A Theoretical Model for Data-Driven Innovation in Public Services

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Resumo

This investigation proposes a set of variables for constructing a theoretical model of predictors to use open government data (OGD) for generating innovation in public services. Based on a systematic review of the literature, 98 articles were analyzed through a qualitative approach. The variables were selected using content analysis. Based on the literature, the relationship between the variables was established and a model was generated. The proposed model will be used in field studies to measure the effectiveness of open data in generating new ideas for public service innovation. The main variables are Strategic, Technical, Behavior and New Ideas for Innovation. The implications of the theory and propositions for future research were discussed.

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Abstract: This investigation proposes a set of variables for constructing a theoretical model of predictors to use open government data (OGD) for generating innovation in public services. Based on a systematic review of the literature, 98 articles were analyzed through a qualitative approach. The variables were selected using content analysis. Based on the literature, the relationship between the variables was established and a model was generated. The proposed model will be used in field studies to measure the effectiveness of open data in generating new ideas for public service innovation. The main variables are Strategic, Technical, Behavior and New Ideas for Innovation. The implications of the theory and propositions for future research were discussed.

Keywords: Open Government Data (OGD), Innovation, Public Services, Theoretical Model.

Introduction

The use of open government data (OGD) can stimulate innovation processes (Ubaldi, 2013; Lee & Kwak, 2012). However, studies about OGD for innovation (OGDI) are a recent phenomenon. In general, current literature about OGD concentrates its efforts on encouraging the use of the open data (Jaakola, Kekkonen, Lahti, & Manninen, 2015), intentions for using open data (Weerakkody, Irani, Kapoor, Sivarajah, & Dwivedi, 2017), innovation in smart cities with the reuse of OGD (Capdevila & Zarlenga, 2015), and techniques to improve information openness (Sayogo et al., 2014).

However, the transformation of open data in innovation is not entirely explained. The lack of knowledge about how OGD contributes to innovation process has limited the potential benefits of OGDI. The central role of OGDI is the generation of new ideas and insights for innovation process (Weerakkody, Kapoor, Balta, Irani, & Dwivedi, 2017).

The OGD can be an innovation itself because it creates new possibilities for accountability, transparency, and innovation (Caprotti et al., 2014; Gonzalez-Zapata & Heeks, 2015). However, innovation is a complex and multifaced process that requires multiple resources and steps (Lounsbury & Crumley, 2007). Its contribution is essential and constitutes a step towards innovation process. The basic assumption is that OGD is a fundamental resource for public sector innovation.

It contributes to innovation in public services by identifying opportunities or problems. Based on that, it is possible to generate innovative solutions through novel processes, services or practices that lead to better results for the society and the government. The knowledge about how open data contributes to innovation needs to be discussed for a broader understanding of the variables that can transform open data into a resource for innovation (Attard, Orlandi, Scerri, & Auer, 2015; Nam, 2015; O'Riain, Curry, & Harth, 2012).

Therefore, to integrate models, combining existing studies and new empirical research is crucial for theoretical advancement. The models can be tested in different scenarios, however, the test in a specific context will be to identify new variables or exclude them according to the situations, cultures or political–legal environments (Kaschesky & Selmi, 2014; McNutt et al., 2016). The knowledge obtained about the phenomenon for endless model possibilities is widespread (Weerakkody, Kapoor, et al., 2017). Despite mentioning the term "models", this has been understood in a broad sense, contemplate qualitative or quantitative approaches.

Even in the advanced models, the specificities of local contexts are essential to adopt these models. General models can improve the applicability of OGDI in many contexts. Evidence from sophisticated models can reveal how open data can be used in futures initiatives

of the government in order to improve innovation (Davies & Edwards, 2012). Advanced models, tested in government or economic activities, can provide accurate measures for the OGDI effectiveness (Kaschesky & Selmi, 2014).

This investigation proposes a set of variables for the conception of prediction models that use OGD to generate new ideas for innovation in public services. Based on a systematic review of the literature, 98 articles were analyzed through content analysis. The implication for the theory was discussed, as well as the propositions for future research.

2 Theoretical Background

This section was developed to compose a background of the main themes that support this investigation. Key-theories about services innovation and OGDI were selected and discussed.

2.1 Services Innovation

Innovation is the central issue for the development of nations (Francis & Bessant, 2005; Nam, 2015). From the Schumpeterian point of view, technology impacts the economic and social dimensions (Keupp & Gassmann, 2009). Government actions influence innovation development through investments, strategies, regulation, and policies that stimulate it in the social and business environments (Allen et al., 1978).

The study of service innovation is complex because service innovation, per se, does not exist. Innovation is difficult to capture—most of times an innovation is detected post-facto, after the success of it (Tether, 2005). Service innovation is associated with qualifying processes and includes the execution of "something". It can be an action that creates value for the services or processes, or for an idea has been previously unrecognized (De Jong & Vermeulen, 2003).

Innovation can be a process that occurs in several phases, starting from a specific problem. It requires the systematization of existing difficulties, the perception of innovative practice and the political processes that involve the acceptance of innovation by the stakeholders (Lounsbury & Crumley, 2007).

Innovation in services is often associated with the adoption of information technologies (IT) (Gallouj & Savona, 2008), helping organizations improve the quality of their services (Gallouj & Windrum, 2008). This involves, in most cases, small and incremental changes in processes and procedures (De Jong & Vermeulen, 2003). Considering that the service sector is characterized by extreme diversity, innovations in services occur through new processes or new services. The execution of service innovations is different from the traditional forms (Hipp, 2008; Hipp & Miles, 2000).

Innovation in processes occurs to develop new methods or to significantly improve them, causing better results. Such methods may involve changes in equipment or process organization. This can include a combination of these changes, derived from the use of new knowledge. The methods may be intended to produce or deliver technologically novel or improved services. They may also seek to increase efficiency in the delivery of existing services. Three levels represent services innovation: something new in the world (maximum level of innovation), in the country or region (intermediate level of innovation), or new in an organization (limited level of innovation). Service innovation is classified into five categories, according to the type of innovation (OECD, 2005):

a. Product innovation: The introduction of a new product on the market which will demand services linked to this product (innovation occurs exogenously);

b. Process innovation: Occurs when processes are modified to produce or provide a particular service (endogenous);
c. Organizational innovation: The organization modifies or adapts its structure, which impacts its management;
d. Market innovation: The emergence of new segments or even new services in a specific market;
e. Ad hoc innovation: The creation of solutions for some specific issues (customization).

Innovations in services are influenced by a set of forces that work internally and externally for the innovation process. The external forces are trajectorial forces: professional, managerial, technological, institutional and social, composed for the stakeholders. The internal forces that operate are management, strategy, and human resources (Sundbo & Sundbo, 2015). Service innovation, to be effective, must overcome the following barriers to innovation development (Sheth & Ram, 1987):

a. Expertise: Characterized by the risk of too much specialization, putting individuals in the operational comfort zone and making it difficult to search for innovations;
b. Processes: The processes of the organization is already adjusted and adapted to the innovation intents, thus, increasing the intention to cause changes;
c. Resources: The unavailability of financial, material or human resources, for the implementation of innovative processes;
d. Legislation and norms: The set of regulations can constitute a type of barrier or agent of deceleration of the innovation process;
e. New markets and products: Limiting entry into new markets, or developing new products/services, may limit the innovation process.

To summarize, services innovation is mostly intangible and starts with new ideas or problems, which can be better understood after the implementation of innovation. It creates value for services through the positive results of implementation of new processes or new services as well as creates public value for the society.

The implementation of service innovations occurs in several systematic phases, associated with IT and influenced by internal and external forces that shape its processes. Service innovation, to be effective, requires the overcoming of a set of barriers and the acceptance of stakeholders. Figure 1 illustrates the general process for the achievement of service innovations.

Figure 1: process for the achievement of service innovations
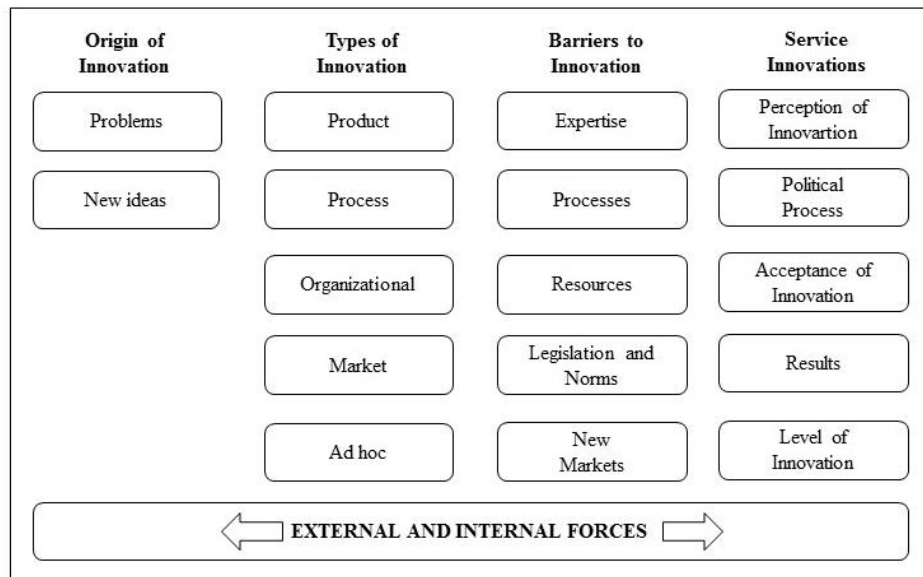
The next section discusses OGDI and the primary objective of innovation in the public sector—to generate public value.

2.2 Open Government Data to Innovation (OGDI)

The OGD contributes to the strengthening of democracy, transparency, social control, active citizenship, public administration improvements, cooperation and innovation. It should be freely accessible on the internet and be adequate for machine processing (Thorsby, Stowers, Wolslegel, & Tumbuan, 2017).

The main objectives of OGD are transparency and the use of data to generate public value. Its use improves the citizen's participation in public administration. Utilizing the OGD provides incentives for the economic activities through information and ideas to develop new products, services or jobs. OGD has the potential to generate more information and knowledge about the economic and social environment. Governments produce OGD, and they should disseminate and incentivize citizens and organizations to use it to generate value for the society (Attard et al., 2015; Linders, 2013).

Transforming the government as an information provider changes and redefines its role in society. The new role adds new values to the OGD and provides a new stage for social participation. OGD has the potential to produce information with social relevance. It can generate new ideas to start the innovation process with the primary objective to generate public value (Scholl, 2013).

Some reasons for the opening-up of government data is the possibility of increasing transparency and social participation for the generation of new ideas or identification of social demands. Increasing participative governance can create public, social and commercial value, transforming society which will enable a better quality of life and a more developed society (Attard et al., 2015).

Innovations produced for OGD, caused by the technologic push and the spread of Internet, are considered relativity new. The information and knowledge produced can generate new insights or ideas which can improve growth, competitiveness, and innovation (Dawes, Vidiasova, & Parkhimovich, 2016). For these propositions, the primary task of governments is to make the data available, encourage the society to use, as well as to create conditions for its

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possible use for innovation in public services. This government can benefit from the use of OGD, for instance, in decision-making processes (Zuiderwijk, Janssen, Kaa, & Poulis, 2016).

OGD can be an innovation itself because of the potential to generate information and knowledge for organizations and the whole society (Gonzalez-Zapata & Heeks, 2015). Other visions consider OGD as a recombined innovation because it is a result of data recombination (Coriat & Weinstein, 2002; Gallouj & Windrum, 2008), increasing the created value.

Some authors consider OGD essential for innovation (Attard et al., 2015; Hellberg & Hedström, 2015; Lakomaa & Kallberg, 2013; Yannoukakou & Araka, 2014). A series of studies (Capdevila & Zarlenga, 2015; Davies & Edwards, 2012; Kaschesky & Selmi, 2014; Kassen, 2018; Weerakkody, Irani, et al., 2017; Zuiderwijk, Shinde, & Janssen, 2018) try to understand the transformation of OGD in innovation. These studies selected a restricted set of variables concerning specific contexts and were successful in these propositions.

Despite these efforts, an integrated model, which explains the primary processes for transforming the OGD into new ideas for innovation, are scarce. Integrative models are advantageous because it enables comparisons between different realities. This model offers a general explanation that future-oriented studies facilitate the investigations in further specific contexts.

Some factors limiting the development of a general model are the context of the studies (the political-legal and cultural factors), making it difficult to summarize the OGDI in a single model or one set of variables. Unifying these studies requires additional effort to identify common variables in different contexts. Innovation and services innovation concepts are required to advance this discussion to construct the general model.

Innovation is a process then occurs in several steps to solve problems in an organization, collective difficulties or society demands (Lounsbury & Crumley, 2007). The forces that shape innovation are related to information [21], technological, professional, institutional, social, managerial, forces (Coriat & Weinstein, 2002; Gallouj & Savona, 2008) and the participation of stakeholders (Dwivedi et al., 2017; Weerakkody, Irani, et al., 2017). Considering OGD like a resource for public service innovation can be considered as a set of activities that create value for services originating from new ideas or social problems (Smith, 2008).

Innovation in services begins with information technologies (Barras, 1986), new forms to perform a service, and efficient processes (Tether, 2005). The results of service innovation needs to improve the existing services or create new ones (Tarafdar & Gordon, 2007).

The vision of innovation in public services requires the observation of the New Public Management approach. This approach considers the main objectives of innovation in public services which are the improvement of general performance, effectiveness, and accountability (Hood, 1995). Bureaucracy is a barrier to innovation in public services; however, it can be a resource for innovation if directed towards improving innovation.

In order to transform bureaucracy into a resource of innovation, it requires strategic orientations, actions and public policies favorable to innovation. However, these alone may not increase innovation, thus, it is necessary to provide conditions for innovation development. The government needs to realize the following three-fold actions, described below (Burlamaqui & Proença, 2003):

a. Stimulate technological cooperation based on long-term investments;
b. Administer the creative destruction by monitoring and controlling the occurrence of predatory practices;
c. Create institutions that allow the implementation of the measures previously mentioned.

The role of the government related to OGDI is the generation and dissemination of data aligning strategies, actions, and policies towards innovation. The OGD needs to be made available but under the set of conditions mentioned above. The generation and dissemination of OGD requires strategic orientations for multiple objectives. If the objective includes innovation in the public sector, the data will make possible the identification of social problems or the generation of new ideas, producing practical and measurable results.

If the results generate innovation in public services, it will create the basis for the generation of public value. Public value creation will be obtained by improving public services or creating new ones —these two ways for service innovation requires demonstrating better results and more effectiveness than the current public services. New or better services will create value for the society, improving the quality of public services, and initiate a virtuous cycle.

3 Research Method

A systematic review of the literature was developed to construct the theoretical model and content analysis analyzed the results. The investigation is qualitative, mainly because the subject is new and required adaptable methods to produce adequate results.

The first step was a systematic review of the literature. The keywords were "open data" plus "government" plus "innovation." These keywords were used to search for articles in several scientific databases, namely: Science Direct (59 articles), Web of Science (51 articles), Scopus (33 articles), Ebsco (09 articles), Emerald (03 articles), JSTOR (06 article), Wiley (06 articles), Sage (08 articles), Springer (12 articles), Taylor & Francis (12 articles), ProQuest (16 articles).

Before removing the duplicates, the total number of articles was 203. Manual selection eliminated the duplicated ones, as well as articles not related to the objective of this investigation (factors involved in innovation in public services with the use of OGD). Following these criteria, 105 were removed and 98 articles constituted the corpus of the analysis.

In order to create the model, content analysis was used to identify the factors and establish the relationships between them. The content analysis had to be performed in many forms. For this paper, qualitative content analysis was chosen following the indications of (Insch, Moore, & Murphy, 1997). The orientation of those authors divides the analysis into three steps: codification, categorization and a building a map or model connecting the categories.

The number of codes is not relevant because the focus of the analysis is the factors involved in the process, not the prevalence of these codes. Another reason for choosing this qualitative way is the necessity for interrelating the factors to create a model. The number of codes cannot demonstrate the relationships between variables. It is more important to understand why each code is related to another.

Complementing the idea of qualitative content analysis, the corpus of analysis is small, considering that just fourteen articles were quantitative. The traditional approach of content analysis will not identify the importance of codes and the relationships between these categories.

The next step was reading all the articles and selecting codes than relating to new ideas using OGDI or identifying social demands that required new government solutions. Initial codes demonstrated a set of factors related to reusing OGD for innovation. Subsequently, the factors are grouped under categories. Finally, according to the previous theory, the categories were connected, generating a proposed theoretical model for causal relations (Figure 2).
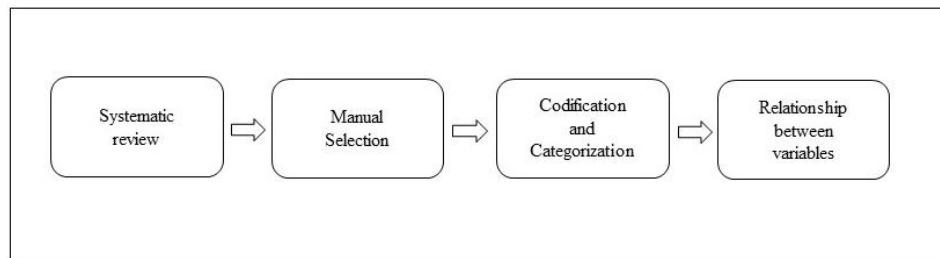
Figure 2: Steps of analysis

Some articles are included in this paper. This procedure is adopted to avoid excessive duplications of the same factors. The recent articles cited demonstrated factors which were investigated in the actual scenario.

4 Results and Discussion

A model was developed following the procedures mentioned in the preceding section. First, the codes were selected. The categories were formed by grouping the codes. Literature analysis enabled the nomination of each category and the establishment of the relationship between them. An explanation of each category demonstrated the connection between variables and finalized the content analysis. Table 1 summarizes the codification and categorization.

Table 1: Codes and the initial categories

Codes/Authors	Category
Objectives of OGD initiatives (Zuiderwijk et al., 2018), normative legal paths within this emerging area of innovation practice, where certain combinations of conditions are sufficient to move open data policies forward—policy innovation, legal-normative (Ingrams, 2017), prohibitive delays (Sadiq & Indulska, 2017).	Public Policies
OGD literature, which is more supply-focused and not demand-driven (Hermanto, Solimun, Fernandes, Wahyono, & Zulkarnain, 2018); citizen-driven (Roy, 2014).	Demand-Driven Orientation
There is a mismatch between the benefits delivered and the objectives (Zuiderwijk et al., 2018).	Strategic Alignment
Broader and more holistic transformational prism of open and innovative governance is required (Roy, 2014).	Innovative Governance
Benefits (Roy, 2014).	Benefits
Risks (Roy, 2014), adverse effects (Sadiq & Indulska, 2017).	Risks
Open data and its impact do not occur overnight (Kaschesky & Selmi, 2014).	Long-range Plans to OGDI
Difficulties of promoting the reuse of open public data (Hellberg & Hedström, 2015).	Promotion to OGD Re-use
The underlying assumption that once the data are more discoverable, accessible, and available in alternative formats, with licensing schemes that allow free re-use (Gascó-Hernández, Martin, Reggi, Pyo, & Luna-Reyes, 2018); quality of resources (Zuiderwijk et al., 2016).	Quality of Open Data
Big open linked data (BOLD) (Rana, Dwivedi, Lal, Williams, & Clement, 2017).	IT Resources

Perceived usefulness (Weerakkody, Kapoor, et al., 2017).	Perceived Usefulness
Technical skills, user training, transforming raw data into summarized information and communicating findings to diverse audiences (Gascó-Hernández et al., 2018); The existence of independent developers is crucial in promoting various open data-driven projects (Kassen, 2018), lack of understanding, the capacity of the body of knowledge on effective use of open data (Sadiq & Indulska, 2017); knowledge (Davies & Edwards, 2012).	Training to use OGDI
Cooperation between stakeholders, sharing related expertise (Kassen, 2018), co-creation (Kaschesky & Selmi, 2014), co-produced (Gascó-Hernández et al., 2018).	Cooperation Propensity
Bottom-up initiatives (Capdevila & Zarlenga, 2015), stakeholder engagement (Kaschesky & Selmi, 2014), empower, engaged, participatory society (Roy, 2014).	Participatory Society
Intentions to use open data, adoption to open data (Weerakkody, Irani, et al., 2017), Value creation (Zuiderwijk et al., 2016).	New Ideas for Innovation
Contextual factors (Zuiderwijk et al., 2016).	Context Variables

Sets of codes were used to form the main categories. Each category was nominated and interrelated generating the model. Following which, the subtitles in this section discriminated and explained each category. Figure 2 illustrates the model. Four primary categories were generated to describe the factors that were grouped. Based on the theoretical background, these primary categories were organized in antecedents and consequents. Contextual elements, in future studies, will attribute to the relative importance of each category and add or exclude categories/factors.

4.1 Strategic Alignment

The first category describes a set of variables concerning the strategies that initiate the processes of OGDI. These variables are considered strategic because they come from evaluations and strategic decision, which shape the generation and application of OGD in producing innovations. Actors, which will generate these strategic decisions, are multiple and then will be society, government or organizations, according to the political-legal-normative-cultural scenario.

All variables in this category are oriented to direct effort to create, disseminate and use OGDI. It is necessary to evaluate the orientation of the variables. It is a demonstration of strategic alignment if all variables converge in the same direction—an example referring to public policies for OGD. However, if these policies are directly related to transparency, innovation with the use of ODG will be not the focus. The objectives of OGD will be including innovation.

Public policies refer to the political-legal environment, which defines strategic objectives to direct the generation, dissemination, and use of OGD for innovation or other goals (Ingrams, 2017; Sadiq & Indulska, 2017; Zuiderwijk et al., 2018). For public policies to be proficuous to innovation, requires effort and focus on this objective; other purposes will be contemplated as well.

Demand-driven orientation referred to in the literature, turn to academic investigations (Hermanto et al., 2018), however, have practical implications for the OGDI. Directing the

production of OGD to the demands of society and organizations improves the innovation possibilities, with a focus on the problems of stakeholders. The demand orientated objective eliminates the gap between the target benefits of the OGD and the primary goals (Zuiderwijk et al., 2018).

Innovative governance is needed to direct actions and strategic policies to interact with stakeholders, transforming the governance in an open continuous innovative process. Benefits and risks (Roy, 2014; Sadiq & Indulska, 2017) are a premise to the investments of OGDI and consist strategic decisions about the skeptical possibilities of OGD to produce new ideas for innovation. The evaluation involves, for instance, the analysis of scenarios and costs, possible benefits, time of return of investment. All stakeholders participate in this sophisticated analysis, using multiple techniques defined by the contexts and objectives of the initiatives.

Long-range plans for OGDI signify not exceeding the expectations of immediate returns of OGD initiatives needing maturity, investments and adequate efforts to achieve innovation (Kaschesky & Selmi, 2014). Promotion for OGD Re-use consists of bridges the barriers (cultural, legal), awareness and information rather than the existence and benefits of OGDI (Hellberg & Hedström, 2015).

4.2 Technical and Behavior Variables

Technical variables represent a set of resources (materials, knowledge, and humans) essential to transform the OGD to be applicable as ideas for innovation. The quality of open data (free re-use, discoverable, available in alternative formats, and accessible) is cited by many authors as a fundamental resource for the usability of OGD. IT resources need to be available to operationalize strategic objectives, improving the agility of the capture and to analyze data for the transformation of new ideas (Gascó-Hernández et al., 2018; Rana et al., 2017; Zuiderwijk et al., 2018).

Perceived usefulness refers to the capacity of resources to be accessible for any user [3]. Training for OGDI use requires experts and independent developers to disseminate knowledge for stakeholders and for it to be possible to transform open data into new ideas than conduce to innovation (Gascó-Hernández et al., 2018; Kassen, 2018; Sadiq & Indulska, 2017; Weerakkody, Kapoor, et al., 2017).

Behavior variables are related to stakeholders' motivations and conscience about the importance of the use OGD for OGDI. Cooperation presumes the stakeholders are willing to chance information, expertise and working towards the same objectives in the co-creation processes. Cooperation conducted for experts in OGDI, or other stakeholders, comes from the government, organizations or the society.

The primary question in this variable is the level of knowledge, the experience of the contributor and the propensity for cooperating in the sharing of knowledge with other stakeholders (Gascó-Hernández et al., 2018; Kaschesky & Selmi, 2014; Kassen, 2018; Zuiderwijk et al., 2016). Participatory society demonstrates the capacity of society participation through bottom-up initiatives and the government empowering society (Capdevila & Zarlenga, 2015; Roy, 2014).

4.3 New Ideas for Innovation and Contextual Variables

The effective use of OGD can generate new ideas for innovation. This variable will be measured for strong intentions to use OGDI or for its effective use to generate new ideas and insights to initiate the innovation process (Weerakkody, Kapoor, et al., 2017). If the research

scope is the perception of use or behavioral studies, it will be used as secondary data or other indicators and can be measured for interviews or survey.

Value creation determines innovation in public services (Zuiderwijk et al., 2016). Perceptions or quantitative indicators reveal the effectiveness of innovation (OECD, 2005). Consulting authors such as Smith (2008), Gallouj and Sanson (2007), Tarafdar and Gordon (2007), Tether (2005), De Jong and Vermeulen (2003), Barras (1986) and Schumpeter (1982; 1942), it is possible to measure for results through innovation in public services. If the results are positive and proportioned in terms of economic or social returns, an innovation in public services is obtained.

Context variables (Zuiderwijk et al., 2016) will be defined through the adaptation, exclusion or addition of variables. Training for OGD use is not possible in undeveloped societies, for example, because the population does not know what OGD is. In this case, other variables can be more critical and relevant for the generation of applicability results and for the contribution to other studies in similar scenarios. Figure 2 illustrates the model.
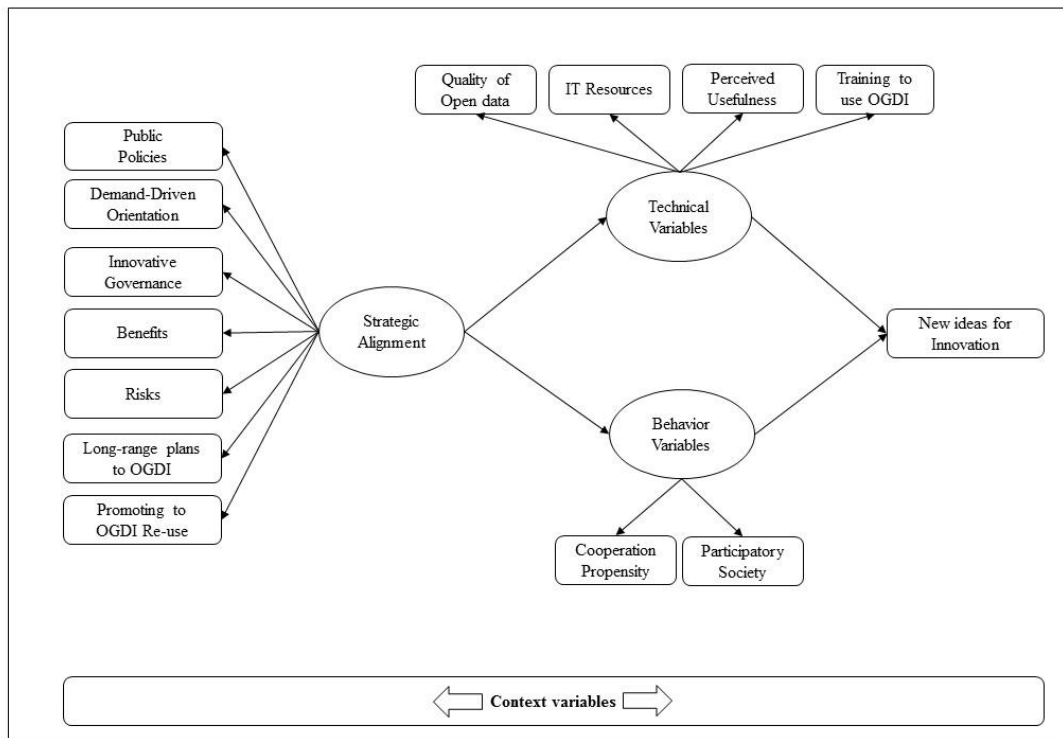

Figure 2: A proposed model

Methodological questions are essential to measure this set of variables. The prism of analysis changes according to the objectives of the data collection, techniques of analysis and who will respond to the research. For example, if the respondents are IT specialists and participated in the implementation of OGDI projects, they can be related if they share individual knowledge. If the participants are citizens not involved in the creation and use of OGDI, the indicated way is to ask for knowledge about the use of OGDI and active participation in these initiatives.

To validate the model empirically is not restricted to a method or specific technique. However, thinking of future studies and the possibility of comparing different environments, a general quantitative model can be adapted in different situations. Despite that, qualitative studies are unpredictable for a deeper understanding of the role of each variable and the

variables are undetected in this paper. Methodological suggestions have been made to test the model in the field. Multiple techniques are adequate for this proposition.

4.4 The role of OGD in the innovation process

A final idea discussed in this investigation is the role of OGD in the innovation process. Starting from the proposition of Attard (Attard et al., 2015), the theoretical background, the analysis, the model and a reflection on all these items concludes the following:

The OGD will initiate the innovation process for the capacity to generate new ideas or identify problems to be solved. An example is the recombination of data and the identification of a social demand, previously unobserved. The new demand is not innovation itself but an initiation of the process. An additional idea was discussed to illustrate the role of OGDI in services innovation. OGD contributes to innovation, generating new ideas for identifying social problems that require innovative solutions. Figure 3 connects the main variables of the proposed model with the services innovation process.
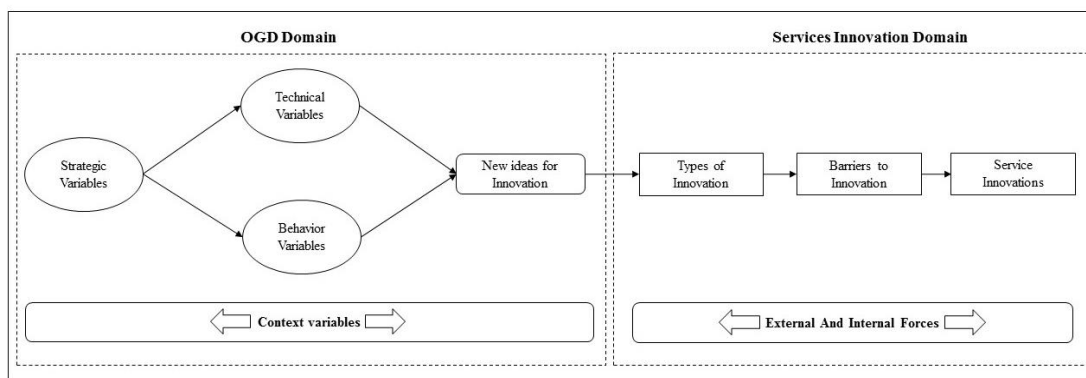

Figure 3: OGD and service innovation connection

Nevertheless, it is necessary to understand that innovation is a complex process and that multiple forces influence service innovation. The OGD will contribute to it; however, innovation can occur without it. Individual creativity or insights can generate new ideas for innovation. A structured process is beneficial for innovation. Because of the multifaced nature of innovation, these processes are not the only way to obtain it. Despite the restricted contribution of OGD, the importance of OGDI is evident. However, its role is overestimated.

5 Final Remarks

The proposed model will be used in field studies to measure the effectiveness of open data to generate new ideas and contribute to innovation. This idea leads to understanding that OGD is a resource of complex innovation processes. The open data can star projects by identifying the problems to be solved through new technological innovations or the adaptation of processes and public services to attain favorable results. Recombination of open data and innovation initiates strategic decisions and actions, following the availability of technical resources and the propensity of favorable behaviors of stakeholders, for the effective use of open data and following technical orientations.

Innovation in public services will occur when the results of the projects are positive and measurable, independent if the results are subjective —evidence of better quality public services, improving the quality of the population or the financial results. It is a discussion of how to measure the results of innovation, and the traditional literature considers financial results

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the primary results of innovation. The public sector has a different role because society is the "customer" and financial results are less critical as compared to improving the quality of public services.

Limitations involve a lack of testing of the proposed model in empirical investigations for accessing the validity. Future studies can apply the model using qualitative or quantitative approaches, increasing or excluding the variables and evaluating if the antecedents and consequents being described are in appropriate sequences.

Another question to be commented on is the research gap in the 98 articles analyzed. In general, past investigations included fewer variables and no effort for developing general models. Specific models concerning one context, limits broad comprehension regarding the phenomenon and the comparison between scenarios. This investigation makes a core contribution in the overview of OGDI for proposing future research.

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