

Creating Knowledge for Value Creation in Open Government Data Ecosystems

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Abstract

Open Government Data (OGD) has grown quickly in the last decade. However, the simple availability of OGD does not mean these data are used well in society. Social actors, both organizations and individuals, must to work collaboratively to create an Open Data Ecosystem (ODE) to manage and deliver OGD. OGD creates value only when the data are analyzed and reused to generate new knowledge. The creation of useful and applicable knowledge is not a simple and permanent thing, as it requires special attention from governments to make the data available and ODE actors to ensure the effective generation of knowledge. Limited research has studied the creation of knowledge in OGD ecosystems and more investigation is required into knowledge work within ODE. This research-in-progress aims to explore and answer the question of how is knowledge constructed in OGD ecosystems.

Keywords

Open Data, Open Government Data, Value Creation, Ecosystem, Knowledge , Knowledge Management.

Introduction

In the past decade, the open data (OD) movement has gained popularity, building from the Obama administration's 2009 Open Government (OG) policy, which is being adopted in many countries at various governmental levels (The Open Data Barometer, 2019). OD initiatives have also been adopted in various areas of society, involving academia (Link, et al., 2017) and private organizations (e.g., Uber, 2019). Open Government Data (OGD) has the potential to expand the delivery of public services to society, increase the transparency of public actions, facilitate decision-making, generate wealth and jobs, and improve communication between governments and society (Styrin, et al., 2017, p. 136).

However, the simple availability of OD and OGD does not mean these data are used well in society. Research and experience shows that social actors (organizations and individuals) must to work collaboratively (Chan, 2013) and create an Open Data Ecosystem (ODE) in order to manipulate and use the data. An ODE aims to generate and disseminate information and knowledge of value to society, organizations, or individuals. In other words, the results expected from investments in OGD initiatives do not depend solely on government effort and interest, but also on the formation and interaction within healthy ecosystems (Styrin, et al., 2017). The role of the ODE becomes even more important when one observes practical challenges, such as: the inability of governments to enforce open data repositories, limited use of open data, low quality and relevance of the data available, and the lack of skills and technical resources of consumers to effectively use and manipulate OGD (Corbett, Templier, & Takeda, 2018; Felipe Gonzalez-Zapata & Richard Heeks, 2015).

In order for ODEs to function effectively and deliver positive results, data must be made available to be transformed into information to generate new knowledge (Probst, et al., 2002). The generation of new knowledge depends on the use by individuals or social groups, which through their interactions generate new knowledge (Coelho, 2007). Analyzing the efficiency of knowledge creation in these environments and identifying factors that act as levers or inhibitors of knowledge creation is a necessary step in value creation. Understanding these mechanisms may facilitate the direction of public policies of ODG and help ecosystem members to increase their potential for value creation. This research-in-progress aims to develop a novel theoretical model that explains the interactions between knowledge creation and value creations processes within ODEs. It begins with a review of the relevant research on the topic and synthesis of the main concepts

relevant to the subject. This second part is necessary because some terms are defined differently in the literature. By synthesizing the literature, more precise definitions of terms can be presented, which in turn will guide the research and facilitate the development of a theoretical model.

The remainder of the paper is organized as follows: next is the theoretical background, followed by the research methodology adopted. Then, the preliminaries results are presented and the paper concludes with expected contributions and next steps.

Theoretical Background

An ODE is comprised of a variety of stakeholders who "find, manage, archive, publish, reuse, integrate, mix and consume OGD in connection with tools, electronic services (online) and society" (Ding, et al., 2011, p. 326). ODE is composed of a complex multidimensional set of interdependent, socio-technical actors, including data providers, users, individuals and organizations. Members of an ODE interact, provide feedback, and engage in dynamic multidirectional and multi-institutional exchanges (Corbett, et al., 2018). ODEs act as process intermediaries between data providers and data users, showing users how OD can be used and providing guidance on its use (Zuiderwijk, et al., 2014). An ODE is composed of an eclectic set of independent actors, each presenting its own interests, objectives and visions in the process, and providing mutual support for processes of knowledge creation and innovation (Ding, et al., 2011). Within an ODE, actors have a variety of objectives. For their part, governments want to increase efficiency, reduce expenses, increase revenues, broaden employment bases, and increase social participation. On the other hand, companies want to increase revenues, reduce taxes, exclusivity of operations, reduce labor, and lower salaries (Gonzalez-Zapata & Heeks, 2015). Meanwhile, individuals are motivated to reduce taxes paid, gain access to better services, have more job opportunities and higher salaries. ODE can serve as a provider and developer of knowledge, providing the resources and intermediation needed to overcome the existing barriers between governments, as data providers, and data consumers, including the government themselves. The ecosystem has a level of complexity that needs effective management to align many diverse interests and the knowledge that is generated.

OGD has become an important part of government management and has grown quickly in the last decade. In just four years between 2009 and 2013, there was an increase from 2 to more than 300 initiatives of OGD, having been opened and published by 2013, more than 280 catalogs of OGD, involving a set of more than one million data (Máková, et al., 2018). Despite this growth, many barriers exist in achieving the value and potential of OGD, including institutional barriers; complexity of taxation; difficulties in using and accessing data; legal support; data quality; and technological barriers. (Huang, et al., 2017). Among the main barriers are the lack of ability to discover the appropriate data and the lack of knowledge to use or give meaning to the data (Máková, et al., 2018).

OGD creates value only if the data are analyzed and reused to generate new knowledge. However, the creation of useful and applicable knowledge is not a simple and permanent thing, because knowledge is a fluid mixture of condensed experience, values, contextual information and experienced insight (Davenport & Prusak, 1998). Although the term knowledge has been widely disseminated in the literature and practice, questions remain around the concept, its formation and forms of diffusion, even in the academic environment. At the most basic level is data, which come to be elements that do not present intrinsic value can be interpreted in multiple ways, present different values, and generate numerous interpretations, even for the same person. When a data set is combined, a context can be generated, thus leading to one of the possible interpretations of the element. In this way, this element ceases to be a data point and becomes a piece of information, which carries in itself a certain interpretative value. By internalizing the information, an individual undertakes a process that integrates previous knowledge, beliefs, values, truths and the interpretation of this new information, integrating this information set in a new knowledge (Matos Junior, 2017). The process to arrive at knowledge, therefore, occurs at levels, starting from symbols, which can be transformed into data and which, in turn, can be interpreted and transformed into information, through perceptive thinking with deductive and inductive reasoning (Leme, 2001), information that combined with other elements to generate knowledge (Probst, et al., 2002).

The interaction of individuals, in daily life or within organizations, opens the possibility of developing new knowledge, through the conversion of tacit (the one that has not yet been codified, existing only in the human mind), and explicit (the knowledge already codified or explicit) knowledge, and vice versa. Takeuchi

and Nonaka (2008) outline four distinct knowledge creation interactions. Socialization occurs when there is the sharing and creation of tacit knowledge through direct experience of everyday life, in a tacit-tacit movement. Externalization is an opportunity in which tacit knowledge is articulated through dialogue and reflection, in a tacit-explicit movement. Combination occurs when there is an intentional and direct systematization of combining two or more explicit knowledge and systematizing them in a new information, in an explicit-explicit movement. Internalization takes place when there is the acquisition of new tacit knowledge, in practice, in the internal process of learning, in an explicit-tacit movement.

Knowledge in the organizational context can be understood as "the engine of economic growth and productivity, based on information, technology and learning, and contributing to its becoming one of the most important factors of production" (Guedes, 2012, p. 7). Recognizing knowledge as the engine of growth means this concept becomes increasingly important and strategic for corporations, therefore deserving greater control and management to ensure its use, its availability, and avoid its loss (Matos Junior, 2017). The existence of knowledge alone does not guarantee benefits if there is no proper use of this resource, therefore, knowledge must be managed such that it is used for the desired purposes. In other words, a direct, proactive and intentional action is necessary, aiming to guarantee the direction or manipulation and use of knowledge, so that the greatest benefits can be extracted from this human and social capital (Dall'Agnol, 2010). Organizations should be well advised to identify the internal knowledge capable of generating new knowledge, create innovation, enable competitiveness and direct the initiatives/efforts of organizations involved in OGE (Espadinha-Cruz & Cabrita, 2018). Based on this background, we believe more investigation is required into knowledge work within ODE. This research is guided by the following question: how is knowledge constructed in open government data ecosystems?

Research Methodology

For the first part of this research, we conducted an analysis of the extant research focusing on studies that address the issue of knowledge creation in ODE. Steps 1, 2 and 3 of a systematic literature review (SLR) (Templier & Paré, 2015, p. 115) are applied. The ProQuest ABI/INFORM Global portal was initially chosen for the collection of articles because it is one of the most important, broad and respected publication research portals (ProQuest, 2019). Key word combinations were applied as shown in Table 1. Following the execution of the searches, we examined the results to identify and remove duplicates. During this process, we noted that all of the articles returned in searches 3 to 9 were already captured within the results of search 2. Thus, the sample of articles to be reviewed was 146.

Search #	Search term	Period	Articles
1	"open data"	2000–2019	445
2	"open data" + value	2008–2019	146
3	"open data" + ecosystem	2012-2019	26
4	"open data" + "knowledge creation"	2017-2018	2
5	"open data" + "knowledge management"	2013-2018	21
6	"open data" + ecosystem + "knowledge management"	2016-2018	5
7	"open data" + value + ecosystem	2014-2017	7
8	"open data" + value + "knowledge management"	2013-2018	8
9	"open data" + value + ecosystem + "knowledge management"		0

Table 1 - Variations in terms based on the term "open data" with cut from 2000 to 2019

The 146 articles were analyzed according to their abstracts and introductions in order to identify those that address the research question. Forty-nine articles were selected as being relevant to our research. The other articles, although using the term open data, incorporate analyses in different topics, such as the financial market, the use or development of applications, and were excluded due to low relevance.

Using the analytical tool Atlas.TI a preliminary content analysis was performed to identify the key words that are most frequently used within the articles. The initial steps involved using the Atlas.TI built-in functionality to create a cloud of words. Then, based on those results and our areas of interest, we used the Atlas.TI functionality to tag the occurrence of four key words – open data, value, ecosystem and knowledge management - in all of the articles and to produce a map showing the occurrence and relationships.

As the research progresses, further analyses and the other steps of the SLR process will be applied in order to analyze the selected articles to give meaning to existing knowledge on the topic, facilitate the development of a new theoretical model, and identify more research needs (Templier & Paré, 2015).

Preliminary Results

Several preliminary results can be observed. First, the results point to the fact that open data has become a theme of recent prominence for the academy, with the largest volume (90.2%) covering the last 5 years (2014-2019). As the numbers in Table 1 show, there is a low level of research on ODE and on the creation of knowledge in relation to OD. Even less research has been done into the creation of knowledge in ODE. This can be observed by the result of 5 articles involving OD + ecosystem + knowledge management. Second, there has been limited research attention situated at the intersection of knowledge management and value creation within ODE. This is evidenced by the fact that applying the filter with all 4 key words together resulted in no published articles.

The analysis of the frequency of use keywords in the selected articles is shown in Figure 1. These results confirm the evidence that few articles are dedicated to the issue of value creation, knowledge and ecosystems. Our analysis shows that most articles focus more on the difficulties and barriers of OD. For instance, text analysis of the articles returned the following results: 576 occurrences of the term ‘barrier’, 291 occurrences of ‘ecosystem’, 31 occurrences of ‘value’ and 11 occurrences of ‘knowledge management’.

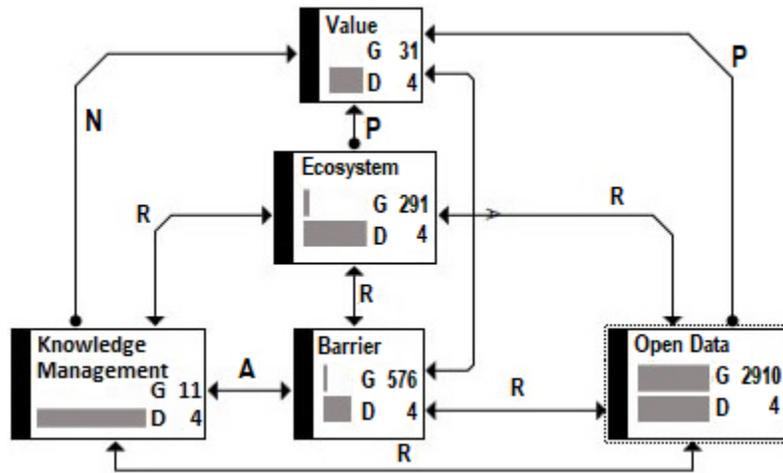


Figure 1 – Cloud of words

Expected Contributions and Next Steps

As a work-in-progress, this paper contributes to the information systems and open data literatures by highlighting a important gap in the extant open data research. The preliminary results suggest a need for research on knowledge creation and management in ODE. As the research continues, additional databases such as World of Science and Scopus will be searched and we will include other keywords such as “open government data” to ensure a comprehensive review of the literature. From this review, we plan to construct a theoretical model that goes beyond data publication and use to explain knowledge-building activities in ODE. In other domains, knowledge management has been linked to value creation, thus such a model could serve as a framework for a future OD research. Further, given the vulnerabilities associated with knowledge management (e.g., knowledge loss), the theoretical model may provide novel insights into how to preserve the knowledge and ensure its longevity.

As noted, this article represents a first step in a research program that aims to analyze and understand how and when the knowledge is created in these ecosystems, as well as the efficiency of ODE in preserving the knowledge generated and its use for value creation. This research is important for the various stakeholders of OGD (governments, private and social organizations, and interested individuals), and aligns with the recent movement of academic research towards responsible science (Responsible Research for Business and Management (RRBM), 2019), which is dedicated to inspiring, encouraging and supporting credible and

useful research in the disciplines of business and management. RRBM believes that responsible research leads to the production of credible knowledge, and that it can be used to form progressive government policies, promote positive and sustainable business practices.

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