br/index.php/43-milhoes-estao-fora-do-auxilio-emergencial/ https://wwfbr.awsassets.panda.org/downloads/relatorio_de_implementacao_do_auxilio_emergencial_renda_basica_que_queremos.pdf
Slow and unstable software in the first months with many complaints that it blocked.	a) documental analysis	https://www.cmfor.ce.gov.br/2020/04/30/problemas-em-receber-o-auxilio-emergencial-saiba-o-que-fazer/ https://www.fenae.org.br/portal/fenae-portal/noticias/pagamento-do-auxilio-emergencial-tem-filas-reduzidas-em-agencias-da-caixa-8A19A3047431C6A6017435A56B6A5DC5-00.htm https://www.fenae.org.br/portal/fenae-portal/noticias/federacao-alerta-sobre-consequencias-de-filas-virtuais-em-aplicativo-caixa-tem-8A19A3047368E79B01736D3F25CC730D-00.htm https://www.cnnbrasil.com.br/business/2020/04/22/caixa-tem-nao-funciona-usuarios-reclamam-de-aplicativo-do-auxilio-emergencial
Longs time to analyze the registration and authorize the aid.	a) documental analysis	https://bancariosbh.org.br/atraso-do-governo-com-calendario-de-pagamentos-e-falta-de-informacoes-claras-a-populacao-sobre-auxilio-prejudicam-trabalho-de-bancarios-da-caixa/ https://spbancarios.com.br/05/2020/acesse-agora-dataprev-lanca-site-para-consulta-do-auxilio-emergencial https://www.cmfor.ce.gov.br/2020/04/30/problemas-em-receber-o-auxilio-emergencial-saiba-o-que-fazer/ https://www.gov.br/agu/pt-br/comunicacao/noticias/acordo-estabelece-prazo-de-ate-20-dias-para-analise-de-pedidos-de-auxilio-emergencial-949636 https://wwfbr.awsassets.panda.org/downloads/relatorio_de_implementacao_do_auxilio_emergencial_renda_basica_que_queremos.pdf
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A critical analysis of the bank Caixa's digital social savings account from the perspective of coproduction

Queues at bank branches due to customers' demand to solve problems.		https://www.cmfor.ce.gov.br/2020/04/30/problemas-em-receber-o-auxilio-emergencial-saiba-o-que-fazer/ https://www.fenae.org.br/portal/fenae-portal/noticias/auxilio-emergencial-site-da-dataprev-tambem-recebera-contestacao-para-quem-teve-pedido-negado-8A19A30473E7F40001740C5762E87379-00.htm https://www.gov.br/cidadania/pt-br/noticias-e-conteudos/desenvolvimento-social/noticias-desenvolvimento-social/documentos-pendentes-podem-ser-enviados-pelo-aplicativo-a-partir-desta-quinta-feira https://wwfbr.awsassets.panda.org/downloads/relatorio_de_implementacao_do_auxilio_emergencial_renda_basica_que_queremos.pdf
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Many application rejections and misunderstandings among users exceeded the limit set by the Caixa of two members of the same family for enrollment in the aid program.	a) documental analysis b) direct observation	https://www.fenae.org.br/portal/fenae-portal/noticias/auxilio-emergencial-confira-os-prazos-para-contestacao-de-beneficios-indeferidos-cancelados-ou-bloqueados-8A19A304764E88B601764F492A970858-00.htm https://www.fenae.org.br/portal/fenae-portal/noticias/auxilio-emergencial-site-da-dataprev-tambem-recebera-contestacao-para-quem-teve-pedido-negado-8A19A30473E7F40001740C5762E87379-00.htm https://g1.globo.com/economia/noticia/2020/05/05/auxilio-emergencial-saiba-quais-sao-os-principais-erros-de-cadastro-que-podem-provocar-demora-na-analise-do-beneficio.ghtml https://wwfbr.awsassets.panda.org/downloads/relatorio_de_implementacao_do_auxilio_emergencial_renda_basica_que_queremos.pdf
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