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Enrolling Actors in a Social Information System: the incremental development of unique registry in Brazilian "Bolsa Família" Program

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Abstract. Although the Brazilian "Bolsa Família" Program (BFP) was largely discussed due to its economic and social outcomes, little is known about the Information Systems (IS) that support BFP. In the context of BFP, CadÚnico system emerged as the registry for citizens who seek to qualify for BFP income transfers, as well as it is an important source of information for other public policies. This paper presents a case study of BFP's evolution over decades through the CadÚnico development. We analyze how the CadÚnico system evolved in Brazil from a fragmented, offline databases in the early 2000 to a unified, online registry essential to BFP operation. Based on enrolment operations, the paper explains how CadÚnico first attracted other ministries from the Federal Government and later attracted municipalities to data registering. By analyzing BFP IS, we bring more evidences to the political and incremental nature of IS development in developing countries.

Keywords. Bolsa Família Program, Social Programs, Brazil, Critical-Interpretative Case Study, Actor-Network Theory, Enrolment.

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1 Introduction

The Brazilian "Bolsa Família" Program (BFP) is an income transfer program that regularly delivers money to nearly 14 million families in condition of poverty or

extreme poverty in Brazil [1]. BFP began in 2003, after the Brazilian Federal Government decided to integrate existing fragmented income transfer programs; today, it is one of the largest income transfer programs in the world [2]. By means of BFP, the Government regularly transfers money to families, aiming to eradicate poverty and hunger and to reduce economic and social inequalities within the country. BFP management is decentralized, i.e., Federal Government, states and municipalities have attributions in its execution [1].

Despite BFP being a widely discussed social program and considering the importance of Information System (IS) to operate social and welfare programs [3-5], with a few exceptions [6-9], little is known about the role of IS in the implementation of BFP. One of the essential IS for running the BFP is the Federal Government's Unique Registry for Social Programs, called "Cadastro Único" (CadÚnico) in Portuguese. CadÚnico is an IS that registers data from citizens to enable them to receive BFP money transfers. It also allows the government administration to track healthcare and children education conditions, as well as to understand the socioeconomic reality of its members and the population in general.

Due to BFP's magnitude, managing its resources is a great technological challenge, especially in a developing country of continental dimensions and heterogeneities, such as in the case of Brazil. Enabling a program on this scale involves technological elements (eg: network connectivity, data processing and storage in a country with infrastructural deficiencies), social issues (eg: registering low-income people that sometimes are illiterate and often have difficulty to use technology), and political issues (eg: negotiation with city halls, provision of service at distant locations and training people for data registration at municipalities). In this context, this paper hence addresses the following research question: How did CadÚnico system evolve over time to support a social program (BFP) in a developing country such as Brazil, with its continental dimensions?

In order to present our argument, we conducted a longitudinal case study on CadÚnico's development. This paper therefore aims to explain how BFP evolved technologically and socially throughout the last 20 years. We operate the "enrolment" category to describe how actors were attracted to the BFP.

The paper is structured in six sections. After this introduction, Section 2 discusses the importance of IS for welfare programs. Section 3 defines Actor-Network Theory and enrolment category. Section 4 describes the research method, data gathering and analysis procedures based on an interpretative research. Section 5 presents the CadÚnico case study based on two movements of enrolment: first movement - enrolling the ministries, and second movement - enrolling the municipalities. Conclusion and directions for future research are presented in Section 6.

2 The Role of IS Social and Welfare Programs

Social Programs are very important to promote social and economic development. Income transfer programs in middle and low-income countries contribute to improvements in the population's health and education conditions [3,10,11].

Fukami and McCubbrey [4] describes the 7-year deployment obstacles of the Colorado Benefits Management System (CBMS), an information system aiming at

replacing six aging legacy systems supporting welfare programs in the State of Colorado, USA. The purpose of investing in CBMS was to centralize citizens' applications through data integration and web access. However, for 7 years and after different IT managers, CBMS was not able to be deployed in its full capacity, bringing great losses, including legal proceedings against the state. The scalability of CBMS was hampered by political issues, budget restrictions, lack of planning, unclear accountability and lack of trained people in serving citizens.

There is also a strong understanding of social programs data as the basis for effective statistical analysis and business intelligence IS for public policies decision making. These issues bring new design implications for the welfare programs as well as challenges to their operation.

In DC context, Conditional Income Transfer Programs (CITP) emerged and expanded in the 90's, being integrated to Social Protection Systems in most Latin American countries. CITPs have been called "Social Protection Networks", composed by a set of compensatory interventions focused on combating poverty and extreme poverty. These interventions are the main mechanism to address the so-called intergenerational poverty in the Latin American countries [10].

The importance of management IS to social and welfare programs, and the sociotechnical nature of their IS are reported in research literature. Oliveira *et al.* [6] carried out a study whose main objective was to analyze the effectiveness of IS as an element of federative coordination, also evaluating the management, control and transparency processes related to the use of three IS implemented since 2008 in Brazil: (i) the System Horus, in the area of Health; (ii) Sisjovem, the system responsible for the activities of the Projovem Adolescent Program, in the area of social assistance; and (ii) the interactive School Development Program (SDP), in the area of education. Analyzing their use in the public sector, IS have been considered a strategic tool to improve the efficiency of public services, generating greater savings for the government administration, greater level of transparency and more quality for meeting citizens' demands. Oliveira *et al.* [6] cited, as an inspiring case, CadÚnico as a BFP's IS integrated with other IS of social programs, such as Sisjovem. According to the authors, CadÚnico has tools that allow the generation of numerous social indicators used by the government administration and by researchers to analyze the impacts of the program and formulate new policies.

2.1 The BFP and CadÚnico

The BFP began on October 2003 and serves families living in poverty and extreme poverty. The program started transferring money to 5 million people and after 10 years, the number of beneficiaries almost tripled to around 14 million people, as shown in Fig. 1. The BFP Budget increased from the R$ 2.3 billion spent by the former program "Bolsa Escola" in 2002 to R$ 29 billion in 2014.

According to the Ministry of Citizenship (2020) [1], BFP has three main axes: i) Income supplement - every month, families served by the Program receive a cash benefit, which is transferred directly by the Federal Government guaranteeing the most immediate poverty alleviation; ii) Access to rights - families must fulfill certain commitments (conditions), which aim to reinforce access to education, health, and social assistance offering conditions for future generations to break the cycle of

poverty. The conditions do not have a punitive logic; they exist to guarantee that basic social rights reach the population in situation of poverty or extreme poverty. iii) Integration with other social actions - BFP has the capability to integrate several social policies, for example healthcare and education, in order to help people overcome the families' situation of vulnerability and poverty.

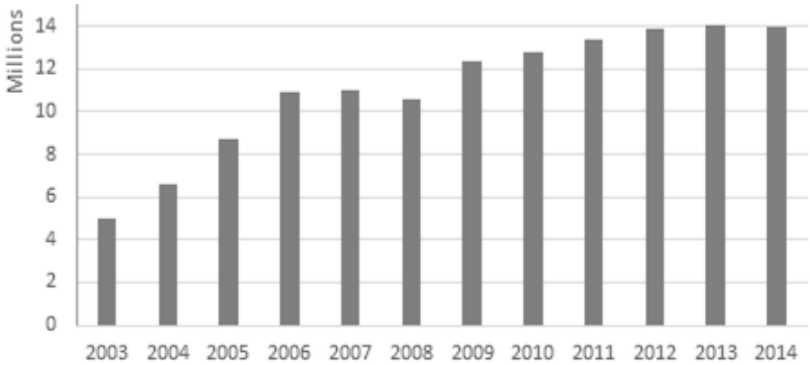

Fig. 1 - Number of Bolsa Família Beneficiaries. Data gathered from MSD's System for Evaluation and Information Management [13].

The functioning of BFP raises some complexities: Brazil is a continental country organized as a federative republic where Federal Government, 27 state governments and 5571 municipalities are autonomous political entities and public policies are negotiated between the three levels of government administration. For example, Federal Government does not have the workforce and resources in every municipality to register individuals in the BFP. Due to this, the Federal Government negotiates with municipal governments through the mayors' association to register individuals using municipal resources. The intersectoral nature of BFP adds more complexity, once program's decisions are based on information gathered from different sectors of government administration, such as, education and public health. The Brazilian social policies are decentralized, that is, schools and primary care are usually managed by municipalities by means of their educational and health departments, respectively. Therefore, these departments share information on social services to fulfill the BFP registry. In addition, Brazil is a heterogeneous country where some people live urban metropoles, peripheries, rural areas, semi-arid regions and rainforest. Thereby, different strategies are necessary to reach individuals throughout the country.

Considering the aforementioned complexity, BFP management is shared among the Federal Government and municipalities. At the federal level, the social program is managed by Ministry of Social Development (MSD), and Caixa Econômica Federal (CAIXA), a Brazilian's public bank, maintains the information technology resources and transfers the money its beneficiaries. Municipalities are responsible for registering families - those seeking to be included in the program go to a service center in their city to provide their information for registration in CadÚnico – the BFP management information system. All the information is digitally registered in the CadÚnico and centralized in a database at the MSD for eligibility analysis.

CadÚnico started on 2001 and supported the increase in Bolsa Família beneficiaries. Today, besides the nearly 14 million beneficiaries, there are other 14 million people registered in CadÚnico, totaling around 28 million registrations, according the MSD's System for Evaluation and Information Management [14]. This number comprises beneficiaries, and people that registered but did not fulfil the requirements, people that are waiting to receive the benefit, and former beneficiaries that do not need the aid from BFP anymore. CadÚnico is also an instrument of transparency and accountability for BFP. Individual data is available on the Transparency Portal [15] of Federal Government, and through the MSD´s System of Evaluation and Information Management [15].

Considering the BFP context, some studies analyzed the access to the program. Feitosa [7] carried out a study about how citizens are codified in BFP and CadÚnico. Jayo [8] analyzed the banking correspondents which provide banking services on behalf of CAIXA to several distant locations in Brazil, and Santos [9] described the impacts on financial inclusion indicators of a bank agency installed in a boat on Marajo Island, in the Amazon region. These research studies offer distinct contributions in order to understand the access to BFP in many heterogeneous places of Brazil. This paper proposes a different approach focused on how the BFP IS evolved from the perspective of the Brazilian government administration. In order to analyze CadÚnico's development, we take inspiration in the Actor-Network Theory [23,24,26,27] and chose to describe it based on the idea of *enrolment* [24] of actors, as we explain next.

3 Actor-Network Theory

The Actor-Network Theory (ANT) approach has inspired research in IS field since 1990. However, from 2000 onwards, its use was intensified, as several IS tracks, including ICT4D, started to report research inspired by this approach, such as: digital inclusion [16-17]; e-government [18,19]; health IS [20,21] and geographic IS [22].

ANT-inspired studies often observe a longitudinal approach [16-22], the aim of such research being to study the movement, formation of groups and translations, rather than collecting information about a specific moment. Most of the ANT research addresses controversies of technical artifact construction referring to complex environments with multiple actors having opposing preferences, whereby the political dimension of an IS implementation is present. Some works analyzed how actor networks are mobilized to develop sustainable IS in developing countries [18, 20]. It can also be seen that these papers depict complex settings, as well as the role of technical artifacts and other factors in network stabilization.

The movement to attract other actors are described as moments of translation [23], namely: problematization, interessement, enrolment, and mobilization. Moments of translation [23] have been widely used in IS research [16-19]. In these processes, systems are understood to be similar to an Obligatory Passage Point, where the other actors tend to converge during the course of the translation. It is important to stress that consensus building in ANT is not a simple endeavor that can be taken for granted as several negotiations, also referred to as *translations*, are needed to succeed in the deployment of an IS.

Here, we focus in the enrolment of actors. Callon [23] define enrolment as the "the device by which a set of interrelated roles is defined and attributed to actors who accept them". The enrolment is therefore depicted as "the group of multilateral negotiations, trials of strength and tricks that accompany the interessements and enable them to succeed". According to Callon and Law [24]: "The theory of enrolment is concerned with the ways in which provisional order is proposed and sometimes achieved". CadÚnico system's unique registration had to make numerous translations to be able to leave several fragmented bases and offline databases in the early 2000 and built a unified and online registry essential to BFP's operation. In the case of BFP, we will show how MSD and CadÚnico enrolled ministries and municipalities to construct the BFP.

We therefore aim to extend Feitosa's [7] argument by adding some evidence to the incremental and evolving nature of CadÚnico. We analyzed ten years of CadÚnico development and observed how the political configuration on BFP registry infrastructure changed over time.

4 Research Method

This research was designed as a longitudinal case study based on the critical-interpretative approach [25, 26]. The ANT approach was chosen to analyze the case's trajectory, involving heterogenous actors. While ANT does not attempt to be a critical approach, "tracing the network and the actions of its constituents, combined with a refusal to make a priori distinctions or grant status, enables a critical light to be shone on the assumed, the mundane and the status quo" [27].

In this case study, we gathered and analyzed data related to BFP from 2001 to 2012. Data was gathered through a period of eighteen months based on semi-structured interviews (conducted in two rounds) and public documents related to BFP. The first round of interviews were conducted from March to December 2018 and approached six technicians and managers at CAIXA, located in Rio de Janeiro, Brazil. The second round covered nine interviews at the MSD in Brasília, on December 2018. Interviews lasted 1h30min on average and most of them were recorded with interviewees' consent. The interviewees' were CadÚnico managers and BFP businesswomen, as well as IS coordinators and developers. Generally, interviewees have more than 10 years of work experience in BFP or CadÚnico. In addition to the interviews, we had access to reports and data published on Internet, and material provided by the interviewees.

This paper considers the research quality criteria proposed by Klein and Myers [28]. Interviews transcripts and notes were successively read so that the story became clear to the researchers. After carrying out this process successively, a coherent narrative was achieved to write a plausible manuscript. Multiple interpretations were considered, since different people in distinct positions at CAIXA and MSD were interviewed. Concerning contextualization, we presented the historical and social background of BFP, based on interviews, documents from public agencies and newspaper articles.

To address the abstraction and dialogical reasoning criteria, we conducted a dialogue with the research field, associating the findings in the field through interviews. We also asked some participants to read and confirm the reports after the interviews. The case presented here does not aim to be directly generalized to other contexts, but by means

of transferability we hope the findings presented in this paper might help other researchers and managers to think about their theoretical and practical questions.

5 The Case of CadÚnico

During the decade after the promulgation of the current Brazilian Federal Constitution, a social-liberal government proposed opening the Brazilian market while focusing on social services. During the second term of the former president Fernando Henrique Cardoso (1998-2002), the Federal Government conducted pilot projects of conditional income transfers. “Bolsa Escola” program transferred money to families with children attending school and was managed by Ministry of Education. “Bolsa Alimentação” was an instrument for the Union's financial participation in supplementing family income to improve access to food and was managed by the Ministry of Health. The program especially targeted pregnant women, nursing mothers, and children up to six years of age. “Auxílio Gás” was managed by the Ministry of Mines and Energy and consisted of an aid for the purchase of gas cylinders. The aid addressed nutrition issues indirectly simply because poor people were unable to regularly purchase gas cylinders for food preparation. The three social programs together assisted 5.5 million families and were managed by different ministries while CAIXA technologically supported all the programs.

In 2001, the Federal Government published a law establishing the Unique Registry for Social Programs, called in Portuguese as “Cadastro Único” (CadÚnico). As its name suggests, CadÚnico was designed with the aim of unifying several IS that previously registered social benefits. Similarly to Fukami and McCubbrey´s study [4] of CBMS, BFP also faced difficulties in the development and implementation of its various supporting IS, such as: different interests, different databases and decentralized management. These issues are reported in following paragraphs.

5.1 First movement – enrolling other ministries

We observed that, before BFP, each social program was managed by a different ministry, that is, the programs were fragmented among the government administration sectors. This fragmentation in different ministries hindered dialogue between internal government actors to manage benefits in the same direction, as they would have to negotiate, and each ministry had its own priorities. Additionally, each social benefit had its separate registration and a beneficiary could have several registrations for different benefits. An excerpt from the interview follows: *“Registration was precarious. There was no CadÚnico. The register was decentralized. We had an IS that attached all the benefits within it”*. (Respondent 2 - 8 years in BFP)

The various existing programs in the previous years used different numbers to identify and select the target audience, which in turn made it difficult to coordinate actions, fragmented the service and reduced its efficiency. As the name Unique Registry suggests, designing CadÚnico intended to unify several IS that previously registered social benefits in a fragmented way. In order to unify the fragmented registries, the system was split into two, the CadÚnico and the novel Information System for Benefits Payment (SIBES), which is not object of this paper. The former would hold people

information while the later, after the analysis of conditions, would transfer money to the beneficiaries.

In the year 2003, Luís Inácio Lula da Silva ascended to the Presidency, changing the political group in charge of Federal Government. The new government created MSD, which proposed the BFP in order to eradicate extreme poverty in Brazil through a regular aid offered to every family in the condition of extreme poverty. At that time, the income transfers which were previously pilot projects, gained political projection as one of the main goals of the new term. Thus, the Federal Government put conditional income transfers in the core of its agenda by centralizing BFP in MSD, including IS that supported the previous social programs. About enrolling other ministries to promote the BFP and CadÚnico, an excerpt from the interview follows:

"When the unification of social programs took place, the Federal Government's transition team that carried out the study and unification of the programs worked physically inside the Bolsa Escola building. Bolsa Escola was the largest cash transfer program that existed among the four programs that were unified. They considered it important to have profound knowledge of the dynamics of this program to understand what to expect, how it worked etc. The inception of the unification of the programs had been built, but not the operation of the new unified program. An effort was made within Ministry of Education and Culture (MEC) to make employees available to help the operationalization of the new unified social program together with the transition team. When the ministry that would serve the program was defined, part of the staff permanently migrated from MEC to MSD. During 2003 and 2005, I also worked at the MEC in parallel (...). In 2003 there was no MSD yet, there was not even an e-mail server. Extraordinary Ministry of Food Security and Fighting Hunger came first and only in 2005 that it migrated to MSD". (Respondent 8 - 17 years in MSD)

By the end of year 2003, there were 6 million people receiving the money transfers from BFP. They were all registered in CadÚnico. CAIXA technologically supported the former social programs and had the infrastructure to enable the payment of these benefits. Moreover, CAIXA was the bank that operated social security in Brazil. Therefore, CAIXA held the skills and infrastructure to hold a national registry for social programs as well to deliver the money to its beneficiaries. It was hence chosen as the financial operator of BFP and started a relationship with MSD.

CadÚnico was then delivered to the municipalities that opted to offer "Bolsa Família". Every city in Brazil started to register families seeking access to the monthly aid. Law unified the registry, but the registering procedures were still fragmented in the various municipalities, as explained: "*The database was decentralized. A person could be in several places, because people moved from city to city, and there was no such control in the registry*" (Respondent 4 - 15 years in CadÚnico). Interviewees referred to this third period as "CadÚnico offline" because there was no internet connection in all municipalities to support registration procedures directly to the centralized base at that time. Municipalities had to register families' information in a local system and later send it the database to MSD.

5.2 Second movement – enrolling the municipalities

The following excerpt summarizes the technological challenge of the CadÚnico development in the first years: *"In 2005, we barely had a computer to work with. In*

addition, we barely had access to CadÚnico. The very first CadÚnico database I had access to was delivered just in January 2005. The system was offline and installed in 5,571 municipalities. The base was problematic. The data was transmitted to CAIXA and had a return file for each municipality. The municipality analyzed the issues and all inconsistencies, treated and sent them to CAIXA. Even though it was unified, there were multiple registrations. When the city hall's management changed, the previous management erased the entire previous base. The municipality then had to ask CAIXA for a new base. This generated a great deal of rework for city halls". (Respondent 6 - 13 years in CadÚnico)

During the period known as CadÚnico offline, it was possible to notice several issues related to the continued management of CadÚnico, according to the following excerpt: *"A study of the CadÚnico's database was carried out and many problems and multiplicities were identified. There was no flag of active and inactive registrations. CAIXA had to limit access to the CadÚnico base nationwide. Everyone stayed without work waiting for the end of the appointments at the base. From the moment it made this appointment, MSD launched Law 360/2005 to update its registration. The MSD remunerated the municipalities to promote the registration update".* (Respondent 6 - 13 years in CadÚnico)

There was an urgent and necessary action to systematize the process to avoid issues, such as the constant extinction of the base during the municipalities' mayor transition. Law 360/2005 was published after marking the bases to promote the registry update and offered incentives for data quality improvement to municipalities. With the reward for registry improvement, municipalities promoted the registration update in their communities. This was the first moment of political promotion of CadÚnico's system to the municipalities. In 2006 the number of people assisted by BFP was around 10,5 million, almost double from 2003 figures when CadÚnico started.

CadÚnico's transformation was imminent. The offline data transfer from municipalities to centralized CadÚnico incurred in data and money losses to MSD and CAIXA, since this process was susceptible to errors. CadÚnico needed an online infrastructure to unify registries, and to share them among all government levels.

In 2010, CadÚnico started to be online and data fragmentation was eliminated. The move from offline to online has brought a great improvement to CadÚnico. The most significant change was the possibility to transfer citizens' data from one municipality to another. This digital transfer carries several political articulations followed by technological improvements so that this movement could take place and reach CadÚnico online. This change eliminated data inconsistencies which occurred during the CadÚnico offline. At that time, BFP served 12.8 million families.

After the move from offline to online version, MSD released a new instrument to enroll municipalities in the CadÚnico maintenance, called DMI-M (Decentralized Management Index - Municipalities). DMI-M was launched through Law 754/2010 initiating a second moment of political action for municipalities to update CadÚnico. The municipality signed a term with MSD to comply with two registration indicators (updated and valid registration) and two social indicators referring to the conditions recommended by BFP (health and education). As the DMI-M increased, the more financial aid the municipality received from MSD. In 2012 the number of BFP beneficiaries reached the mark of 14 million people and since then this is the average

number of people benefited by BFP. Moreover, CadÚnico holds data of more people, 28 million on average.

The various efforts to enroll municipalities, including on-line registering and DMI-M, were successful instruments since they aligned interest of MSD and municipalities for the qualification of CadÚnico.

6 Conclusion

This paper reports an investigation of the trajectory of CadÚnico, a registry that supports the BFP by drawing on ANT enrolment to discuss how CadÚnico incrementally aligned a network of political actors over fifteen years.

As described in previous sections, CadÚnico system was built as a response to unify several fragmented IS (the reason for its name). The former fragmented registers limited the scaling of the novel social program "Bolsa Família", but also offered a problematization of the new "unified register" CadÚnico.

The CadÚnico system was built in Brazil through five different government terms over 18 years and this shows its incremental and resilient nature. It was initially built by decision of the Federal Government; certainly, a crucial condition for its success. Nevertheless, its implementation did not take place without gradual growth, since negotiations and change of roles where necessary for its establishment. First, ministries were enrolled in CadÚnico and BFP. They changed their roles from managers of former social projects to partners of MSD, as now they monitor health and education indicators, for example, based on CadÚnico information. Later, municipalities enrolled in data registering in CadÚnico. Here BFP improved infrastructure, trained employees and used financial instruments to align local interest to the national agenda. Therefore, municipalities registered families and maintained the registry updated to assist people and have access to funding for local social services.

This analysis was carried out through a longitudinal case study, considering the quality criteria and using multiple sources of evidence. Our analysis shows that, despite CadÚnico's success, it was not enough to provide a good technological infrastructure with connectivity, computers and databases. It was necessary to go beyond articulating a network of actors to make possible the identification and registration of millions of impoverished families in Brazil. Thus, CadÚnico comprised a series of legal and political operations to attract city halls to register families in their respective municipalities.

As such, in this paper, we bring a theoretical contribution to refine the understanding of social IS in Brazil and in a specific scenario, by means of translation movements of the actors articulated themselves so that the CadÚnico could be transformed from offline to online IS. Through the interpretative approach method, the IS was studied in its context of production and use, and came up with critical and important knowledge for understanding social IS.

As a managerial and social contribution, this paper can help managers of the public agencies to get a starting point to reflect on how IS are produced within organizations, as well as to understand how different IS work using ANT concepts. This paper also proposes a new approach to observe and manage IS that can assist in their development process.

A limitation of our work was the lack of financial resources and time to conduct more interviews, considering the countless IS that operationalize BFP. We therefore hope to bring to light an unavailable knowledge - the story of the most important IS which supports a social program of enormous magnitude such as BFP

As a research agenda, we suggest theorizing about IS that promote social services to citizens in the Brazilian context, considering the peculiarity of this very heterogeneous scenario. We expect future works to promote a stronger dialogue with established literature, for example, Information Infrastructure studies. Finally, based on this work, we concluded that CadÚnico is a vital condition for the BFP to have an updated registration and promote improvement in the lives of beneficiary families.

This paper was finished during the covid-19 pandemic, a time when CadÚnico is mentioned in many political discussions. Brazilian Congress passed a bill that offers an emergency relief income to help millions of informal workers left with no income by the social distancing measures adopted in the country to fight de pandemic. The emergency income is a two-month payment of approximately half minimum salary for every Brazilian citizen in poverty condition, and targets nearly 60 million people. An important part of the 28 million people registered in CadÚnico were able to receive the emergency income, while the remaining people spend days in lines to fulfill the information to qualify to the benefit. This catastrophe, besides the horror spread throughout the world, shows us the importance of IS to keep citizen information updated and ready to offer responses to unexpected situations.

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