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Research Article

Public Value in the Perception of Citizens from the Perspective of Smart Cities

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ABSTRACT

This study addresses the public value theory from the perspective of smart cities and aims to propose the validation of a framework from the citizen's perception and the principles of public value generation from the perspective of smart cities. For its development, the principles of the OECD were related to the characteristics of smart cities for the elaboration of a questionnaire, using the five-point Likert scale, which was applied to 256 residents of the city of Natal. The collected data were analyzed using descriptive statistics and the exploratory and confirmatory factor analysis technique. The results show that even when the citizen has not contributed to the elaboration of the principles for the generation of public value, he/she recognizes the importance of the theme for the delivery of better public services. As a contribution to managers and society, it is suggested more investment in education and knowledge of citizens about the importance of their participation and use of digital services, raising the level of user maturity to the level of maturity of government actions. As an academic contribution, the scale theoretically represented and statistically validated contributes to the continuity of studies on public value, as a key element for governance in smart cities. As an opportunity for future research, the application of the tool in other cities is suggested to establish comparisons, as well as research involving the maturity of respondents, as users of digital government services and their knowledge of public value, for a better alignment between government and citizen.

Keywords: smart city; digital government; public value; e-government

JEL Code: nonadherent

INTRODUCTION

In the 21st century, technological and scientific advances in industry have posed several challenges to governments and citizens, the so-called third industrial revolution. Thus, this rapid change with the absence of adaptation interventions, increasing government spending, and large-scale public debt financing have required governments to adopt new strategies for their administrations (Scholl & Scholl, 2014).

In this context, governments in several countries have taken initiatives to use information and communication technologies (ICTs) to improve, reform, and modernize government works, as stated by Shah and Arfeen (2017). In the early 1990s, Brazil began collaborative work with the Organization for Economic Cooperation and Development (OECD) adhering to 26 recommendations and other suggested instruments, according to the Ministério das Relações Exteriores (2019). Among the recommendations, in 2017, the highlight was the Brazilian Digital Government Review document based on the OECD Recommendation on digital government Strategies (2017). The Brazilian strategy emphasized the prediction of the use of digital technologies, as an integral part of government modernization strategies, in the creation of public value. This document, in particular, encourages the Brazilian government in the transition from an e-government approach to a digital government, in the search for a sustainable digital transformation of the public sector and the creation of public value (Ministério da Economia e Governo Digital, 2017).

As a complement to this strategy of governmental modernization, technology, and cities, there is the context of smart cities, which, according to Chourabi et al. (2012), are presented as a requirement in the search for guaranteeing housing conditions in the context of rapid housing growth throughout the world. Despite the definitions of smart cities being on a progressive development trajectory, it can be said that, among the various elements that determine them, some are crucial for the advancement of understanding of what a smart city would be (Harrison et al., 2010; Nam & Pardo, 2011), three of which are contextual conditions, governance models, and the assessment of public value (Meijer, 2017; Meijer, Gil-Garcia, & Bolívar, 2016; Walravens & Ballon, 2013).

However, public value presents itself as a multidimensional construct of significant complexity. It is taken as a reference point that public value is what is 'consumed' by the citizen, which is perceived by him, as it is how he values certain government actions (Moore, 1995). Thus, the understanding and demand of citizens should be equivalent to the partners of a firm, that is, public value is presented as a correlate of private value or shareholder return (Horner & Hazel, 2005). Thus, the citizen should act as a shareholder concerning how his tax is spent.

In the incorporation of public value in this debate, there is a broad perspective of possibilities for knowledge development, from the premise of the idea of a new paradigm of public administration to the perspective of evaluating this value in practical actions and decisions for public management (Jorgensen & Bozeman, 2007; Meijer, 2015; Meijer, 2017; Stoker, 2006). Therefore, when considering the strategic perspective of the OECD recommendations with the objective of

generating public value, and also the importance of evaluating this value for the context of smart cities, one questions what is the citizen's perception of the principles of generation of public value, from the perspective of a smart city?

Hartley, Alford, Knies, and Douglas (2017) survey empirical research on public value to inspire and guide further empirical research with a diverse range of research parties. The authors reinforce that the theme lacks a basis in empirical research for it to be challenged and tested. Recognition of the conceptual alongside the practical is also true of those who have developed and debated public value theory of public value (e.g., Alford 2008; Benington & Moore 2011; Bryson, Crosby, & Bloomberg 2014; Hartley 2012).

Therefore, the objective of the research was to propose the validation of a framework from the citizen's perception, the principles of public value generation from the perspective of smart cities.

The concern with public value analysis, production of results, provision of adequate services to the population, and development of trust have been frequent elements in the debates of many governments, in search of legitimacy, based on the need for integration and the relationship of their citizens and the state and the implications for the process of government structures themselves (Al-Hujran, Al-Debei, Chatfield, & Migdadi, 2015; Twizeyimana & Andersson, 2019). However, as Panagiotopoulos, Klievink, and Cordella (2019) point out, there is still a theoretical lack about the meaning and conduct of actions in the measurement of public value, particularly, how technologies can contribute to its development and which ones are predominant in meeting the population's expectations. Thus, this research becomes relevant because it intends to point out and articulate these themes in the Brazilian context, to stimulate the generation of guidelines and, consequently, the advancement of public policies.

THEORETICAL REFERENCE

Smart cities

The concept of smart cities was developed in relation to urban progress and the resulting increase in the needs of local communities, and also in relation to increasing financial and environmental costs. It is very difficult to define clearly and precisely what a smart city is because the term encompasses domains such as technology, communication, ecology, and sociology (Orlowski & Romanowska, 2019).

According to Albino, Berardi, and Dangelico (2015), it was in the 1990s that the term smart cities emerged to name cities that were using new ICTs, making their infrastructure more modern. However, in smart cities technology is only a tool aimed at facilitating the life of city dwellers (Orlowski, Marć, Namieśnik, & Tobiszewski, 2017), that is, technologies should be used as a means and not as the final objective.

For a city to become a smart city, it must improve the intelligence of its fundamental elements. When we talk about city intelligence, we are referring to three essential perspectives, such as effectiveness, consideration for the environment, and innovation (Dameri & Rosenthal-Sabroux, 2014). In the systematic review by Bouzguenda, Alalouch, and Fava (2019), a connection between smart cities and sustainability is evident and emphasizes the significant role of ICT in the movement toward smart sustainable cities.

Ismagilova, Hughes, Dwivedi, and Raman (2019) provide a valuable and relevant synthesis of the literature on the concepts of smart cities. In this study, we can highlight the use of ICTs in urban spaces in order to generate quality of life for citizens, technologically advanced territories that deal with various social, technological, and economic growth aspects, and which are cities that have intelligent inhabitants in terms of education level and quality of their social interactions in relation to integration and public life and openness to the world in general.

Digital government

The discussion on digital government is initiated by the presentation of e-government. Gil-García and Pardo (2005) state that this is a government that makes intensive and widespread use of ICTs, applying them in the provision of public services, seeking to improve managerial effectiveness and promote democratic values and mechanisms. In this sense, the use of information technology (IT) has become one of the central elements of management reform and for the adoption of e-government (Moon, 2002).

In Brazil, the first political projects aimed at e-government started in 2000, with the Information Society Program (Programa Sociedade da Informação) and the Executive Committee of e-government (CEGE – Comitê Executivo do Governo Eletrônico) (Ministério do Planejamento, Desenvolvimento e Gestão, 2016). In 2001, the e-government Portal was created and in subsequent years other portals and decrees were created, with the Transparency Portal being created in 2004 to promote transparency in public management, in addition to equipping society to carry out social control, as the portal page informs us.

As time went by, the discussion on digital government emerged as a complement to the debate on e-government. Chun, Shulman, Sandoval, and Hovy (2010) present three stages that describe the patterns of government interactions through digital mechanisms with the public: 1st – focused on the ‘digital presence’ with simple websites and basic information; 2nd – simple interaction between governments with citizens, businesses, and other government agencies through email contacts and interactive forms, which can dynamically provide the necessary information; and 3rd – starts to provide online transaction services, such as license renewal, permission requests, and tax payments.

Entering the context of digital government, this is perceived as a global phenomenon where public servants start to adopt new ways to leverage IT to better serve citizens (Marchionini, Samet, & Brandt, 2003).

For 16 years, Brazil has continued to signal, with projects, portals, and decrees, its intention to offer public services through digital transactions for citizens, industries, NGOs, and government agencies in all spheres: federal, state, and municipal; and in the legislative, executive, and judicial spheres. In parallel with these actions, Brazil has carried out over the years bilateral cooperation with the Organization for Economic Cooperation and Development (OECD), to which, based on its experiences over 15 years, with reforms in the public sector, Brazil requested a review of its digital government (Ministério da Economia e Governo Digital, 2017).

The revision proposed by the OECD aims to assist in the transition of Brazilian e-government to a sustainable digital government. Within this document, the OECD presents six dimensions of digital government, as shown in Table 1, taken from the OECD thematic document on the structure of digital government (Organização para a Cooperação e Desenvolvimento Econômico [OCDE], 2017).

Table 1

From e-government to digital government: the six dimensions of digital government

e-government	Digital government
User-centric administration	User-driven administration
Reactive	Proactive in developing public policies and providing services
Information-centric	Data-driven public sector
Scanning of existing processes	Process by digital design
Government service provider	Platform for co-creating public value
Access to information	Default opening

Note. Developed by the authors based on Organização para a Cooperação e Desenvolvimento Econômico (OCDE). (2017). *Revisão do Governo Digital do Brasil*. Projeto Digital Government OCDE. Brasília, DF. Retrieved from <https://www.gov.br/casacivil/pt-br/centrais-de-conteudo/eventos/ocde/2018/seminario-sobre-perspectivas-para-o-governo-digital-no-brasil/relatorio-revisao-do-governo-digital-no-brasil>

The Digital Governance Strategy (EGD – Estratégia de Governança Digital) document, presented by the Ministério do Planejamento, Desenvolvimento e Gestão, brings as a concept of digital governance the use, by the public sector, of information and communication technologies to improve information and provision of services, encouraging citizen participation in the decision-making process and making the government more accountable, transparent, and effective (Ornager & Verma, 2005).

Based on the above, in summary, e-government is limited to sharing data and information about its management through institutional platforms and websites, while digital government goes further, opening space for citizen participation with the objective of co-creation to generate public value, enabling the delivery of better services.

Digital technologies, which are the basis of digital government initiatives, are a fundamental aspect of the constitution of public value, as they make possible the operations of managerial aspects, such as transparency, efficiency, accountability, and others (Panagiotopoulos, Klievink, & Cordella, 2019).

It can be concluded that these are effective tools for reducing corruption, promoting good governance, reducing corrupt behaviors, improving relationships with citizens, and monitoring employee behaviors more efficiently (Shime & Eom, 2008).

Public value

According to O'Flynn (2007), public value is a multidimensional construct, as it covers different aspects of the public sector. Stoker (2006) articulated a public value management model for forms of collaborative networks, differentiating 'new public management' from 'public value management,' to find solutions that balance democracy and efficiency. Therefore, the author presented paradigms of public management, as described in Table 2.

Table 2

Public management paradigms

	New public management	Public value management
Description	Post-bureaucratic government	Post-competitive
Dominant focus	Results	Relationships
Management objectives	Achieve agreed performance goals	Multiple objectives, including responding to citizen/user preferences, renewing the mandate and trusting through quality services, directing the network
Definition of public interest	Individual preference is aggregated	Collective preferences are expressed
Performance objective	Management of inputs and products to ensure savings and responsiveness to consumers	Multiple goals are pursued, including service outputs, satisfaction, results, trust, and legitimacy
Dominant accountability model	Upwards through performance contracts; sometimes outwards to customers through market mechanisms	Various accountability systems, including citizens as government overseers, customers as users, and taxpayers as funders
Preferred delivery system	Well-defined private sector or long-armed public agency	Menu of pragmatically selected alternatives

Note. Developed by the authors based on Kelly, G., Mulgan, G., & Muers, S. (2002). *Creating public value*. London: Cabinet Office; based on Stoker, G. (2006). Public value management a new narrative for networked governance? *The American Review of Public Administration*, 36(1), 41-57. <http://dx.doi.org/10.1177/0275074005282583> and based on O'Flynn, J. (2007). From new public management to public value: Paradigmatic change and managerial implications. *Australian Journal of Public Administration*, 66(3), 353-366. <https://doi.org/10.1111/j.1467-8500.2007.00545.x>.

The public value paradigm is not the value produced by collective organizations that represent individual preferences or that seek the good of the community such as parliaments, NGOs, government organizations, but the value that citizens perceive about a specific public good, public service, or public policy (Alford & Hughes, 2008).

In this process, the protagonists must act by ensuring coordination of different dimensions and with strategic stakeholders, because if what is defined by citizens as a valuable purpose is not in

line with the key authors of the authorizing environment, the manager has the option to adapt what was assigned as a value, in the search for an intermediate solution; or persuade the authorizing environment to review its opinion (Benington & Moore, 2011). In this context, in essence, public value must be considered what adds value to the public sphere and what society considers valuable.

In their studies on the paradoxes of low e-government adoption, Savoldelli, Codagnone, and Misuraca (2014) suggest that smart government, which produces public value, is based on a triangle of good decision defined by policy, values, and evidence and that to achieve this the public sector must go beyond the traditional concept of service innovation and conclude that, instead, it must introduce conceptual and systemic innovation relating to a new way of thinking and interacting with stakeholders and citizens as sources of legitimacy and evidence.

The concept of public value was used to explore the different ways of creating value for society in a smart city and, thus, measure the performance of these cities. Osella, Ferro, and Pautasso (2016) developed a framework to assess the 'intelligence' of a city through the perspectives of economic, social, and environmental performance, following the principle of 'triple sustainability.' This research was carried out using key performance indicators (KPIs) that can be grouped into 'key' and 'ancillary' categories. The 'core' indicators are those that allow for international comparability between cities, helping policymakers in benchmarking, and the 'auxiliary' indicators consider the particularities of the city's local situation. It is noteworthy that the framework developed was established to capture the perception of public value from several different stakeholders. Finally, the authors used the Italian city of Turin as a case study to test the proposed assessment instrument.

Karunasena, Deng, and Singh (2011) introduced the e-Sri Lanka program on public value through a case study. Four main dimensions of creating public value through e-government were used: the provision of public services, achieving results, building trust, and the effectiveness of public organizations to assess the performance of the e-Sri Lanka program.

In addition, the progress of the e-Sri Lanka program was assessed and possible areas for improvement in e-government development in Sri Lanka were identified. In turn, Hills and Sullivan (2006) developed a framework to assess whether instruments to measure public value are appropriate. This developed framework assesses whether the proposed questions are appropriate, holistic, democratic, and credible. It is also applied to a set of different measures that have been used in measuring the performance of the public service.

Using the premises of public value as the objective of public activities, the OECD (2017) brings together around the three main pillars (access to information, provision of services, and social participation) a digital governance strategy for the Brazilian government. This strategy presupposes nine transversal principles that guide the execution of each strategic objective expressed in Table 3.

Table 3

Framework components

Pillars of public value			Principles
Information	Services	Participation	Openness and transparency
Encourage the provision and the use of open data	Expand and innovate the delivery of digital service	Encourage collaboration in the cycle of public policies	Innovation
Expand the use of ICTS's for transparency and publicity turned to the application of resources	Share and integrate data, process, systems, services, and infrastructure	Improve the direct interaction between government and society	Safety and privacy
			Focus on the citizens' needs
Ensure information safety and state communication and the privacy of citizen's data	Improve governance and management through technology	Expand and encourage participation in the creation and improvement of public services	Government as a platform
	Enable and universalize the use and the access to digital services		Prioritization of online public service
			Social participation and control
			Simplicity

Note. Developed by the authors based on Ministério do Planejamento, Orçamento e Gestão. (2016). *Estratégia de Governança Digital da Administração Pública Federal 2016-19*. Brasília, DF: Ministério do Planejamento, Orçamento e Gestão, Secretaria de Tecnologia da Informação. Retrieved from <https://www.gov.br/governodigital/pt-br/estrategia-de-governanca-digital/revisaodaestrategiadegovernancadigital20162019.pdf>

The nine established principles are detailed, creating a theoretical framework to guide the actions of the actors involved. Among the principles presented here is a focus on the needs of society, participation, and social control. Giffinger, Haindlmaier, and Kramar (2010) present, in their studies on the characteristics of smart cities, citizen participation in decision-making, public services, social, transparent governance, and political strategies as criteria for achieving these characteristics, thus reinforcing that the needs of society, both natural and legal, are the main inputs for the design and delivery of digital public services.

Scholl, Barzilai-Nahon, Ann, Popova, and Re (2009) bring as a key point for a good partnership with public management the capacity for cooperation and the good relationship between stakeholders. Flak, Moe, and Sæbø, (2003) focus their research on user engagement and stakeholder investigation in e-government initiatives. Yet, according to the authors, e-government needs to discover what citizens want to suggest better products and services, but on the other hand, it is difficult for citizens to know how to express what they want before the electronic service has been offered.

In his studies, Paletti (2016) states that according to the public value perspective, behind the co-production of services, there is the willingness of many citizens to create new models of public service production that correspond to their current collective aspirations and ideas and that the current model of public administration is unable to satisfy.

The OECD document (2017) highlights the importance of citizen collaboration at all stages of the public policy cycle and in the creation and improvement of public services. Public bodies and entities must be transparent and publicize the application of public resources in Federal Government programs and services, providing timely, reliable, and accurate information so that the citizen can supervise the government's actions.

The principle of transparency permeates all good actions performed by the public administration. Schwarc and Deane (2003) report in their study that transparency is a motivating factor for reducing corruption. According to Mooij (2003), technology can improve governance and with the help of technology and through electronic governance, transparency is obtained and corruption is reduced. Odendaal (2003) states that governance is sustained by the relationship between society and technology itself.

Governments that use technology to deliver services to their citizens are responsible for ensuring that no one is forgotten, according to the UN (Organização das Nações Unidas [ONU], 2018). The United Nations organization still places the responsibility for social cohesion on governments. So that there is wide use of services, the OECD lists simplicity as a principle aiming to reduce the complexity, fragmentation, and duplication of information and digital public services, optimizing business processes, focusing on the efficiency of the provision of services to society.

According to O'Reilly (2011), the citizen has the power to trigger innovation that will result in a better approach to governance. In his book, Bolívar (2018) states that the interaction of social and technological innovation has the potential to transform the government and administration of cities.

With the use of technologies in digital governments, an enormous amount of data is generated. Through this information, the government will also be able to discover new needs of the citizen. On the other hand, new challenges are created for the security of these data (Tankard, 2012).

The use of technology also helps in the search for a more systemic view of the internal environment, rather than a view by department or sectors. Thus, service capacity sharing emerges as a management tool to integrate activities allowing for greater understanding. For the OECD, bodies and entities should share infrastructure, systems, services, and data to avoid duplication of efforts, eliminate waste and costs and reduce the fragmentation of information into silos.

In their studies, Ganapati and Reddick (2018) explore opportunities and challenges of the sharing economy for the public sector in general and digital government in particular. The rapid rise of the sharing economy presents new opportunities for the public sector. The authors further claim that the sharing economy is innovative when using underutilized assets and surplus labor. It has environmental benefits when reusing existing assets of capacity.

Service capacity sharing is nothing new for the private sector, but it poses major challenges for the public sector. The Digital Government Strategies document (2016-2019) presents the main

challenges to be faced to improve the effectiveness of digital governance actions, including the sharing of systems, services, and data, encouraging integration and interoperability between crosscutting systems and government information systems, and sharing of government ICT infrastructure, elements related to the themes of smart cities. Nam and Pardo (2011), in their research, searched the literature for a way to define this dynamic that involves adapting technological solutions for cities and concluded that leading a smart city initiative requires an understanding of the complexities and interconnections between social factors and technical and environmental aspects of the city.

The concept of public value is broad and is under construction, based on several studies that have focused on the topic. However, the importance of using technology to generate value is well-founded, as it is known that technology is not value-free, on the contrary, its implementation is driven by perceived values (Bannister & Connolly, 2014).

This study adopts Moore's (1995) perspective on public value concerning the collective expectations of citizens toward government and public services. The study is also based on the guidelines of the OECD (2017) for value generation and to follow the path of sustainable digital transformation, considering that Brazil has sought to comply with its guidelines to join the agency.

Seeking to identify the citizen's perception about the concepts presented in the literature and institutional documents, Table 4 was elaborated with the observed factors that are related or complement each other, described by authors who have been debating the theme and recommendations of the OECD.

Table 4

Factors and observable variables for public value generation

Social participation (PS)

PS1) The citizen's collaboration with the government is an important tool to implement actions that generate a better quality of life. PS2) Citizen participation in defining the government budget is an instrument for citizen collaboration with the government. PS3) Citizen participation is essential as an agent for controlling government actions.

Chourabi et al. (2012);
Harrison et al. (2012);
Lam (2005); OCDE
(2017); Scholl et al.
(2009)

Focus on citizens' needs (FN)

FN1) It is important for citizens that the government is aware of their needs. FN2) The focus on individuals must be one of the inputs for the delivery of digital services. FN3) A government that focuses on the needs of its citizens tends to make better decisions. FN4) Citizen participation is essential to present their needs to their governments.

Transparency (TRANS)

TRANS1) The constant sharing of information with citizens generates greater transparency in government decision-making. TRANS2) The use of technology helps in the transparency of government actions. TRANS3) Transparency is an instrument for the empowerment of citizens. TRANS4) Transparency improves tax returns on basic services such as health, education, and security for citizens.

Chourabi et al. (2012);
Harrison et al. (2012);
Mooij (2003); Nfuka
and Rusu (2010);
OCDE (2017);
Odendaal (2003);
Schware and Deane
(2003)

Continues

Table 4 (continued)**Innovation (INOV)**

INOV1) Investment in technology is important, with a view to improving the provision of public services. INOV2) Innovation in communication channels (social networks, institutional websites, public ombudsmen) enables greater citizen participation, allowing them to participate in the city's management and making them active users. INOV3) The use of technology to process information (data collection and organization to generate relevant information) improves communication. INOV4) Social networks are practical, accessible, and useful tools in the solution for communication between government and citizens.

Chourabi et al. (2012);
Odendaal (2003);
OCDE (2017)

Service capacity sharing (SC)

SC1) The centralization of administrative activities of public bodies allows them to be exclusively dedicated to their core activity, enabling excellence in the provision of services. SC2) Bringing together a subset of administrative functions such as finance, procurement, and human resources in shared service centers ensures standardization of services and cost reduction. SC3) The integration and sharing of public services allow for a better understanding of management strategies. SC4) The sharing of urban resources such as space, transport, services, goods, and data end up being democratized and everyone's responsibility.

Bergeron, Shipp,
Rosen, and Furst
(2013), Chourabi et al.
(2012); Mooij (2003);
OCDE (2017); Silva
and Pereira (2009)

METHOD

The research considered the city of Natal, capital of the state of Rio Grande do Norte (RN), which is located in the northeast of Brazil, as an important scenario to evaluate the applications of smart cities concepts, as the city has the Program Natal Smart and Humane City, and which, until 2019, is the only city in Brazil to be affiliated to the IEEE smart cities initiative (Institute of Electrical and Electronic Engineers, 2018). This initiative aims to transform Natal into a smart city through the development of systems and applications to reinforce the use of IT as a way to contribute to improving the quality of life of its citizens (Cacho, Lopes, Cavalcante, & Santos, 2016). It is noteworthy that the city of Natal is considered the second smart and social city in Brazil, which has an initiative called 'Smart City Natal,' which seeks to provide a better quality of life for people, through the use of connectivity and sustainability, collaboratively, creating spaces and opportunities for citizens to interact with the city (Guimarães, Severo, Felix, Costa, & Salmoria, 2020).

Therefore, the sample consisted of 256 respondents, considered non-probabilistic and for convenience. After data collection and purification, six respondents were excluded, resulting in 250 valid responses. Nineteen observable variables were developed, obtaining 13 respondents per observable variable, demonstrating that the sample size is representative for the study as, for each observable variable, five to ten respondents are needed (Hair, Black, Bardin, & Anderson, 2010).

Data collect

The data collection instrument was a questionnaire containing objective questions based on the document issued by the OECD, where nine fundamental principles for the generation of public value are presented. However, this research correlated these principles to the elements presented by Chourabi et al. (2012). In their research, Chourabi et al. (2012) presented relevant definitions about the characteristics of government for smart cities. This study found similarities in the principles presented by the OECD and the elements of the study by Chourabi et al. (2012) using

these parameters to choose the principles that guided the elaboration of the research questions, as shown in Table 5.

Table 5

Relation of the OECD principles and the elements of Chourabi et al. (2012)

OECD principles	Definition	Smart cities elements (Chourabi et al., 2012)	Definition
Social participation	It represents the collaboration of citizens in the search for solutions to the city's problems, constant action, and active participation with the government.	Collaboration	It represents the collaboration of citizens in the search for solutions to the city's problems, constant action, and active participation with the government. Debating with the citizen the problems of cities, the government tends to have actions that are more successful.
Focus on citizens' need	Focused on individuals and companies, these are the inputs for the delivery of digital services.	Collaboration	
Transparency	Commitment of public management to the disclosure of accountability and decision-making.	Transparency	Transparency appears as an instrument of citizen empowerment that helps fight corruption and represents the commitment of the public administration to the disclosure of accountability and decision-making.
Innovation	The use of technologies to innovate in improving the provision of public services.	Communication	Communication between the government and its voters, this communication tends to generate more transparency in decision-making. The importance of technologies that link government and citizens is highlighted so that communication is efficient.
Service capacity sharing	Public bodies and entities must share infrastructure, systems, services, and data to avoid duplication of efforts, eliminate waste and costs, and reduce the fragmentation of information into silos.	Integration of shared services	Its objective is to create management strategies to improve processes, seeking excellence in the provision of services, facilitating communication between the parties (public sectors), and aiming to reduce costs.

Note. Developed by the authors based on Organização para a Cooperação e Desenvolvimento Econômico (OCDE). (2017). *Revisão do Digital Government do Brasil*. Projeto Digital Government OCDE; and based on Chourabi, H., Nam, T., Walker, S., Gil-Garcia, J. R., Mellouli, S., Nahon, K., ... & Scholl, H. J. (2012, January). Understanding smart cities: An integrative framework. *Proceedings of the Hawaii international conference on system sciences*, Maui, Hawaii, USA, 45.

Based on OECD principles, in the study by Chourabi et al. (2012) and the literature exposed throughout the research, the questionnaire was constituted according to Table 4, which was evaluated using a five-point Likert scale, in the range of 1 – totally disagree to 5 – totally agree.

In addition to the observable variables shown in Table 4, the questionnaire verified whether the respondent was a resident of Natal and characterized the respondent's profile. This was developed in the period of June and July 2019, soon after the questionnaire was validated by specialist PhD professors in the area, on July 30 and August 4, 2019, aiming at a better understanding of the issues, as well as a pre-test on August 5 and 11, 2019 with eight respondents, to assess the understanding of the questions.

Data collection took place between August 13 and August 31, 2019. Respondents were approached remotely via email, social media, and in person. When submitting questionnaires

online, the snowball method was used, that is, the electronic form was initially sent to the researcher's contacts, who later sent it to other respondents (Hair et al., 2010).

The online questionnaire was divided into three sections, the first questioning whether the respondent was a resident of the city of Natal, the second about the respondent's profile about age, gender, and education, and finally, the questions that were developed to compose the research. In the face-to-face collection, upon delivery of the questionnaire, the respondent was asked if he lived in the city of Natal; if the answer was affirmative, the questionnaire was given to him. Table 6 presents the characterization of the sample.

Table 6

Respondent characterization

Gender			
	Frequency	Percentage	Cumulative percentage
Female	140	56	56
Male	110	44	100.0
Education			
Level	Frequency	Percentage	Cumulative percentage
Elementary school	1	0.4	0.4
High school	40	16.0	16.4
Higher education (undergraduate)	132	52.8	69.2
Specialization	47	18.8	88.0
Graduate (doctorate)	10	4.0	92.0
Postgraduate (master's)	20	8.0	100.0
Age			
Age of respondents	Frequency	Percentage	Cumulative percentage
To 18 years	14	5.6	5.6
Between 19 and 33 years	149	5.6	65.2
Between 34 and 53 years	59	23.6	88.8
Between 54 and 73 years	28	11.2	100.0

The participation of men and women in the study was balanced, with 56% females and 44% males; 83.6% of respondents had at least higher education, with 52.8% having higher education, 18.8% having specialization, and 12% having master's/doctorates, which demonstrates the respondents' qualification to participate in this study. Regarding the age of the respondents, 83.2% are between 19 and 53 years old, that is, they are of economic and politically active age.

Data analysis

For data analysis and processing, SPSS® software version 21 was used. The techniques used were descriptive statistics and multivariate data analysis, through exploratory factor analysis and intra-block confirmation, which are techniques that contribute to the statistical validation of variables and observable factors, which were elaborated from theoretical precepts. Thus, such statistical techniques are used to test the reliability, integrity, and normality of data and scale (Hair et al., 2010; Guimarães, Severo, & Vasconcelos, 2018; Severo, Guimarães, & Dorion, 2018).

Before the development of data analysis, the existence of data normality was observed, and asymmetry and kurtosis were used to assess the normal distribution of variables (Guimarães, Severo, Jabbour, Jabbour, & Rosa, 2021; Kline, 2015; Marôco, 2010), as shown in Table 7.

Table 7

Descriptive data

Factor	Observable variable	Mean	Standard deviation	Skewness coefficient	Kurtosis
Social participation (PS)	PS1	4.496	0.818	-2.164	5.640
	PS2	4.124	0.955	-1.143	1.096
	PS3	4.484	0.879	-2.007	3.953
Citizens' needs (FN)	FN1	4.776	0.704	-3.969	16.771
	FN2	3.884	0.939	-0.499	-0.108
	FN3	4.444	0.935	-1.975	3.809
	FN4	4.588	0.751	-2.480	7.659
Transparency (TRANS)	TRANS1	4.620	0.708	-2.517	8.144
	TRANS2	4.468	0.914	-2.049	4.127
	TRANS3	4.472	0.874	-1.877	3.472
	TRANS4	4.324	0.963	-1.560	2.149
Innovation (INOV)	INOV1	4.560	0.775	-2.288	6.350
	INOV2	4.352	0.814	-1.314	1.835
	INOV3	4.532	0.781	-2.063	4.963
	INOV4	4.004	1.077	-1.018	0.427
Service capacity sharing (SC)	SC1	3.548	1.090	-0.452	-0.309
	SC2	3.832	0.959	-0.594	0.069
	SC3	4.184	0.882	-1.113	1.220
	SC4	4.308	0.938	-1.415	1.758

It can be considered that the data follow a normal distribution, since values below three for asymmetry and below five for kurtosis are desirable to obtain a normal distribution (Kline, 2015). According to the study by Carvalho (2014), kurtosis is also admitted with values up to 10. Standard deviations smaller than two or close to one are also observed, with high agreements and low standard deviations, with the highest variability being that of the service capacity sharing (SC) group, with a standard deviation of 1.09. There is a high degree of agreement regarding the statements, demonstrating that the residents of the city of Natal are highly aware of the importance of the principles presented by the OECD for the generation of public value.

FN1 is the study variable with the highest mean (4.78) and the lowest standard deviation (0.70), thus demonstrating the high agreement on the fact that, in the citizen's perception, the government must be aware of their real needs, looking for solutions to the problems that most impact their daily lives. Although FN1 is the only one to extrapolate the limits of asymmetry and kurtosis, this variable was kept in the analysis process due to its theoretical importance. The variable SC1 had the smallest mean (3.55) and the largest standard deviation (1.09), assuming that the sharing of administrative services is not perceived with a degree of importance for providing excellent services.

After evaluating the descriptive data, the descriptive observation of the data was followed, in which the elements that most contribute to the development of public value and those that stand out less were analyzed. In the multivariate analysis, the statistical information of the research factors was observed by means of exploratory factor analysis (EFA) (main components), with varimax rotation, thus building the combination of observable variables in their respective factors or new groupings. After this step, an intra-block confirmatory factor analysis (CFA) was developed to observe the factors formed, grouped according to the theoretical precepts (Table 7), to validate the factors. The requirements of Cronbach's alpha, Kaiser, Meyer, and Olkin (KMO), Bartlett's sphericity tests, and total variance explained were followed as theoretical validation parameters.

It is observed that data collection and analysis have limitations related to the method, including non-probabilistic data collection, for convenience, is limited to a group of respondents without equitable distribution about the population; the other important aspect is that the use of the Likert scale, using levels of agreement, applied to a single respondent, without another source of data triangulation, can lead to the formation of response biases (Bagozzi & Yi, 1991; Guimarães, Severo, & Vasconcelos, 2018; Podsakoff, Mackenzie, Lee, & Podsakoff, 2003), with the occurrence of common method variance (CMV) and the halo effect, which can contribute to the wrong generalization. However, according to Severo, Guimarães, and Dellarmelin (2021), the normality, variability, EFA, and reliability tests contributed to the validation of the measurement model (scale with clustered observable variables) and are essential to reduce the impact of the study limitation.

DATA ANALYSIS AND DISCUSSION

Descriptive statistics

Table 8 presents the descriptive results about the frequencies of the variables by the factor, evaluating the level of agreement and disagreement of the respondents.

Table 8

Observable variable — Frequency distribution

Observable variable	Totally disagree	Partially disagree	Indifferent	Partially agree	Totally agree	Total
Factor: Social participation						
PS1	2.00%	1.20%	5.10%	27.70%	64.00%	100.00%
PS2	2.00%	4.70%	13.30%	37.00%	43.00%	100.00%
PS3	1.60%	3.50%	5.50%	22.70%	66.70%	100.00%
Factor: Citizens' needs						
FN1	2.00%	0.80%	1.60%	8.60%	87.00%	100.00%
FN2	1.60%	3.50%	29.30%	33.60%	32.00%	100.00%
FN3	2.70%	2.00%	8.20%	21.00%	66.10%	100.00%
FN4	1.60%	0.80%	3.90%	23.80%	69.90%	100.00%
Factor: Transparency						
TRANS1	1.20%	0.80%	3.50%	23.00%	71.50%	100.00%
TRANS2	2.30%	2.70%	6.30%	21.90%	66.80%	100.00%
TRANS3	1.60%	2.30%	8.60%	21.10%	66.40%	100.00%
TRANS4	2.30%	3.10%	10.90%	25.40%	58.30%	100.00%
Factor: Innovation						
INOV1	1.60%	0.80%	5.50%	23.40%	68.70%	100.00%
INOV2	0.80%	2.00%	10.50%	33.20%	53.50%	100.00%
INOV3	1.20%	1.60%	5.90%	24.60%	66.70%	100.00%
INOV4	3.50%	6.30%	16.40%	31.60%	42.20%	100.00%
Factor: Service capacity sharing						
SC1	5.10%	9.40%	31.30%	30.90%	23.30%	100.00%
SC2	2.00%	5.50%	26.20%	37.50%	28.80%	100.00%
SC3	1.20%	3.50%	12.90%	38.60%	43.80%	100.00%
SC4	2.00%	2.30%	13.70%	25.40%	56.60%	100.00%

Regarding the variables that deal with the social participation factor with the government, to guide it in its decisions and as a regulatory agent, all statements obtained more than 80% agreement among the respondents. The variable with the highest agreement (90%) was PS3, showing that, in the perception of citizens, their participation as a regulatory agent of government actions is important. The variable PS1 is also highlighted with high agreement, reinforcing that through active citizen participation it is possible to influence government actions to provide a better quality of life.

The factor focused on the needs of the citizen, presented the FN1 variable with an agreement of over 90%, stating that it is important that the government is attentive to the needs of the citizen, to make more assertive decisions regarding the definition of actions to be developed, this way reaffirming the importance of citizen participation with the government pointed out by Flak et al. (2003).

As for the variables dealing with the transparency factor in government actions, but with different focuses, not only aiming at reducing corruption but also as a way to meet the needs of the citizen, the TRANS1 question had the highest level of agreement among respondents (94.5%). It states that the constant sharing of information with citizens generates greater transparency in government decision-making, corroborating Mooij (2003) when the author concludes that the

use of technology can improve governance, and with the help of technology and through electronic governance, transparency is achieved and corruption is reduced.

Also in the study by Harrison et al. (2012), it is defined that information, transparency, and democracy form a basic and necessary composition, as it is only from this that there is a possibility of acting in decision-making. Therefore, it is demonstrated that transparency is a key point for the intervention of the population, giving them rights to use their democratic power, thus generating their best performance.

The innovation factor also had the highest percentage of respondents in agreement in the statements, highlighting the observable variable INOV1, which states the importance of investment in technology, aimed at improving the provision of public services, highlighting that digital governments must seek innovation so that innovative solutions are found that result in the improvement of public services, as the OECD (2017) guides in its review document of the Brazilian Digital Government. In their study on the typologies of barriers in the adoption of digital government, Salvodelli et al. (2014) point out the high investment and maintenance costs of technologies as a barrier to their implementation.

Concerning the analysis of the sharing factor, there is a greater diversity of responses between those who agree and those who are indifferent to the factor. Variables SC1 (the centralization of administrative activities of public bodies allows it to be exclusively dedicated to its core activity, enabling excellence in the provision of services) and SC2 (gathering a subset of administrative functions, such as finance, supplies, and human resources in shared service centers guarantees the standardization of services and cost reduction) obtained 31.3% and 26.2% of indifferent respondents, respectively, the highest among the factors.

The degree of indifference may be associated with the fact of not being aware of shared services or not believing that the centralization of administrative activities can reduce costs and at the same time offer excellent services.

Exploratory factor analysis

To assess the possibility of using the factor analysis technique, the KMO and Bartlett's sphericity tests were performed, where it was verified whether the study variables are correlated and thus allow the use of factor analysis. Table 9 presents a KMO above that recommended in the study methodology, as well as Bartlett's sphericity tests showed significance, concluding that there is a correlation between the study variables.

Table 9

Results of observable variables consistency tests for use of factor analysis

Cronbach's alpha	Bartlett's sphericity		KMO	Explained variance (%)
	Chi-square	Sig.		
0.889	1624.907	0.000	0.905	57.81

It is also observed in Table 9 that Cronbach's alpha is above 0.6, demonstrating the reliability of the study variables and that they represent 57.81% of data variability, which explains the importance of the principles presented by the OECD for the generation of public value.

The Pearson test was also developed to verify the existence of multicollinearity between variables when they have a correlation above 0.8 (Hair et al., 2010). The highest correlation was 0.610. Based on the parameters established, it was concluded that the factor analysis is adequate for the study.

Nineteen observable variables were used to validate the instrument, worked through factor analysis to verify the correlation between these variables. Factor analysis is frequently used in research in social sciences and humanities, and this statistical method is multivariate, assuming that the correlation between variables comes from the sharing and relationship that these variables have with the common factor (Kamakura & Wendel, 2000).

Exploratory factor analysis (EFA) was performed with varimax rotation, which helps divide the original set of variables into subsets with a greater degree of independence (Severo, Dorion, & De Guimarães, 2017). As well as the theory proposed in the study, the factor analysis identified four factors that form the principles for generating public value in the context of smart cities, as shown in Table 10.

Table 10

Factors extracted from exploratory factor analysis and percentage of explained variation

New factors	Variance (%)	Cumulative (%)	Observable variables
FACTOR1	19.713	19.713	FN3, FN4, TRANS1, TRANS2, TRANS3, TRANS4
FACTOR2	12.882	32.595	INOV1, INOV2, INOV3, INOV4
FACTOR3	12.680	45.275	PS1, PS2, PS3, FN1
FACTOR4	12.540	57.815	SC1, SC2, SC3, SC4

The innovation (INOV) and shared services (SC) factors remained as the method of study. However, the factor focused on the needs of the citizen was united with three variables of transparency (TRANS). Its definition became transparency focused on the citizens' needs (TSFN). The social participation factor was joined to a variable focused on the needs of the citizen representing the importance of social participation to guide government decisions to meet their needs. For this reason, the new factor was called social participation to focus on citizens' needs. It is observed that the focus on citizens' needs is now integrating aspects of transparency and social participation. Meer and Wilden (2003) highlight innovative forms of virtual governance

and citizen participation as central points of smart cities. According to Ballas (2013), governments and all levels of public bodies are adopting policies and programs that seek sustainable development, economic growth, and a better quality of life for citizens. They also emphasize that it is necessary to be very careful so that the interests of the community are not replaced by the interests of the developer and for the accumulation of capital (Hollands, 2008).

Thus, according to Table 11, by testing the theoretical model of factor composition through their respective observable variables and using exploratory factor analysis (EFA), the following composition was identified, capable of representing which factors are important, in the citizen's perception, for generating public value.

Table 11

Factors extracted from the exploratory factor analysis (varimax rotation)

Factor	Construct	Statically validated variables	Theoretical variables	Factorial loads	Communality	Anti-image
1	Transparency focused on the citizens' needs (TSFN)	TSFN 1	FN3	0.605	0.441	0.715
		TSFN 2	FN4	0.608	0.624	0.464
		TSFN 3	TRANS1	0.716	0.655	0.432
		TSFN 4	TRANS2	0.529	0.521	0.625
		TSFN 5	TRANS3	0.683	0.544	0.565
		TSFN 6	TRANS4	0.664	0.615	0.521
2	Innovation (INOV)	INOV1	INOV1	0.507	0.557	0.529
		INOV2	INOV2	0.615	0.519	0.625
		INOV3	INOV3	0.698	0.700	0.506
		INOV4	INOV4	0.669	0.574	0.681
3	Social participation focused on the citizens' needs (PSFN)	PSFN 1	PS1	0.393	0.416	0.641
		PSFN 2	PS2	0.669	0.527	0.708
		PSFN 3	PS3	0.770	0.657	0.605
		PSFN 4	FN1	0.713	0.633	0.568
4	Service capacity sharing (SC)	SC1	SC1	0.664	0.578	0.662
		SC2	SC2	0.819	0.741	0.504
		SC3	SC3	0.592	0.546	0.564
		SC4	SC4	0.574	0.556	0.677

As a result, four groups of observable variables were obtained, showing that the statistical results complement the theoretical elements defined in this study, as all variables provided for in the theoretical model together with their respective factors are supported through empirical observation of data analysis when analyzing their factorial loads, commonality, and anti-images.

However, the PSFN factor obtained variable with factorial load below 0.5. However, for Kline (1994), factor loadings greater than 0.30 are acceptable, as they explain at least 9% of the total variance, in which case the factor variance is 12.68%. The TSFN1 and PSFN1 variables presented communality below 0.5, but their anti-image was superior, validating their permanence in this study.

Confirmatory factor analysis (intra-block)

Aiming to develop the statistical validation of observable variables, verifying whether the assertions presented can measure the degree of importance of the factors, through the perception of the citizen of the city of Natal, we used the technique of confirmatory factor analysis.

For the correct development of the confirmatory factor analysis, the same parameters established for exploratory factor analysis were observed. After identifying the constructs through the EFA, confirmatory factor analysis (intra-block) (CFA) was performed, observing the representativeness of each construct, identifying Bartlett's sphericity, KMO, and explained variance, as well as developing Cronbach's alpha reliability test by construct, as shown in Table 12.

Table 12

Intra-block factor analysis and reliability testing

Block	Cronbach's alpha	Bartlett's sphericity		KMO	Explained variance (%)
		Chi-square	Sig.		
Block 1 (TSFN)	0.813	452.261	0.000	0.857	53.06
Block 2 (INOV)	0.716	205.025	0.000	0.747	55.77
Block 3 (PSFN)	0.711	192.239	0.000	0.730	54.54
Block 4 (SC)	0.710	213.073	0.000	0.680	54.42

All factors present Bartlett's sphericity test results that are adequate to the parameters established in the method, demonstrating that the factor analysis treatment is a consistent technique for the research sample and that each block individually has relevance in the explanatory capacity.

The internal consistency of each factor was assessed by Cronbach's alpha, which demonstrates the reliability in the representation of the factor. Although block 4 has the KMO a little lower than expected, it has Cronbach's alpha of recommended significance and expresses a high percentage of explained variance. Among the blocks, the INOV stands out for its higher percentage of explained variance and the TSFN for obtaining the highest level of reliability.

This confirmatory analysis was developed through blocks that represent the principles established by the OECD for the generation of public value in the process of implementing the Brazilian Digital Government. After applying the exploratory factor analysis, the factors are grouped into blocks presenting new factors that will be validated by the confirmatory factor analysis (intra-block) (CFA). The new factors presented were: transparency focused on the citizens' needs (TSFN), innovation (INOV), social participation focused on the citizens' needs (PSFN), and service capacity sharing (SC) (Table 13).

Table 13

Intra-block factor analysis

Block	Observable variable	Factorial load	Communality	Anti-image
Block 1: Transparency focused on the citizens' needs (TSFN)	FN3	0.625	0.391	0.764
	FN4	0.774	0.599	0.555
	TRANS1	0.810	0.656	0.503
	TRANS2	0.673	0.453	0.718
	TRANS3	0.741	0.549	0.617
	TRANS4	0.733	0.537	0.638
	INOV1	0.749	0.561	0.700
Block 2: Innovation (INOV)	INOV2	0.759	0.577	0.702
	INOV3	0.813	0.661	0.620
	INOV4	0.658	0.433	0.808
	PS1	0.683	0.466	0.782
Block 3: Social participation focused on the citizens' needs (PSFN)	PS2	0.682	0.465	0.781
	PS3	0.793	0.628	0.655
	FN1	0.789	0.622	0.660
Block 4: Service capacity sharing (SC)	SC1	0.663	0.440	0.738
	SC2	0.842	0.709	0.561
	SC3	0.767	0.588	0.665
	SC4	0.664	0.441	0.789

The intra-block analysis of block 1 – transparency showed satisfactory factorial loads, with only the FN3 variable with a community value (0.391) lower than 0.5, but with factorial load and anti-image values above the established values, thus justifying its permanence in this study.

Among the assertions developed, the one that showed the greatest representation was TRANS1 (constant sharing of information with citizens generates greater transparency in government decision-making), showing that citizens perceive the government's transparency actions to be of high importance, corroborating Harrison et al. (2012). The authors state that information, transparency, and democracy form a basic and necessary composition, as it is only from this that there is a possibility of acting in decision-making.

The observable variables of block 2 – innovation obtained factorial, communality, and anti-image loads within the desired range. INOV3 (the use of technology to process information [data collection and organization to generate relevant information] improves communication) obtained the highest factorial load, demonstrating that this significantly contributes to the representation of ICT in co-production, can help the state to provide public services that generate public value (Paletti, 2016).

Governments need to invest in innovation, seek the help of technology to solve the new demands of cities and citizens. Behind the co-production of services, there is the willingness of many citizens to create new models of public service production that correspond to their current collective aspirations and ideas, according to Paletti (2016).

For the analysis of block 3 – social participation focused on the citizens' needs, the variables obtained satisfactory factor loadings. The PS3 variable (citizen participation as an agent of control of government actions is essential) obtained the highest factorial load and communality, expressing that respondents perceive the importance of the citizen as a regulatory agent of government actions.

Observing the variables that make up block 3, it appears that the principles of social participation and focus on citizens' needs, presented by the OECD, become complementary for them to happen. In their studies on the relevant characteristics for public electronic services, Lindgren and Jansson (2013) highlight the importance of questioning in the creation of public value which interests are served and for whom the value is being created. Savoldelli et al. (2014) bring as an institutional and political barrier the lack of citizen participation.

It is evident how the citizen's participation in the creation of public value becomes differentiated, as it is only he who perceives it, as he is the agent who will benefit from the services offered by the government. Moreover, the government needs to encourage among citizens the importance of their participation with it so that their needs are met, validating the statement by Liu et al. (2014) that the perception of the citizen affects the adoption of electronic services, and only the use of users has an impact on the development of e-government.

The intra-block analysis of the service capacity sharing factor, represented by block 4, verified satisfactory factorial load. The communality and anti-image of the variables are also statistically consistent; the variables SC1 and SC4 obtained communality below that established by the study, but with high values of anti-image, validating the variables for this study.

In block 4, the variable that obtained the highest factorial load was SC2 (combining a subset of administrative functions, such as finance, supplies, and human resources in shared service centers guarantees the standardization of services and cost reduction), demonstrating its high degree of contribution to the block. On the other hand, the observable variable obtained 17.6% of respondents who disagree or are indifferent to the statement.

The variable SC3 (the integration and sharing of public services allow for a better understanding of management strategies) presented expressive factorial load, communality, and anti-image, and among the respondents, it was the statement that had the highest percentage of agreement (82.4%), and the lowest percentage of indifference. It is noted that for the citizen it is important that public entities be aligned with management strategies, enabling greater effectiveness. With the validation of the intra-block factor analysis and its respective variables, raised by the study, it is possible to present a framework of the most relevant principles for the generation of public value, which is composed of four factors and a set of 18 variables, according to Figure 1.

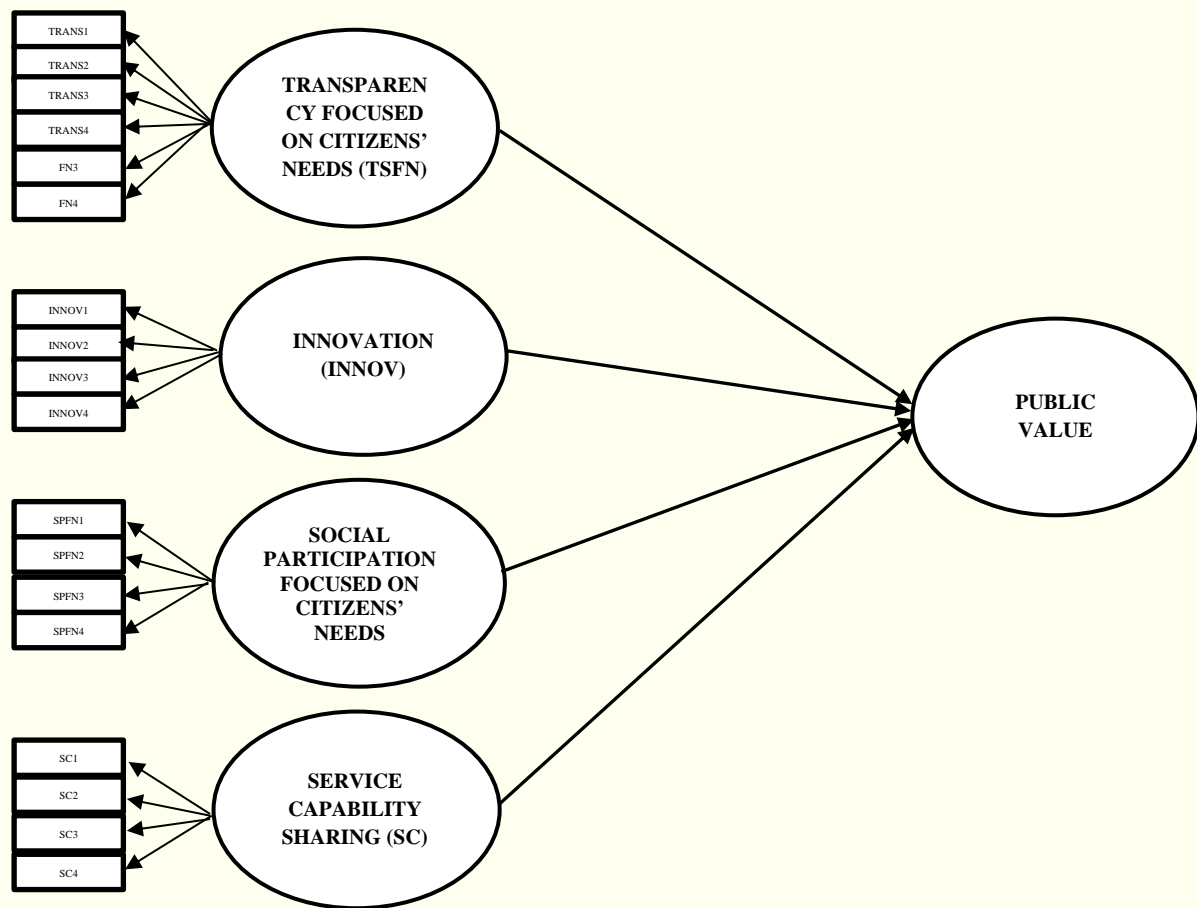


Figure 1. Framework of principles for generating public value.

In the framework (Figure 1) presented, four factors stand out for the generation of public value. Each factor is composed of variables that enable a greater understanding of how the factor can generate value for the citizen, thus creating solutions that correspond to the population's expectations and, consequently, within a smart cities perspective. Note that the only variable that appears in two distinct factors is the focus on citizens' needs, which reinforces the results of this study.

CONCLUSIONS

The citizen's role in the creation and improvement of public services is a perspective identified, nationally and internationally, as fundamental in the development of public policies. Thus, understanding to what extent the elements for generating public value are mobilized in the citizen's perception becomes preponderant for the development of governments, and consequently, in the perspective of smart cities.

Therefore, this research had this proposal: to propose a framework based on the principles presented by the OECD for the generation of public value. The elaboration of this framework

helps governments develop public policies that meet the expectations of their citizens through the elements: transparency focused on the citizens' needs; innovation; social participation focusing on citizens' need; and service capacity sharing.

By relating the OECD principles with the elements for smart cities by Chourabi et al. (2012), that from the analysis of the Brazilian Digital Government Review documents and Digital Government Strategies, a high degree of maturity on the part of the government was identified in the search for this transition. From the perspective of the most relevant principles in the citizen's perception, a hierarchy of principles that generate public value was identified, resulting in a guide for public managers in the formulation of effective guidelines in the context studied, thus becoming the managerial contribution of the research.

The research identified that even the citizen who did not contribute to the elaboration of the principles for the generation of public value recognizes the importance of the theme so that better public services are delivered. As a contribution to managers and society, it is suggested more investment in the education and knowledge of citizens about the importance of their participation and use of digital services, so that they act constantly and consciously, raising the level of maturity of the user to maturity level of government actions.

As an academic contribution, the scale theoretically represented and statistically validated contributes to the continuity of studies on public value, as a key element for governance in smart cities. As public value is a developing concept, the scale presents itself as a tool that provides a theoretical framework for measuring the maturity relationship of government actions and its users. Therefore, the framework (Figure 1) contributes to the advancement of administrative science and studies related to the identification of factors that support and build the public value, in which it is essential to identify the perception of users of public services, for the construction of a smart city based on the perception of value for the population's quality of life.

The limitations of the study are related to the methods of collection, analysis, and sample size. Data collection using the snowball method can lead to a partial view of the population, with a homogeneous trend of the sample; however, statistical tests indicate that the sample has sufficient variability to show a heterogeneous distribution, but with low amplitude. To identify research biases related to CMV and the halo effect, normality, variability, EFA, and reliability, tests were applied. The sample had as a geographic limitation the city of Natal, which is an important city in the Brazilian northeast, which has important projects to improve the quality of life and sustainability based on the smart city precepts.

Thus, as an opportunity for future research, it is suggested to apply the tool in other cities that have initiatives to become smart cities, as well as those that have these public value principles consolidated. From this perspective, it is possible to establish comparatives and consequently scientific advances. The importance of researching the maturity of respondents, as users, about the digital services offered by the government and their knowledge of public value is highlighted, so that there is a satisfactory alignment between government and citizen.

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