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Digital-by-Default: Exclusion through Digital Public Service Channels

Javiera Fernanda Medina Macaya

Andre F. Alves

João Porto de Albuquerque

Maria Cunha

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Javiera Fernanda Medina Macaya
Getulio Vargas Foundation
javiera.macaya@gmail.com

André Francisco Alves
Getulio Vargas Foundation
andalves@gmail.com

João Porto de Albuquerque
University of Warwick
j.porto@warwick.ac.uk

Maria Alexandra Cunha
Getulio Vargas Foundation
alexandra.cunha@fgv.br

Abstract

The use of digital channels has been promoted by governments as a way of improving services and reducing costs. This article aims to discuss how new forms of exclusion can be created by policies based on a digital-by-default orientation. To this end, more than 1.2 million service records are analyzed, as well as being considered socioeconomic indicators and spatial factors of the city of São Paulo. Results show that there is a statistically significant correlation between income and digital channels usage, as well as between digital channels usage and the requested service attendance time. It is also verified that the districts of the central region of the city tend to have high income, high rates of human development and high digital channels usage, while the periphery's districts tend to have low income, lower rates of human development and high traditional channels usage. It is concluded that, by prioritizing digital service channels, new forms of social exclusion are being created and that a portion of the population may be "forgotten" by the government.

Keywords: E-Government, Service Channels, Digital-by-default, Digital Divide, Brazil.

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1. Introduction

The interaction between governments and citizens have changed over time and, in part, this change has been leveraged by the governmental use of information and communication technologies (ICT), known as e-government, aiming to improve government performance and processes (Chun, Shulman, Sandoval, & Hovy, 2010). Also, the use of ICT contributes to improving transparency, accountability, and changes the role of citizens, allowing them to be more than consumers of public services (Bonsón, Torres, Royo, & Flores, 2012).

Although e-government literature is vast (Cunha & Miranda, 2013), there is a tendency to underestimate the use of ICT and the digitization as if they were limited to technical discussions, minimizing its political aspects and consequences (Löfgren & Sørensen, 2011; Hall, 2008), ignoring contexts of social exclusion, with only a few researchers addressing e-service provision and digital exclusion (Schou & Pors, 2018). The service provision solely through electronic channels as a self-service – or the digital-by-default orientation – is based on the pre-requisite that citizens have access to technologies, have digital skills to use them, and have the socioeconomic conditions to benefit from it (Schou & Pors, 2018).

Aiming at analyzing the usage of service channels, captured by the different service channels available in a mega city in the global south, this paper discusses the possibility of to strengthen social exclusion through in the case of digital-by-default orientation, arguing the importance of maintaining the existence of traditional channels, with the same quality in the provision of services. Thus, in an effort to understand how citizens from São Paulo city (Brazil) interact with the municipal government to register requests for public services, this article presents a quantitative data analysis of the SP156, the service multichannel of São Paulo City (PMSP, 2018). The analysis is based on the requests registered in the SP156 service channels, which can be on-site, online (website and app) or via call center. The aim is to answer the research question: Is there a relation among spatial factors, socio-demographic characteristics and the service channels used by citizens?

Based on the use of large volumes of data (big data) to analyze public services requests, as it analyzes more than 1.2 million attendance records, the contributions of this paper are: (i) the use of spatial information to analyze the digital divide, which was not found in other publications, should be considered to advancement of theoretical frameworks; and (ii) the analysis of the digital divide in a global south context, which is virtually unexplored by current literature. The discussion of digital-by-default orientation and the digital divide based on the city of São Paulo data may inspire public managers to reflect on service channels offer to the citizen and on the need to provide mechanisms other than digital ones, especially in the large cities of the global south. The data processing of requests showing territory is also a contribution to the administrators of big cities, so that they can design services considering the territorial and social differences, such as the income of a specific territory.

2. Digital-by-Default and Digital Divide

The ways governments and citizens interact have changed over time, in part influenced by the governmental use of ICT. More and more governments are required to offer electronic

services – e-services, understood as the use of ICT tools as a channel for providing public services to citizens (Cunha & Miranda, 2013) –, delivering services that empower citizens and meet their needs (Lopes, Macadar, & Luciano, 2018; Cunha & Miranda, 2013). The use of ICT in the provision of services aims to improve public management, as well as increase the provision, quality and effectiveness of the services provided (Araujo, Reinhard, & Cunha, 2018), efforts that only make sense when they create value for citizens (Meijer, Koops, Pieterson, Overman, & Tije, 2012).

The new forms of interaction, leveraged by ICT, influence the growing use of multi-channel for interaction, especially electronic channels (Ebbers, Jansen, & van Deursen, 2016; Giritli Nygren, Axelsson, & Melin, 2014). However, to make these new forms of interaction possible, it is necessary to consider the existing digital gaps which in order to do not reinforce current socio-economic and territorial inequalities. Schou and Pors (2018) emphasize that citizens have increasingly been understood as being "digital-by-default" by decision makers, placing those who do not use digital technologies as non-standard. The criticism regarding the digital-by-default orientation is that, by including self-service solutions, citizens are understood as being responsible for seeking services themselves, impacting people who do not use digital technologies who will thus face new forms of exclusion (Schou & Pors, 2018).

These new forms of exclusion are known as digital divide and can be distinguished by three groupings or levels (Ebbers, Jansen, & van Deursen, 2016; van Deursen & Helsper, 2015; Reddick, Abdelsalam, & Elkadi, 2012): the first level of digital divide is related to the access to technology; the second level encompasses digital skills, considering that people might have skills to use technology; the third level of digital divide presumes that, even among people who have access to and skills to use the technology, not all of them would be able to transform the access and use into real outcomes. The lack of skills impacts the use of online government services (Van Deursen, 2007) and this must be considered as governments are increasingly offering online services and presuming that citizens are able to fully use all those online services (Van Deursen & Van Dijk, 2009). Figure 1 shows the theoretical framework that considers three levels of digital exclusion.

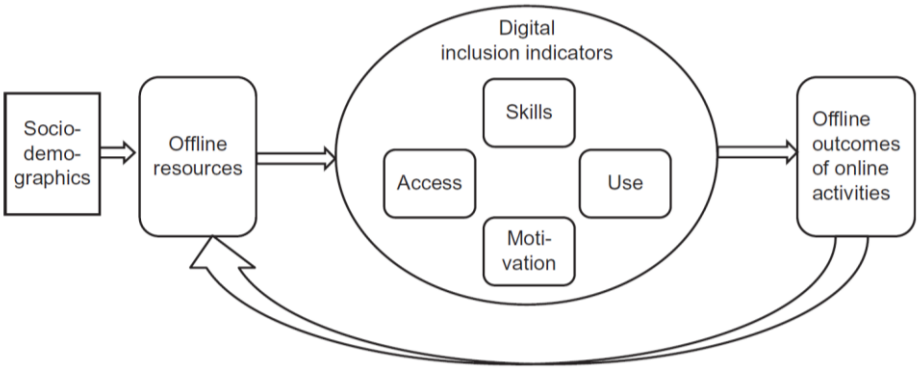


Figure 1: Theoretical Framework of Digital Exclusion
(Source: van Deursen & Helsper, 2015)

The implementation of public policies that presume the use of digital devices (such as computers or mobile phones) for interaction might also consider the possible biases among the requests resulting from that interaction (O'Leary, 2013). Those policies should consider that, in order to interact through digital solutions to register request, citizens should have access to the device and app, and the context (O'Leary, 2013, p. 184); if there is no other

form of interaction and citizens do not have access to any of these three conditions, they cannot, for example, engage in interactions with governments, then generating forms of digital exclusion. O'Leary (2013) cites the case of Street Bump, a mobile app implemented in the city of Boston (USA) to capture the holes in the streets of the city; to use it, citizens had to have the app installed, an iPhone and a car, conditions tied to socioeconomic issues that could result in the improvement of some areas of the city and not others. Therefore, it is important to consider the territory – and all the socioeconomic issues inherent to it; as noted by Reddick, Abdelsalamb and Elkadic (2012), "access to public services is not just a technological issue, social and economic forces come into play as well".

Aiming at analyzing the usage of service channels, this paper explores how socioeconomic characteristics and spatial factors are related to how citizens from São Paulo city register service requests to the municipal government. Considering spatial and socioeconomic issues of the territory is especially relevant, mainly in a country with the dimensions and inequalities of Brazil and, specifically, of São Paulo. The population of São Paulo city is estimated to be more than 12 million inhabitants (IBGE, 2019), ranking it among the world's largest cities, and it has a high Municipal Human Development Index (MHDI)[i] for the Brazilian standard (0.805) (IBGE, 2017), but also has high inequality among its population, with a Gini index[ii] of 0.6453 (DATASUS, 2019). In Brazil 70% of the population had used the Internet in the last three months (NIC.br, 2019) – 75% in the Southeast region of the country, where the city of São Paulo is located. Specifically, 90% of higher social class users are Internet users by mobile phone, contrasting with 55% of lower class, numbers that approximate the proportion of individuals who have used e-government in the 12 months prior to the date of the survey: 75% from higher and 37% from lower classes (NIC.br, 2019).

Guided by the research question 'is there a relation among spatial factors, socio-demographic characteristics and the service channels used by citizens?' the requests registered in the SP156 service channels were analyzed. In December 2016, São Paulo City Hall improved the availability of online citizen service channels: The Service Portal SP156 – reformulating the former Citizen Assistance Service (SAC) with regard to the presentation of services and the most simple and user-friendly language – and SP156 App, a new service channel. Aiming at simplifying and modernize the citizens' access to public services, by using these new platforms, they can register their requests to the municipal government through the website or app, as well as telephone and in person at the on-site service centers. However, it is important to note that not all services are available to be requested online and the expansion of online services is one of the lines of action of the current management of the City of São Paulo (PMSP, 2017).

3. Methodology

In order to answer the research question, an exploratory-descriptive study was carried out, with a quantitative approach, through secondary data analysis. Data referring to the services recorded by the service multichannel SP156 were extracted from Open Data on the São Paulo City website (PMSP, 2013) on 11/15/2019 and, for this research, the service request data from January 2017 to December 2018 was considered. Initially, a total of 1,479,988 occurrences were obtained. However, due to the focus of this paper was to analyze how socioeconomic characteristics and spatial factors are related to the usage of SP156 service channels, the following records were disregarded: records without district, 67,128 occurrences; service channel type "Integration"[iii], 58,321 occurrences; services without requests on the four channel types, 150,274 occurrences[iv]; records with start date after end date, 664 occurrences. In this way, the final sample was 1,203,601 service requests. For the

purpose of comparison, São Paulo City's population is over 12 million people, that is, the number of service requests is equivalent to approximately 10% of the population.

Data referring to São Paulo districts' income were obtained through download from IBGE's website (IBGE, 2010) and the most recent available data corresponded to the 2010 Census. As IBGE data is detailed by Census enumeration area, it was necessary to group such data by city district, in order to allow the information to be cross-checked with the SP156 service center records. Thus, the weighted average values of the household's monthly income were calculated being grouped by district. Data regarding the MHDI was downloaded from Open Data website of the Municipality of São Paulo (PMSP, 2015) on 11/15/2019, corresponding to 2010 MHDI's data for this research.

It is important to note that it was not possible to carry out individual analyses, since the available data is related to the service request, and not to the person who requested it. This would be an interesting analyses, since the results from previous researches show differences in the use of e-government by men and women (69% and 59% respectively), by education level, ranging from 26% for illiterate people to 85% for university graduates, by age group and social class (O'Leary, 2013).

The cross-checked information from Central SP156 records and IBGE's socio-demographic data was carried out using the software Excel version 365, considering the "Distrito" column in the records of Central 156 and column "Nome_do_distrito" in the IBGE database. Minitab version 19 was used as supporting software for statistical analyses, considering confidence intervals of 95% for the mean, and the individual standard deviations were used to calculate the intervals. The spatial data were obtained from GeoSampa website on 11/15/2019, where the shapefiles from districts, on "Administrative Boundaries" section were downloaded. The software QGIS version 3.10 was used for spatial analysis. Maps illustrated in this research consider the data grouped by quartiles of the information they represent.

For data presentation and representation purposes, service channels will be referenced in figures as follows: Application SP156 will be treated only by Application; Central SP156 will be denominated Telephone; Portal of Service SP156 will be treated as Web Portal; and for Service Centers the nomenclature is maintained. Data shown on all the maps are split into 4 quartiles, having each quartile exactly 24 districts, totaling the 96 districts of São Paulo's city. Besides, Attendance Time is the elapsed time between citizen register a request and the update of the status request and it is calculated through the subtraction of date from "Data do parecer" column minus the date from "Data de abertura" column.

4. Data Analysis and Discussion

Most of the requests registered in the SP156 between 2017 and 2018 were through the Telephone (61.09%), followed by the Web Portal (24.23%), the Application (7.64%) and the on-site Service Centers (7.04%).

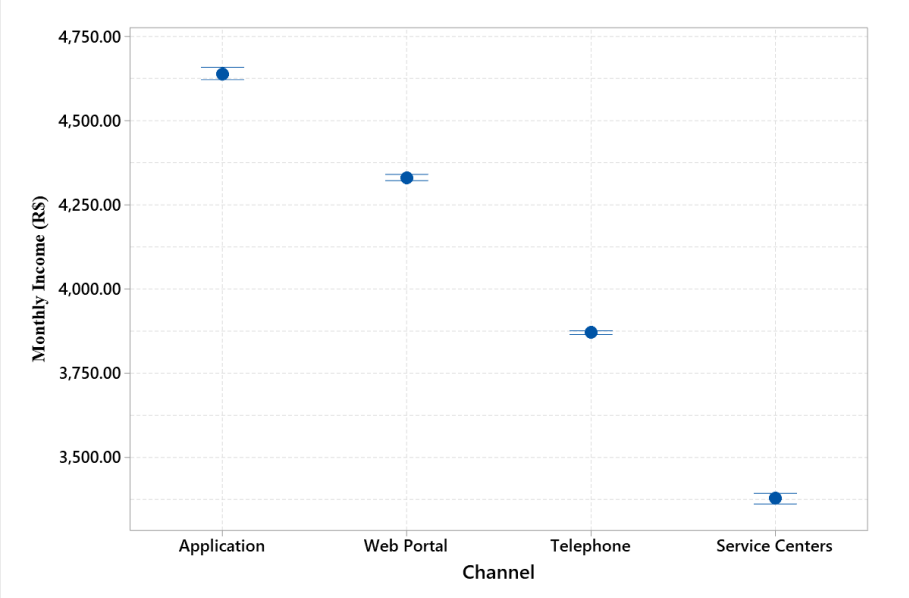
Table 1 presents descriptive statistics of income, MHDI, Digital Channels usage and Traditional Channels usage, where it appears that there is a wide range of data for all variables. The districts' average income was R$ 3,966.74, but the lowest income identified was R$ 1,221.64 and the highest was R$ 12,655.17, a variation of almost 10 times. When talking about MHDI, it appears that the lowest human development was 0.64700, this HDI is like that of countries with medium human development and the highest HDI was 0.94467, like countries with better HDI. However, when analyzing digital channels usage, the district

that least uses digital channels presented 10.97% made through these channels (Application or Web Portal), and on the other hand, the one that used the most presented 73.57% of the requests registered through digital channels. The variability of traditional channels (Telephone and Service Centers) is also no different, where 26.43% of requests were registered by traditional channels in the district that least used these types of channels, and 89.03% of requests were made through digital channels in the district that most used it.

Variable	Mean	Standard Deviation	Minimum	Quartile 1	Median	Quartile 3	Maximum
Income	R$ 3,966.74	R$ 2,708.12	R$ 1,221.64	R$ 2,255.11	R$ 3,027.94	R$ 5,326.48	R$ 12,655.17
MHDI	0.7896	0.0659	0.64700	0.74191	0.78497	0.82569	0.94467
Digital Channel	30.84%	9.53%	10.97%	23.98%	30.42%	36.12%	73.57%
Traditional Channel	69.16%	9.53%	26.43%	63.88%	69.58%	76.02%	89.03%

Table 1: Descriptive Statistics of Variables Used in Research

Figure 2 shows an interval plot of districts average income according to the service channel usage. It is noticed that digital channels (Application and Web Portal) are mainly used by districts with higher income (R$ 4,639.66 and R$ 4,330.33, or US$ 1,091.68[v] and US$ 1,018.90, respectively) and traditional service channels (Telephone and Service Centers) are mainly used by lower income districts (R$ 3,869.70 and R$ 3,376.54, or US$ 910.52 and US$ 794.48, respectively). The difference of means was statistically significant ($p < 0.001$) with a significance level of 0.05 according to the analysis of variance (ANOVA) conducted. In other words, the plot indicates that digital service channels usage is concentrated, but not limited, to higher income districts, while the use of traditional channels is concentrated, but not limited, to districts of lower income.

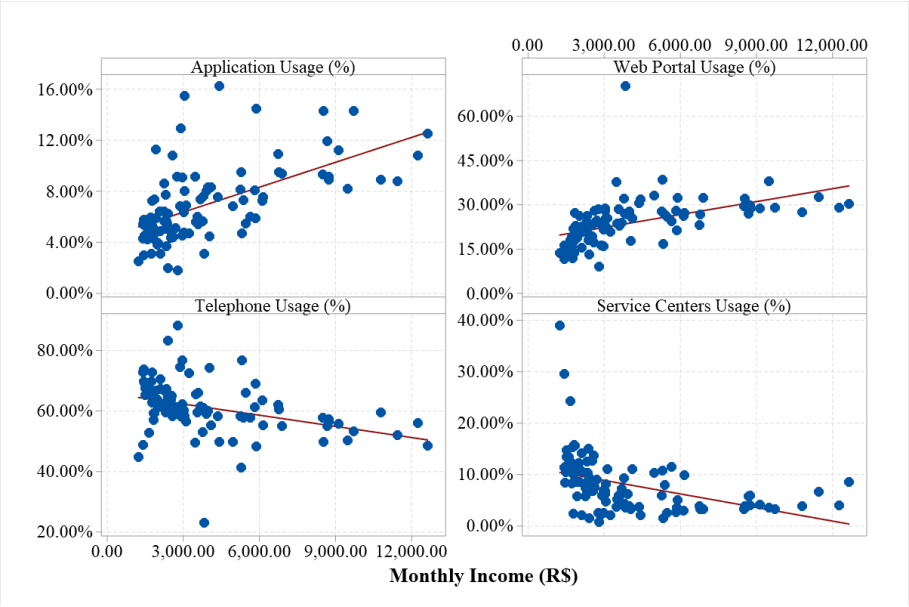


Notes: n = 91,903 for Application; n = 291,618 for Web Portal; n = 735,336 for Telephone; n = 84,744 for Service Centers. Individual standard deviations were used to calculate the intervals. 95% confidence interval for the mean.

Figure 2: Monthly Income Grouped by Channel Type

The preference for the use of digital channels in highest income districts is confirmed by correlation analysis between the channel usage percentage and district income, as shown in

Figure 3. The correlations are statistically significant for all analyzed channels ($p < 0.001$) with Pearson's correlation coefficient (r) of: 0.58 for Application; 0.50 for Web Portal; -0.38 for Telephone; and -0.41 for Service Centers. That is, the positive Pearson's correlation coefficient found for Application and Web Portal Usage indicates that when income increases the digital channels usage also tends to increase, and as income decreases less it tends to be the digital channels usage. On the other hand, the negative Pearson's correlation coefficient found for Telephone and Service Centers indicates an inverse behavior, that is, when income increases the traditional service channels usage tends to decrease and when the income decreases the traditional service channels usage tends to increase.



Note: n = 1,203,601.

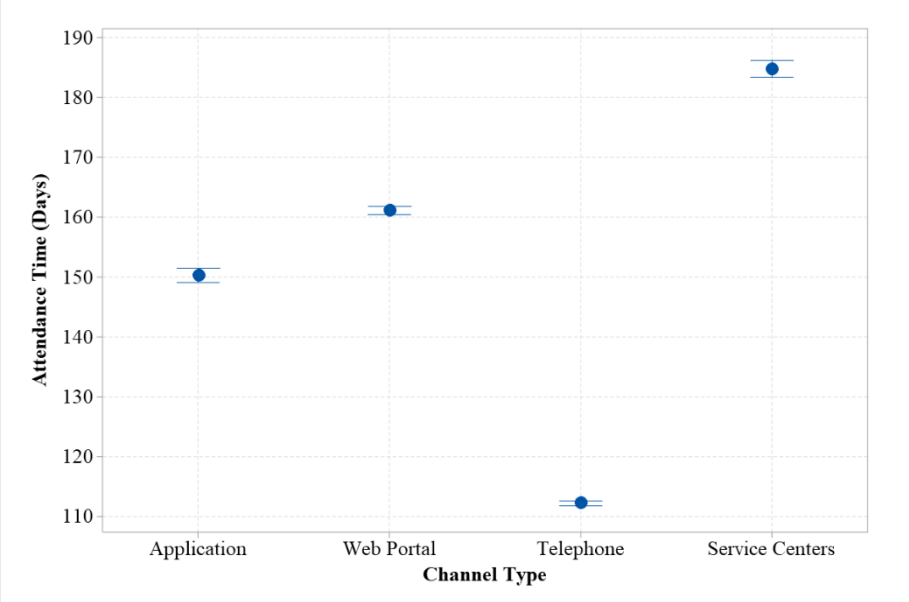
Figure 3: Correlation between Monthly Income and Channel Usage Percentage

These findings corroborate with others that point to income as one of the determining variables for ICT use and for digital channels usage (van Deursen & Helsper, 2015; van Deursen, van Dijk, & Helsper, 2014; van Dijk, 2006). A low income makes it difficult for the population to access computers, laptops, smartphones or even a data access plan, which characterizes the first level of digital divide (van Deursen & Helsper, 2015).

When analyzing the average attendance service time, it is noticed that Service Centers attendance time (184 days) is superior to all other service channels (Application: 150 days; Web Portal: 161 days; and Telephone: 122 days), as shown in Figure 4. The differences between the average attendance service times are statistically significant ($p < 0.001$) according to the ANOVA test performed, for a 95% confidence interval. This result is also found when analyzing the average attendance time services type individually. Here it is worth remembering that service centers tend to be the preferred channel for people living in low-income districts.

Still, if we compare the attendance time of requests registered through Service Centers (which tend to be the channel of choice for the lower income population), they tend to be, on average, 23 days slower than that registered through Web Portal and on average 34 days slower than Application. In other words, people who use digital channels tend to have their

requests answered in a faster time than those who use Services Centers, being able to enjoy the outcomes of their request in advance when compared to Service Centers.



Note: n = 88,086 for Application; n = 278,784 for Web Portal; n = 714,610 for Telephone; n = 79,817 for Service Centers. Individual standard deviations were used to calculate the intervals. 95% confidence interval for the mean.

Figure 4: Attendance Time Grouped by Channel Type

Having the request answered sooner does not mean only to have the grass in a square cut or a hole in the street repaired in advance (which is also important), but could mean a place that has diseases vectors clean or an unclogged manhole, which can prevent flooding. These findings contribute to the discussion on the third level of digital divide, which seeks to obtain real outcomes from digital channels usage (van Deursen & Helsper, 2015; Helsper, 2012); here the discussion does not only considers the achievement of real outcomes from citizens who are able to use digital channels to request public services, but goes further by exploring how citizens who use digital channels have access to the real outcomes faster than those using traditional channels

Considering a spatial analysis, it is noted that the city of São Paulo is also very unequal. Figure 5 shows two maps São Paulo's districts, with a comparison between the average monthly districts' income (map on the left side) and the districts' MHDI (map on the right side). It is noticed that there is concentration of high-income districts in the central region and that this income concentration is accompanied by a high human development. The MHDI of the central region districts is comparable to countries with high human development (HDI >= 0.8), while the MHDI of the districts on the periphery is comparable to countries with medium human development (HDI <= 0.699). For comparison, Brazil's HDI is 0.761.

The digital channels usage spatial behavior, illustrated by Figure 6, is very similar to that verified by the income and MHDI. The map on the left side represents the digital channels usage percentage quartiles (Application and Web Portal) in the districts and the map on the right side represents of traditional channels usage percentage quartiles (Telephone and Service Centers) in the districts. It is noticed that the digital channels usage is concentrated in central region districts (the same region that tends to have high income and very high human

development) and the traditional channels usage is concentrated in the periphery districts (which tend to have low income and lower human development).

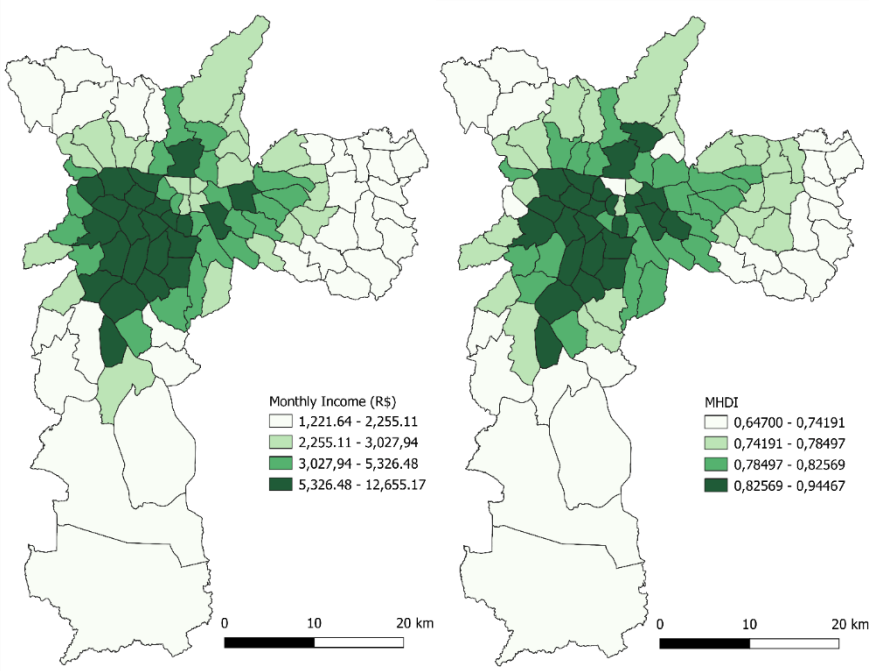


Figure 5: Comparative maps between average monthly income and MHDI

The spatial analysis between income, MHDI, use of digital channels and use of traditional channels (as illustrated by figures 5 and 6), together with the statistical analyzes previously exposed, shows that there is a trend in high-income districts (concentrated in the region) use digital channels, which tend to have a shorter service time compared to Service Centers.

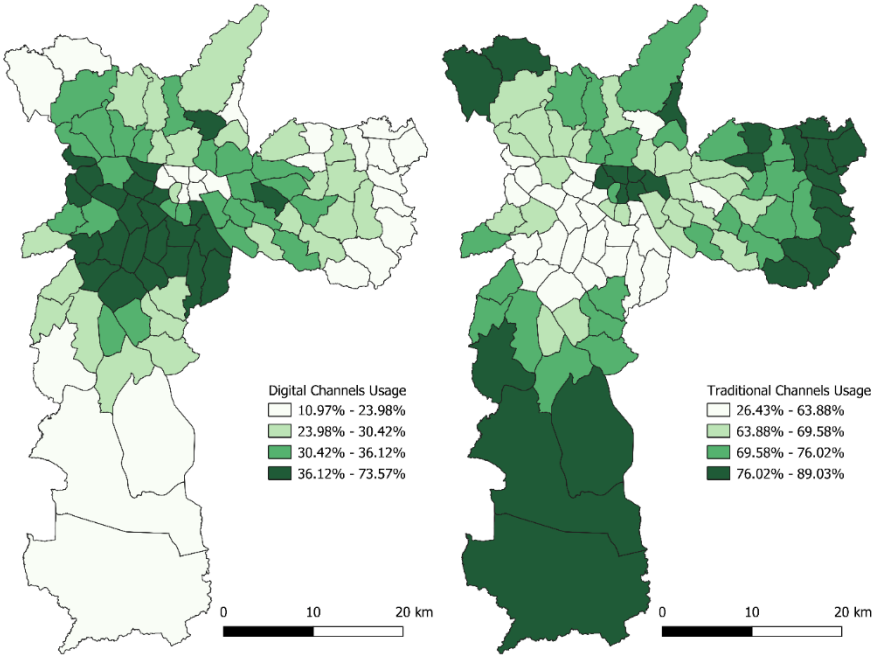


Figure 6: Comparative Maps between Digital and Traditional Channel Usage

The outcomes that can be obtained by the lower attendance time (as shown in Figure 3) can further reinforce the existing social inequalities (as shown in Figure 5, map on the right) of the city, as the districts that tend to use digital channels also tend to have higher HDI.

5. Conclusion

The purpose of this paper was to analyze how new forms of exclusion can be created by policies based on a digital-by-default orientation. To do so, databases of the public service requests, spatial data from São Paulo, and sociodemographic data of the districts of the city were used.

The analyses allowed us to identify that there is a statistically significant difference in how districts' citizens with different income levels make their service requests. People with higher incomes tend to use digital channels (Application and Web Portal) for their service requests, whereas people with lower incomes tend to use more traditional service channels (Telephone and Service Centers), with Service Centers being the channel that tends to be used by the lower income population. At the same time, Service Centers are the channel type that tends to have the highest attendance time. Thus, population of peripheral districts, usually composed of people in a situation of vulnerability, ends up being neglected about the attendance time of their requests.

It was also verified, through spatial analysis, that there is a concentration of districts with higher income in the city's central region, and that these districts also tend to present a higher digital channels usage. The periphery districts tend to have low income, lower human development and higher traditional channels usage.

In this way, it is not enough for the government to create new digital service channels, based on the idea of digital-by-default, and expect that citizens will use those and take the advantages and real outcomes that their use could result in. Together with the digital channels, the government should be concerned with creating policies to equalize the service provided for all the channels, improving the use of ICT for the service of the Service Centers, as well as through inclusion policies, be they through the provision of access points, access, digital literacy, as well as awareness of e-citizenship. If this is not done, there is a risk that digital divide creates new forms of social exclusion, as well as accentuating existing social differences.

The findings of this research collaborate with the existing digital divide discussions, mainly with regard to the first and third level of exclusion (van Deursen & Helsper, 2015; Helsper, 2012; van Dijk, 2006), as well as it shows the importance of considering the territory in decision making (O'Leary, 2013), and of offering different means to register requests, without presuming the digital by default characteristic (Schou & Pors, 2018). Future studies could further analyze the data on the usage profile of individuals by district of the city considering devices used, Internet use, use of e-government, for example. This information could help local decision-makers to better understand what it takes, for example, what makes the citizen use one channel and not the other.

A limitation of the analysis is the inference of people's average income who requested services as being equivalent to the district's average income. Additionally, it is important to acknowledge that the requests sample, despite being large enough, is non-parametric. In addition, it has been inferred. Finally, it is recommended that, for public policy and future

research purposes, the databases be made available with other sociodemographic breaks, such as the gender and age of the requesting person, respecting and following the privacy and data protection policies, ensuring data anonymity. Also, it would be valuable to analyze the data from other cities and citizens, in order to understand how this phenomenon occurs in other contexts.

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[i] The MHDI uses the same dimensions of HDI (health, education and income) and adjusts it to the municipal reality.

[ii] The Gini index measures the extent to which the distribution of income among individuals or households within an economy deviates from a perfectly equal distribution (OECD, 2006).

[iii] The "Integration" service channel contains requests registered through the Integrated Systems SP156 - Military Police and Traffic Engineering Company (CET) - and it were discontinued in December 2017 for Military Police and in June 2018.

[iv] 97 service types were requested by the 4 channels out of a total of 356 available services.

[v] US$ 1.00 = R$ 4.25 according to 1/30/2020 exchange rate.