# Digital Transformation Initiatives in Public Administration During the Covid-19 Pandemic in Brazil: Unveiling Challenges and Opportunities

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**Abstract.** The development of ICT is an important factor in boosting the economies of developing countries. Despite the multiplicity of technological novelties and recipes for their successful implementation, these initiatives are taking much longer and facing more difficulties than it has been expected. During the outbreak of the Covid-19 pandemic and with the implementation of social distancing, digital transformation has become a major issue. The world has encountered several challenges as the adoption and use of technologies became mandatory. In public administration, the development of an environment capable of keeping up with this pace of change was paramount. Hence, this study aims to understand the role of digital transformation during the Covid-19 pandemic, by analyzing several mini-cases in Brazil. Therefore, adopting a qualitative approach based on multiple longitudinal mini-case studies grounded on a critical interpretive approach, one analyzed the positive, negative, and unforeseen outcomes accrued from digital transformation initiatives in Brazil, thereby unveiling potential challenges and opportunities for technology in a post-Covid-19 reality.

**Keywords:** Digital transformation · Information and communication technology · Covid-19 · Pandemic · Digital government

## 1 Introduction

The uncertainties triggered by the Covid-19 pandemic revealed dangerous and complex problems of society, and its management and mitigation by the government are challenging [1, 2]. The implementation of digital transformation initiatives worldwide accelerated drastically [3], and Information and Communication Technology (ICT) has had a central role to play [4]. Some studies have examined the relationship between Covid-19 and ICT risk management and continuity [4], leadership [5], consumer behavior patterns [6], supply chain decisions [7], digital privacy [8], and ICT-mediated classroom [9]. Hence, although it was not the first pandemic of this century, the Covid-19 pandemic has had unprecedented impacts on society.


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Brazil is an emerging market and so offers a unique opportunity to explore ICT-based social and business innovations at a societal level of analysis [10]. Indeed, its significant participation in social networks, the impressive growth rate of e-commerce and adoption of technology innovations such as online banking and electronic voting, indicate the country's insertion in the digital economy and presents a noteworthy occasion to explore the Brazilian context.

Thus, this article addresses the following research question: how were digital technologies used to deal with emergency issues during the Covid-19 pandemic in a developing country like Brazil? Therefore, this study aims to understand the positive, negative, and unforeseen effects of digital transformation initiatives implemented in Brazil to respond to the challenges of the Covid-19 pandemic.

## 2 Literature Review

The development of ICT is an important factor in boosting the economies of developing countries [11], and it has been the focus of studies in emerging markets [12–14]. In Brazil, ICT, encompassing products and services, produces 4% of Brazilian GDP, and the number is increasing primarily due to public authorities' active IT usages such as the e-voting system and electronic reporting to the police [11]. Since 2010, Internet access by the low-income population has increased remarkably with more than 200 million phone subscriptions in the country [14]. In short, Brazil has become an important laboratory of ICT-mediated social, and business innovations. Important areas using innovative technology are government and public administration [15], banking technology [16], digital inclusion [17], and e-democracy [18] to name a few.

Applications such as electronic voting and online income tax declarations have attracted international attention since the 1990s [14]. Indeed, the electronic voting system of Brazil is seen as a trustworthy mechanism of producing election results that accurately represent the choices of the electorate [12]. In addition, the rapid growth of Brazilian participation in social networks [19] places the country in the third world position in hours/day spent on social networks, and in second in hours/day spent on the internet [20]. Moreover, Brazil has an impressive growth rate in e-commerce, accounting for almost 66 million online shoppers and more than 150 million Internet users, with a penetration rate of 71% among the population [21]. These figures highlight the country's insertion in the digital economy and an exceptional opportunity to be explored by researchers.

Despite the development of infrastructure for the digital economy, the country faces important challenges related to digitization. In fact, 23% of the adult population, in 2018, had never used the Internet [22]. In addition, the low qualification of Brazilians, with more than 50% of adults without high school education, prevents many citizens from using technology effectively, benefiting from them. ICTs are potentially capable of contributing to the improvement of various aspects of life, from reducing poverty to strengthening democratic policies [23]. However, the application of ICT has not always been successful in developing countries [24]. In this sense, the Covid-19 pandemic revealed a complex scenario in Brazil, with successful experiences of large-scale adoption of technologies (for example, the banking sector), living with a digital divide in the health and education sectors.

### 2.1 Theoretical Framework

Digital technologies are transforming the socio-economic and political arenas, having provided groundbreaking beneficial innovations to the world [25]. So far, most research has focused on the development and implementation of digital technologies. The present study intends to contribute to the field reflecting on and understanding the influence of actors, technologies, and discourses and how they are integrated.

Bringing together the theories on contextualist ICT innovation [23, 26], the social shaping of technology [27, 28], and the structuralism view of technology [29, 30], one presents below an empirical framework combining three central concepts: social groups, technologies, and discourses.

**Contextualism, Social Shaping of Technology, and Structuration Theory.** The social constructivist approach allows the understanding of the acceleration of digital transformation in the pandemic addressing conceptual relationships such as technology/society, agency/structure, and technical reasoning/institutional dynamics [23]. That way technology could be considered as part of a broader social context raising questions concerning the way specific categories of technologies and social actors' clusters are formed and shaped, leading to specific socioeconomic outcomes. Actors, discourses, and technologies elements derive from the social shaping of technology line of research by which two broad categories emerge: socio-economic shaping of technology and social construction of technology (SCOT). Pozzebon and Diniz [14] argue that the actor's interpretations of technology presented by the social shaping view strengthen the opportunities for decision making regarding technology management. Another theoretical influence on the present study is the structuration view of technology or the Giddens' structuration theory, which has been developed by some researchers [29–31]. The concept of technology-in-practice, derived from the structuration theory, explains how social groups, negotiating meanings and applications of a given ICT, adapt them locally and what are the consequences. According to the theory, different cultures will be involved differently with local adaptations or appropriations. In addition, the concept of improvisation that emerges from emergency or crisis situations [32], in response to unexpected opportunities or unexpected actions sown in intuition to solve a problem [33], opens space for research in the Brazilian context. In fact, improvisation is frequent in developing regions due to the less stable political and economic environment [33].

**Framework Dimensions.** Table 1 presents the main dimensions of the Multilevel and Pluralistic Conceptual Framework developed by Pozzebon and Diniz [14], considering the three theoretical perspectives abovementioned: contextualism, social shaping of technology, and structuration view of technology.

'Actors' refer to the social setting where the ICT artifact is being implemented and used. It helps define the boundaries of the investigation and includes the identification of different relevant social groups. Social groups refer to a group of people who share a common geographical space, a common social class, a common professional occupation, to name a few. It also includes the identification of interpretive frames for each social group, allowing the recognition of shared and conflicting perceptions, expectations, and interests that characterize the community context.

'Technologies' refer to the socio-technical characteristics of the ICT artifact being implemented, as used by specific actors at a given level of analysis (individual, social groups, society). The technologies-in-practice resulting from the process of negotiation is both intended and unintended, and their choice emerges from the literature on digital transformation in addition to the analysis of the mini-cases.

'Discourses' refer to the understanding of "how social groups influence the negotiation process taking place around the implementation and use of a given ICT artifact. The implementation of ICT in a community or region can be seen as an opportunity to change information flow, resource allocation, and responsibility attributions" [14].

**Table 1.** Framework components.

| | Dimensions | Concepts |
|---|---|---|
| Actors | Context | Social groups |
| Technologies | Content | Technology-in-practice |
| Discourses | Process | Mechanisms of negotiation |

In sum, the present study focuses on the categories of negotiation that consider the different interests, commitments, plans, perspectives, and positions of the network of social groups interacting with the technology, and how they will influence the process and outcomes of technologies-in-practice and the emergent social structures.

## 3 Research Method

The present study intends to analyze four mini-cases in the Brazilian context vis-à-vis the aforementioned theoretical framework. The adopted criterion for selecting each mini case was based on three main components: relevance, reliability, and impact on society. Such criterion provides a unique research opportunity to understand an important phenomenon through the lens of real-life cases which, according to Kardos and Smith [34] usually ends with issues and points for discussion. In fact, the mini-cases are not as deep as traditional case studies however, the mini-cases chosen presented a favorable occasion for data collection, being extremely relevant in the Brazilian pandemic context. Also, each mini-case brings a different and complementary perspective, which allows abstraction and generalization of the findings through the discourses presented.

The research method was developed considering the following steps. First, the mini-cases were analyzed through data collection. The data collection comprised a logbook of events recorded during the outbreak of the Covid-19 pandemic. The procedure conducted sought consistent and trustworthy data, and information collected through several methods like observation [47] and document analysis [48]. The Table 2 presents the synthesis of the data collection. In science in action studies all the material within reach should be gathered in a logbook, thus comprising recording notes of events and interviews during the outbreak of the Covid-19 pandemic [48]. Second, the theoretical framework was applied to each mini-case in order to understand the meaning or knowledge constructed

by people and the way people make sense of their world and their experiences in this world [35].

The theoretical perspectives were then articulated through a primary coding of actors and technologies. It was followed by the analysis of discourses in a dialogue between the theory and the field. Finally, specific outcomes were presented from the analysis of the selected mini-cases. The criterion to define the outcomes considered the results of each case at the societal level, and how the technologies, actors, and discourses impacted such results.

**Table 2.** Summary of data collection.

| Data sources | Description | Period | Role |
|---|---|---|---|
| Public documents | Articles in the media, annual reports, books, podcasts, websites | October 2020 to March 2021 | Important for establishing the chronology of main events and for understanding different viewpoints |
| Observation | Field notes from participation in public conferences/events | October 2020 to March 2021 | Important for understanding the dynamics of interactions among the social groups and the discourses that emerged |
| Cetic.br Survey | Studies on the use of ICTs in Brazil during the Pandemic | January 2021 to March 2021 | Important for monitoring and evaluating the socioeconomic impact of ICTs for development |

## 4 Brazilian Mini-Cases

### 4.1 Emergency Aid as a Measure of Social Protection

The Emergency Aid, instituted by Law 13.982, of 2020, is one of the biggest initiatives of the Brazilian Federal Government to minimize the economic effects of the Covid-19 pandemic [36]. This aid is directed at the most vulnerable population, among them, the beneficiaries of the conditional cash transfer program 'Bolsa Família' and those enrolled in the single registry for social protection 'Cadastro Único para Programas Sociais do Governo Federal'. The benefit also covers informal employees, self-employed and individual microentrepreneurs. This new aid covers a gap in the social protection of so-called informal workers as long as they meet the conditions stipulated by the law.

The 'Cadastro Único' currently contains data on more than 74 million citizens [37], and is used by various federal programs, with the largest user program being the 'Bolsa

Família'. More than ten years ago, the 'Cadastro Único' was defined as a tool that could be widely used due to its three essential characteristics: broad census information (for the poor population), registry data (with identification and address data), and for its broad identification of information about the conditions of these families' lives [38]. According to the Caixa Econômica Federal, the operating agent of the 'Cadastro Único' and the 'Bolsa Familia' (2020), approximately half of the Emergency Aid target was unknown to the Ministry of Citizenship, as they were neither 'Bolsa Família' beneficiaries nor registered in the 'Cadastro Único', which generated additional complexity for the policy's successful implementation.

### 4.2 Health System: Monitoring the Number of Covid-19 Cases and Deaths

Before the first Covid-19 cases were reported in the country, a variety of measures have been implemented including the adjustment of a legal framework to carry out isolation and quarantine [39]. The first case of coronavirus in Brazil and in South America was registered on February 26th, 2020 in São Paulo. On March 13th, the Ministry of Health announced recommendations to prevent the spread of the disease and recognized that community transmission was occurring across the country, as a strategic measure to ensure a collective effort by all Brazilians in order to reduce virus transmission.

"The Brazilian government's response to the Covid-19 pandemic, under the presidency of Jair Bolsonaro, has caused a political crisis resulting from a divide on how to handle the spread of the disease" [40]. In March 2020, Brazil's Ministry of Health declared that each state should devise guidelines to fight the virus and strongly recommended social distancing and self-isolation. Meanwhile, the president dismissed the severity of the pandemic, and encouraged people to "go back to normality". In June 2020, after sacking two ministers, the Ministry of Health has reduced the quantity and quality of the data available about the pandemic, which urged the creation of a partnership between the media groups to collect Covid-19 statistics directly from the state health departments. The main goal was to draw public attention guaranteeing transparency and accountability in regard to the disclosure of data related to the pandemic.

### 4.3 The Impact of Covid-19 in Education

According to the United Nations children's agency Unicef [41], in Latin America and the Caribbean, 97% of children are not having face-to-face classes. That is around 137 million students. Covid-19 pandemic imposed an unseen situation on the Brazilian educational system: the need to adapt to remote learning. Unequal access to digital tools, connectivity, and lack of training has imposed challenges for governments, schools, and teachers to engage students in long-distance education. Such abrupt change affects all actors in the education systems, however low socioeconomic students faced it more critically. The Brazilian National Council of Education argues that Brazil is facing an unprecedented situation in an area that traditionally does not have a culture of digital, remote work, or distance education. That is new and complex for those who are working with basic education in public and private schools. Indeed, Brazil is one of the most unequal regions in the world, and Covid-19 has brought out those inequalities when it comes to education. As stated by Unicef [41], schools also provide important services

beyond education, such as school feeding programs and health programs. That way, the impacts go beyond education, having a long-lasting effect that surpasses the learning process. As per higher education, the Covid-19 pandemic has revealed weaknesses and difficulties that threaten students' access and retention. The instability of the labor market, loss of jobs, and latent uncertainties about the future of the labor market weaken the ability of students to remain in higher education. Altogether, the Covid-19 crisis has rendered more visible and urgent the need to improve the access of socially disadvantaged students to education.

### 4.4 Fake News and Data Protection

The acceleration in digitalization has brought an inevitable acceleration in cyberattacks and fake news, forcing companies to invest more in cybersecurity and data protection. Besides fighting the pandemic, the society faced the spread of speculations and fake news about the disease [42]. The main issue regarding the fake news is that misinformation makes people confused and unsure as to what sources can be trusted. In addition, the spread of misguided news about the Brazilian Unified Health System and Ministry of Health spread rumors that have eventually challenged the very legitimacy of these organizations. Considering Brazil's political and economic context, such media repercussions have a strong impact on the population's decisions [40].

Nine in every 10 Brazilians have been exposed to fake news about the pandemic, which is typically shared via WhatsApp groups [43]. Seven in 10 say they believed in the information they received. The risks of fake news have gained new urgency because of the seriousness of the health issue. In order to fight fake news, the Ministry of Health created a channel called "Health without fake news" to analyze viral news and determine whether it is true or false. To manage the Covid-19 situation more carefully, the former ministry created a specific channel for information related to the pandemic. Also, Brazil's Congress is pushing for legislation to stop this flood of disinformation. The bill, however, has raised fears about freedom of speech and government surveillance. Despite the discussion around information transparency, fake news is rampant, and one can affirm that the spread of the same has contributed to discrediting science and global public health institutions, thereby weakening people's adherence to the necessary preventive care [42].

## 5 Results

In this section, one presents and consolidates the main outcomes of each mini-case by applying the proposed framework.

### 5.1 Emergency Aid as a Measure of Social Protection

The introduction of the Emergency Aid and the expansion of Bolsa Família represented an increase in the income of the poorest by 40%. For instance, the average 'Bolsa Família' family received less than USD 37 per month and with the Emergency Aid, they received USD 110 to USD 222 monthly. According to Caixa Econômica Federal,

58 million Brazilians received at least one installment of emergency aid through digital accounts. Positive innovative factors have been developed such as the remote request solutions, collaborating with social distancing measures. The package of assistance made a difference in how families coped with the pandemic.

### 5.2 Health System: Monitoring the Number of Covid-19 Cases and Deaths

When the World Health Organization declared the novel coronavirus a pandemic on March 11th, 2020, Brazil was still a week away from reporting its first death due to Covid-19. Nevertheless, the country soon claimed global attention, as the number of Covid-19 cases and deaths in the country grew exponentially, reaching the third and second highest figures worldwide, respectively, only behind the U.S. and India. In January 2021, Brazil surpassed the threshold of seven million cases and 200,000 deaths. Brazilian government's response to the Covid-19 pandemic, under the presidency of Jair Bolsonaro, has caused a political crisis resulting from a divide on how to handle the spread of the disease [40]. The absence of reliable information on the pandemic affected potential countermeasures at local and national levels.

### 5.3 The Impact of Covid-19 in Education

More than 180,000 schools were closed in 2020 and 47 million students tried to adapt to a new routine of distance education in Brazil [44]. A concern shared by the government and schools is how to prevent dropouts and provide additional support to students with fewer opportunities for virtual learning. Most public schools lack adequate technological infrastructure to support teachers in conducting online courses. In addition, teachers in Brazil feel unprepared to deal with technological resources, digital platforms, and virtual classrooms [45].

### 5.4 Fake News and Data Protection

The Ministry of Health created the channel "Health without fake news" to analyze viral news and determine whether they were true or false. Also, Brazil's Congress is pushing for legislation to stop the flood of disinformation. Platforms that do not comply would be subject to fines as large as 10% of their group revenues in Brazil the previous year. In 2020, the most-viewed YouTube channels concerning Covid-19 were the ones spreading fake news [42].

After analyzing the mini-cases and surveying the scientific literature, four main discourses related to digital transformation were drawn, namely: (1) Economic Development; (2) Sustainability; (3) Data Privacy & Citizenship; (4) Transparency & Participation. Digital technologies have the potential to impact Economic Development by increasing productive capacity, reducing social inequalities, redesigning government, or delivering public services. The mini-cases such as the Emergency Aid, provides evidence of such influence. Sustainability encompasses prosperity, social inclusion, environmentally oriented policies, inclusive good governance, and peace. While the positive cases showed how action provides sustainable outcomes, others such as the Health System

monitoring, the education system, and fake news exacerbate the inequalities and the challenges to achieve human capacity through improvements in education and health care. Data Privacy and Citizenship aims to make the digital environment a safe and reliable place, conducive to services and consumption and in which citizens' rights are respected. The pandemic made visible the growing volume of commercial and financial online transactions and the provision of public services virtually, reducing the boundaries between online and offline. There have been important legislative improvements, however the rise of fake health news during the pandemic contributed to discrediting science and public health institutions. Finally, Transparency & Participation involve expanding channels for citizen collaboration in public policymaking to achieve online transparency, accountability, inclusion, and participation. The mini-cases showed how digital platforms should converge to enable the application of such principles effectively.

In sum, such categories are relevant as they offer a comprehensive diagnosis of the challenges to be faced, a vision of the future, and a set of strategic actions to monitor progress in achieving the social and economic goals. Table 3 reports the summary of the analyses performed.

**Table 3.** Summary of the mini-cases.

| Mini-Cases | Actors | Technologies | Discourses | Outcomes |
|---|---|---|---|---|
| Emergency aid as a measure of social protection | Government<br>Citizens | Mobile, Big Data Analytics, Artificial Intelligence, Cloud Computing | Economic Development, Transparency & Participation | Positive |
| Health system: monitoring the number of covid-19 cases and deaths | Government<br>Media groups<br>Civil society<br>Citizens | Big Data Analytics, Artificial Intelligence, Cloud Computing, Smart Cities | Sustainability, Data Privacy & Citizenship, Transparency & Participation | Negative |
| The impact of covid-19 on education | Government<br>Civil society<br>Families<br>Citizens | Mobile, Big Data Analytics, Cloud Computing, Smart Cities | Economic Development, Sustainability | Negative |
| Fake news and data protection | Government<br>Private companies<br>Media groups<br>Citizens | Cloud Computing, Big Data Analytics, Mobile, Social Media | Sustainability, Data Privacy & Citizenship, Transparency & Participation | Unforeseen |

## 6 Discussion and Conclusions

The Covid-19 pandemic has provoked unprecedented changes in society, health systems, economies, and governments worldwide. Social groups combined with technologies and

discourses associated with each scenario provide a viewpoint in which such categories can be articulated to establish a theoretical relationship between the success and failure of each case. While the case of Emergency Aid showed how the technological measures adopted by the main social groups via important discourses impacted positively the lives of millions of Brazilians, the lack of articulation between government, media groups, and citizens, in the case of the Health System Monitoring, not only caused a political crisis but also resulted in a divide on how to manage and mitigate the pandemics. The same was observed in the case of the education system, where the lack of adequate technological infrastructure to support the professors, schools, and families in delivering courses online not only increased the extant digital divide but also will generate a long-lasting effect that surpasses the learning process and will have implications for the future of an entire generation. Besides, unforeseen outcomes were also identified such as fake news and data protection which show how digital platforms, transparency, and participation are fundamental in the aggregation and convergence of common interests from government, private companies, media groups, and citizens.

The contribution of this study is twofold. First, it contributes to academic research as no study investigated and categorized the impact of the digital transformation acceleration by analyzing mini-cases in the context of a global pandemic in order to unveil the role of actors, technologies, and discourses in the Brazilian context in the midst of a crisis. Second, from a public policy perspective, this study presents a set of reflections that can help policy makers to identify the positive, negative, and unforeseen consequences of a pandemic, which is a learning opportunity for them to be better prepared for future outbreaks. The study also presents some limitations which point toward avenues for future research. Firstly, the researchers draw reflexivity processes while conducting the data collection, and interpretation of the results. Thus, the study focused on the socially constructed reality of the subjects [48]. Such criteria imply the authors' reflections revealing their personal role and selection of the mini-cases and the actors represented in the study. Secondly, the study does not seek to find objective truth, but rather to understand which speeches about digital transformation emerged during the pandemic, and how the actors mobilized these speeches and technologies to socio-technical proportions and potential consequences at a society level. Finally, the study analyzed four mini-cases based on the extensive material produced during the research [47]. Future research could re-examine the assumptions that underlie the work, which can be handled through the selection of multiple longitudinal case studies providing an in-depth and unique research opportunity to understand an important phenomenon through the lens of real-life cases [48] in the context of a pandemic.

Venkatesh [46] argues that one of the virtues of theories and by association empirical work is often considered to be generalizability. However, Covid-19 reveals that some contexts can be unique to the point where generalizability becomes irrelevant. In this sense, the present study aimed to understand the impact of digital transformation during the Covid-19 pandemic to unveil potential challenges and opportunities in a post-Covid-19 world.

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