AN EMPIRICAL STUDY OF OPEN GOVERNMENT DATA AND IT USE BY SMALL AND MEDIUM SIZED ENTERPRISES IN CANADA

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Abstract

Little research exists on the use of Open Government Data (OGD) by small and medium enterprises (SMEs). However, a few studies suggest that firms, including SMEs, can benefit from using OGD as a resource to stimulate growth and create value. This dissertation investigates the use of OGD by Canadian SMEs. The proposed research is rooted in the Resource Based View (RBV) framework, which provides a theoretical base to explore the use of OGD by SMEs. An explanatory sequential mixed-method approach was applied, combining quantitative and qualitative methods to address this question. The study findings confirmed that Canadian companies use OGD to varying degrees. The internal capability to source, capture and extract meaningful and usable information from OGD is one of the keys to generating potential value in terms of new products and services. Theoretically, the study suggests that, although OGD is a free resource available to all competitors, companies can create value through idiosyncratic ways of integrating OGD with internal data and through the internal capabilities they develop related to information processing. The key to distinguishing their OGD based products and services from others in the market lies in the competencies, knowledge and technologies used to process OGD.

Keywords: Open Government Data (OGD), Small and Medium Enterprises (SMEs), OGD use and process, Competitive advantage, Economic value.

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To my family, special thanks for their support and encouragement throughout my many years of student life. I would like to take this opportunity to pay tribute to my parents, Massika and Said Kherchouche, who are no longer with us but with whom I have very fond memories.

[1] Background: Ouassila Kherchouche holds a B.A. in art and an M.B.A. Over the past twenty years, she has acquired experience in the public, private, and non-profit sectors. She currently works for the Government of Canada as a senior analyst. She has also been a teacher, trainer, and consultant in colleges, private schools, and companies in Ottawa and Montreal. She has taught courses in communications, management, marketing, and economics. Previously, she worked as a journalist and communications advisor for an international oil group.

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Chapter 1: Introduction

The trend towards open government has led to a focus on Open Government Data (OGD): government departments and agencies providing free access to granular data on a range of topics of interest to citizens. For example, over ten thousand datasets have been published by Natural Resources Canada on mineral production, deposits, and facilities in Canadian provinces and territories.

Accessible freely online, OGD is now a reality that has the potential to better engage citizens in the democratic process, provide social benefits, and drive economic growth by enabling private sector organizations to innovate and possibly create new products and services.

The economic argument has been the focus of a series of studies starting in the late 2000s. The European Commission, the US Department of Commerce, and the Australian government have all explored the economic value of OGD. Central to these studies is the assumption that using OGD allows small and medium enterprises to gain competitive advantage in the marketplace, innovate and generate economic value. A few empirical studies suggest that firms can benefit from using OGD to stimulate growth and create value (Zuiderwijik et al., 2014; Safarov et al., 2017; Magalhaes, 2020).

Despite the consensus that OGD can provide economic benefits, few studies have explored the mechanisms by which this might occur, and there has not been a concerted effort to examine this phenomenon in the Canadian context. To date, only one study,

conducted in 2016 by the Open Data Exchange (ODX)[2] along with Open North[3] and Govlab,[4] has explored the use of OGD by businesses. Furthermore, little is known about the conceptual underpinnings of how and why companies would commit to using OGD.

Accordingly, this dissertation explores OGD use by Canadian SMEs. The information and analyses in this study can be used to guide SMEs in the creation of projects or initiatives when they choose to take advantage of OGD available on the Open Government portal.[5] It can also provide guidance to the publishers of OGD to better enable take up and use by SMEs.

Theoretically, the aim of this research is to contribute to the debate on whether and in what ways OGD, as external resources, can be used to achieve competitive advantage and generate value. In practical terms, this research aims to identify the essential components for the successful exploitation of OGD enabling the adoption of an effective strategy for the use of this resource in improved economic performance.

This introduction provides the background and introduces the research questions related to the study.

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[2] ODX is a public-private-academic partnership created in 2015 to enhance access to open data for commercialization purposes in Canada. See, https://codx.ca/

[3] Open North is a not-for-profit social organization founded in 2011 to develop innovative online tools that promote government transparency and citizen participation. See, http://www.opennorth.ca/

[4] Govlab is an action research center based at New York University, initiated in 2012 to promote the design of more open, effective and networked governing institutions using data, technology and crowdsourcing. See, http://www.thegovlab.org/

[5] Open Government Portal, https://search.open.canada.ca/opendata/

1.1 Background

Several definitions of "Open Data" exist. Often, it is defined in terms of its practical and technical aspects: "…structured data that is machine-readable, freely shared, used and built on without restrictions" (open.canada.ca, 2014; opendefinition.org). Geiger & Lucke (2012) define Open Data "as stored data which could be made accessible in the public interest without any restrictions on usage and distribution (p. 265)". According to the Open Data Handbook of the Open Knowledge Foundation, Open Data has two specific features[6]. First, the data should be available in a machine-readable standard format and able to be retrieved and meaningfully processed by a computer application. The most used formats are CSV, XLS, DOC, PDF, and HTML. Second, the online published data needs to be licensed in a way that permits commercial and non-commercial use and re-use without restrictions (Shueh, 2014). These definitions differentiate OGD from the other forms of information available from governments such as, various reports generally available in document formats. The point here is that users should easily integrate OGD into their own information systems.

The publication of OGD is a complex, dynamic, heterogeneous process involving many stakeholders in creating, publishing, sourcing, and using government data (Jenssen et al., 2012; Magalhaes et al., 2013; Zuiderwijk & Jessen, 2014; Saxena & Janssen, 2017). There is a cost to creating such data, and on the benefit side of the equation, two types of value are frequently discussed. The first is an economic value that can be generated in the market through the market value associated with goods or services. The second is a social value

[6] See, http://opendatahandbook.org/guide/en/how-to-open-up-data/

that can be perceived through the improvements generated in the lives of individuals or society in general (Jetzek et al., 2014).

1.1.1 Open Government and Open Government Data

The growth of OGD can be linked to the adoption of Open Government.[7] Open Government has come a long way since the publication of open scientific data in the late 1950s. In 2009, Barack Obama was the first President to support the idea of Open Government, and to this end, he signed the Memorandum on Transparency and Open Government.[8] By mid 2010s, the motivation to use open data grew and more governments were making such data available.

In June 2013, the members of the G8 Summit met in Lough Erne to discuss the International Open Data Charter (IODC). The G8 governments announced their decision to open their data for the public to facilitate, improve, and enhance the participation of all citizens in the democratic process (Castro & Korte, 2015). The agreement involves implementing a set of principles[9] and best practices for releasing and reusing Open Government Data (OGD). Based on the concept that open data is an important tool for ensuring accountability, delivering quality services, reducing operating costs, and stimulating innovation, each G8 government has since published an Open Data Action Plan and established a national data portal (Castro & Korte, 2015; Ren & Glissmann, 2012).

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[7] Open Government is "a governing culture that holds that the public has the right to access the documents and proceedings of government to allow for greater openness, accountability, and engagement." See the definition at https://www.tbs-sct.canada.ca/pol/doc-eng.aspx?id=28108

[8] See, Open data 101: The history and principles of open data, https://apolitical.co/solution-articles/en/open-data-101-the-history-and-principles-of-open-data-part-1

[9] In 2015, six principles for data release were adopted and included in the Charter: "Open by default; timely and comprehensive; accessible and useable; comparable and interoperable; for improved governance and citizen engagement; and for inclusive development and innovation." See, https://opendatacharter.net

In Canada, between 1999 and 2006, the federal government implemented several reforms aimed at changing the way it communicated with the public and improving internal administrative practices and culture (Brown, 2007). These reforms coincided with the implementation of the government's first e-government project called 'Government On-Line' (Roy, 2006).[10] This project was launched in 2000 and involved a public service-wide initiative to convert primary federal services to an electronic environment (Brown, 2010) to deliver better services and enhance access to information (see Appendix B). In October 2014, the *Directive on Open Government*, adopted by the Treasury Board of Canada Secretariat (TBS), came into effect,[11] and *Open by Default* became the new policy of the Government of Canada.

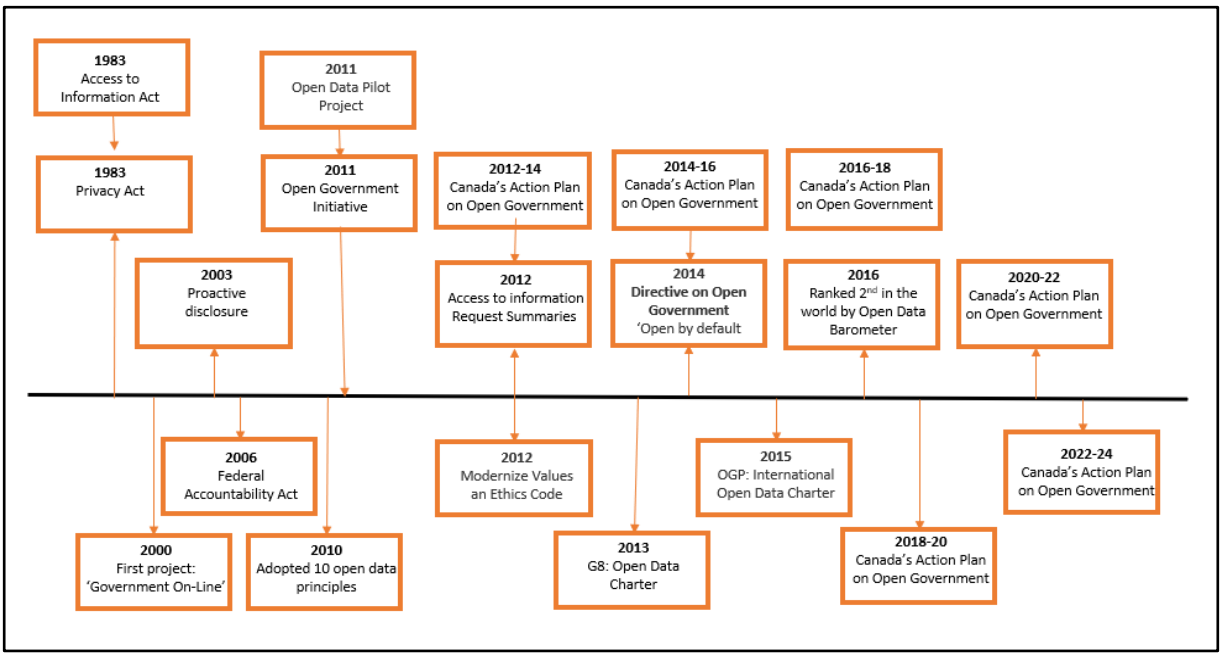

Figure 1.1.1: Timeline: Progress made in opening Canadian OGD

10 See, http://publications.gc.ca/collections/Collection/P4-1-2006E.pdf

11 See, https://www.tbs-sct.gc.ca/pol/doc-eng.aspx?id=28108

The objective of the *Directive on Open Government* is to maximize the publication of government information and data to support transparency, accountability, citizen engagement, and socio-economic conditions. Some 67 federal government departments and agencies have since provided datasets to the Open Government Portal, covering nineteen subjects (Figure 1.1.1 provides a timeline of the progress made in opening OGD).

By publishing open data, governments expect it to be used and exploited by citizens to be better informed, and by businesses to innovate and improve their products and services (Ubaldi, 2013; Zuiderwijk et al., 2015; Magalhaes & Roseira, 2020).

According to Canada's Open Government Plan 2016-2018,[12] the use of OGD by citizens and businesses offers a means of catalyzing innovation and contributing to the growth of the Canadian economy. For example, the ODX[13] identified the case study of the Piinpoint company.[14] This small Canadian company demonstrates how open data (including OGD) can bring accuracy to the process of selecting the best site for retail or commercial expansion. This company uses datasets and advanced retail analytics to find the best locations for small and medium businesses by collecting data on traffic, householder income and expenditure, occupancy rate and, real estate, etc.

[12] See, https://open.canada.ca/en/content/canadas-new-plan-open-government-2016-2018

[13] See, The ODX presentation, COD: Cash in on Open Data https://www.slideshare.net/CODX/cod-cash-in-on-open-data

[14] See, https://www.piinpoint.com/

1.1.2 The business sector and OGD

In Canada, there are approximately 1.21 million small and medium-sized businesses and 22,905 medium-sized businesses in 2019.[15] Small enterprises employed 68.8 percent of the total private labour force, while medium-sized enterprises employed 19.7 percent.[16] According to the Open Data user stories posted on the open government website, SMEs are users of OGD.[17] This data represents an opportunity for these companies to make use of free data-based resources to build their businesses. When the number of Canadian SMEs is compared with the number of datasets downloaded,[18] however, the number of companies using OGD is relatively low.

The average number of visits to the Open Government data portal[19] between August 2022 and July 2023 was approximately 244,000 per month (see Figure 1.1.2, Appendix A). These visits include Canadian citizens, organizations as well as visitors based abroad. It is not clear from the statistics how many SMEs make use of the data, but given the number of SMEs in the country, one would expect the number of visits to be much higher if they were making extensive use of OGD (Figure 1.1.2 provides a trendline of the open data portal use).

[15] See, https://www.ic.gc.ca/eic/site/061.nsf/eng/h_03126.html

[16] Ibid

[17] See, https://open.canada.ca/en/stories

[18] See, https://open.canada.ca/en/content/open-government-analytics#top10

[19] See, https://open.canada.ca/en/content/open-government-analytics#top10

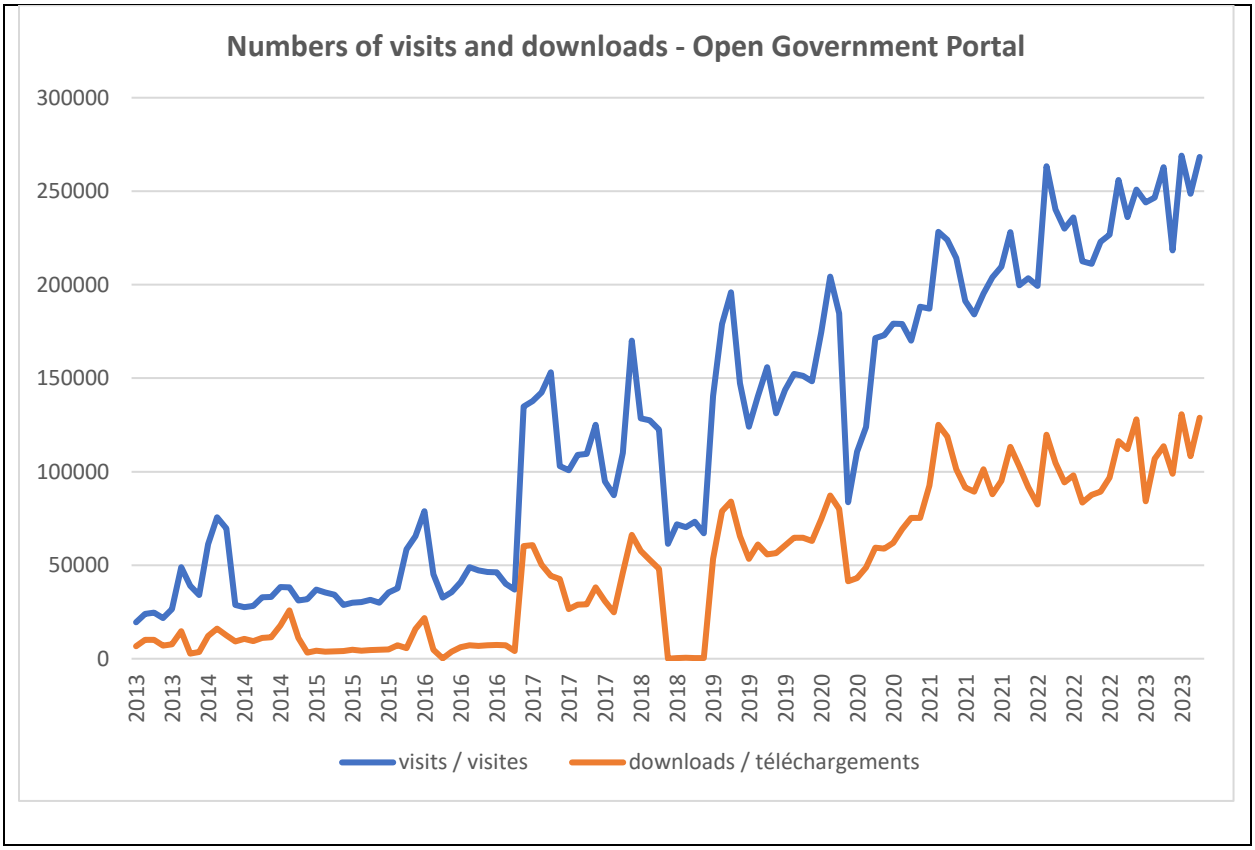

Figure 1.1.2: Open Government Data - Number of Visits, Downloads

The number of visits and downloads shows the evolution of access to OGD from 2013 to 2023 (see Graph 1, also Appendix A). The data related to this graph is updated monthly and available on the Government Analytics page (Open Government Portal).[20] The data used to create charts do not provide details on the categories of visitors[21] or users of the datasets downloaded from the open government portal.

[20] See, the published data on the Open Government Portal https://open.canada.ca/data/en/dataset/2916fad5-ebcc-4c86-b0f3-4f619b29f412/resource/02a92b0f-b26d-4fbd-9601-d27651703715

[21] Categories of visitors: Citizens, companies, non-governmental organizations, etc.)

According to the project called "the Open Data 150 Canada," initiated in 2016 by the Open Data Exchange (ODX),[22] Open North[23] and Govlab,[24] 152 Canadian companies have confirmed their use of OGD. This is the first study to list Canadian companies using OGD.[25] Interestingly, 57% of the companies on the list are active in the Data/Technology sector. The remaining companies (43%) come from various sectors such as Healthcare, Environment & Weather, Lifestyle & Consumer, Media, Management Consulting, Business & Legal Services, Food & Agriculture, Geospatial/Mapping, Education, Electricity & Energy Transmission, Business & Legal Services, Transportation, etc.

A key question for businesses is what to do with OGD and how best to integrate it into their business models. The fact that such a large proportion of companies in the Open Data 150 project were in the Data/Technology sector suggests that these companies, by virtue of their understanding of data, might be well positioned to leverage OGD relative to companies in other sectors. Several authors have explored business models related to OGD. According to Massa et al. (2017, p.73), "a business model is a description of an organization and how that organization functions in achieving its goals impact (e.g., profitability, growth, social impact)." Osterwalder and Pigneur (2010) explain that "a business model describes the rationale of how an organization creates, delivers, and captures value" (p. 14). Therefore, the business model helps to define how a firm creates

[22] ODX is a public-private-academic partnership created in 2015 to enhance access to open data for commercialization purposes in Canada. See, https://codx.ca/

[23] Open North is a not-for-profit social organization founded in 2011 to develop innovative online tools that promote government transparency and citizen participation. See, http://www.opennorth.ca/

[24] Govlab is an action research center based at New York University, initiated in 2012 to promote the design of more open, effective and networked governing institutions using data, technology and crowdsourcing. See, http://www.thegovlab.org/

[25] See, All Companies | Open Data 500: Canada

value that enables it to earn revenues (Chesbrough, 2008; Osterwalder & Pigneur, 2010; Lecocq & Demil, 2010; Janssen and Zuiderwijk, 2014; Zeleti, 2014).

Each organization uses one or more business models that could be "explicit or implicit" (Jonhson, 2010; Zeleti, 2013). Magalhaes & Roseira (2020), summarize several emerging business models for OGD that directly address how businesses might create value. Deloitte Analytics (2013) identified five business model archetypes for "supplying and consuming open data and services derived" from the open data "marketplace" (p.2). These models contribute to creating a favourable environment to generate economic benefits and growth by using Open Data in general and OGD particularly:

- **Suppliers** that publish their data via an open portal to the public to use and reuse it (including public and private sector organizations. Economic, societal, and environmental benefits may result from this greater access to open data. Open data suppliers are governments, businesses, and individuals (Deloitte Analytics, p: 2, 2013).
- **Aggregators** that pool, combine, and clarify open data on a particular theme, find correlations, identify efficiencies, or visualize complex relationships. As these insights are subsequently provided as value-added services to businesses and consumers, 'freemium' pricing can be used.
- **Apps developers** enable ease of use. They design, build, and sell web-based applications for individual consumption. Such applications use more dynamic types of open data, updated frequently.

- **Enrichers** that combine open data with proprietary data to provide services can enhance their existing products and services. Businesses can save money with the support of enrichers to make their operations more efficient.
- **Enablers** that provide platforms for leveraging open data and facilitating the supply or use of available data.

Zeleti (2013) analyses the characteristics and patterns of emerging open data business models and concludes that a need exists to understand the values and strategies linked to potential economic opportunities. From the perspective of capability for publishing and using OGD, Dodds & Newman (2015) describe an Open Data Maturity Model based on five (5) themes: Data management processes, Knowledge and skills, Customer support engagement, Investment and financial performance, and Strategic oversight. The Open Data Maturity Model is developed to help organizations assess how effectively they publish and consume open data.

These capabilities might or not might not be present in small and medium enterprises (SMEs), [26] which are essential in Canadian economic growth. As mentioned earlier, in 2022, SMEs represented 1.21 million businesses in Canada: 1.19 million "small" (1-99 employees) and 22,700 "medium-sized" (100-499 employees) across Canada (ISEDC, 2022).[27] SMEs contributed, on average, 38.1 percent of the gross domestic product (GDP)

[26] For this project small and medium sized enterprises are defined in Canada as a business establishment with 1 to 499 paid employees. A small business has 1 to 99 paid employees and medium-sized business has 100 to 499 paid employees. See, https://www.ic.gc.ca/eic/site/061.nsf/eng/h_03018.html#toc-02

[27] See, https://ised-isde.canada.ca/site/sme-research-statistics/en/key-small-business-statistics/key-small-business-statistics-2022

from 2015 to 2019 for all Canadian provinces. “SMEs accounted for more than 50.0% of the value added to the country's output.” (ISEDC, 2022).[28]

Small businesses in Canada are more highly concentrated in the services sector than medium-sized and large businesses (Seens, 2015). These enterprises employ over 8.2 million individuals, and medium-sized enterprises employ 2.5 million workers. This represents 67.7 percent and 20.4 percent of the total private labour force in 2021 (ISEDC, 2022). About 935,824 small enterprises operate in the Services and Producing sector (ISEDC, December 2021).

Since 2012, many efforts have been made by the federal government to make data available to the public through the open government portal.[29] ODG is freely shared, accessible, and regularly updated to be used by civil society organizations, academics, and the private sector. Canadian SMEs can freely extract, use, and reuse the available OGD. These data can be used as resources and be combined with their internal resources to reduce their costs, save time, increase partnerships, explore new virtual markets, enhance return on investments, generate economic value, innovate, and more.

OGD originates in the long-standing practices of government-produced document recording and archiving systems. Over several decades, government agencies have invested in the deployment of various technologies dedicated to the storage, management, and transfer of government data. Much of this data is currently in the public domain and is available and accessible to the public.[30]

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[28] See, https://ised-isde.canada.ca/site/sme-research-statistics/en/key-small-business-statistics/key-small-business-statistics-2022#s5.1

[29] See, https://open.canada.ca/data/en/dataset

[30] See, https://www.bac-lac.gc.ca/eng/Pages/home.aspx

New technologies have made it easier to access millions of online resources. These resources are introduced as an important source of information for all types of organizations. Some existing studies suggest that firms could potentially benefit from using OGD as resources to develop new products and increase their growth (Ubaldi, 2013; Zuiderwijk et al., 2015). On the other hand, OGD is claimed to support transparency, citizen participation, and collaboration and be a lever for economic development.

Yet, according to Ruijet and Meijet (2020), the impact of OGD remains unclear, and OGD has not yet lived up to its promise. Several barriers and criticisms have been mentioned in the existing literature on OGD.

Barriers were identified at different levels by Jenssen et al. (2012) and Zuiderwijk & Janssen (2014), such as no uniform policy for publicizing data; no process for dealing with user input; lack of ability to discover the appropriate data; no access to the original data; no explanation of the meaning of data; prior written permission required to gain access to and reproduce data; data format, obsolete and non-valid data; information is missing; lack of meta standards; legacy systems that complicate the publicizing of data; etc.

The criticisms that have been pointed out most often are privacy, measurement, (Davies et al., 2019) and matching between the supply and demand of open data (Zuiderwijk & Janssen, 2014a; Susha et al., 2017; Ruijet & Meijet, 2020). In addition, the quantity and the quality of open data are often criticized (Jenssen et al., 2012; Zuiderwijk & Janssen, 2014; Susha et al., 2017; Ruijet & Meijet, 2020).

In 2021, more than 80,000 open data and information assets were accessible from the Canadian open government portal.[31] For many small and medium enterprises (SMEs), the

[31] See, https://open.canada.ca/en/open-data

availability and free access to OGD could offer a potential opportunity to diversify their resources. For interested parties, the benefits of diversifying resources are to develop more products and services and create new employment opportunities. OGD could be a secure data source for SMEs if it is more reliable and available.

Gill & Biger (2012) concluded that market challenges, lack of financing, and regulatory issues are significant barriers to their growth. The use of OGD might be a way to address both marketing challenges (providing resources for creating new products and services), and financing issues since the company has access to a free resource.

Despite this optimism, there is a substantial gap in the evidence base relating to SMEs' use of OGD. A myriad of cultural, organizational, legal, and technological challenges is associated with using open data in a viable and effective manner. Such challenges impede realizing the opportunities afforded by OGD (Zuiderwijk & Janssen, 2012; Martin et al., 2013).

There also is an absence of knowledge about the external users of OGD (Zuiderwijk, 2015), how exactly OGD is used by external parties (Safarov et al., 2017), and what might be the processes by which OGD contributes to creating value (Jerzek et al., 2014; Attar et al., 2016) among firms of all sizes. Given that the use of OGD is still early in its lifecycle, the question of how such data could benefit companies requires further exploration (Magalhaes & Roseira, 2014, 2020).

Based on the above discussion, this dissertation aims to examine how SMES use OGD internally, the challenges they face and potential solutions that might facilitate the use of this data.

1.2 Research question

SMEs face many challenges when deciding whether to use raw[32] and open data[33] (Martin et al., 2013; Zuiderwijk & Janssen, 2014a; Safarov et al., 2017). There is little substantive empirical evidence supporting claims that OGD use enables SMEs to acquire a competitive advantage in the market, innovate, and generate economic value. Our assumption is that OGD is being used by SMEs. In this research, we aim to test and provide evidence that Canadian SMEs are indeed using OGD. Based on the foregoing discussion, the aim of this dissertation is to:

(i) better understand how and why SMEs use OGD,

(ii) identify the challenges they face in doing so, and

(iii) identify what might be done to facilitate its use.

To this end, the proposed study investigates how claims about the opportunities afforded to SMEs using OGD resources stand up to empirical scrutiny. The central research question guiding the dissertation is: **How do SMEs use OGD as a resource and leverage it to generate potential economic value?**

[32] "Raw data refers to any data object that has not undergone thorough processing, either manually or through automated computer software." See, https://www.techopedia.com/definition/1230/raw-data

[33] "Open data is data that can be freely used, re-used and redistributed by anyone - subject only, at most, to the requirement to attribute and share alike." See, http://opendatahandbook.org/guide/en/what-is-open-data/

To address this question, the research will be guided by three sub-questions.

SQ1: To what extent is OGD being used by small and medium Enterprises (SMEs) in Canada?

SQ2: What are the impediments with which small and medium-sized enterprises (SMEs) must contend in seeking to use OGD as resources?

SQ3: What are the key considerations influencing OGD use in these enterprises?

1.3 Dissertation Structure

This thesis is organised into seven chapters: 1- Introduction, 2- Literature review, 3- Methodology, 4 - Survey findings, 5- Case studies discussion, 6- Analysis, 7 - Conclusion.

The introduction provides the background and the research question related to critical issues regarding the uptake and potential economic value of OGD for SMEs in Canada. This first section introduces the practical aspects surrounding the adoption of public data openness for all Canadian citizens and the current evolution of its use in the Canadian private sector.

The second chapter will set out the theoretical and conceptual foundations. The starting point for the discussion in this chapter is rooted in the Resource-Based View (RBV) of firms, particularly because OGD is free and available to all SMEs. Therefore, the ability to capture and leverage it for competitive advantage would rely on internal capabilities. Given the nature of the resource (i.e., data), an information systems framework is also used to define information processing activities that form the basis of these internal capabilities.

Chapter three describes the methodology used to conduct the research which followed an explanatory sequential mixed-method design. The structure of the questionnaire survey and the interviews used in this design are also discussed.

Chapter four provides a detailed description of the survey results. It includes demographic information of the respondents, findings on the use and process of OGD and its impact on the business. The chapter also includes a statistical and descriptive breakdown of the responses received from survey respondents.

In chapter five, interviews with company representatives describe how seven Canadian SMEs use OGD. Following the mixed-method logic, the interviews serve to better explain how SMEs use OGD. This section is followed by a discussion with an analysis summary of the interviews.

Chapter six discusses the key findings of this dissertation and provides an analysis and discussion. This includes a theoretical analysis of the findings derived from the survey and interviews in relation with the information system approach. This chapter (i) provides a detailed answer to each of the sub-questions and the central research question; (ii) reflects on the limitations of the study; and (iii) outlines avenues of future research relating to our research topic.

The last chapter wraps up the dissertation. A summary of the key elements from the findings are included to respond to the central research question.

Chapter 2: Literature Review

In the first part of this chapter, the existing literature about the potential for OGD to generate economic value will be reviewed. The main goal is to discuss whether and in what ways OGD can contribute to fostering a competitive advantage and generating value for organizations.

In the second part of this chapter, the relationship between using OGD and achieving a competitive advantage is explored in more detail. This section provides an overview of the Resource-Based View (RBV), focusing on connections between an organization's internal resources and its competitive standing in the marketplace. This part of the discussion examines the epistemological foundations of RBV, how it has been applied concerning information system resources, as well as the criticisms levied at this perspective and the responses to these criticisms by its proponents.

In the third part of this chapter, the conceptual framework based on the Information system for this research will be presented as a means of assessing the specific processes related to OGD use within the context of the RBV.

2.1 Value of OGD

As mentioned earlier, OGD is a raw digital data as distinct from the vast store of documents typically available from government departments. Thus, OGD is bounded by specific characteristics that does not apply to the other types of information available from governments.

Before examining how a company collects open data and how it can be used, it's best to first look at how that organization can create value to be competitive. Only then can the

company identify what data is needed and what other resources are required before to select and combine data internally to achieve its goals.

Gil-Saura (2009) argues that the idea of "value" in business activities can be seen as a subjective and multidimensional concept; therefore, it is only through a multidimensional view that it is possible to better understand the value generated. For example, an open dataset can be useful in several ways and, therefore, has many dimensions of value when exploited by different users from different sectors and with different objectives and interests. Each organization can exploit and unlock the needed value dimension from the same resource in different ways. A core assumption of this dissertation is that investigating the hypothesized connection between the use of OGD by firms and the potential, in turn, of these firms to generate economic value and achieve a competitive advantage through such activities requires precisely this type of multidimensional view because business value through OGD could be realized through many different avenues.

Like most other public goods, open data is seen as a public resource that can create value (Jetzek, 2014; Zuiderwijk & Janssen, 2015). To define the value of open data, Janssen et al. (2012) write that "open data on its own has little intrinsic value"[34] (p: 264), because it is the use of open data that makes it valuable.

Unlike physical assets whose value might be apparent and often unidimensional, such as new technology (robotics, for example) or a prime location that increases the visibility of the business to potential customers, OGD delivers value through use and this use could vary significantly from one organization to another. Therefore, collaboration between

[34] Writing from a philosophical point of view, Zimmerman & Bradley (2019) define intrinsic value as the value that a "thing has "in itself," or "for its own sake," or "as such," or "in its own right."

governments and companies in leveraging OGD could open new perspectives for economic development (Janssen et al., 2012; Ubaldi, 2013) by stimulating innovation, growth, and efficiency. Ubaldi (2013), for example, highlighted OGD's role in driving economic growth, fostering collaboration, and enabling data-driven decision-making.

Jetzek (2013a, p. 49) likewise contends that the value of open data is a "shared value generated from the use of open data by an agent or by a collaboration of agents." Echoing this view, Ubaldi (2013, p: 15) asserts that the value of open data is "…obtainable through the combination and linkage of different data sets" and, as such, its use should trigger many activities and value-creating business models. For instance, some firms might use OGD to inform and/or facilitate strategic decision-making (Attard et al., 2016), while others might use OGD to design and develop new products and services (Janssen et al., 2012; Jetzek, 2013; Zuiderwijk et al., 2014, 2015).

Furthermore, when thinking about the value of open data, it is essential to distinguish between its economic and social value. Jetzek (2014, p: 104) defines economic value as "the worth of a good or service as determined by the market, most often measured relative to units of currency." It consists of the incomes and earnings firms generate from using their resources. According to Jetzek (2013a), the private sector generates economic value by creating new products and services (i.e., innovation), whereas in the public sector, it tends to be generated through increased efficiency and effectiveness.

Social value, on the other hand, "is created when resources, inputs, processes or policies are combined to generate improvements in the lives of individuals or society" (Jetzek, 2014, p. 49). The public sector generates social value through increasing the transparency and accountability of government actions, and the private sector contributes through

participation and collaboration with the government to improve society's quality of life (p:104).

Jetzek et al. (2013, 2014) claim that the economic value derived from OGD use is generated exclusively by its users. The mechanisms for generating this value are based on four factors: openness, data governance[35], capabilities,[36] and technical connectivity. The authors further argue that, in turn, these four factors affect four value-generation mechanisms that impact social and economic value: efficiency, innovation, participation, and transparency.

Jetzek et al. (2013a) also distinguish between value generation (i.e., creation) and value appropriation (i.e., capture). According to these authors, "value generation is when the utility of society´s members, increases after accounting for the resources used in that activity" (p: 49). Moreover, Bowman and Ambrosini (2000) argue that value appropriation "happens when an actor is able to capture a portion of the value created by an activity".

Jetzek et al. (2014) explain that access and the availability of OGD are not enough to lead to more use and value creation by public and private organizations and/or citizens. This is because the motivation and the ability to use the data meaningfully are required to achieve social and economic value.

[35] Data governance is a resource that is defined "as a function of leadership, data governance procedures and data dissemination skills within the public sector that is intended to increase the quality and sustainability of data resources" (Jetzek et al., 2014, p:103)

[36] Jetzek et al., (2014) define capabilities as "the collective ability of individuals and organizations to use and re-use OGD, as a function of equitable access opportunities and technology and data literacy" (2014, p: 103).

Ubaldi (2013) anticipated that the potential value creation of OGD in economic, social, and political terms[37] might be significantly enhanced when OGD is adopted and used by private enterprises and citizens. The author relies on empirical analyses and existing reports on open data that emphasize their potential to provide economic and social value.

Some mainstream narratives surrounding OGD contend it has the potential to become an additional resource for firms, assisting them in generating economic value (Ubaldi, 2013; Jetzek et al., 2014; Gonzalez-Zapata & Heeks, 2015; Zeleti et al., 2016a). Proponents of this view hypothesize that, assuming open data is available and of sufficient quality to be useful and valuable for business/commercial purposes, SMEs can use OGD to:

- reduce their operational costs (e.g., saving on access to information and public data expenses, data licence fees, survey expenses for collecting data, and more[38]);
- save time by having access to public data from an online single portal/platform at any time (Sunlight Foundation; Geiger & Von Lucke, 2012; Ubaldi, 2013);
- perform specific tasks (e.g., writing reports, analysis, consultation) (Jetzek et al., 2014);
- increase partnerships by participating in collaborative projects (Open Government Partnership, Ubaldi (2013), Jetzek et al., (2014));
- exchange information and update know-how with universities and competitors during Hackathons and Datathons (Johnson & Robinson 2015, Anslow et al., 2016);

[37] According to Ubaldi (2013, p: 13 & p: 44), the creation of political value is reflected through the political accountability in relation to the openness of government data. I recognize the links between economic, social and political values; however, this research will focus only on the economic values of Open Government Data.

[38] See, https://project-open-data.cio.gov/business-case/

- acquire new knowledge from combined data sources and patterns in large data volumes (opendatahandbook.org;[39] Gonzalez-Zapata & Heeks, 2015);
- refine the quality of OGD and increase its quantity (Zuiderwijk et al., 2015b; Attar et al., 2016);
- explore the new virtual markets' (Janssen & Zuiderwijk, 2014);
- enhance return on investments and generate economic value (Janssen et al. (2012), Ubaldi (2013), Jetzek et al., (2014)); and
- innovate by using the data (Susha et al., 2015; Attar et al., 2016).

As can be seen from the discussion thus far, the relationship between OGD and value generation is complex "due to the nature of openness, the features of digital data and the possibilities enabled by recent technological advances" (Jetzek, 2013a, p. 55).

Bearing in mind these complexities, and for the purposes of this dissertation, the notion of value as it pertains to OGD is defined as *A positive and multidimensional economic contribution produced by using OGD within a firm to meet the needs of its clients*.

2.2. OGD Studies

The literature on OGD spans conceptual papers supporting the presumed benefits to be derived from this data, along with some empirical work examining who uses the data and for what.

Charalabidis et al. (2016) reviewed the literature to that point to create a descriptive theory of the domain as a precursor to the development of more advanced theories that examine relationships among its concepts and thus provide a base for further development. The authors have followed by applying theories that include ease of use (Jiang et al., 2022;

[39] See, http://opendatahandbook.org/guide/en/why-open-data/

Wirtz et al, 2018), the Unified Theory of Acceptance and Use of Technology (Saxena & Janssen, 2017), and institutional theory (Altayar (2018). These studies focused at the process level in terms of motivation and ability to use OGD. Zhao & Zan (2018) explored OGD from the Resource-Based View perspective, focusing primarily on government organizations and the ways in which they create capacity to publish OGD.

This dialogue is based on the notion that access to OGD is seen as having both democratic and economic value (Jetzek et al., 2013; Castro & Korte, 2015), insofar as the availability of information is essential to citizens better exercising their rights, (Brown, 2010), public data are key to increasing public transparency and boosting the economy (Ubaldi, 2013). It is further hypothesized by some commentators that facilitating access to OGD will contribute to higher efficiency and cost savings in processing transactions (Bătăgan, 2014) and requests (Bertot et al., 2012) through better exchange and organization of data flow between government and its stakeholders (Janssen et al., 2012; Zuiderwijk & Janssen, 2014; Zimmermann & Pucihar, 2015).

From an economic perspective, according to the McKinsey Global Institute report (Manyika et al., 2013), open data, public information, and shared data by the private sector have the potential to provide more than $3 trillion each year in value to the global economy across seven areas (Education, transportation, consumer products, electricity, oil and gas, health care, and consumer finance).

Table 2.4.1 provides a summary of the studies that have been carried out on OGDs.

Table 2.2.1 Summary of OGD studies	
Davies (2010)	Explored the use of OGD and the public sector in UK. The author examined who is using OGD, how it is being used, and the implications for alternative types of democratic change and public sector reform. He identifies the process of the emerging practices of OGD use, the motivations driving different individuals to engage with OGD, and some policy issues related to OGD use.
Davies and Bawa (2012)	Explored the promises and perils of OGD. The authors proposed a contribution to develop debates and practices of OGD
Janssen et al. (2012)	An exploratory study was conducted to derive benefits and barriers to adopting Open Data and Open Government from data collected through interviews and a workshop. The authors concluded that the many barriers delay the promises and potential of open data.
Jetzek et al., (2014)	Explored how using OGD can bring about new innovative solutions that can generate social and economic value. The authors explored a case study and proposed a conceptual model of the data-driven innovation mechanism.
Zuiderwijk et al. (2012)	Investigated the socio-technical impediments of open data. The authors identify several barriers to the successful implementation and utilization of open data (from literature and open data users' perspectives. Several impediments to the successful deployment and use of OGD were mentioned in this article, such as cultural resistance, collaboration, data quality, challenges, technological infrastructure, privacy, legal frameworks, and user engagement for the successful implementation of open data initiatives.

Magalhaes and Roseira (2014)	Explored how OGD is used to develop commercial products and services. Findings were obtained from a sample of 500 American firms. The authors proposed three business model archetypes (enablers, facilitators, and integrators) and presented a framework that describes each business model archetype concerning its openness and OGD. They also examine the value created in the context of the OGD ecosystem.
Zuiderwijk et al. (2015)	Examined the use of open data by companies to create competitive advantage. In this study, three methods of data collection were combined, namely, scenario development, semi-structured interviews, and a survey (40 companies). The findings reveal that the availability and the use of three resources, namely IT resources, information and data resources and human resources, are required, for companies to gain a competitive advantage.
Gonzalez-Zapata & Heeks (2015)	Investigated the literature on the multiple meanings of OGD. The authors analyzed the different definitions, concepts, and foundations related to OGD.
Susha et al., 2015	Explored the driving factors of OGD adoption by businesses for service innovation in Sweden and Netherlands. The factors are motivation, benefits, effort, influence, skills, experience and facilitating conditions relating to the use of data.
Attard et al. (2016)	Examined the existing processes of value creation from OGD. The authors identified the different dimensions that impact value creation and proposed a framework for value creation assessment.
Zeleti, et al (2016)	Explored the economic value of OGD. The author identified a list of Open Data Business Models (ODBMs) in the practice community when using open data

Magalhaes & Roseira (2017)	Sought to understand how firms use OGD to create value. Twelve (12) different models were identified from the dataset analysis of 178 firms that use OGD across various industries in the U.S. The authors suggest that OGD are a value-added resource for competitive advantage in the private sector.
Purwanto et al. (2017)	Examined the use of OGD and aimed to develop an OGD success evaluation model to understand how OGD creates value The proposed OGD success model was adapted from Delone and Mclean success model (1992)
Safarov et al. (2017)	Presented an overview of the literature on types, effects, conditions, and users of OGD. The authors analyzed 101 academic studies on utilizing OGD and related topics. They identified the challenges and opportunities, the frameworks for assessing OGD utilization, and some policy implications

The literature also addresses business models for OGD. According to Zimmermann and Pucihar (2013), a business model defines the overall idea of how a company or network of companies will generate value. Open data business models provide companies with a framework to reuse and combine available open data to leverage it and produce valuable output.

Table 2.4.2 summarizes the existing business models discussed in the literature related to open data in general, OGD, and both. These business models have been categorized according to the external resources used by the enterprises, such as the open data business model, OGD business model, Re-use open data, and OGD Business Models.

Table 2.2.2: Summary of Business Models

Business Models	Open data Business Model	OGD Business Model	Re-use OD and OGD Business Models
Shafer et al 2005 Based on four major categories: strategic choices, creating value, capturing value, and the value network.	**Irving (2013): (9) BM** Form a community to enter in new data, sell tools to an upstream generator of open data, use open data, sell tools to downstream users, Collaborative curation, General purpose data marketplaces, and give labour/money to upstream to help them create better Data, Viral open data licensing, Corporations release data for strategic advantage	**Osterwalder &Pigneur (2010, 2013)** The Business Model Canvas is a tool for business model Innovation and is applicable for OGD. It is used as a strategic management template to develop new business models.	**Musings (2012): (8) ODBM** Cost Avoidance, Sponsorship, Freemium, Dual Licensing, Support and Services, Charging for Changes, Increasing Quality through Participation, and Supporting Primary Business.
Osterwalder &Pigneur (2010) Business model canvas is based on nine (9) basic building blocks: Customer Segments, Value propositions, Channels, Customer Relationships, Revenue Streams, Key Resources, Key Activities, Key Partnerships, and Cost Structure. The blocs cover four business areas: Customers, Offer, Infrastructure, and financial viability.	**Tennison (2013)** Freemium (free entry level, charged added value), Cross-subsidy (get extra benefit from your data), network effects (collaborate in rich data environment).	**Kalampokis et al., (2011)** A stage model: 1- Aggregation of Government data, 2- Integration of Government data, 3- Integration of Gov Data with non-Gov formal data, 4- , Integration of Gov Data with non-Gov formal data and social Data.	**Ferro and Osella (2013): (8) ODBM** Premium, Freemium, Open Source, Infrastructural Razor & Blades, Demand-Oriented Platform, Supply-Oriented Platform, Free as Branded Advertising and White-Label Development
Jonhson M. (2010): (19) BM Affinity Club, Brokerage,	**Lindman & Nyman (2014)** They limit their investigation to four questions:	**Tennison (2013)** Freemium (free entry level, charged added value), Cross-subsidy (get	**Zeleti (2014): (15) ODBM** Premium, Freemium, Open Source, Infrastructural Razor & Blades, Demand-Oriented Platform, Supply-Oriented Platform,

Bundling, Cell phone, Crowdsourcing, disintermediation, Fractionalization, Freemium, leasing, Low-touch, Negative operating cycle, Razor / Blades, Reverse Razor/ Blades, Reverse auction, Product to services, Standardization, Subscription, User communities.	- Who are the main actors? - How is the output developed? - What is the output of the development? - Who is interested in the output?	extra benefit from your data), network effects (collaborate in rich data environment). **Jetzek et al. (2013)** Conceptual model with four areas: Enabling factors, Innovation mechanism, Impacts. **Ubaldi (2013)** Five business models archetypes Suppliers, Aggregators, Apps developers Enrichers, Enablers	Free as Branded Advertising and White-Label Development Cost Avoidance, Sponsorship, Dual Licensing, Support and Services, Charging for Changes, Increasing Quality through Participation, and Supporting Primary Business.
	Dodds & Newman, (ODI, 2015) OBM Open Data Maturity Model based on the five (5) themes: Data management processes, Knowledge & Skills, Customer support and engagement, Investment & financial performance, Strategic oversight	**Sieber & Johnson P. (2015): (4) models** Data publishing, Code Exchange, Civic Issue Tracker, Participatory Open Data	**Bonina (2014) :(8) BM** Premium Products, Freemium Products, Open-Source-Like, Infrastructural Razor & Blades, Demand-oriented Platforms, Supply-Oriented Platforms, Free as Branded Advertising, White-Label Development
		Lokitz J. (2015). "Data as a Service (DaaS)" using Osterwalder's canvas	**Howard (2014): (8) ODBM** Premium Product / Service, Freemium Product / Service, Open Source, Infrastructural Razor & Blades, Demand-Oriented Platform, Supply-Oriented Platform, Free, as Branded Advertising, White-Label Development

Little is known about how Canadian SMEs use OGD. Most research on OGD in Canada is observational. Few studies have explored the mechanisms by which OGD can bring benefits to companies.

In Canada, the Open Data Exchange (ODX),[40] Open North[41] and Govlab,[42] conducted in 2016, a project called "the Open Data 150 Canada" that targeted 152 Canadian companies that use OGD. This project marked one of the first attempts to comprehensively map Canadian companies using OGD.[43]

The results suggest that Canadian SMEs use OGD but face several challenges in accessing and fully exploiting the data. Depending on the area of business, OGD, as accessible and free resources, represents a potential source of assets that could generate benefits and value.

The publication of open data by the Canadian government is based on a key assumption: it will improve collaboration, participation, and democracy, boost performance and innovation, and enable companies to create new products and niche markets.[44] On the other hand, there is a substantial gap in the evidence base relating to the use of OGD by Canadian SMEs. Most of the open data research used in this dissertation is published abroad.

A few studies on OGD, however, address some aspects of the Canadian context. For example, Roy (2014) examined the evolution of open data strategies in Canadian municipal

[40] ODX is a public-private-academic partnership created in 2015 to enhance access to open data for commercialization purposes in Canada. See, https://codx.ca/

[41] Open North is a not-for-profit social organization founded in 2011 to develop innovative online tools that promote government transparency and citizen participation. See, http://www.opennorth.ca/

[42] Govlab is an action research center based at New York University, initiated in 2012 to promote the design of more open, effective and networked governing institutions using data, technology and crowdsourcing. See, http://www.thegovlab.org/

[43] See, https://codx.ca/od150/

[44] See, https://open.canada.ca/en/open-data-principles#toc97.

governments to understand how open data can facilitate more open and innovative governance. Scassa and Singh (2015) explored the Canadian experience of Open data related to official languages. Moles (2019) investigated OGD curation using the City of Toronto as a case study. Diaz and Breux, S. (2021) provided a report on the re-users of open public data available on the portal of the City of Montréal. Lauriault (2022) investigated the Canadian open data story from a critical data studies approach and called for the adoption of a broader and more integrated openness approach.

Rivard et al. (2006) explored the relationship between information technology (IT) and firm performance through the lens of competitive strategy and the resource-based view (RBV). According to the authors, the RBV theory conceptualizes the enterprise as a 'bundle of unique resources.' If the same resource is owned by several competitors, it cannot contribute to a competitive advantage. The study included a survey of 96 small and medium-sized enterprises (SMEs) to test a model designed by Spanos & Lioukas (2001), which includes both Porter's competitive strategy framework and the RBV perspective. The authors proposed an integrated model that highlights how IT resources and capabilities can contribute to a firm's competitive advantage and overall performance. They emphasized the importance of aligning IT investments with strategic goals and leveraging IT resources effectively to create value. The article provides insights into how firms can strategically manage their IT assets to achieve sustainable competitive advantage in dynamic business environments.

Finally, the results of this study confirmed that there are two types of enterprise IT objectives associated with business strategy (internal objectives aimed at improving operational efficiency) and external objectives (aimed at the strategic positioning of the

company). In other words, it demonstrated that there is a first close link between the IT support of the company's assets and profitability, as well as a second link observed between the IT support of the strategy and market performance.

Given that OGD is digital data requiring the use of new technologies combined with basic or advanced technical knowledge, a few studies have been carried out on the use of new technologies by Canadian SMEs. A study by Raymond et al. (2016) showed how manufacturing SMEs can use IT to build a dynamic learning capability that enables them to compete. The authors argued that these SMEs should first consider thoughtfully deploying e-business capabilities, that is, by order of importance, e-intelligence, e-commerce, and e-collaboration capabilities for knowledge acquisition and assimilation. Indeed, this study underlines the importance of raising awareness among SME managers of the need to take greater account of their ability to acquire and assimilate knowledge and to transform and exploit it within the company.

In summary, the literature shows that OGD is thought to be something of value to companies. Publishing OGD for use or reuse could generate benefits for users, but the fact remains that this data needs to be collected, analyzed, and exploited. Although the authors (Ubaldi, 2013; Jetzek et al., 2014; Gonzalez-Zapata & Heeks, 2015; Zuiderwijk et al., 2015; Susha et al., 2015; Safarov et al., 2017) have attempted to explore the concept of OGD to highlight the benefits of its use and impact on the economy, the OGD potential must first be identified, explored in depth and revealed in order to increase interest in its use. Indeed, few studies suggest how SMEs can benefit from using OGD as an internal resource to create value to be more competitive.

As raw digital data, OGD can be distinguished by its characteristics and uses from those of other documents made accessible by the government (Janssen et al., 2012, Gonzalez-Zapata & Heeks, 2015). The articles on OGD found in the literature state that companies use and exploit data but do not present detailed descriptions that might explain how the data is processed to extract value or how this data is processed in the company's internal environment. Moreover, numerous business models have been identified and classified, including those which promote the use of digital resources in the sector of new technologies. The question that arises in this case is how these models could be adopted and applied by SMEs to support the use of OGD, benefit from it and be competitive.

Through the articles consulted, several theories have been applied in different contexts, enabling new models and frameworks to be developed. However, the contributions that have been made do not examine how other ministries are handled, used and exploited in practice by SMEs. In fact, some empirical work based on theory contributes little to advancing ideas about how firms use free resources to generate value.

Studies carried out in Canada on open data, published at the federal and provincial organizations, do not demonstrate how SMEs use data internally and, to what extent the use of OGD allows SMEs to obtain distinct products and services and to be competitive within the Canadian economy.

This debate is becoming increasingly important on how users, and especially businesses, can leverage and benefit from other technologies as a resource or asset once adopted internally.

2.3 Theoretical Framework

The discussion in the previous section focused on establishing an understanding of the concept of value with respect to the economic potential of OGD and explored the extant literature. The purpose of the discussion in this section is to introduce the theoretical framework informing the research presented in this dissertation – i.e., the Resource Based View of the firm (RBV), including notions of competitive advantage.

2.3.1 RBV in light of OGD

Schlagwein et al. (2010) note that whereas Barney (1991) claims that valuable resources must be protected and closed to external actors to ensure competitive advantages, new IT business models enable resources to be shared with competitors. In such cases, a firm's success, it is claimed, is possible through opening its resources to the public and/or using open resources.

Moreover, Schlagwein et al. (2010) contend that opening a valuable information resource to external users and competitors can benefit all stakeholders and create new niches in the market (for example, open-source software). In advancing this claim, the authors cited examples of IBM and Facebook. In 2005, IBM offered over 500 source codes to the Open-Source Software (OSS) community to support the Linux system and enable compatibility between IBM and Linux systems. [45] In 2007, Facebook opened its APIs

[45] In the late 1990s, IBM supported Linux with patent pledges, a $1 billion investment of technical and other resources, and dedicated resources to support the Apache Web Server projects. IBM continues to provide open sources to communities. See open source @IBM: https://www.ibm.com/opensource/story/

(Application Programming Interface) to its user profile information database, allowing developers to create more than 500,000 applications for the Facebook platform.[46]

Such examples suggest that data resources do not necessarily need to be immobile because they can be used in idiosyncratic ways to help a firm achieve a competitive advantage. In the case of open data, SMEs who use OGD (an external resource) but combine it with their internal resources, could contribute to achieving a competitive advantage since it is the mix of resources that provides an advantage relative to other firms.

To date, there appear to have been relatively few studies in which RBV has been applied as a lens for examining changes in firm behaviour in relation to open data and OGD. One exception is Zuiderwijk et al. (2015b), who examined the use of open data for creating a competitive advantage from the RBV and Resource Dependency Theory (RDT) perspectives. These authors chose RBV as a theoretical lens to anchor their study because, as they state, it allows for capturing a strategic management view of "how firms formulate and implement strategies in order to accomplish a desired objective" (p. 84).

Drawing from surveys, interviews, and the collection of stories from representatives of private companies, Zuiderwijk et al. (2015b) demonstrate that some firms combine their internal resources (e.g., survey and research) with external resources (e.g., open data) to achieve a competitive advantage. Their study suggests that a firm must have in-house capabilities and resources for using open data to begin with. These authors note that although open data resources are available to all companies, information capabilities are not (p. 80). Thus, to generate a competitive advantage from these freely available resources,

[46] Facebook is supporting several projects through Open Source technology to empowering communities. See, https://opensource.facebook.com/projects

a firm must develop its own capabilities. In addition, the authors' examination of open data use by private companies in Europe reveals that combining IT resources, information and data resources, and human resources is needed to gain a competitive advantage. This is noteworthy for the purposes of this dissertation because it suggests that OGD could be appropriated and combined with firm data and thus be treated as its own internal resources. At the same time, each firm could develop new capabilities (specific to each firm) to use OGD as an internal resource to build an advantage in exploiting this resource.

OGD, as a firm's resource, is free and accessible in abundance to all competitors. The open and available resources in the external environment of the firm can be collected, selected, refined, and combined with the existing internal resources of a firm to create new internal resources. Specifically, the question of whether and how an external public resource can be transformed into a firm's internal resource and trigger a competitive advantage is a key consideration in this study.

According to the RBV theory, a firm's resources can only become a source of competitive advantage if they meet the VRIO attributes (Valuable, Rare, Inimitable, Organizational). However, when the VRIO attributes are applied to OGDs, they are neither inimitable nor rare. Accordingly, based on the VRIO model, OGD cannot be a source of competitive advantage. The following section will explore the RBV in more detail to address this issue.

2.3.2 Resource-Based View of the Firm

The RBV suggests that a firm's unique resources and capabilities can be combined and leveraged to create a competitive advantage. Development of the RBV spans several decades leading to an articulation of characteristics of internal resources that can lead to competitive advantage. As will be discussed later, these characteristics include the degree to which the resource can provide value (enable the firm to become more effective or efficient), is rare, inimitable, and is well integrated into organizational processes (the VRIO framework). The general idea is that a resource needs to meet all these criteria to enable a competitive advantage.

We note, however, that the literature does suggest that firms are leveraging OGD to create new products and services. More recent explorations of the RBV suggest that the rise of digital organizations could require adjustments to the framework given that VRIO might decline substantially in the context of these types of ecosystems (Cuthberson and Fureth, 2022; Kim and Makadok, 2023). Helfat et al. (2023) suggest that the data firms have access to might increasingly become the basis for competition. Thus, more work is needed to examine how the strategies firms pursue vary accordingly. Accordingly, the VRIO framework might not fully explain competitive advantage when digital resources are involved, because information processing is an important element to consider when exploring the benefits of digital assets through the lens of the RBV.

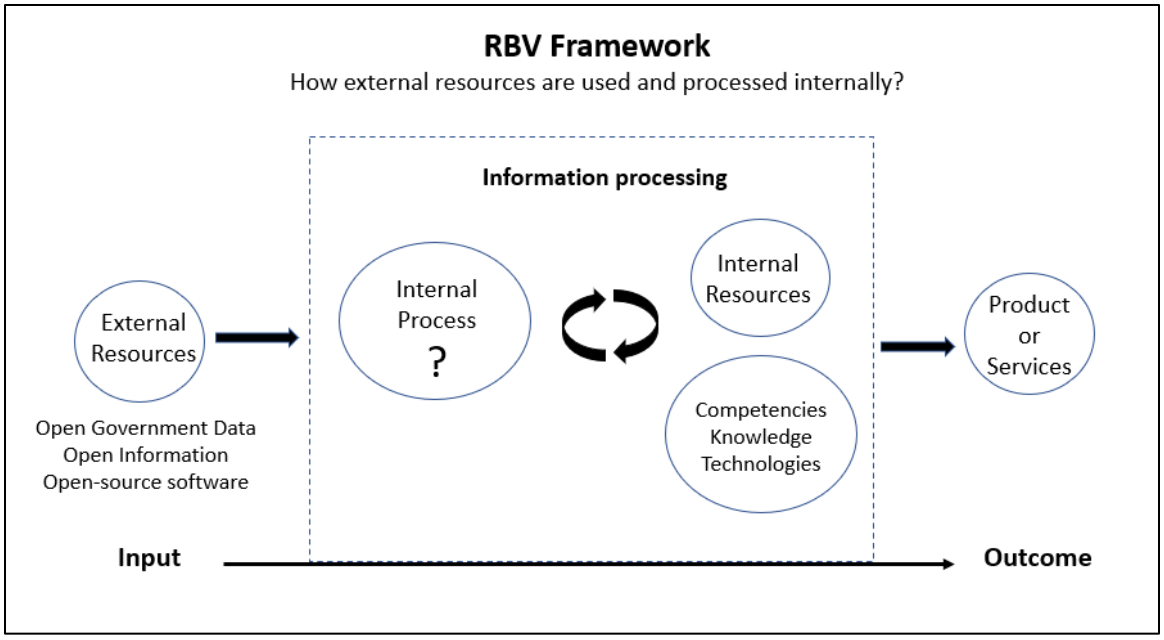


Figure 2.3.2.1: RBV and its Information processing

According to RBV, information processing is where people, technology and skills come together to transform resources and capabilities for acquiring competitive advantage (See Figure 2.3.2.1). However, RBV theory does not explain how to use internally external resources, nor does it describe the internal process. Moreover, this theory does not provide an answer on how to unlock value from resources, or how to combine external with internal resources and competencies to gain a competitive advantage. The RBV perspective of the firm originates in Penrose's 1959 Theory of the Growth of the Firm, which expounded upon differences between economic activity inside firms and in the market. Penrose averred that a firm could be understood as "a collection of productive resources, the disposal of which between different users and over time is determined by an administrative decision" (Penrose, 1959, p. 24).

Defining firms' resources as the physical things they can buy, lease, or produce and the people who effectively are part of the organization, Penrose (1959) maintained that the general purpose of firms is to organize the use of their internal resources in combination with external resources for the production and sale of goods and services. To this end, she identified two types of firm resources, physical and human, and hypothesized that firms grow – or not – according to how they deploy and leverage these resources. She defines physical resources as all "tangible things" used in the production process (plant, equipment, materials, products, stocks), and human resources as all unskilled and skilled employees involved in all firm processes (clerical, administrative, financial, legal, technical, and managerial staff).

This said Penrose was quick to note that these physical and human resources are only meaningful in the context of their environment. She writes:

> It is never resources themselves that are the "inputs" in the production process, but only the services that the resource can render... exactly the same resource when used for different purposes or in different ways and in combination with different types or amounts of other resources provides a different service or set of services. (1959, p. 25)

Put simply, services are derived from resources following their acquisition and deployment within the firm and are described as 'an input' by Penrose. However, the author insists on the ability to select, combine, and use the resources to provide various services insofar as these resources enable the creation of new products and support the firm's activities.

Penrose (1959) maintained that the most important resources are human resources, emphasizing the managerial staff and their interactions inside the firm. She explains that a

firm's growth depends on the knowledge, competencies, and experiences of its human resources. In her view, entrepreneurial employees and managers are at the heart of the production process because they are the ones who have the ability to perceive and identify profitable activities (p. 31-37).

For Penrose, all firms' resources are a set of potential productive services insofar as they can be selected, transformed, and directly contribute to generating profit. While explaining the importance of optimizing a firm's resources, she notes that not all resources are exploited or used efficiently to provide services. Indeed, a firm can select certain resources and not use them immediately. These resources, "unused or slack resources," are set aside by the firm for eventual transformation or use in creating a new product.

When these unused resources are combined, reorganized, and improved, they become the main driver of the firm's expansion. These resources can provide productive services that, in turn, may enable firms to get a unique and competitive product or service in the market. The process of enhancing unused resources can lead to innovation and thus become a source of competitive advantage. Unused productive services are, for the enterprising firm, at the same time a challenge to innovate, an incentive to expand, and a source of competitive advantage. They facilitate the introduction of new combinations of resources – innovation – within the firm. (Penrose, 1959)

The productive services are generated by combining unused resources, knowledge, skills, and entrepreneurial abilities. However, the entrepreneurial capacities of the firm acquired by using the resources create a favourable environment to identify and take advantage of the potential services available from the unused productive services. In this context, Penrose defines 'capacities' as the abilities and competencies of firm managers to

leverage resources. In her view, these capacities play an important role in the firm's expansion. She wrote:

> The services that resources will yield depend on the capacities of the men using them, but the development of the capacities of men is partly shaped by the resources men deal with. The two together create the special productive opportunity of a particular firm. (Penrose, 1959: 78)

According to Penrose, resources, knowledge, experience, competencies, and capacities are not equally available to all firms; they are particular to each firm. The firm's history matters because it combines the knowledge and know-how developed internally, and the experience accumulated since its creation. Protecting the internal fruits of extensive research and development from competitors to maintain a competitive advantage. In addition, the capacities and competencies of the entrepreneurial employees and managers, combined with the firm's historical knowledge, enable it to produce and diversify its services.

With respect to OGD, several critical ideas emerge from Penrose's writings. First, the notion of resources providing a service: In the OGD world, data can be used internally to improve organizational efficiency or externally as a product or service sold to others. Second, the idea of slack resources is important to consider since companies might download OGD and not use it for a while. Third, investment in knowledge and skills are needed to make productive use of resources.

Wernerfelt (1984) both re-launched and extended the foundations of a nascent RBV of the firm. Wernerfelt's research focused on a product-based notion of firm strategy and redirected attention to the association between firm resources and strategy. Drawing from Penrose (1959), he proposed that resources and products are "two sides of the same coin," with most products requiring several resources and most resources being able to be used in

several products. For Wernerfelt (1984), resources refer to "(tangible and intangible) assets which are tied semi-permanently to the firm" (p. 172) and which can be thought of as comprising, in part, the strengths and weaknesses of any given firm. Examining how resources lead to profitability over long periods of time, Wernerfelt (1984) applied Porter's five competitive forces framework as a tool for analyzing firms "from the resource side rather than products side" (p.171).

In his canonical 1984 article, Wernerfelt explains that the performance of firms directly depends on their products but that firms remain strongly and indirectly influenced by their resources insofar as products are the result of how firms apply and use their resources. Moreover, he argues that 'versatile' resources give more options and contribute to achieving competitiveness (p. 178).

Wernerfelt (1984) labels internal firm resources that directly or indirectly influence its position in the market in terms of strengths and weaknesses as the 'firm's resource position.' In his view, the latter constitute essential resources for creating products with a strong potential for generating high profits and, as such, determine the firm's success and/or failure. In addition, resource position can create what Wernerfelt labels 'resource position barriers.' Drawing on Porter's (1980) notion of 'entry barriers',[47] Wernerfelt defines resource position barriers as "partially analogous to entry barriers" (p. 173). He writes:

> An entry barrier without a resource position barrier leaves the firm vulnerable to diversifying entrants, whereas a resource position barrier without an entry barrier leaves the firm unable to exploit the barrier (Wernerfelt, 1984, p. 173).

[47] Porter (1980) defines entry barriers as the requirements or conditions in a competitive industry that make it difficult for a firm to access the market.

According to Wernerfelt, resource position barriers contain mechanisms that enable firms to have an advantage over their competitors and which can also serve as obstacles to the entry of competitors into the market. Like Penrose, he contends that a firm's growth strategy must be based on finding a balance between exploiting existing resources and developing new ones. Put simply, if a firm possesses new types of resources (e.g., OGD) that can be accessible to all competitors, these 'new' resources can potentially lead to high profits so long as they can be improved upon by adding and mixing them with a firm's existing resources (i.e., firm knowledge, experience, and entrepreneurial abilities of its managers). All resources and capabilities used to enhance these 'new' resources can create other new resources that, in turn, can constitute resource position barriers for other competitors.

With respect to the use of OGD, Wernerfelt's framework highlights a few important issues. The multiple uses and reuse of resources to create products and services is a key consideration. Open data can be packaged, likely more easily than other forms of resources, into various products suitable for consumers. Secondly, the notion of resource position barriers is not likely relevant in an environment of free resources unless the idea here is that using OGD resources needs to be tied to the firm.

While external factors play a role in defining a company's competitive position, the authors of the RBV argue that internal resources are also crucial. Barney (1991), who was strongly influenced by the work of the authors discussed thus far, introduced an approach for understanding and explaining how resources are managed inside firms to achieve competitive advantage. He is recognized as the first person to label the notion of RBV and

was followed by several other researchers, such as Petraf (1993), Mata, Fuerst, and Barney (1995), and Teece et al. (1997).

Building upon the work of Penrose and Wernerfelt, he suggested that instead of focusing primarily on external influences when analyzing competitive strategy, firms should look to internal influences and potentials to achieve sustained competitive advantage. For Barney (1991), sustained competitive advantage refers to maintaining a favourable competitive position over the long term by exploiting the firm's valuable resources and preserving its potential for future gains. Barney (1991) explains that resources must be selected, linked, and/or combined with other resources and protected by firms to take advantage of them. In his view, firm resources have two origins: external and internal. The former are inputs from outside a business, and the latter comprises assets, capabilities,[48] and skills available inside the firm that cannot be imitated or obtained from outside. These internal resources are often seen as principal sources of competitive advantage. Barney (1991, p. 101) identifies three categories of resources:

(i) Physical capital resources (e.g., plants, equipment, technology, and raw material),

(ii) Human capital resources (e.g., expertise, knowledge, intelligence, and employees' experience), and

(iii) Organizational capital (e.g., the organization's planning, reporting, coordinating, controlling mechanisms, and relations between the firm, people, and its environment).

However, his focus is primarily on human resources and available and valuable capabilities within an organization. The combination of key abilities, knowledge, and

[48] Capabilities are a firm's capacity to deploy use or exploit resources. See, Amit and Schoemaker (1993).

competencies within the firm drives this focus. Barney argues that this combination is essential to trigger the process of transforming resources into new products.

According to Barney (1991), resources are valuable when they enable a firm to implement strategies that improve its productivity and profitability, including leveraging assets to neutralize environmental threats. He explains that it is possible to benefit from "efficiency rents" (p. 116), where the latter is defined as "a return in excess of a resource owner's opportunity costs." Rents correspond to the difference between what the firm invests in the factor of production and what can be earned from the result of that investment. Internal resources are historical investments that are unique to the firm through development, training or idiosyncratic processes that lead to greater efficiency thus saving on production costs. These savings on production costs contribute to achieving a competitive advantage (Penrose, 1959; Barney, 1991).

Valuable resources, he argues, must be protected, and closed to ensure sustainable competitive advantage. This is because firms can earn sustainable returns if they have strategic resources that are secured by some mechanism preventing their replication by a competitor and diffusion throughout the industry. Figure 2.3.2.2 provides a schematic view of the argument.

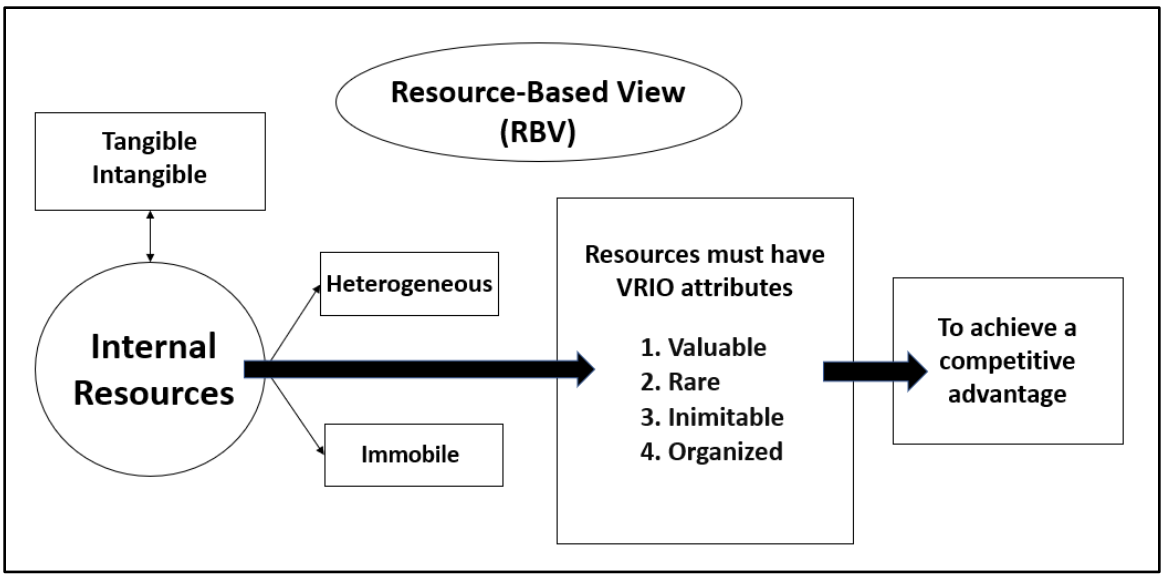


Figure 2.3.2.2: The Resource-Based View Framework

Barney (1991) argues that firm resources may be heterogeneous and immobile. Heterogeneity implies a mix of resources combined in some unique way. A firm controls immobile resources and does not share them with other firms. These characteristics enable a firm to implement strategies to improve its efficiency and effectiveness relative to other firms. This is possible insofar as the diversity and particularity of the firm's resources do not allow their transfer to another firm. These two characteristics create barriers to entry and mobility thus preventing other firms from acquiring the same resources (Barney, 1991). In addition, his approach to analyzing key internal resources is based on specific attributes of firm resources.

Barney argues that a limited number of empirical indicators can identify whether resources can become a source of competitive advantage. Indeed, he first attempted to identify key resources by assessing whether they meet the following four VRIN attributes:

1. Valuable. Valuable resources involve value-creating strategies, improving firm effectiveness and increasing efficiencies.
2. Rare. Rare resources are not available to competitors.
3. Inimitable. Inimitable resources are duplicable by competitors.
4. Non-substitutable. A non-substitutable asset means that not other resources can't substitute for the resources in question.

Ten years later, following much criticism of *VRIN*, particularly by Priem & Butler (2001), Barney modified the attributes to *VRIO*: Valuable, rare, costly to imitate, and organized to capture value.

The concept of "organization" implies that a firm must organize its management systems, processes, organizational structure, and culture to be able to fully leverage its resources and capabilities and achieve sustained competitive advantage. This characteristic necessarily implies some level of management skill, perhaps over and above the management skills available to competitors.

Based on the VRIN[49]/ VRIO[50] attributes, Barney (1991, 1995, and 2001) concluded that not all firm resources hold the potential to sustain a competitive advantage. He distinguishes four categories of competitive advantage, and each is contingent on the resource's attributes.

[49] Valuable, rare, inimitable and non-substitutable asset (VRIN). The VRIN attributes serve as a decisive test to determine whether a resource can be a source of sustainable competitive advantage.

[50] Valuable, rare, costly to imitate, organized to capture value (VRIO) VRIO is a tool to assess the strategic potential of a firm's resources by evaluating their value, rarity, imitability, and organization.

Based on this work, Mata, Fuerst and Barney (1995) proposed four categories of competitive advantage based on the VRIO characteristics, as follows:

- Competitive disadvantage: A competitive disadvantage will occur if firms possess no valuable resources. The firm underperforms in comparison with other competitors in the same industry.
- Competitive parity: When resources are valuable, rare, and not distributed heterogeneously, a competitive parity will occur, which means that the firm has the same performance as two or more firms at the same level.
- Competitive advantage: A temporary competitive advantage will result if the resources are valuable, heterogeneous and can be imitated. This means that the firm has obtained a good performance relative to competitors over a certain period.
- Sustained competitive advantage: If the resources are valuable, heterogeneous, inimitable (i.e., mobile), and organized to capture value, the firm can benefit from a sustained competitive advantage. This means that the firm achieves a higher performance for a longer period when compared to its competitors.

Mata, Fuerst, and Barney (1995) employed this model to analyze the link between using IT to leverage resources and enabling IT to be a potential source of sustained competitive advantage. Using the RBV logic, these authors claim that tangible IT assets such as hardware and software do not confer competitive advantages. They posit that managerial IT skills are the most likely source of sustained competitive advantage in this context. The

latter, they propose, are not common among competitors, and without them, the full potential of IT for a firm will not be realized.

The scenario outlined in Figure 2.3.2.3 suggests that, to maintain competitive advantage, firms engaged with OGD, for example, would need to collect resources that offer an opportunity to earn a profit and are both heterogeneous and immobile. For instance, if an existing law firm collects open datasets on cases and legal decisions from the governmental portal, it will create a reliable database. The processing and combination of these data with the firm's internal data can create a database. If this database is user-friendly and up-to-date, it will be useful for clients who pay to access it regularly as a service of the firm. Using the open data sets could improve the reliability and quality of the firm's services and thus increase its profit and reputation. Moreover, the specific tools, IT skills, and managerial processes used to create the database are heterogeneous and likely immobile since it would be difficult to replicate all aspects of the human and technological components that comprise the database.

The RBV has generated much debate over the years and is related to other schools of thought, mostly focused on the internal deployment of resources, and the capabilities needed to do so. According to El Shafeey & Trott (2014), this field of inquiry can be divided broadly into three complementary schools of thought, each of which focuses on specific elements of firm behaviour: Resource-Based View (RBV), the Dynamic Capabilities view (DC), and the Competence-Based View (CBV).

The first school of thought, RBV, principally focuses on strategic resources and capabilities. Barney (1991) defines resources as the sum of assets and capabilities within a firm. Strategic resources are thought to include "all assets, capabilities, organizational

processes, firm attributes, information, knowledge, etc. controlled by a firm" (p. 101). In 1995, Barney clarified that "resources and capabilities "include all of the financial, physical, human, and organizational assets used by a firm to develop, manufacture, and deliver products or services to its customers" (p. 50). The key assumption upon which the perspectives that loosely make up this school rest is that firms possess differing bundles of productive resources—heterogeneous and immobile, that are the essence of their competitive advantage. The strategies used by firms to obtain competitive advantage is related to how the resources are integrated into the production process (Penrose, 1959; Wernerfelt, 1984; Barney, 199, 1995; Mata et al., 1995; Peteraf & Barney, 2003, Barney & Clark, 2007).

Amit and Schoemaker (1993), argue that this resource integration process relies on capabilities that refer to a firm's capacity to deploy resources and are based on developing, carrying, and exchanging information through a firm's human capital.

The dynamic capabilities perspective considers 'resources' as available assets that are controlled by a firm, with capabilities understood as the ability to harness these resources to deliver innovation and to adapt to changes in the business environment as they occur (Forsman, 2015). Put simply, capabilities here are seen as patterns of actions in using assets that transform inputs into outputs (Wade & Hulland, 2004). Grant & Verona (2015) state that capabilities are "latent constructs that are inherently unobservable" (p. 61). They are also central to the firm's dynamic capability view.

Teece et al. (1997; 2010), a key proponent of this school of thought, contend that resources may be understood as firm-specific assets that are difficult or impossible to imitate. These authors extended the RBV by introducing the idea that a firm's ability to

adapt and change its resources is important to maintaining competitive advantage. They define dynamic capabilities as referring to "the firm's ability to integrate, build, and reconfigure internal and external competencies to address and shape rapidly changing business environments" (Teece et al., 1997, p. 516). Competencies, on the other hand, refer to the skills needed to exploit resources and create new products.

Teece (1997) describes capabilities as dynamic because, in his view, they are focused on the development and renewal of resources and have the potential to be sources of competitive advantage. Teece (2018, p. 189) explains that capabilities emerge, in part, from a firm's combination of learning, organizational assets, and acquisitions. As such, capabilities are seen to be specific to each firm when deploying resources. Research adhering to this perspective tends to examine such things as how markets co-evolve with firm capabilities and technologies (Teece et al., 1997; Eisenhardt & Martin, 2000; Winter, 2003; Seoudi, 2009).

The third approach is known as the (core) competence-based view (CBV) of the firm. This school of thought draws from social constructivism and focuses on competencies that facilitate firm adaptation to changing environments. Core competencies may be understood as a combination of resources and capabilities available to an organization. They are sometimes referred to as strategic assets and/or competitive advantages. The key assumption upon which this perspective is anchored is that core competencies enable firms to integrate economic, organizational, and behavioural concerns to construct and shape the environment in which they exist (El Shafeey & Trott, 2014). Research adhering to this perspective tends to examine how firms create future markets through learning new

competencies and creating new knowledge (Prahalad & Hamel, 1990; Sanchez et al., 1996; Sanchez and Heene, 2004).

Taken together, the above three schools of thought have contributed to the understanding of how strategies for optimizing resource management are developed within firms. Although the RBV has been criticized (Kraaijenbrink et al., 2010), it forms a basis for considering resource deployment in firms and how competitive advantage can be generated and protected. The authors identify eight categories of critique:

1- RBV is lacking in managerial implications (Priem & Butler (2001b), Connor (2002);
2- RBV involves a firm in endless research for higher capabilities (Priem & Butler (2001a), Mahoney (1995), Teece (2007));
3- RBV as having only very limited applicability; (Connor (2002), Barney (2002));
4- Sustained competitive advantage is not achievable (Barney (1991), Fiol (2001));
5- RBV is not a theory of the firm (Priem & Butler, (2001b), Mahoney (2001));
6- The resources attributes of the VRIN and the VRIO are neither necessary nor sufficient for the sustained competitive advantage (Mahoney, (1995), Peteraf & Barney, (2003), Pitelis (2007));
7- The value of a resource is too indeterminate for a theory (Priem and Butler (2001a, 2001b), Peteraf and Barney (2003);
8- The definition of resource within RBV is unworkable ((Priem & Butler, 2001a), Amit, and Schoemaker (1993), Peteraf (1993);

Other criticisms were cited in the literature and include:

9- Claims that Barney (1991) did not explain how to develop and to acquire the VRIN (Priem & Butler 2001; Kraaijenbrink et al, 2010);
10- Suggestions that VRIN/VRIO attributes ostensibly are an exogenous black box (El Shafeey & Trott, 2014); and
11- Too little consideration has been given to factors surrounding resources (Zuiderwijk et al. 2015b).

With respect to the use of OGD by SMEs, the various frameworks suggest that external data that are free resources can be seen as assets for the organization. Although the asset is free, the firm would need internal capability to capture and integrate it with other resources. The cost of doing so would be lower, of course, than if the firm paid for the asset, but the firm would need to be cognizant of the "total cost of ownership" that includes integration and maintenance. The sole basis for generating competitive advantage then, would be the internal capabilities that could not be easily replicated by competitors.

2.3.2 Competitive advantage

According to Porter (1980), competition determines the success or failure of firms. He argues that a competitive strategy is required when firms struggle to cope with increasing competition. In his view, competitive strategy aims to find a position in the industry where a firm can be protected from competitive forces or influence them to its advantage. In other words, competitive strategy is about achieving a competitive advantage in the market where a firm competes. Porter (1980) defines the concept of 'competitive advantage' as the superior performance and position that a firm can achieve in the market compared to other firms.

To this end, Porter (1980) advances a framework for both assessing the profit-making potential of an industry. This framework involves looking at five forces that he contends determine the dynamics of a specific industry:

1. Barriers to entry;
2. Threat of substitutes (i.e., how can the firm's product or service be substituted);
3. Bargaining power of buyers (i.e., positions and ability of buyers to order large volumes);
4. Bargaining power of supplies (i.e., the position of sellers, potential suppliers, and monopoly); and
5. Rivalry among the existing firms (i.e., competition between players and dominant players).

This framework contributes to understanding competition in the market, improving, and maintaining long-term profitability by offering a means of deconstructing and analyzing industry structure and a firm's relative positioning within that structure. This framework is

also useful when a firm needs to create or adopt a new corporate strategy for a given industry sector. Porter (1980) proposes "three potentially successful generic strategic approaches" to cope with the five competitive forces (p. 35-38):

1- Overall cost leadership: A firm can obtain a privileged position in the market by reducing its costs, thereby providing the same products and services as its competitors at a lower price.
2- Differentiation: A firm can obtain a differentiation advantage by providing superior and/or unique products or services, thereby offering better advantages to its clients than its competitors.
3- Focus: A firm can focus on a particular target group, segment of product, or geographic market, thereby allowing it to concentrate effectively on a particular niche market audience or segment while its competitors compete more broadly.

According to Porter (1980), any of these three approaches can be used to achieve competitive advantage in a wide range of industries. However, only one generic strategy can be applied at a time because each approach appeals to a different consumer base and various organizational strengths and attributes.

Wang (2014) argues that a competitive advantage is achieved when an organization develops or acquires attributes that enable it to perform better than its competitors. Resulting from strategic organizational actions, it is therefore possible to identify a competitive advantage when a company's profit margin is higher than the average profit margin of all the companies in its industry (Peteraf, 1993; Wang 2014). The uniqueness of the strategy adopted by the firm is defined by the rareness, the value, and the inimitability, which enables an organization to re-organize and allocate valuable resources to promote

knowledge and creativity (Barney, 1991; Wang, 2014). Establishing a competitive position in the market requires some action from the company, such as the use of internal resources or relationships (Wang, 2014).

Peteraf (1993) proposed four "cornerstones" necessary to maintain a competitive advantage: Heterogeneity and imperfect mobility, *Ex post* and *Ex ante* limits to competition. The first is based on the heterogeneity of resources as previously discussed. While firms with only average resources hope to achieve equilibrium, those with superior resources obtain Ricardian (based on inherent scarcity of resource supply) or monopoly economic rents (based on the deliberate restriction of output). However, companies can only maintain their competitive advantage if their resources are rare and inimitable.

Imperfect mobility is a related but slightly nuanced concept. Resources that are immobile have no use outside the company that owns them. Resources that demonstrate imperfect mobility will see their value diminish when they are used in another context (Forgues & Lootvoet, 2006).

Ex-post limits to competition suggest that once a company has obtained a competitive advantage, barriers will limit the competition to maintain resource heterogeneity. Lippman and Rumelt (1982) identified causal ambiguity as one approach to protecting the resource: the ways in which the resource has been integrated into the operational process make it difficult for competitors to imitate. They are unable to understand or imitate the key elements that make the business successful.

The fourth condition for maintaining competitive advantage, identified by Peteraf (1993) is *Ex ante* limits to competition. The argument here is that before the firm acquires

the asset, there should be limited competition for it. Otherwise, the price will be bid up to the point that the resulting return might not be of great value.

With respect to OGD, *Ex ante* limits do not seem to apply since the resources are free. Neither does the concept of "supply scarcity": one firm downloading a dataset does not preclude another from doing so. Accordingly, competitive advantage in using OGD would likely rest solely on the integration capacities of SMEs using the resource.

However, the question here is how to generate a competitive advantage when SMEs use external resources such as OGD. The literature review showed that RBV, as introduced by Penrose (1959) re-launched by Wernerfelt (1984), and developed by Barney (1991, 2001), does not describe how external resources are used, processed, and transformed in the internal environment of the firm to make enough valuable to acquire a competitive advantage. Furthermore, this theory does not explain how we create value from external resources combined to gain a competitive advantage. Accordingly, the motivation for this study started from the question of how external resources, such as OGD, brought into the organization are used, processed, valued, and leveraged by the organization.

In this dissertation, to describe and to understand how external resources as OGD, are used by a firm, we applied Hunter's model (2015), which describes how resources, particularly digital assets, are processed and transformed by small companies through their information systems.

2.4 Conceptual Framework: Information System

About the use of OGD, firms need some form of information system (people with skills and technology to capture and process the data). The discussion below helps to define an information system as a mix of people and technology, as well as key data processing steps needed.

The RBV perspective suggests that a firm's resources and capabilities can generate sustained competitive advantage (Barney, 1991). This said, Barney (1991), maintains that an information processing system "is deeply embedded in a firm's informal and formal management decision-making process" and "may hold the potential of sustained competitive advantage" (1991, p. 114). While this author suggested that the information system is where people, and skills come together to transform internal resources and capabilities and acquire competitive advantage, he did not identify or describe any internal process on how to leverage these resources. Barney (1991) considers that internal resources must be protected and should be kept secret. But in a new open world, another question emerges, how can the data be processed within the company? Hunter (2015) attempted to answer it by exploring the information systems of small businesses.

A firm's information processing system is socially complex and involves the close interconnection of people and computers. Therefore, a firm's information processing system is key to achieving a sustained competitive advantage precisely because it is not imitable. But few firms have been able to create a close manager-computer interface (Barney, 1991). He envisions an information processing system[51] as an environment in

[51] The difference between information systems and information processing systems was highlighted by Teichroew et al. (1978, p. 189). These authors claimed that information processing systems, as subsystems of information systems are the formal processes within an organization that include formal procedures,

which data processing capacity and people's knowledge and skills are combined to create a rare and specific system to process firm resources. He posits that this internal and formal system within the firm enables the creation of an internal ecosystem that generates the firm's performance. In this manner, Barney's 'information processing system' broadly parallels contemporary notions of 'information system' as an environment rather than a technological platform.

Yaverbaum et al. (2004) define the 'information systems environment' as an area where information systems professionals can apply technology skills professionally in an organization (p.5). They also define the 'environment' as the ecosystem in which information systems are employed (p.6). According to Yaverbaum et al. (2004), an information system interacts with its environment by responding to it and potentially shaping it.

To avoid any confusion between 'information system' and 'information technology', we define 'information technology' as a set of tools, including software, hardware, communications technologies, and related services for storing, retrieving, and sending information.[52] The term 'information system' is understood as comprising people/computer interactions that help to collect, store, combine and convert data into information[53] while using Information Technology. In this context, the concept of

manual systems, and all operations performed manually. Teichroew et al. (1978) distinguished two types of information processing systems: 1- Manual systems that are used for all operations performed manually; and 2- Computer-based systems that support some operations performed by a computer. The information system is a sub-system of an organization in which information is received, recorded, processed, stored, retrieved, and transmitted. The information system may be informal, depending on the firm strategy. Barney's understanding of an information processing system coincides more with a combination of the manual systems created by the firms (which are specific to them and, therefore, rare) and computer-based systems. The latter is mainly based on machines that can be purchased and are likely to be imitable.

[52] See, what is Information Technology? See link here
[53] Geeksforgeeks.org (2019) See, link here

information systems is used to structure an analysis of what happens inside an organization to transform resources and capabilities to acquire a competitive advantage.

Tarafdar & Gordon (2007) claimed that the RBV literature classifies resources related to a firm's information systems into three distinct categories:

1. Technical, including hardware, software, databases, applications, networks and firm-owned technology and applications.
2. Human, comprising the skills of information system professionals, including: technical, experimentation and innovation, IT management, communication, and understanding of the business.
3. Skills intangibles encompassing knowledge assets, a customer orientation, a flexible Information system culture, vendor relationships, end user and top management relationships and partnerships between IT and business units.

This categorization is relevant because it highlights the interplay between human and technical skills in functioning information systems. At the crossroads of sociology, marketing, human resources management, and strategic management fields, information systems are used to explain what is happening within an organization and how resources are transformed to obtain a competitive product (Rodhain et al. 2010). The information system is organized to facilitate an organization's planning, control, coordination, and decision-making. It is specific to each organization regarding its resources, human skills, and capabilities.

Adopting a socio-technical perspective, Laudon & Laudon (2013) define an information system as "a set of interrelated components that collect (or retrieve), process, store, and distribute information to support decision making and control in an organization" (p. 45). The authors explain that there is no business without an information system. Being key elements of an organization, information system components are essential for running a

business, namely people, structure, business processes, policy, and culture. Information systems, they maintain, are more than computers. In their view, using information systems requires understanding the organizational, management and information technology dimensions that shape these systems. In this context, use refers to an approach to organizational work design based on the interaction and "mutual adjustment" of the behaviour system (people) and technical system (technology) to achieve optimal performance of the firm. The authors consider that the social and technical systems used in production processes, for example, must be optimized to achieve firm targets. Furthermore, contemporary firms use information systems intensively and invest more and more in information technology to increase their performance.

According to Laudon & Laudon (2013), most firms focus on information systems to achieve six strategic business goals: operational excellence, new products, services, and business models, customer and supplier intimacy, improved decision-making, competitive advantage, and survival.

Echoing Barney's (1991) formulation of the information processing system, Hunter (2015) states that an information system translates data into information to support various decision-making activities within a business. An information system can be manual (i.e., operations performed by humans) or automated, depending on the volume of transactions and data quantity. He claims that data are "raw unorganized facts in the business environment" (p. 82) and are collected by firms for commercial purposes. These data are turned into information to support decision-making within a firm.

Hunter (2015) explains that when transaction and data volumes increase, an information system becomes necessary and could be automated. He argues that SMEs' information

system helps to reduce costs, increase profits, improve services, acquire a competitive advantage, and develop new business initiatives. For example, SMEs can garner potential benefits and competitive advantages from increased sales, profits, productivity, and improved decision-making (Barney, 1991; Thong, 2011; Janssen & al, 2012; Ubaldi, 2013) through the strategic use of their information system (Delone & Mcleod, 1991; Gu & Jung, 2013; Hunter, 2015). This is noteworthy because resources passing from the external to the firm's internal environment are indeed processed to extract information and create a new innovative and profitable product.

Given Hunter's definition, an information system could process all sorts of data needed by an organization but still depends on human resource skills and software used or owned by the firm. He identifies five components comprising the basic information system environment as follows:

1- People. They are the most important component of the information system because they have the knowledge to operate the system as well as to analyze and to interpret results;
2- Processes: Applied to data, there are five generic processes, namely, calculate, compare, sort, classify, summarize;
3- The hardware; all tangible parts of the computer (e.g., system unit, internal and peripheral devices);
4- The network. It provides an interface to receive or send information.
5- The software –i.e., all programs and procedures necessary for operating a computer system and the applications.

Laudon & Laudon (2013) and Hunter (2015) argue that collected and selected data can be introduced in the SMEs' information systems as an "input" and transformed into information through several processes, such as: calculating, comparing, sorting, and

classifying. Laudon & Laudon (2013, p.46) state that the input captures or collects raw data from within the organization or from its external environment. Hunter (2015) offers the following diagram to illustrate how data is handled within the firm's internal environment (See Figure 2.4.1).

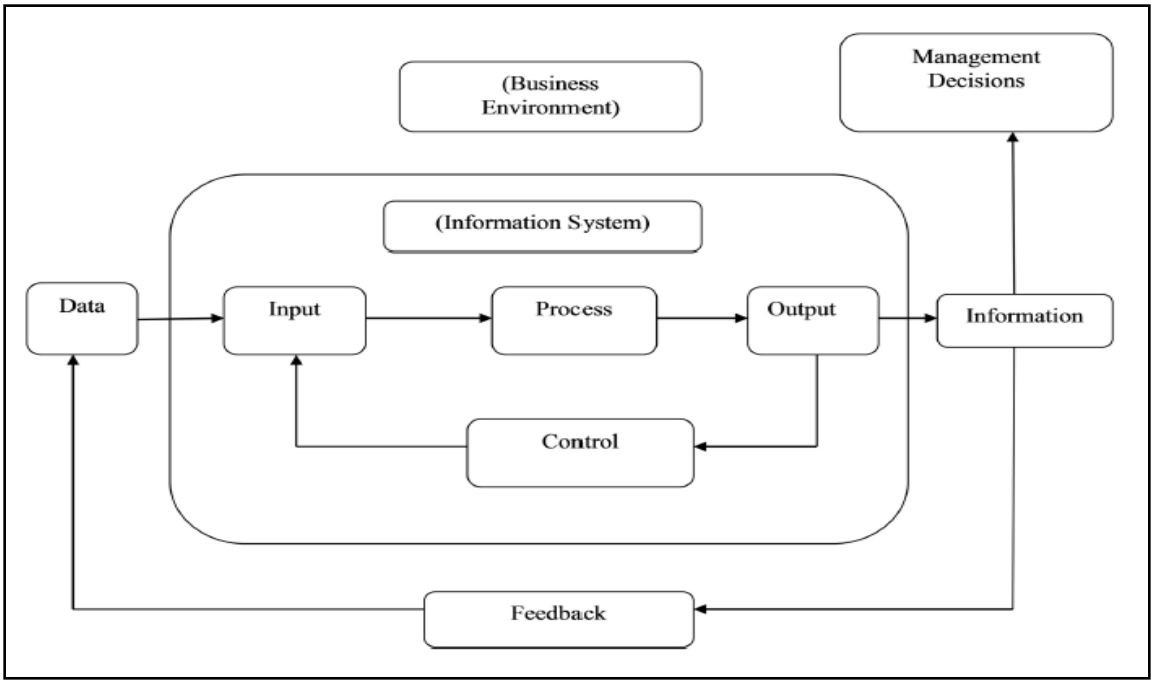


Figure 2.4.1: General Information Systems Diagram

Source:
Hunter, M. G. (Ed.). (2015). *Strategic Utilization of Information Systems in Small Business*. IGI Global.

Hunter (2015) explains that once collected, the data crosses the threshold separating the business environment from the information system and becomes Input. Otherwise, the company's employees select, collect, and organize the data to enable their use as input within the information system. When the data has been entered into the information systems, it needs to be expressed in the language of this system.

The “process” stage is the heart of the information system and depends on the firm’s assets and capabilities. A process with several steps is applied to leverage data. According to Hunter (2015), five generic processes, namely, calculate compare, sort, classify, and summarize, are used to process data. This process requires all employees’ skills, the firm’s knowledge, technology and communication network, software, dataset and more.

The ‘process’ depends on the firm's available resources, capabilities, and the targeted product or service. This is noteworthy because it could enable the identification of the common elements or steps needed to process external resources, such as OGD. Although the firm’s information system is complex, examining the process and its components could help observe how OGD as external resources can be added, processed and integrated with the existing firm internal resources.

The processed data is shaped to make it meaningful and useful for users, called the output (e.g., a new product or a service). This stage can involve such things as capabilities and competencies of the human capital, among other things, to introduce and to promote the products in the markets (Hunter, 2015). The final product resulting from the whole process is “information.” This is noteworthy for the purposes of this dissertation because the information system framework offers a lens through which to investigate how data is used within a firm’s process stage.

Bourgeois et al. (2019) define the process as a series of steps and tasks to accomplish a specific goal or outcome for a firm. They argue that some businesses focus on the process stage and use it to achieve competitive advantage. For example, a firm can adopt a process that eliminates costs and allows it to reduce the price of its products or services. As a result, the firm could be more competitive. The firm’s objective is to improve its internal and

external processes and their interfaces with suppliers and customers to increase its performance and be more competitive within its sector of activity.

Bourgeois et al. (2019) indicate that within an information system, new roles of individuals are regularly created within the firm based on human reasoning, creativity, and leadership. In order to create a new product, it is important to renew skills and acquire new technologies that are essential to information systems.

Information systems with their components (technology, people, and processes) could enable any firm to create new products and services within the contemporary business environment. According to Veit et al. (2014), the contemporary growth of the Internet has enabled an unprecedented wave of digitization to create more opportunities for businesses by enabling them to expand their business transactions on the web.

Firms have had to adapt their business logic and processes in this rapidly changing competitive environment to survive or maintain their position in the market. In this case, businesses have chosen to adapt their business strategy and models[54] because these adjustments can provide a framework for structuring, analyzing, and designing new approaches in a new environment. (Osterwalder and Pigneur, 2013; Veit et al., 2014).

[54] In Information system research, the business model is used as a tool or a framework for depicting, innovating, and evaluating business logic in start-ups and existing organizations because it provides a link between the firm's strategy and its processes, according to (Veit et al. 2014, pp. 45-46). According to Teece (2018, p.40), a business model describes an architecture for how a firm creates revenues, manages costs, achieves profits and delivers value to customers. He argues that a successful business model is possible if the VRIN assets, as described by Barney (1991) - valuable, imperfectly imitable and non-substitutable – are associated with this model. The design and operation of a business model depend on the firm's dynamic capabilities. To highlight how a business model creates differentiation from competitors, Teece (2018, p.40-41) compares the business model of Uber and a traditional taxi cab company. Uber's business model is based on software and data skills with the ability to manage activities at a global level using information technologies. Meanwhile, taxi companies are low-technology skills-based businesses because their activities are based in a limited geographical area and restricted competition. Uber's taxi drivers must be able to use GPS driver guidance and Uber applications to provide services. While traditional taxi cabs have no obligation to use digital technologies.

In most cases, to seize new opportunities, a firm needs the managerial skills to implement a new strategy and enhance its information system (Viet et al., 2014). However, Teece (2010a, 2018) claimed that strategy management, dynamic capabilities and business models are interdependent. For Teece et al. (1997), dynamic capabilities refer to the firm's ability to adapt internal and external resources within a changing business environment. The author argues that a firm with strong dynamic capabilities might be able to create and renew its resources, assets, and capabilities to adapt them as needed to innovate, increase profit, and improve its market position.

Bharadwaj et al. (2013) recognize that when a firm adopts an IT strategy, it is also changing and shaping its business strategy and transforming its processes and scope. The change in the firm's business strategy enables it to develop suitable forms of dynamic capabilities (p. 472) to adapt to its changing external and internal environment. Vartiainen & Hansen (2019) argue that firm "capabilities are no longer utilized and developed within firm boundaries but across inter-firm networks." In this case, new organizational capability requirements for information systems are needed to achieve a competitive advantage. Capabilities and firm resources could be aligned with information systems to create a new firm strategy and move to a new target.

The discussion above helps to define an information system and to introduce the conceptual framework adopted in this research. The need to invest in or to refresh capabilities to develop a well-functioning information system and the notion that the information system itself can confer capabilities that lead to a competitive advantage, particularly in an OGD context.

2.5 Research Question

OGD falls into the category of free resources for organizations. The literature review demonstrates that researchers and government agencies who publish OGD assume that several benefits accrue, among them the stimulation of innovation that includes new products and services.

In this research, the resource-based view (RBV) was adopted as the theoretical framework. This theory implies that only strategic resources offer an organization the possibility of obtaining competitive advantages if these resources are based on four attributes: valuable, rare, inimitable and organization (VRIO). However the RBV did not identify or describe any internal process for exploiting these resources.

Our literature review shows that few researchers have used RBV to discuss how SMEs use external open resources (such as OGD) to unlock value and achieve competitive advantage. Zuiderwijk et al. (2015b) chose RBV as a theoretical lens to capture a strategic management view of how commercial open data is used to achieve a competitive advantage.

Most studies found on OGD are not based on theory that can help inform broader applications of OGD. These studies do not discuss how firms can use OGD internally to unlock value and compete. Jetzek et al. (2013) explored how using OGD generates social and economic value. Magalhaes and Roseira (2014) provided an overview of the growing use of OGD in the private sector and identified some business models. Gonzalez-Zapata and Heeks (2015) investigated the literature on the multiple meanings of OGD and analyzed some related concepts. Attard et al. (2016) examined the existing value-creation

processes from OGD. Zeleti et al. (2016) Explored the economic value of OGD and identified several Open Data Business Models.

In this dissertation, the concept of information systems has been adopted as a conceptual framework. The literature review shows that in the context of OGD, the information system can be a space where capabilities are brought together to unlock the value of digital resources and gain a competitive advantage.

Hunter (2015) explained that when transaction and data volumes increase within an SME, the information system helps reduce costs, develop a new product or service, increase profits, acquire a competitive advantage, and develop new business initiatives. The author provides a framework describing how resources are processed internally as input, transformed, and converted to an outcome.

However, based on the literature review discussions, it seems that when SMEs use OGD as internal resources, the outcome obtained could help a firm achieve a competitive advantage and generate economic value. Our study aims to assess whether such claims stand up to empirical scrutiny. The dissertation's central research question is: ***How do SMEs use OGD as an internal resource and leverage it to generate potential economic value?***

Three sub-questions are stated to allow us to set up our research approach to focus on the internal use of OGDs within the firm and finally answer the main research question. Relying on the answers to these three questions, it will be helpful to proceed in stages and with precision.

SQ1: How and to what extent is OGD being used by small and medium Enterprises (SMEs) in Canada?

SQ2: What are the impediments with which small and medium-sized enterprises (SMEs) must contend in seeking to use OGD as resources?

SQ3: What are the key considerations influencing OGD use in these enterprises?

The discussion in this chapter has focused on the theoretical and conceptual frameworks guiding this study. I began by defining the concepts of OGD and outlined some of the mainstream narratives about the supposed benefits that OGD potentially offers SMEs. This was followed by discussing the theoretical foundations underpinning this dissertation, the RBV approach to building competitive advantage. The notion of an information system as a conceptual framework for analyzing the internal capabilities of the firm as a mix of machines and people was presented. The discussion in the final section of the chapter set out the central research question guiding this study.

In terms of theoretical orientation, given the relative newness of digital business models with respect to the RBV, this study focuses on theory elaboration rather than theory testing. This approach is appropriate in situations where the context is not well known enough to generate testable hypotheses (Fisher and Aquinis, 2017; Lee et al., 1999; Chaudhuri et al, 2022). Theory elaboration can follow a variety of different paths including exploring the application of the theory in different domains (horizontal elaboration), or through vertical contrasting, or exploring the implications of the theory across different levels of analysis (Fisher & Acquinis, 2017).

In the case of the RBV, it has been pointed out that the original conceptions did not examine exactly how strategic resources were to be developed. As an organizational level theory, this was likely not intended at that time. Nevertheless, it has been argued that, since the VRI tend to decline over time, the "O" of the RBV model can be more important in contemporary organizations (Cuthbertson and Furseth, 2022; Kim and Madakok, 2023). Therefore, the theoretical model adopted for this study explores theory elaboration across levels of analysis (organizational to process) by examining the role of the information processing system as the "O" component within the VRIO model.

Chapter 3: Methodology

The previous chapter outlines the theoretical and conceptual framework and research questions guiding this project. In this chapter, I focus on the research design and methods used to conduct the study. The discussion is divided into four parts. The first section outlines the research design based on mixed methods. The second section is focused on how data was collected through the questionnaire survey.

In the third section, I present the second stage of the study, describing the interviews with SME representatives and the tools for analyzing our data. The fourth section provides conclusions for this chapter.

3.1 Research Design

The central research question guiding this dissertation is: *How do SMEs use OGD as an internal resource and leverage it to generate potential economic value?* To answer this research question, I adopted the mixed-methods research design that included quantitative (surveys) and qualitative (interviews) research methods.

Based on available studies on OGD use (Martin et al., 2011; Zuiderwijk et al., 2014; Susha et al., 2015; Hossain et al., 2016; Safarov et al., 2017), it is apparent that surveys and interviews are commonly used research methods.

For example, to carry out an overview of socio-technical barriers to the publication and usage of open data, Zuiderwijk et al., (2014) conducted six structured interviews in various European countries, a survey on the use of open public sector data (about 300 users filled out the questionnaire; 50% of them answered all the questions) and four workshops at international conferences. The authors (p. 125) concluded that many barriers related to

people, policies, procedures, law (social), as well as computers, infrastructures, networks, and software (technical) exist.

To investigate the driving factors of open data adoption by businesses for service innovation, Susha et al. (2015) surveyed companies in Sweden and the Netherlands that have experimented with open data. The survey took place over four months and was sent by e-mail to a sample of 50 businesses achieving a response rate of 50%. The authors concluded that the driving factors motivating businesses to innovate with open data differ widely. However, the innovation capability[55] of the enterprise, its expertise, and its skills play an essential role in enabling innovation with GOD and, therefore, require more attention from open data providers.

Safarov et al. (2017) found that the predominant research type in OGD studies is qualitative or quantitative (mainly survey based). According to the authors, these methods may be less successful in drawing robust causal conclusions about cause and effect. They explained that establishing the causal link between utilization and potential OGD outcomes requires using various methods and datasets to monitor and determine results and effects. The authors recommend that qualitative studies using in-depth interviews may be able to identify the causal mechanism between the use of OGD initiatives and their effects.

Zuiderwijk et al. (2014), Susha et al. (2015), and Safarov et al. (2017) believe that it is essential to use multiple methods to provide robust evidence and be able to answer the research question objectively while reducing the risk of bias. Accordingly, I adopted a mixed-methods research (MMR) approach for this study.

[55] See the definition proposed by Lawson and Samson (2001). Innovation capability is "the ability to continuously transform knowledge and ideas into new products, processes and systems for the benefit of the firm and its stakeholders."

According to Yin (2009, 2014), MMR mainly integrate qualitative and quantitative methods. These methods can answer complex research questions by allowing a more detailed set of data to be collected than can be obtained by a single method. Indeed, MMR allows the researcher to use a combination of methods to investigate the research question, such as collecting data and conducting additional analyses from different perspectives (Yin, 2009). The main objective of using the mixed method is to obtain a more complete and detailed analysis of the study phenomenon. In the case of this dissertation, given that research of SME use of OGD is in early stages, I considered that a rich interpretation of the rationale and approach by SMEs who use OGD could be realized through mixed methods. Venkatesh et al. (2013) proposed seven objectives of mixed methods research that include "expansion": using one method to explore in more detail the knowledge gained from a prior method. This was the key objective of using MMR and more specifically, the "explanatory sequential" mixed method approach first gathering quantitative data followed by qualitative data to seek a deeper understanding of the phenomenon (Caruth, 2013).

A mixed method approach is important to obtain as complete a picture as possible of how SMEs use OGD in their business operations. According to the literature (Yin, 2009; Venkatesh et al., 2013; Caruth, 2013), the use of mixed methods in the analysis of a phenomenon is recognized for the possibilities it offers researchers, such as flexibility, comprehensiveness, and the ability to deepen their knowledge and understanding.

The design combined a quantitative (a survey) and one qualitative (interviews) research component, to address the same research question. This combination enables the researcher to collect and analyze both closed-ended (quantitative) and open-ended (qualitative) data

about a phenomenon (Yin, 2009, 2014; Queirós et al., 2017; Schoonenboom & Johnson, 2017; Almeida, 2018).

According to Almeida (2018), research questions cannot always be answered by relying on only one approach. Quantitative methodologies aim to assess and measure the behaviour of the individuals in a population and involve collecting numerical data that can be subjected to statistical analysis (Yin, 2009, 2014; Queirós et al., 2017; Schoonenboom & Johnson, 2017; Almeida, 2018). Qualitative methodologies, on the other hand, focus on specific behaviours and the collection of opinions and expectations of the individuals in a population. Queirós et al. (2017) assert that qualitative approaches aim to understand a complex reality and the meaning of actions in a given context.

To implement MMR in this study, I focused first on gathering numerical data about SMEs' use of OGD in Canada by using a survey with closed-ended questions. The survey aimed to obtain quantifiable results from a sample of SMEs who are using OGD.

Second, I explored the subjective reality of OGD use by conducting interviews with open-ended questions targeting 6 to 8 representatives of Canadian SMEs. Using interviews with open-ended questions as a data gathering tool allows the researcher to collect more detailed answers than is possible in a survey and thus better reflect their point of view. The quantitative approach is therefore used to collect data on OGD use and processing, and the qualitative approach is used to explain and understand the quantitative results from the survey in more detail.

Although this study did not follow a formal case study method, the interviews, were structured as part of a broader case study approach. Yin (2014) defines a case study method as a research method “used in many situations to contribute to our knowledge of individual,

group, organizational, social, political, and related phenomena." A case study is a qualitative research method "that helps in the exploration of a phenomenon within some particular context through various data sources" (Baxter & Jack, 2008, p. 544). Yin (2009) describes a case study approach as an appropriate means for studying a complex social phenomenon as it occurs in the real-world context, especially when the boundaries between the issue and the context are not obvious (2014). Indeed, the case study is an empirical inquiry that addresses the "how" or "why" questions of the phenomenon studied (Yin, 2014; Creswell, 2013). According to Rashid & Rashid (2019), the case study methodology explores a phenomenon within some context through various data sources. Usually, a case study identifies a challenge for which a solution needs to be found. However, in this study, the case studies are 'use cases' that describe and compare the different uses of OGD across different sectors of Canadian industry.

Multiple sources of evidence permit data triangulation (Yin, 2009, 2014). To obtain valid results through the case study method, the researcher cross-references several sources of evidence that are essential and critical to understanding the phenomenon (Yin, 2009, 2014). Using multiple sources complements each other and increases the quality and reliability of the data collected (Yin, 2009, 2014). Accordingly, data for each SME interviewed included the interview notes, (focused on OGD use and processing), direct observations from the survey and interviews (demographics, skills, level of participation and interest), and a documentary review (existing literature about the company). To summarize:

1. Interviews are essential for collecting data on perceptions and ideas about the research topic.

2. Direct observations focus on characteristics that provide information not clearly expressed through the interview and survey. Once conducted, these observations contribute to collecting more data, thus providing additional evidence to the data analysis.
3. The document review (when available) helps prepare for evaluating current data use and processing practices and comparing the data obtained from the interviews.

Yin (2009, 2014) argues that the mixed methods study can be advantageous and, at the same time, represent a challenge for researchers. This is because the researcher must report on the completed interviews and separately on data obtained using other methods. The study report would then be based on the pattern of evidence from all methods used (Yin, 2009, p. 174). The explanatory sequential design approach adopted is depicted in Figure 3.1.1 (Creswell, 2013).

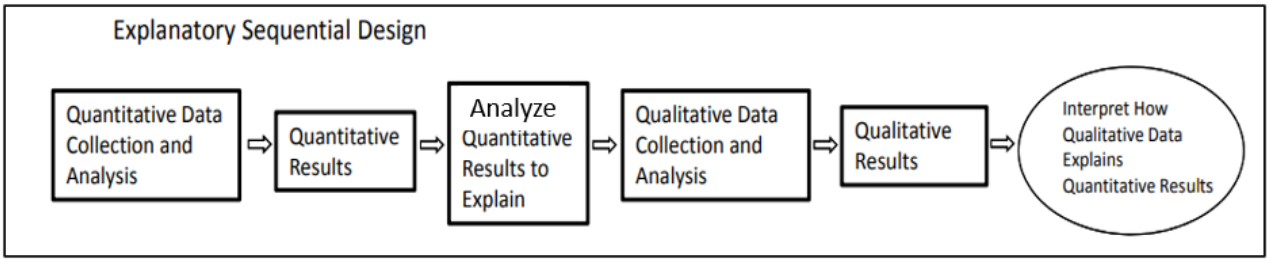


Figure 3.1.1: Explanatory Sequential Design

Mixed methods researchers need to consider how to integrate the findings from the different methods used (Creswell and Plano Clark; 2011 Creswell, 2013; Dawadi et al., 2021). Since the focus of this dissertation is on better understanding why and how SMEs use OGD, integration will occur at the design (the same questions will be asked in the

survey and the interviews) and the interpretation stages by drawing on the combined insights from both quantitative and qualitative methods. At the interpretation stage, the interviews will be used to better establish linkages (Safarov et al., 2017) between aspects noted in the survey for example, the motivation for OGD use and its associated outcomes.

To obtain more generalizable results, rather than explore one case study, I sought to explore several use cases. According to Yin (2014), the multi-case study approach is a research methodology in which a limited number of cases (generally, between 4 and 10) are examined. The multi-case study design integrates replication logic, in which the researcher replicates the inquiry procedures for each case thus lending to more generalizable findings. For this dissertation, a multiple case study approach was applied to describe and analyze case studies of participating SMEs. To do this, 6 to 8 organizations were selected from the list of more than 150 Canadian companies that use OGD (published between 2016 and 2017) on the GOVlab website[56] and from other list of firms identified by the researcher. The intent was to also select firms from different sectors.

Two phases of data collection were conducted. In the first phase, quantitative data was collected from a survey; in the second phase, qualitative data was collected from the cases. Analysis of the quantitative data would inform data gathering in the qualitative phase (Yin 2009, 2014; Creswell, 2013; Rashid & Rashid, 2019).

[56] See, the list of the firms who use OGD, created in 2016 by the Govlab and is available here: https://web.archive.org/web/20190902144353/http://canada.opendata500.com/list-page.html

3.2 Survey

The survey collected cross-sectional data on how SMEs use and process OGD. Surveys are helpful tools for gathering information about demographics, opinions, attitudes, or behaviours. The questionnaire consisted of 20 questions and took 15-20 minutes to complete. The objective of asking demographic questions was to gather basic information on respondents to assess how their company fits into the targeted sample. This involved identifying the firm name, the respondent's name and position, the size of the firm, the city, and the industry in which the firm operates. With respect to the company's interaction with OGD, questions addressed the categories of interest in OGD, the motivation for accessing OGD, and how often each firm used OGD (Survey questions are provided in Appendix C).

3.2.1 Survey Questions

To formulate the survey questions, key concepts based on the conceptual framework that included people, technologies, and processes were considered. For our research purposes, the three concepts have been subdivided into six elements that included OGD use (preparation of input), people skills (experience and capabilities), hardware and software (tools), data processing (steps and processes to transform OGD into information), targeted product or service (output), and decision making (strategy & competitive advantage).

The decision to use close-ended questions in the survey is based on the need to collect data that can be analyzed objectively. Closed-ended questions allow one to ask short, simple, and direct questions while giving respondents a choice between easy and quick answers. One advantage of closed-ended questions, in which participants choose one

answer, used to obtain clear, easy-to-manage, and easy-to-analyze information to compare responses quickly using survey and analysis software (Neuman, 2007). The participants can also provide optional short answers (limited number of characters) for some questions on the OGD use and processing.

3.2.2 Participant Selection

The targeted firms must have had their head office in Canada and have access to and use the OGD available on the Canadian Open Government portal. Potential respondents were identified from an online list created by ODX in 2016 that named 150 firms using OGD.

The researcher extracted 80 companies from this list of 150 Canadian companies using OGDs shared online by Govlab as part of the Canada (ISED) report on SMEs (2022). The reduced number is due to the survival rate of businesses from goods-producing and service-producing sectors in Canada, for example, from 2015 to 2019, 101,324 businesses were created annually in Canada, and 90,151 closed.[57] For our survey, each company was contacted (by email, phone, or Zoom / MS Teams call) to confirm it was still in business before sending the survey.

In addition, the researcher identified 128 Canadian companies from websites and social media, such as buyandsell.gc.ca, Quebec Enterprise Register, Ontario Business Registry, Crunchbase.com, LinkedIn, and Facebook. The Buy and Sell website[58] lists providers from different sectors who offer goods and services and potentially access and use OGD. Other

[57] Key Small Business Statistics Report provides statistical data on the Canadian business sector, particularly small and medium enterprises. See, ISED (2022) Key Small Business Statistics 2022, https://ised-isde.canada.ca/site/sme-research-statistics/en/key-small-business-statistics/key-small-business-statistics-2022

[58] See, https://buyandsell.gc.ca/procurement-data/contract-history

sources of information on SMEs were from the researcher's network, which has developed over the past five years through participation in open data conferences, meetings, and workshops held in Ottawa and online across Canada. The Quebec Enterprise Register and the Ontario Business Registry are provincial online tools that allow organizations (businesses and non-profit corporations) to interact with the provincial governments. From these websites, it was possible to search for a company and collect information (when available) on the date of creation or dissolution, the website, and contact details.

SMEs were also identified via Corporations Canada,[59] the Provincial Enterprise Register,[60] Business Accelerators and Incubators[61] (Invest Ottawa, Institute Innovation Gatineau and more). SMEs could also be identified, for example, through networking, referral, or SME participants of events to solicit their views about their use of OGD. Finally, several SMEs and business centers in Canada were contacted to identify potential SME participants by requesting research participation online on social media. To build networks of potential participants and to learn more about the state of Open Data, the researcher attended more than 40 meetings organized by the Treasury Board of Canada Secretariat (meetings on OGD open to the public), Canadian Open Data Society, incubators (Invest Ottawa, Innovation Gatineau), and several Ottawa Meetup groups on Open Data (A list is provided in Appendix H).

Once the list of potential participants reached the target number (more than 150) of companies, I sent them an invitation by email to answer the questionnaire and access the online form via Google Forms. An email text introducing the survey, with a link to the

[59] See, https://www.ic.gc.ca/app/scr/cc/CorporationsCanada/fdrlCrpSrch.html?f=&metricsId=GTM-WQQH22

[60] See, Search an enterprise on the register: http://www.registreentreprises.gouv.qc.ca/en/default.aspx

[61] See, https://www.ic.gc.ca/eic/site/061.nsf/eng/h_03045.html

online survey, was distributed by email. The questionnaire was available in both official languages (English and French) to all SMEs who confirmed their participation in the research. The survey was emailed between April 2022 and December 2022 (first round) from September to November 2023 (second round) to 210 Canadian SMEs. Sixty-eight (N=68) responses were received. Of these, 91.2% (n=62) of respondents agreed to answer the questions, and 8.8% (n=6) declined the invitation. Sixty-four (64) respondents completed the survey in English and four (4) in French.

A preliminary test of the questionnaire (piloting) was done with five people, including academics, experts, and representatives of SMEs, before it was submitted to the selected Canadian participants. Two rounds of piloting were done before distributing the survey (Five persons for the first round and three for the second round). Following this consultation, several changes and adjustments were made to the questionnaire to make the questions clearer and to target data collection in line with the objectives of this research.

The survey was made available online, by email and by telephone to all SMEs located in Canada who experiment with and use OGD. The online questionnaire was provided on Google Forms because there are several advantages for the participants and the researcher. For the participants, the interface is accessible and easy to use while respecting privacy (no personal information is collected in the survey). Respondents can decide when and where to take the survey using any electronic device connected to the Internet. This online survey tool allows the researcher to administer the survey quickly, receive unlimited responses, and thus manage data collection and create reports.

Two weeks were provided for participants to complete the questionnaire. The researcher sent a follow-up email to participants who delayed answering to inquire whether they had

encountered challenges responding to any questions. The researcher also followed up by making phone calls or setting up meetings on Zoom or MS Teams.

3.2.3 Structure of the Survey

The online survey questionnaire consisted of 20 questions covering three thematic categories. The same questionnaire were used over the telephone and email if needed. Some questions were required, and others were optional. The structure of the survey included the following sections:

- **Part 1 - Business Origins and Make-up:** Seven (7) questions were used to collect demographic information. Some questions collected information on the enterprise's participants (company name, province, and industry, number of employees and years of operation). These questions help identify in which market areas the company is active. From information system and RBV perspectives, the demographic information will confirm that the respondents represent firms immersed in a competitive market.
- **Part 2 – Use of Open Government Data**: In the second part of the survey, five (5) questions are asked that focus on SMEs' use of OGD, which is recognized as being used when it has been either accessed, reviewed, modified, combined, processed, or transformed by users. This section collected data on how often SMEs use available datasets on the Open Government portal. The questions explored the motivations of SMEs using OGD and the impediments encountered. It also identified the customers

targeted by SMEs who use OGD to improve or create a product or service. In summary, this section sought to confirm that the data is useful and is used by SMEs.

- **Part 3 – Processing Open Government Data:** This section contains five (5) questions and collect data on processing OGD. Data processing consists of collecting raw data and translating it into usable information. Data processing is also a series of operations on data, such as collecting, organizing, protecting, and storing data to be analyzed and used for business decisions. This part collects information on SMEs' experience with OGD, such as how SMEs process OGDs internally. In this part, we want to check and confirm how OGD is effectively processed and then used, such as whether it is used alone, combined with other internal data, or another dataset. This part is one of the most important parts of the survey as it provides critical information to understand SMEs' actual use of OGDs in Canada.
- **Part 4 - Impact of using Open Government Data**: In this fourth part of the questionnaire, three (3) questions are related to the impact of using OGD. The use of OGD internally by SMEs may require some changes and adjustments in terms of the skills required, the way of processing the data, and in particular, the adaptation of the data to capture the information that will allow the creation of new products or services, or collaboration, partnership, and creation of economic value. In this part, the objective is to verify if using OGD enables SMEs to achieve one or more beneficial or profitable goals and results. The questions in this part help to test, verify and understand the links between the phenomenon under study and the theoretical and conceptual frameworks.

Closed-ended questions, such as questions with two or multiple choices, were used to facilitate comparison among the respondents. Respondents were asked to indicate their agreement or disagreement with some items, based on a five-point Likert scale ranging from “Strongly disagree, disagree, neither agree nor disagree, agree, strongly agree”. According to Gosavi (2015), the five-point scale is used because most of the time, respondents are not comfortable answering questions with “Yes” or “No.” The Likert scale format helps capture the phenomenon’s variation insofar as it allows the most reliable ways to measure opinions, perceptions, and behaviours. This is an appropriate approach for this project because the Likert-type questions will provide more granular feedback about the use of OGD by SMEs.

Answers to the demographic questions were optional. For this reason, the response rate differed from one question to another. Answers to the questions on the use, processing, and impact of using OGD are mandatory. Some of the questions proposed (from questions 1 to 9) are of the “Yes” or “No” type. For this type of question, if the response is “No,” the respondent is directed to another survey section. In other questions, the answers provided are single or multiple-choice.

3.2.4 Analysis of the quantitative data

Once received and collected, the survey responses were sorted and organized to prepare them for analysis. Preliminary codes were assigned to the collected data to describe its content. The survey responses were analyzed using descriptive statistics (frequency, percentage response, trends) to provide summary descriptions. Descriptive statistics and graphical summaries (bar graphs, histograms...) were created. The collected data were

saved in an Excel or CSV document to facilitate data transfer to Excel and SPSS software (IBM SPSS Statistics, Version 29).

However, surveys are not very effective for gathering information to provide a deep understanding of all circumstances surrounding the use and processing of OGD. Several sources of evidence are required and critical for data collection within the case study method, according to Yin (2009, 2014). The next section describes the qualitative data collection.

3.3 Interviews / Case studies

To explore OGD use from a subjective dimension, interviews were planned with 6 to 8 representatives of Canadian SMEs. During these interviews, open-ended questions were asked to gather more information about each company's specific use of data. The open-ended questions are the same as the main survey questions. In fact, this choice of question allows us to verify the results of the survey, as well as to gather more details on the specific use of OGD within these organizations. The interview transcripts are added to other information gathered through documents and are integrated into descriptions of the use of each company' use of OGD. In fact, this makes it possible to create and present case studies reflecting each company's particular use of open data.

Generally, a case study identifies a challenge for which a solution needs to be found. However, in this study, the objective of using case studies was not to find a solution to a specific problem. The case studies are 'use cases' that provide more detail on the use of OGD by SMEs and describe and compare the different uses across different sectors of Canadian industry. The case studies contained profiles of the companies, a summary of the responses transcribed after the interviews conducted with the respondents on OGD use and process within their respective firms.

As mentioned above, case studies included data collection through interviews and document review. The interviews sought to collect more information and points of view to understand better how SMEs use and process OGD internally. The structured interview guideline included questions inspired by theoretical and conceptual frameworks that frame this research. The interview questions were chosen based on responses to the survey questions. For example, during the interviews, the researcher asked all questions relating

to the use and process of OGD. This made it possible to draw up a short list of questions to ask respondents who agreed to be interviewed by the researcher.

The interview is a dialogue between the study's participants and the researcher to learn more about the phenomenon. This process allows us to explain, better understand, and explore the internal information environments and competencies of using OGD. The interview process allows verification of the quantitative data analysis results.

In case study research, Robert Yin (2009, 2014) claims that interview questions should be subjective and flexible to facilitate the investigation of topics raised by the interviewee. If several participants are involved in the study, each participant must understand the interview procedure. To maintain the quality of the results, the interviewer should repeat the interview process before each interview to maintain the same level of information with all participants. Implementing an interview process with a limited list of questions keeps the researcher on track while collecting data from different participants.

3.3.1 Document Review

Document review enabled the researcher to explore the content of online documents relating to SMEs and extract useful information to complete the case studies. However, Document analysis involves examining and interpreting data to determine meaning, deepen understanding, and develop empirical knowledge (Bowen, 2009).

According to Morgan (2022), document analysis is valuable when it complements other research methods. In this case, selecting the appropriate documents for targeted enterprises to analyze is crucial to check for authenticity, credibility, representativeness, and meaning.

This qualitative method can be used only with various documents (e.g., websites, reports, PPTs, videos, articles, etc.). The researcher was able to access company websites,

articles, videos and reports to gather more information and create company profiles. Some respondents also shared their documents with the researcher, such as PPT presentations or internet links giving more details about their products (demos, platforms, etc.) and sometimes describing how they use OGD.

3.3.2 Participant Selection

The interviews were conducted in person (face-to-face), by telephone or via videoconference (Skype/ Zoom or MS Teams). These interviews are useful to confirm the survey results and to ask more questions based on the respondent's background. A sample pool (6 to 8) of firms was identified and selected based on the following criteria:

- The firm must have its head office in Canada.
- The firm has already used OGD.
- The firm's respondent signs the consent and agrees that the information provided will be confidential.
- Voluntary participation

3.3.3 Structured Interview

The interviews lasted one hour on average and eighteen (18) questions were asked in the following sections:

- Organization: In this part, SME respondents could introduce themselves and briefly present their company, products, and services.

- Use of OGD: SME respondents described their approach or strategy. During this part, the respondents were invited to explain how OGD is captured and what motivates SMEs to use them.
- Internal processing of OGD: The questions in this part provided a better understanding of how data is processed internally within enterprises. The questions addressed the technologies SMEs use, the skills needed to process OGD and their use for improving or creating a new product or service.
- Impact: In this final part of the interview, the questions asked respondents to discuss the challenges SMEs face, barriers, benefits, and prospects of using OGD.

The interview questions are listed in Appendix D.

3.3.4 Analysis of the qualitative data

The interviews were recorded and transcribed to avoid inaccuracies and data loss. The content analysis of the interviews permitted comparison across cases to find common patterns. A narrative analysis enabled the description and identification of salient points. Codes were assigned to classify specific themes according to pre-defined categories to facilitate analysis. These steps could identify the collected data and information's importance, differences, and connections.

3.4 Conclusion

This chapter has addressed the methodology used to carry out the study. The mixed method approach was adopted, balancing the use of survey data with that of in-depth interviews with companies.

The following chapter analyzes the data collected from the survey and interviews conducted with SMEs.

Chapter 4: Survey Findings

This chapter describes the survey results. It is divided into three sections. The first section provides a descriptive overview. The second section provides a summary of the analysis, and section three is the conclusion of this chapter.

4.1 Survey results

The purpose of the survey (See Appendix C) was to collect information on the use and processing of OGD by SMEs in Canada. It is important to note that this survey was carried out towards the end of the COVID-19 pandemic, during which most companies adopted online or hybrid working approaches. It is possible that the pandemic created some challenges because the researcher observed a high frequency of non-response to e-mails and phone calls. When companies responded, there were long waiting times, postponements, or cancellations of meetings. Sixty-one companies filled in the form directly online, 3 respondents answered the questionnaires by telephone, and 4 answered the researcher (on paper) who then added the answers to the online form. Finally, out of a pool of 210 possible respondents, 68 completed surveys were returned.

Of the responses recorded via Google Forms, 91.2% (n=62) agreed to answer the questions and 8.8% (n=6) replied that they do not use the OGDs from the open government portal. The sixty-four (64) respondents who confirmed using OGDs answered the survey in English and four (4) in French.

In Table 4.1.1, respondents to the demographic questions (n=36) included CEOs (22.22%, n=8), Managers (36.11%, n= 13), Consultants (13.89%, n=5), Data analysts and engineers (11.11%, n=4), Trainers & Instructors (8.33%, n=3), financial advisor (2.78%, n=1), and Real estate agents (5.56%, n=2).

Table 4.1.1: Demographic question - Position		
N of responses (n=68) (Valid: 36, missing: 32)	Number of respondents	%
CEOs, Directors, and Associate	8	22.22
Managers	13	36.11
Consultants	5	13.89
Data analyst / Engineer	4	11.11
Trainer / Instructor/ supervisor	3	8.33
Financial Advisor	1	2.78
Real estate agents	2	5.56
Total	**36**	**100**

Most respondents were individuals who have decision-making authority and set the strategy for their organization. As discussed earlier, the survey included four sections: business origins and makeup, use of OGD, processing OGD, and the OGD impact.

For questions 10 through 20 (except questions 13, which provided for a “yes” or “no” response) and questions 16 and 17 (which were multiple choice), respondents answered questions using a Likert scale. These responses were coded and attributed a numerical value in the following order: {1, Strongly disagree}; {2, Disagree); {3, Neither agree nor disagree (neutral)}; {4, Agree}; {5, Strongly agree}.

Once the survey was closed and responses were collected, data was cleaned and prepared for analysis. To anonymize company names, codes were assigned to replace company names. The name of each company was changed to “OGDU,” which stands for “Open Government Data User,” followed by a number ranging from OGDU1 to OGDU68.

The researcher divided the survey responses into two groups so that the results could be tested, compared to determine whether there was a significant difference in OGD use between them. The first group represents companies operating in the data/ technology sector (IT, Data Analytics, AI, etc.). The second group gathers companies operating in the non-data/technology sector (or other sectors), such as business and legal services, education, environment and weather, food and agriculture, finance and investment, management consulting, real estate, etc.

The data collected during the survey was visualized to understand, analyze, and interpret it. Google Forms helped to collect and organize respondents' answers and present the first insights derived from the survey by consolidating responses into graphs and spreadsheets that can be downloaded in Excel or CSV format.

To facilitate the presentation and analysis of data collected, the responses "Agree" and "Strongly agree" were combined to summarise a "Yes" response. Similarly, the responses "Strongly disagree" and "Disagree," summarise a "No" response in the table provided in the survey results. The percentages of "Yes" and "No" responses were calculated using an Excel sheet.

The Excel spreadsheet software was used to test the exported results (count, percentage, crosstab), to calculate some percentages for comparing the two groups, and to visualize the collected data. SPSS software[62] was used to test statistically the survey responses and verify the results (count, percentage).

Three statistical tests were conducted to analyze survey data: the chi-square, ANOVA and t-test. It was applied to all questions with the Likert scale. The statistical tests were

[62] IBM SPSS Statistics version 29.0

performed here to determine whether enough evidence exists to "reject" or “should not reject” the hypothesis made for each variable related to the use and process of OGD (Franke et al., 2012).

The chi-square test was used for testing relationships between categorical variables in this survey. This test examines the independence of two categorical variables and can be used as a reference distribution (Franke et al., 2012). As this research collected data using a single sample, the test of independence and interpretations of association between variables was applied. This test is used to determine if there is a significant difference between the means of two groups (Franke et al., 2012) and how they are related (Data/technology and non-data/technology groups in our survey). Indeed, the goal of the analysis is to compare the distribution of responses to the outcome variable among the two independent comparison groups.

The chi-square value was calculated using SPSS, and a table was provided with different results, including the degree of freedom and the p-value (under the asymptotic significance column). The p-value was calculated using SPSS and verified using the P-value from the Chi-square[63] Calculator.

To interpret the chi-square test, the p-value is observed and compared to the level of significance $p<0.05$. Given the chi-square results, the p-value is “the probability of rejecting or failing to reject the null hypothesis,” according to Thiese et al. (2016). This value appears on the chi-square table provided by SPSS in the row “Asymptotic Significance (2-sided)” column. The result was analyzed according to the calculated value and compared to the level of 0.05, corresponding to a 95% confidence interval. A small p-

[63] See, https://www.socscistatistics.com/pvalues/chidistribution.aspx

value, less than 0.05 ($p < 0.05$), means that the null hypothesis should be rejected and conclude that there is a significant difference. If the p-value is larger than the level of 5% ($P > 0.05$), the null hypothesis should *not* be rejected and conclude that there is no significant difference.

To report the Chi-square tests, the researcher used the APA requirement[64] for citing statistical test results. Where Chi-square results are not significant, the percentages of each test were analyzed and compared to draw meaningful conclusions. The percentages were calculated in Excel after merging the positive and negative answers under "Yes and "No." For "Likert" type questions, the results do not follow a normal distribution. In this case, the results were grouped into a binary data set, then the chi-square values were used to interpret them. A more sensitive and accurate ANOVA test (including the t-test) was used to re-test the survey results.

The One-way ANOVA test was conducted with SPSS to calculate the variance between two groups or more. This test was used to help to know whether significant differences exist between the means of the independent variable (Data/ technology and non-data/technology groups). The results of this test and the analysis of variance could confirm and reinforce the Chi-square results.

Regarding our survey, the independent variables are the two groups of the industry (Data/technology and non-Data/technology SMEs). The scores on the Likert scale-type questions are the dependent variables. For the ANOVA test, a small p-value (less than 0.05) suggests that the null hypothesis can be rejected and conclude that there are significant

[64] See, How to report a Chi square test from SPSS in APA style: https://www.onlinespss.com/statistical-tests-in-spss/reporting-chi-square-test-in-spss/ and https://ezspss.com/how-to-report-chi-square-results-from-spss-in-apa-format/

differences between the group means. Thus, with the ANOVA test results, the null hypothesis should be rejected if there is a statistically significant result, and the two groups are different. In most of the ANOVA test results obtained, the p-value is greater than .05, so the results are insignificant. The mean and p-value data obtained from the ANOVA tests will be used for reporting and comparison with only significant Chi-square results. It is important to note that the primary test on which our analysis is based is the chi-square test.

In this regard, Knapp (2013) advises using the One-way ANOVA option in SPSS to execute the t-test. Although SPSS has a t-test menu, the One-way ANOVA menu is simpler to use and yields identical results, according to Knapp (2013). [65] After performing the One-way ANOVA test and t-test on SPSS, the same means were obtained.

The obtained Likert data did not follow a normal distribution. Most of the results of the ANOVA tests were non-significant. And even for the three significant results, it was not possible to carry out Post hoc tests because there were fewer than three groups. Thus, it was not possible to use ANOVA to exploit more of the variance, but because of the non-normal data, the researcher grouped the 1-2 and 4-5 responses in a binary format (percentages) and used the chi-square results.

[65] See, the video on t-test: https://methods-sagepub-com.proxy.bib.uottawa.ca/video/t-test-tuto

4.1.1 Section 1: Business Origins and Make-up

In the first section on origins and composition of businesses, six (6) demographic questions were included to gather information on the number of employees, the province in which the company is based, the sector of activity in which each organization operates and the position of the interviewees. A short definition of SMEs was provided to help respondents answer the questions.

Respondents (n=51) to the non-mandatory question on SMEs' creation year reveal that among the SMEs surveyed, 69.2% (n=27) were created between 2010 and 2022. The remaining enterprises (30.8%, n=12) were established before 2008.

N of responses (N=68) (Valid: 51, missing: 17)	SMEs created before 2008	SMEs created between 2010-2022	Total
Data Tech enterprises	5	19	24
Non-Data Tech enterprises	9	18	27
Total	14	37	51

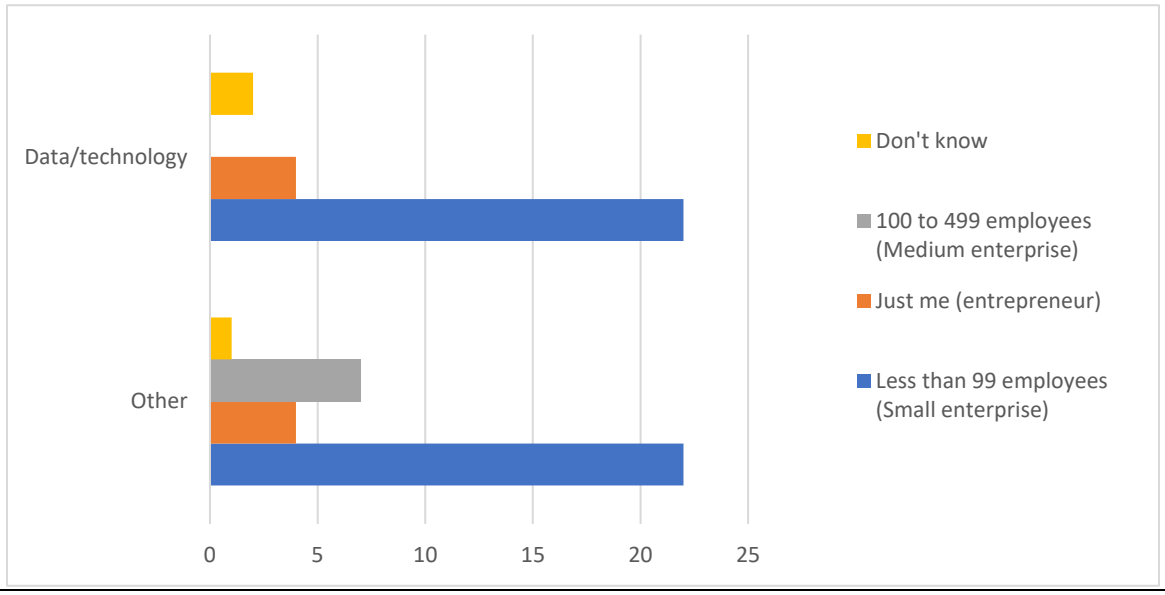
Half (n=12) of the total IT companies surveyed (n=24) were created between 2012 and 2016. This is a higher rate of business start-ups than other years and groups. This may be relevant and can be explained by the fact that since 2012 more data have become available online for free, such as private and community sector open data and government and provincial open data. The economic interest in these data might have stimulated the creation of several companies during this period.

As for the size of the companies, responding organizations (n=62) varied between small and medium enterprises. The visualization of the data collected on these enterprises shows

that 45.16% (N=28) of the respondents are from the Data/technology sector, and 54.84.% (N=34) are from non-data/technology sectors (see Figure 4.1.1.1).

Seventy percent (n=44) of the respondents work for small companies and 11.3 % (n=7) for medium-sized. The remaining 12.9% (n=8) are entrepreneurs, while 4.8% (n=3) do not know. Figure 4.1.1.1 summarizes the sizes of data/technology and non-data/technology enterprises. Among the various industries, small businesses (fewer than 99 employees) are the most represented in this survey.

Figure 4.1.1.1: Size of the enterprises (Crosstab), (Q2).

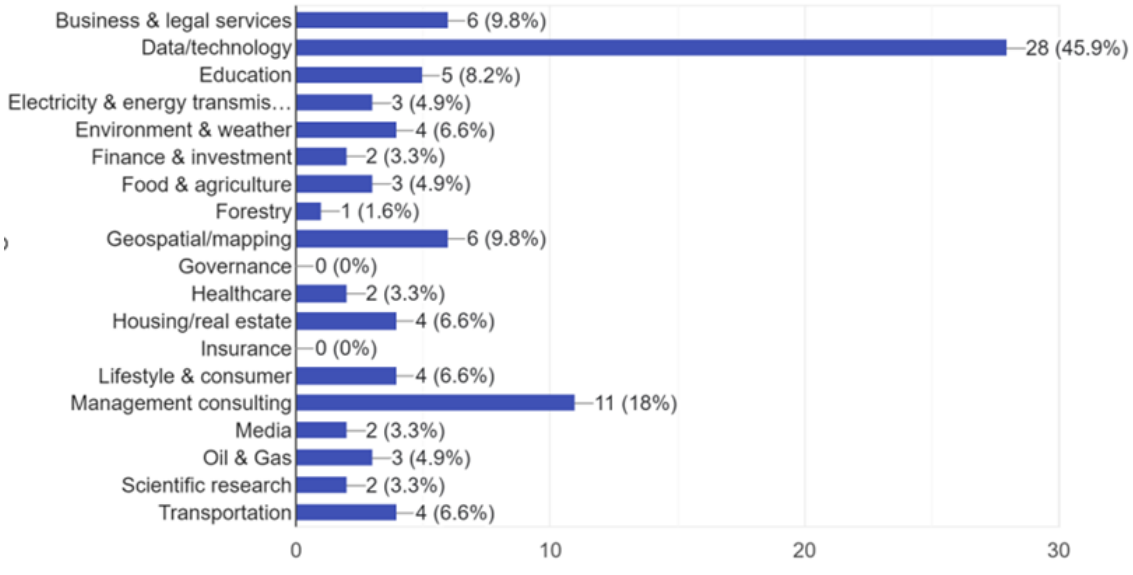


As for the location of SMEs, the surveyed enterprises (n=62) are mostly located in three provinces (Ontario, Quebec, and British Colombia). Only (n=36) of the respondents specified their town, while the rest (n=26) did not.

- 54.8% (n=34) of the surveyed enterprises are in Ontario (Ottawa (36.1%, n=13), Kitchener 5.6%, n= 2), Toronto (11.1%, n=4), Richmond (2.8%, n=1), Markham (2.8%, n=1), and not specified (n=
- 38.7% (n=24) of the surveyed enterprises are in Quebec (Montreal (19.4%, n=7), Gatineau (16.7%, n= 6)), and
- 6.5% (n=4) of the surveyed enterprises are in British Columbia.

The largest proportion of respondents (n=62) is represented by enterprises that operate in the non-data/technology industry (54.84%, n=34). The non-data/technology industry includes different industry sections such as Management consulting (18%, n=11), Geospatial/mapping (9.8%, n=6), Business & legal services (9.8%, n=6), Education (8.2%, n=5), Housing/real estate (6.6%, n=4) Lifestyle & consumer (6.6%, n=4), Transportation (6.6%, n=4) and more (see Figure 4.1.1.2).

Figure 4.1.1.2: Industry sections of SME operations (Q4).

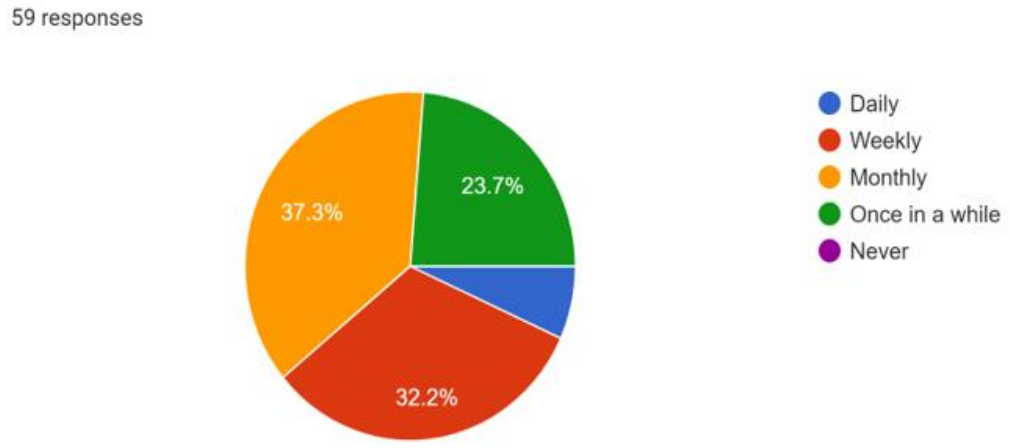


Some companies (n=7) specified other sectors of activity in the comments box of the question, such as:

- Mining
- Telecommunications
- Statistics.
- Training and coaching,
- Environment, Engineering of soils and materials
- Geo-marketing,

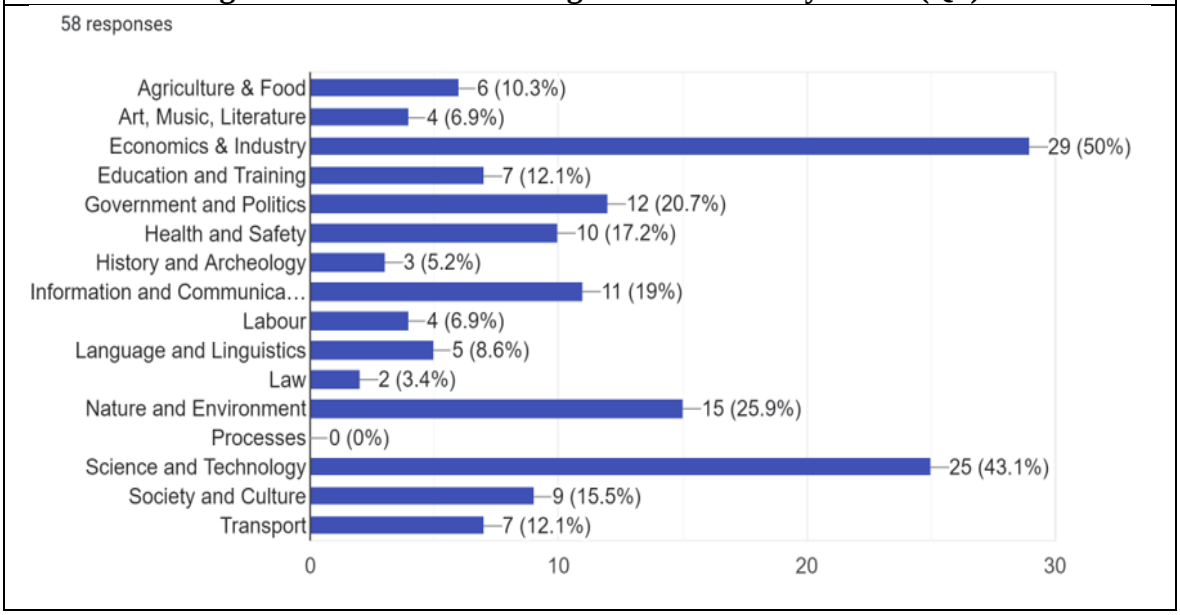
Regarding access to OGD through the Open Government portal (n=62), 95.2% of the respondents (n=59) responded “yes” and 4.8% (n=3) “no.” Those who answered “no” were redirected to the thank you page of the survey. The enterprises surveyed (n=59) confirmed how often they access open data sets: 37.3% (n=22) of respondents accessed OGD monthly, 32.2% (n=19) weekly, 23.7% (n=14) once a while and 6.8% (n=4) daily. (See Figure 4.3):

Figure 4.1.1.3: OGD access frequency (Q6).



Furthermore, the respondents were asked to confirm the categories of datasets they accessed. As for Datasets categories reviewed by SMEs, the results are as follows (See Figure 4.1.1.4):

Figure 4.1.14: Datasets categories reviewed by SMEs (Q7).



When answering this question (n=58), some respondents selected several categories of datasets because they collect data in several fields to meet the needs of their clients. However, it is possible to conclude that most SMEs are interested in datasets on economy and industry, science and technology, nature and environment and Government and politics. Some enterprises specified more dataset categories (n=11) in the comments box of the question, such as,

- Mining,
- Gas
- Geological data
- Funding prospects
- Energy, housing
- Geospatial, real estate investment, retail,
- Construction
- Demographics, census
- Housing statistics
- Real estate, sport.

4.1.2 Section 2: Use of Open Government Data

Open data is recognized as being used when it has been accessed, reviewed, modified, combined, processed, or transformed by users (Hunter, 2015; Gonzalez-Zapata & Heeks, 2015; Zuiderwijk et al., 2015b).

Most enterprises surveyed using OGD (91.5%, n= 59) confirmed reviewing and capturing data of interest. Among the remaining enterprises, 6.8% (n= 4) of the responding enterprises don't know, and 1.7% (n= 1) prefer not to disclose. Regarding the frequency of data use, the responses received (n=59) indicate the following results:

- 33.9% (n= 20) of SMEs use OGD monthly,
- 37.3% (n= 22) use it weekly,
- 23.7% (n= 14) use it once in a while and
- 5.1% (n= 3) use them daily.

Combining frequencies from the above results, it is possible to conclude that 42.4 % of the SMEs surveyed use OGD daily and weekly. However, the use of the data is effective and regular in 76.3 % of the companies surveyed (daily, weekly, and monthly).

Regarding the SMEs' motivation to use OGD, several answers were proposed and measured using the Likert scale (see Table 4.1.2.1). To summarize the percentages in this table, the positive responses combine "Agree" and "Strongly agree" responses, while negative responses combine "Strongly disagree" and "Disagree." The results were ranked from the most to the least frequent responses for each variable. Only responses with a rate close to or above 50 percent are retained. The same reasoning was applied to the other questions in our survey.

For questions related to visualizing data and gaining insight, improving an existing product or service, generating revenue, conducting research, reducing operational costs,

accessing a nice market, and having no motivation, the chi-square test showed no significant difference between data/tech and other businesses, except for meeting the requests of clients. Table 4.1.2.1 shows those questions where there was or wasn't a significant difference between the Data/Technology and Non-Data/Technology enterprises (SME groups).

Table 4.1.2.1: Motivation to use OGD (Q10)

N of responses (n=68) (Valid: 59, missing: 9[66])	No (%)	Yes (%)	Neutral (%)	Chi-square	Df	Asymp. Sign.
Visualize data and gain insight.	13.56	76.27	10.17	3.746	4	0.441
Data Tech enterprises	7.69	84.62	7.69			
Non-Data Tech enterprises	18.18	69.70	12.12			
Analyze it by testing its potential.	64.41	15.25	20.34	9.841	4	0.043
Data Tech enterprises	46.15	23.08	30.77			
Non-Data Tech enterprises	78.79	9.09	12.12			
Meet the requests of clients.	10.17	79.66	10.17	6.576	4	0.160
Data Tech enterprises	3.85	80.77	15.38			
Non-Data Tech enterprises	15.15	78.79	6.06			
Improve an existing product or service.	20.34	66.10	13.56	6.232	4	0.182
Data Tech enterprises	7.69	80.77	11.54			
Non-Data Tech enterprises	30.30	54.55	15.15			
Create a new product.	30.51	45.76	23.73	5.388	4	0.250
Data Tech enterprises	19.23	57.69	23.08			
Non-Data Tech enterprises	39.39	36.36	24.24			
Conduct research.	35.59	44.07	20.34	5.243	4	0.263
Data Tech enterprises	23.08	46.15	30.77			
Non-Data Tech enterprises	45.45	42.42	12.12			
Create a new service.	47.46	30.51	22.03	19.584	4	<0.001
Data Tech enterprises	23.08	30.77	46.15			
Non-Data Tech enterprises	66.67	30.30	3.03			
Generate revenue.	10.17	40.68	49.15	5.761	4	0.218
Data Tech enterprises	0.00	50.00	50.00			
Non-Data Tech enterprises	18.18	33.33	48.48			
Reduce operational costs to be more competitive.	13.56	62.71	23.73	6.771	4	0.148
Data Tech enterprises	3.85	76.92	19.23			
Non-Data Tech enterprises	21.21	51.52	27.27			
Access a niche market and make a secure invest.	27.12	33.90	38.98	5.209	4	0.266
Data Tech enterprises	15.38	42.31	42.31			
Non-Data Tech enterprises	36.36	27.27	36.36			
Without any motivation.	61.02	1.69	37.29	3.399	3	0.334
Data Tech enterprises	50.00	3.85	46.15			
Non-Data Tech enterprises	69.70	0.00	30.30			

{1, Strongly disagree}; {2, Disagree}; {3, Neither agree nor disagree (neutral)}; {4, Agree}; {5, Strongly agree}.
Df: Degree of freedom
Asymp. Sign.: Asymptotic Significance (2-side) = P-value

[66] Using SPSS software, the statistics for each table are based on all cases with valid data from specified ranges for all variable in each table.

The findings suggest that the main motivations of SMEs to use OGD are as follows:

- Meet the requests of clients (Yes with 79.66%, n= 47),

  The relation[67] between the two SME groups and meeting clients' requests (as variables) was not significant, the Chi-square χ^2 (4, N= 59) = 6.576, and the P-value P= 0.160, P value is more than .05 (Null Hypothesis should not be rejected). This motivation doesn't differ for respondents from both groups. Looking at the percentages, the results show that Data/technology (80.77%) and Non-Data Tech enterprises (78.79%) agree that they are motivated to meet the requests of clients.

- Visualize data and gain insight (Yes with 76.27%, n= 45)

  The relationship between the two SME groups and visualizing data was insignificant, χ^2 (4, N= 59) = 33.746, P =0.441 (Null Hypothesis should not be rejected). This motivation does not differ for respondents in the Data/technology and other industries.

- Improve an existing product or service (Yes with 66.10%, n= 39),

  The relation between SME groups and improving an existing product or service was insignificant, χ^2 (4, N= 59) = 6.232, P =0.182 (Null Hypothesis should not be rejected). This motivation does not differ for respondents in the Data/technology and other industries.

- Reduce operational costs to be more competitive (Yes with 62.71%, n=37),

[67] To report the Chi-square tests, the researcher used the APA requirement for citing statistical test results. See, https://www.socscistatistics.com/tutorials/chisquare/default.aspx

The relation between SME groups and reducing operational costs was insignificant, χ^2 (4, N= 59) = 6.771, P =0.148 (Null Hypothesis should not be rejected). This motivation does not differ for respondents in the Data/technology and other industries.

- Conduct research (Yes with 44.07%, n=26),

  The relation between SME groups and conducting research was insignificant, χ^2 (4, N= 59) = 5.243, P =0.263 (Null Hypothesis should not be rejected). This motivation does not differ for respondents in the Data/technology and other industries.

- Generate revenue (Yes with 44.7%, n=21) with 42.6 % (n=20) neutral responses.

  The relation between SME groups and generating revenue was insignificant, χ^2 (4, N= 59) = 5.761, P =0.218 (Null Hypothesis should not be rejected). This motivation does not differ for respondents in the Data/technology and other industries.

Two significant results were found for this question:

"Analyze it by testing its potential" (No with 64.41%, n=38) with 20.34% (n=12) neutral responses. The relation between groups and analyzing data by testing its potential is significant. The chi-square test $\chi 2$ (4, N= 59) = 9.84, P =0.043, $p<.05$, (Null Hypothesis should be rejected).

The mean and standard deviation were calculated: For the Data/technology group, "Mean = 3.33 and Standard Deviation = 0.961". For non-Data/technology groups, Mean = 3.67 and Standard Deviation = 1.127).

According to the percentage of respondents of the two groups, data/technology ("yes" with 30.77%) and non-data/technology do not agree on data analysis by testing its potential, which is a motivation for using OGD.

- Create a new service (No with 47.46%, n=28) with 22.03 (n=13) neutral responses

  The relationship between groups and creating a new service is significant. The chi-square test $\chi 2$ (4, N= 59) = 19.584, P <0.001, (Null Hypothesis should be rejected). The mean and standard deviation were calculated: For the Data/technology group, "Mean = 3.30 and Standard Deviation = 1.031". For non-Data/technology group, Mean = 3.45 and Standard Deviation = 1.416).

  According to the higher percentage of responses, the two groups, Data/technology ("yes" with 30.77%) and non-Data/technology ("No" with 66.67%), agree that creating a new service is not a motivation for using OGD.

As mentioned in the literature review, most enterprises surveyed in the cited articles encountered several impediments when using OGD. Respondents in this survey also confirmed some impediments, as highlighted in Table 4.1.2.2.

For impediments to accessing OGD, legislation and policies, quantity, and quality of OGD, updating OGD, errors in the dataset, incomplete datasets, processing OGD, need for more advanced digital skills/competencies, increasing operational costs, the chi-square test showed no significant difference between data/tech and other businesses, except for Insufficient Quality of OGD. Table 4.1.2.2 shows those questions where a significant difference existed or did not exist between the Data/Technology and Non-Data/Technology enterprises.

Table 4.1.2.2: Impediments encountered when using Canadian OGD (Q11)						
N of responses (n=68) (Valid: 59, missing: 9)	**No (%)**	**Yes (%)**	**Neutral (%)**	**Chi-square**	**Df**	**Asymp. Sign.**
Difficulties in Accessing OGD.	71.19	8.47	20.34	4.094	3	0.252
Data Tech enterprises	61.54	7.69	30.77			
Non-Data Tech enterprises	78.79	9.09	12.12			
Challenges related to legislation & policies.	49.15	15.25	35.59	3.191	4	0.526
Data Tech enterprises	46.15	11.54	42.31			
Non-Data Tech enterprises	51.52	18.18	30.30			
Insufficient Quantity of OGD.	32.20	33.90	33.90	10.237	4	0.037
Data Tech enterprises	11.54	46.15	42.31			
Non-Data Tech enterprises	48.48	24.24	27.27			
Insufficient Quality of OGD.	27.12	28.81	44.07	7.291	4	0.121
Data Tech enterprises	11.54	38.46	50.00			
Non-Data Tech enterprises	39.39	21.21	39.39			
Lack of updating of OGD.	10.17	76.27	13.56	1.606	4	0.808
Data Tech enterprises	7.69	80.77	11.54			
Non-Data Tech enterprises	12.12	72.73	15.15			
Existing Errors in the Dataset.	8.47	32.20	59.32	.969	3	0.809
Data Tech enterprises	7.69	38.46	53.85			
Non-Data Tech enterprises	9.09	27.27	63.64			
Incomplete data sets.	6.78	42.37	50.85	3.857	4	0.426
Data Tech enterprises	3.85	53.85	42.31			
Non-Data Tech enterprises	9.09	33.33	57.58			
Difficulties in Processing OGD.	40.68	11.86	47.46	8.883	4	0.064
Data Tech enterprises	53.85	7.69	38.46			
Non-Data Tech enterprises	30.30	15.15	54.55			
Need for more advanced Digital skills/competencies.	66.10	16.95	16.95	2.431	3	0.488
Data Tech enterprises	76.92	11.54	11.54			
Non-Data Tech enterprises	57.58	21.21	21.21			
Increasing operational costs.	84.75	1.69	13.56	2.200	3	0.532
Data Tech enterprises	80.77	3.85	15.38			
Non-Data Tech enterprises	87.88	0.00	12.12			

{1, Strongly disagree}; {2, Disagree}; {3, Neither agree nor disagree (neutral)}; {4, Agree}; {5, Strongly agree}.
Df: Degree of freedom; Asymp. Sign.: Asymptotic Significance (2-side) = P-value.

By combining the positive results from the columns "Agree (4)" and "Strongly Agree (5)" from Table 4.1.2.2, the participating companies confirmed the following impediments:

- Lack of updating OGD (Yes with 76.27%, n=45),

  The relationship between the SME groups and the lack of updating OGD was insignificant, χ^2 (4, N= 59) = 1.606, P =0.808 (Null Hypothesis should not be rejected). The respondents in the Data/technology and other industries agree on the same impediment.

- Incomplete data sets (Yes with 42.37%, n= 25) with 50.85 % (n=30) neutral responses.

  The relation between the SME groups and incomplete data sets was insignificant, χ^2 (4, N= 59) = 3.857, P =0.426 (Null Hypothesis should not be rejected). The respondents in the Data/technology and other industries agree on the same impediment.

- Existing Errors in the data set (Yes with 32.20%, n= 19), with 59.32% (n=35) neutral responses,

  The relation between the SME groups and existing errors in the data set was insignificant, χ^2 (3, N= 59) = .969, P =0.809 (Null Hypothesis should not be rejected). The respondents in the Data/technology and other industries agree on the same impediment.

- Insufficient Quality of OGD (No with 28.81%, n=17), with 44.07 % (n=26) neutral responses.

  The relation between the SME groups and the insufficient quality of OGD was not significant, χ^2 (4, N= 59) = 7.291, P =0.121, (Null Hypothesis should not be rejected). According to the crosstab, the Data/technology enterprises agree that insufficient data quality represents an Impediment ("yes" = 38.46% with 50% neutral responses). In contrast, enterprises from other sectors do not agree that insufficient data quality presents an impediment ("No" = 39.39% with 39.39% neutral responses). The respondents in the Data/technology and other industries disagree on this impediment. Data quality could be an impediment for some

Canadian SMEs and not for other, depending on their products and the sector in which they operate.

The results from this question suggest that some of the listed impediments are not barriers to using OGD by Canadian SMEs. Surveyed companies (N=59) seem to have no difficulties with:

- Increasing operational costs (No with 84.75%, n=50).

  The relation between the SME groups and increasing operational costs was insignificant, χ^2 (3, N= 59) = 2.200, P =0.532 (Null Hypothesis should not be rejected). The respondents in the Data/technology and other industries agree that there are no increasing operational costs. It is not an impediment.

- Difficulties in accessing OGD (No with 71.19%, n= 42),

  The relation between the SME groups and accessing OGD was insignificant, χ^2 (3, N= 59) = 4.094, P =0.252 (Null Hypothesis should not be rejected). The respondents in the Data/technology and other industries agree that there is no difficulty in accessing OGD. It is not an impediment.

- Need for more advanced Digital skills/competencies (No with 66.10%, n= 39),

  The relation between the SME groups and the need for more advanced Digital skills/competencies was insignificant, χ^2 (3, N= 59) = 2.431, P =0.488 (Null Hypothesis should not be rejected). The respondents in the Data/technology and other industries agree that there is no need for more advanced Digital skills/competencies. It is not an impediment.

- Challenges related to legislation & policies (No with 49.15%, n=29 and 35.59 % (n=21) neutral responses).

  The relation between the SME groups and challenges related to legislation and policies was not significant, χ^2 (4, N= 59) = 3.191, P =0.526 (Null Hypothesis should not be rejected). The respondents in the data/technology and other industries agree that legislation and policies are not impediments. However, 34% of the surveyed enterprises have a neutral opinion.

- Insufficient Quantity of OGD (Yes with 33.90%, n=20, and 33.90% (n=20) neutral responses for responses from the two groups).

  The relation between the SME groups and insufficient quantity of OGD was significant, the chi-square test χ^2 (4, N= 59) = 10.237, P =0.037, P<.05 (Null Hypothesis should be rejected). As $p < 0.05$, the two variables (groups) have a statistically significant relationship.

  The mean and standard deviation for the Data/technology group, "Mean= 3.00 and Standard Deviation = 1.074". For non-Data/technology group, Mean= 3.30 and Standard Deviation = 1.132).

  According to the higher percentage of responses, the two groups, Data/technology ("yes" with 46.15%) and non-Data/technology ("No" with 48.48%), do not agree on the insufficient Quantity of OGD as an impediment.

- Difficulties in processing OGD (No with 40.68%, n= 24) with 47.46% (n=28) neutral responses,

The relation between the SME groups and difficulties in processing OGD was not significant, χ^2 (4, N= 47) = 8.883, P =.064, (Null Hypothesis should not be rejected). The respondents in the Data/technology and other industries agree that there are no difficulties processing data (compared with the low rate of negative responses).

The other variables also have no statistical significance. However, the response to the question on insufficient data quality and quantity shows that respondents were reluctant to answer these two questions since neutral responses are quite considerable compared with positive and negative ones.

For target customers, such as consumers, Enterprises, consumers and Enterprises, Federal Government, and Provincial Government, the chi-square test showed no significant difference between data/tech and other businesses. Table 4.1.2.3 shows those questions where there was or was not a significant difference between the Data/Technology and Non-Data/Technology enterprises.

As for the target customers (see Table 4.1.2.3), most respondents (n=59) indicate that they aim to market their products or services first to businesses (88.14%, n=52) and consumers (52.54%, n=31), for both, Consumers and Enterprises (52.54%, n=31). The positive results from the columns "Agree (4)" and "Strongly Agree (5)" were combined again.

Table 4.1.2.3: Target customers (Q12)

N of responses (n=68) (Valid: 59, missing: 9)	No (%)	Yes (%)	Neutral (%)	Chi-square	Df	Asymp. Sign.
Consumer.	28.81	52.54	18.64	5.103	4	0.277
Data Tech enterprises	30.77	42.31	26.92			
Non-Data Tech enterprises	27.27	60.61	12.12			
Enterprises.	3.39	88.14	8.47	4.111	4	0.391
Data Tech enterprises	3.85	92.31	3.85			
Non-Data Tech enterprises	3.03	84.85	12.12			
Consumer and Enterprises.	25.42	52.54	22.03	3.467	4	0.483
Data Tech enterprises	30.77	46.15	23.08			

Non-Data Tech enterprises	21.21	57.58	21.21			
Federal Government.	35.59	42.37	22.03	1.948	4	0.745
Data Tech enterprises	30.77	46.15	23.08			
Non-Data Tech enterprises	39.39	39.39	21.21			
Provincial Government.	40.68	37.29	22.03	3.145	4	0.534
Data Tech enterprises	42.31	34.62	23.08			
Non-Data Tech enterprises	39.39	39.39	21.21			

{1, Strongly disagree}; {2, Disagree}; {3, Neither agree nor disagree (neutral)}; {4, Agree}; {5, Strongly agree}.
Df: Degree of freedom
Asymp. Sign.: Asymptotic Significance (2-side) = P-value

However, one respondent commented by adding Canadian non-profit organizations as target clients.

4.1.3 Section 3: Processing Open Government Data

This section aims to understand how firms prepare and process OGD. A short definition of Data processing was provided at the top of the section in the survey: *Data processing consists of collecting raw data and translating it into usable information. Data processing is also a series of operations on data, such as collecting, organizing, protecting, and storing data to be analyzed and used for business decisions* (Hunter, 2015). The respondents were asked to answer four questions. Respondents could add written comments at the end of each question if they chose to.

Concerning data processing by companies internally, 70.2% (n=40) of the respondents (n=57) confirmed that they process data internally. Fifteen percent (15.8%, n=7) of the enterprises (all from non-Data/technology sectors) answered "no," and 12.3% (n=7) of the respondents (of which n=6 from non-Data/technology sectors) preferred not to disclose. 1.8 %% (n=1) responded, "I don't know." Compared to the number of "No" responses (15%, n=9), it can be deduced that most companies surveyed process open data internally.

Regarding how OGDs are prepared before being used, most of the firms surveyed (90.70%, n=39) select the data they need (see Table 4.1.3.1) and 93.02 % (n=40) extract data from the OGD categories on the Open Government Portal.

For questions related to selecting data, extracting, cleaning, visualizing, improving, combining, integrating, modifying, analyzing, storing data, and not preparing, the chi-square test showed no significant difference between data/tech and other businesses. Table 4.1.3.1 shows those questions where there was or wasn't a significant difference between the Data/Technology and Non-Data/Technology enterprises (SME groups).

Table 4.1.3.1: How OGD is prepared before being processed (Q14)						
N of responses (n=68) (Valid: 43, missing: 25)	**No (%)**	**Yes (%)**	**Neutral (%)**	**Chi-square**	**Df**	**Asymp. Sign.**
Selected by determining the appropriate data type and source.	2.33	90.70	6.98	3.760	3	0.289
Data Tech enterprises	0.00	87.50	12.50			
Non-Data Tech enterprises	5.26	94.74	0.00			
Extracted by collecting or retrieving data from the categories of OGD.	2.33	93.02	4.65	1.565	3	0.667
Data Tech enterprises	0.00	95.83	4.17			
Non-Data Tech enterprises	5.26	89.47	5.26			
Cleaned by fixing or removing incorrect, duplicate or incomplete Data.	27.91	44.19	27.91	4.799	3	0.187
Data Tech enterprises	25.00	50.00	25.00			
Non-Data Tech enterprises	31.58	36.84	31.58			
Visualized by using visual elements like charts, graphs, and maps.	9.30	79.07	11.63	1.628	4	0.804
Data Tech enterprises	8.33	79.17	12.50			
Non-Data Tech enterprises	10.53	78.95	10.53			
Improved by meeting the requirements for the intended use.	46.51	18.60	34.88	2.778	3	0.427
Data Tech enterprises	41.67	20.83	37.50			
Non-Data Tech enterprises	52.63	15.79	31.58			
Combined by merging OGD with another dataset.	4.65	79.07	16.28	2.738	4	0.603
Data Tech enterprises	0.00	83.33	16.67			
Non-Data Tech enterprises	10.53	73.68	15.79			
Integrated by consolidating OGD from different categories.	34.88	20.93	44.19	4.455	4	0.348
Data Tech enterprises	37.50	20.83	41.67			
Non-Data Tech enterprises	31.58	21.05	47.37			
Modified by changing the contents of tables.	65.12	9.30	25.58	4.660	3	0.198
Data Tech enterprises	58.33	12.50	29.17			
Non-Data Tech enterprises	73.68	5.26	21.05			
Analyzed by transforming and modeling data to discover useful information.	23.26	58.14	18.60	3.393	4	0.494
Data Tech enterprises	16.67	62.50	20.83			
Non-Data Tech enterprises	31.58	52.63	15.79			
Stored by saving it in a storage system.	11.63	67.44	20.93	2.654	4	0.617
Data Tech enterprises	12.50	62.50	25.00			
Non-Data Tech enterprises	10.53	73.68	15.79			
Not prepared.	50.00	0.00	50.00	.875	2	0.646
Data Tech enterprises	50.00	0.00	50.00			
Non-Data Tech enterprises	50.00	0.00	50.00			

{1, Strongly disagree}; {2, Disagree}; {3, Neither agree nor disagree (neutral)}; {4, Agree}; {5, Strongly agree}.
Df: Degree of freedom
Asymp. Sign.: Asymptotic Significance (2-side) = P-value

- Extracted by collecting or retrieving data from the categories of OGD (Yes with 93.02 %, n=40).

The relation between the SME groups and data extraction was insignificant, χ^2 (3, N= 43) =1.565, P =0.667 (Null Hypothesis should not be rejected). Respondents from all sectors agree on data extraction.

- Visualized by using visual elements like charts, graphs, and maps (Yes with 79.07%, n=34)

  The relation between the SME groups and data visualization was insignificant, χ^2 (3, N= 43) =1.628, P =0.804 (Null Hypothesis should not be rejected). Respondents from all sectors agree on the visualization of data.

- Stored by saving it in a storage system (Yes with 67.50%, n=29)

  The relation between the SME groups and data storage was not significant, χ^2 (4, N= 43) =2.654, P =0.617 (Null Hypothesis should not be rejected). Respondents from all sectors agree on the storage of data.

- Combined by merging OGD with another dataset (Yes with 79.07%, n=34)

  The relationship between the SME groups and the combination was insignificant, χ^2 (4, N= 43) =2.738, P =0.603 (Null Hypothesis should not be rejected). Respondents from all sectors agree on merging OGD with another dataset.

- Analyzed by transforming and modeling data to discover useful information (Yes with 58.14%, n=25)

  The relation between the SME groups and data analysis was insignificant, χ^2 (4, N= 43) =3.393, P =0.494 (Null Hypothesis should not be rejected). Respondents

from all sectors agree on transforming and modeling data to discover useful information.

- Not prepared (No with 51.16%, n=22)

  The relation between the SME groups and the data being not prepared was insignificant, χ^2 (2, N= 43) =.875, P =0.646 (Null Hypothesis should not be rejected). Respondents from all sectors agree that data are prepared.

Nevertheless, respondents answered negatively to other actions as the following:

- Modified by changing the contents of tables (No with 65.12%, n=28)

  The relation between the SME groups and modification by changing table contents was insignificant, χ^2 (3, N= 43) =4.660, P =0.198 (Null Hypothesis should not be rejected). Respondents from all sectors confirm that data is not modified by changing the contents of tables.

- Improved by meeting the requirements for the intended use (No with 46.51%, n=20) with 34.88% (n=15) neutral responses.

  The relationship between the SME groups and the improved data was insignificant, χ^2 (3, N= 43) =2.778, P =0.427 (Null Hypothesis should not be rejected). Respondents from all sectors agree that data are not improved.

- Integrated by consolidating OGD from different categories (No with 34.88%, n=15) with 44.19% (n=19) neutral responses.

  The relation between the SME groups and that data is integrated was insignificant, χ^2 (4, N= 43) =4.455, P =0.348 (Null Hypothesis should not be

rejected). Respondents from all sectors agree that data are not Integrated by consolidating OGD from different categories.

The companies surveyed confirmed how open data is processed within their organizations (see Table 4.1.3.2). About the internal process of OGD, Hunter (2015, p. 82) argues that data collected can be introduced into the SMEs' information systems and transformed into information through several processes, such as: calculating, comparing, sorting, classifying, and summarizing.

Regarding these processes, the chi-square test showed no significant difference between data/tech and other businesses. Table 4..1.3.2 shows those questions where there was or wasn't a significant difference between the Data/Technology and Non-Data/Technology enterprises (SME groups).

Table 4.1.3.2: How OGD is processed internally (Q15)

N of responses (n=68) (Valid: 43, missing: 25)	**No (%)**	**Yes (%)**	**Neutral (%)**	**Chi-square**	**Df**	**Asymp. Sign.**
Calculated by combining data from any Data Source to create new Calculated Metrics.	25.58	41.86	32.56	6.005	4	0.199
Data Tech enterprises	20.83	37.50	41.67			
Non-Data Tech enterprises	31.58	47.37	21.05			
Compared by identifying differences and similarities with other data.	6.98	83.72	9.30	.363	3	0.948
Data Tech enterprises	8.33	83.33	8.33			
Non-Data Tech enterprises	5.26	84.21	10.53			
Sorted by arranging data into a meaningful order.	20.93	72.09	6.98	3.841	4	0.428
Data Tech enterprises	25.00	70.83	4.17			
Non-Data Tech enterprises	15.79	73.68	10.53			
Classified by organizing it into relevant categories.	23.26	60.47	16.28	3.861	4	0.425
Data Tech enterprises	25.00	58.33	16.67			
Non-Data Tech enterprises	21.05	63.16	15.79			
Summarized by describing it in simple terms with a short conclusion.	37.21	39.53	23.26	4.209	4	0.378
Data Tech enterprises	45.83	37.50	16.67			
Non-Data Tech enterprises	26.32	42.11	31.58			

{1, Strongly disagree}; {2, Disagree}; {3, Neither agree nor disagree (neutral)}; {4, Agree}; {5, Strongly agree}.
Df: Degree of freedom
Asymp. Sign.: Asymptotic Significance (2-side) = P-value

- Calculate data by combining it from any data source to create new Metrics (Yes with 41.86%, n=18) with 32.56 % (n=14) neutral responses.

  The relation between the SME groups and calculating was not significant, χ^2 (4, N= 43) =6.005, P =0.199 (Null Hypothesis should not be rejected). Respondents' opinion differs on calculating data. The percentages show that Non-Data Tech enterprises (47.37% with 21.05% neutral responses) and Data Tech enterprises 37.5% with 41.67% neutral responses. 25.58% of the responses in both groups do not agree that data is always calculated when processed internally. This probably depends on how the data is used within the company and whether it is processed in a simple or complex way.

- Compare data (Yes with 83.72%, n=36)

  The relation between the SME groups and compare data was insignificant, χ^2 (3, N= 43) =.363, P =0.948 (Null Hypothesis should not be rejected). Respondents from all sectors agree on comparing data.

- Sort data (Yes with 72.09%, n=31)

  The relation between the SME groups and sorting data was insignificant, χ^2 (4, N= 43) =3.841, P =0.428 (Null Hypothesis should not be rejected). Respondents from all sectors agree on sorting data.

- Classify data (Yes with 0.47% (n=26)

  The chi-square test of independence was performed to examine the relationship between. The relation between the SME groups and classifying data was

insignificant, χ^2 (4, N= 43) =3.861, P =0.425 (Null Hypothesis should not be rejected). Respondents from all sectors agree on classifying data.

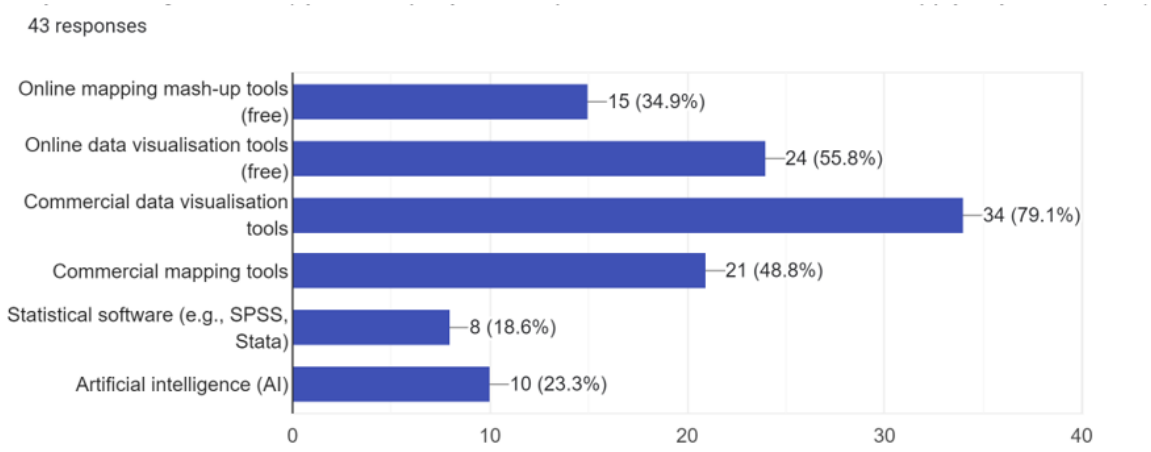
- Summarize (Yes with 39.53% (n= 17) with 23.26 % (n=10) neutral responses

  The relation between the SME groups and summarizing data was insignificant, χ^2 (4, N= 43) =4.209, P =0.378 (Null Hypothesis should not be rejected). Respondents from all sectors agree on summarizing data.

About the technology tools used to process OGD (see Figure 4.1.3.1), the surveyed firms (n=43) answered by selecting or checking off more than one answer (see Figure 4.5). Most of the respondents (79.1%, n=34) confirmed that they use commercial data visualization tools. Fifty-five percent (n=24) confirmed that they use free online data visualization tools, 34.9% (n=15) used free online mapping mash-up tools, and 48.8% (n=21) used commercial mapping tools.

Because respondents could select more than one tool, 112 different tools were noted, indicating that companies use various software to test, analyze and process the extracted data types. In the comments box, companies mentioned the names of the specialized and free commercial software: Excel, Tableau, Python, Apache (free), Cognos, and GIS software.

Figure 4.1.3.1: Technological tools used to process OGD (Q16)

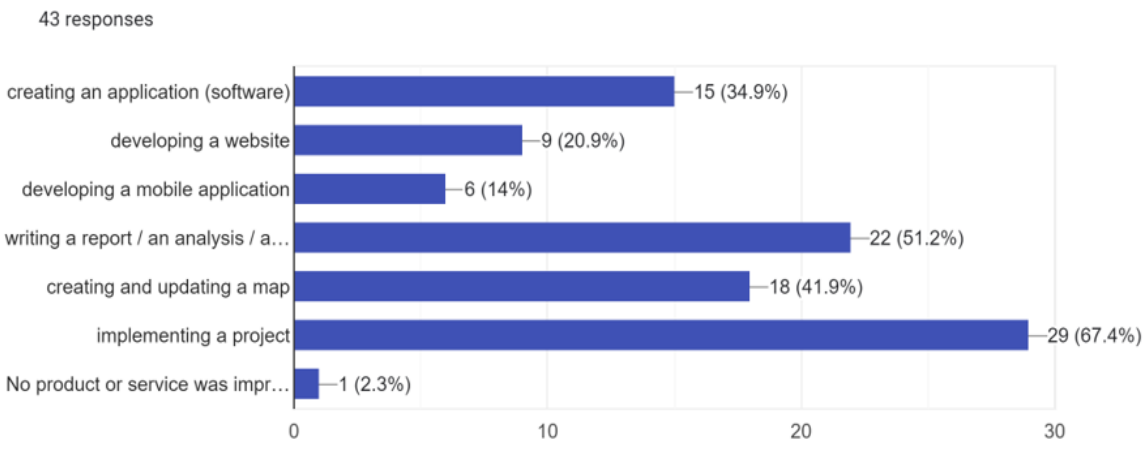


Five (5) companies in the Data/Technology sector mentioned using their tools to extract and process open data (probably developed according to their needs). However, companies in this sector used data visualization tools as much as those in other sectors (See also Appendix E, Table 4.6).

As the OGD is processed internally, the companies surveyed (N=43) were asked to select a response from a proposed list of reasons or objectives (See Figure 4.1.3.2). Similarly, to answer this question, a multiple selection could be made to identify the different outcomes. The respondents made 100 choices among the proposed objectives in this question.

Sixty-seven percent (n=29) of respondents confirmed that they processed the data to implement a project, 51.2% (n=22) to write a report, conduct an analysis or prepare an assessment. Forty-two (n=18) processed data to create and update a map, while 34.9% (n=15) did it to create an application/ software.

Figure 4.1.3.2: Reasons for processing OGD (Q17).



Nine (9) enterprises from the Data/technology sector process data to create an application, while only two (2) enterprises from other sectors processed OGD for this purpose (See Appendix E, Table 4.7)

In the comment box, respondents indicated additional reasons for processing Open Data. which include creating data catalogues, geo-marketing solutions, training materials, platforms, tools, interactive web apps, and creating reports as evidence in legal proceedings.

4.1.4 Section 4: Skills needed and Impact of using OGD

This section aims to understand and confirm the required employees' skills to use OGD and identify the objectives and results of using OGD by SMEs. As regards the employee skills required to use OGD, the companies surveyed selected their answers from a list of skills identified from the data analyst jobs (see Table 4.1.3.3).

For questions related to testing, manipulating, using a database management system, mastering database software, visualizing OGD, combining OGD, conducting an OGD analysis, Innovating with OGD, the chi-square test showed no significant difference between data/tech and other businesses. Table 4.1.3.3 shows those questions where there was or wasn't a significant difference between the Data/Technology and Non-Data/Technology enterprises (SME groups).

Table 4.1.3.3: Employee skills required to use OGD (Q18)

N of responses (n=68) (Valid: 59, missing: 9)	No (%)	Yes (%)	Neutral (%)	Chi-square	Df	Asymp. Sign.
Testing the OGD Platform.	86.44	6.78	6.78	3.527	4	0.474
Data Tech enterprises	80.77	7.69	11.54			
Non-Data Tech enterprises	90.91	6.06	3.03			
Manipulating a large amount of OGD.	27.12	52.54	20.34	11.096	4	0.026
Data Tech enterprises	15.38	69.23	15.38			
Non-Data Tech enterprises	36.36	39.39	24.24			
Using a database management system.	13.56	72.88	13.56	9.754	4	0.045
Data Tech enterprises	7.69	80.77	11.54			
Non-Data Tech enterprises	18.18	66.67	15.15			
Mastering database software.	23.73	64.41	11.86	11.068	4	0.026
Data Tech enterprises	7.69	80.77	11.54			
Non-Data Tech enterprises	36.36	51.52	12.12			
Visualizing OGD.	8.47	86.44	5.08	5.081	4	0.279
Data Tech enterprises	0.00	92.31	7.69			
Non-Data Tech enterprises	15.15	81.82	3.03			
Combining OGD with other data.	14.58	70.83	14.58	3.666	4	0.453
Data Tech enterprises	3.85	76.92	19.23			
Non-Data Tech enterprises	18.18	66.67	15.15			
Conducting an OGD Analysis.	37.93	36.21	25.86	3.406	4	0.492
Data Tech enterprises	30.77	42.31	26.92			
Non-Data Tech enterprises	43.75	31.25	25.00			

Innovating with OGD.	39.66	20.69	39.66	9.693	4	0.046
Data Tech enterprises	19.23	30.77	50.00			
Non-Data Tech enterprises	56.25	12.50	31.25			

{1, Strongly disagree}; {2, Disagree}; {3, Neither agree nor disagree (neutral)}; {4, Agree}; {5, Strongly agree}.
Df: Degree of freedom
Asymp. Sign.: Asymptotic Significance (2-side) = P-value

According to the SMEs surveyed, the main employees' skills are as follows:

- Visualizing OGD (Yes with 86.44%, n=51),

  The relation between the SME groups and visualizing data was not significant, χ^2 (4, N= 59) =5.081, P =0.279 (Null Hypothesis should not be rejected). Respondents from all sectors confirmed that visualizing data is a required skill. Checking the results in numbers, most respondents from Data/Technology (n=24) and other industries (n=27) agree with this statement.

- Using database management system (Yes with 72.88%, n=43),

  The relation between the SME groups and using a database management system was significant, χ^2 (4, N= 59) =9.754, P =0.045 (Null Hypothesis should be rejected). As $P < 0.05$ there is a statistically significant relationship between the two variables (groups).

  The mean and standard deviation were calculated. For the Data/technology group, "Mean = 2.81 and Standard Deviation = 1.272". For non-Data/technology group, Mean = 2.85 and Standard Deviation = 1.395.

  However, respondents from all sectors agree that using database management system data is a required skill. Respondents from Data/Technology (n=21) and other industries (n=22) agree with this statement.

- Combining OGD with other data (Yes with 70.83%, n=34).

  The relation between the SME groups and combining OGD with other data was not significant, χ^2 (4, N= 59) =3.666, P =0.453 (Null Hypothesis should not be rejected). Respondents from all sectors confirmed that the ability to combine OGD with other data is a required skill. Most respondents from Data/Technology (n=20) and other industries (n=22) agree with this statement.

- Mastering database software (Yes with 64.41%, n=38),

  The relation between the SME groups and mastering database software was significant. The chi-square test χ^2 (4, N= 59) =11.068, P =0.026 (Null Hypothesis should be rejected). The P-value is less than 0.05.

  The mean and standard deviation for the Data/technology group, "Mean = 2.70 and Standard Deviation = 1.203". For non-Data/technology group Mean = 2.97 and Standard Deviation = 1.334).

  According to the higher percentage of responses, the two groups, Data/technology ("yes" with 80.77%) and non-Data/technology ("Yes" with 51.52%) agree that Mastering database software is a skill required.

  Respondents from all sectors confirmed that the ability to master database software is a required skill. In addition, most respondents from Data/Technology (n=21) and other industries (n=17) agree with this statement.

- Manipulating a large amount of data (Yes with 52.54%, n=31),

  The relation between the SME groups and manipulating a large amount of data was significant. The chi-square test shows that, χ^2 (4, N= 59) =11.096, P =0.026.

As the P-value is less than 0.05, there is a statistically significant relationship between the two groups (Null Hypothesis should be rejected).

The mean and standard deviation for Data/technology group, “Mean = 2.85 and Standard Deviation = 1.199”. For non-Data/technology group Mean= 3.39 and Standard Deviation = 1.478).

According to the higher percentage of responses, the two groups, Data/technology (“yes” with 69.23%) and non-Data/technology (“Yes” with 39.39%) agree that the insufficient Quantity of OGD is a required skill.

However, respondents from all sectors confirmed that the ability to master database software is a required skill. Most respondents from Data/Technology (n=18) and other industries (n=13) agree with this statement.

According to SMEs surveyed, some employees' skills are not required, such as:

- Testing the OGD Platform (No with 86.44%, n= 51)

  The relation between the SME groups and testing the OGD platform was not significant, χ^2 (4, N= 59) =3.527, P=0.474. (Null Hypothesis should not be rejected). Respondents from all sectors confirmed that the ability to test the OGD platform is not a required skill. In addition, most respondents from Data/Technology (n=21) and other industries (n=30) do not agree with this statement.

- Conducting an OGD Analysis (No with 37.93%, n= 22 and neutral with 25.86%, n=15)

The relation between the SME groups and conducting an OGD Analysis was not significant, $\chi 2$ (4, N= 58) =3.406, P=0.492 (Null Hypothesis should not be rejected). Respondents from all sectors confirmed that the ability to conduct an OGD Analysis is not a required skill. In addition, most respondents from Data/Technology (n=8) and other industries (n=14) do not agree with this statement.

- Innovating with OGD (No with 39.66%, n=23, and neutral with 39.66%, n=23)

  The relation between the SME groups and innovation with OGD was significant, the chi-square test shows that $\chi 2$ (4, N= 58) =9.693, P=0.046. The P-value is less than 0.05 (Null Hypothesis should be rejected). There is a statistically significant relationship between the two groups.

  The mean and standard deviation for Data/technology group, "Mean = 3.22 and Standard Deviation = 1.013". For non-Data/technology group, Mean = 3.39 and Standard Deviation = 1.113).

  According to the higher percentage of responses, the two groups, Data/technology ("yes" with 30.77% and 50% for neutral responses) and non-Data/technology ("No" with 56.25%) do not agree that innovating with OGD is a required skill. Data technology firms see this aspect as more important.

Companies were also asked about the goals achieved by using OGD as shown in Table 4.1.4.1 (see next page).

For questions related to achieving goals by using OGD such as: improving or create a product, improving or create a service, creating valuable data, generating revenue, accessing to a niche market, reducing the operational costs, supporting decision-making, obtaining a competitive advantage, improving collaboration, establishing a new partnership, the chi-square test showed no significant difference between data/tech and other businesses. Table 4.1.4.1 shows those questions where there was or wasn't a significant difference between the Data/Technology and Non-Data/Technology enterprises (SME groups).

Table 4.1.4.1: Goals achieved by using OGD (Q19)

N of responses (n=68) (Valid: 59, missing: 9)	No (%)	Yes (%)	Neutral (%)	Chi-square	Df	Asymp. Sign.
Improve or create a product.	11.86	77.97	10.17	5.683	4	0.224
Data Tech enterprises	3.85	92.31	3.85			
Non-Data Tech enterprises	18.18	66.67	15.15			
Improve or create a service.	22.03	42.37	35.59	4.248	4	0.373
Data Tech enterprises	15.38	38.46	46.15			
Non-Data Tech enterprises	27.27	45.45	27.27			
Create valuable data.	18.64	54.24	27.12	3.146	4	0.534
Data Tech enterprises	15.38	57.69	26.92			
Non-Data Tech enterprises	21.21	51.52	27.27			
Generate revenue (or a profit).	11.86	57.63	30.51	3.473	4	0.482
Data Tech enterprises	3.85	65.38	30.77			
Non-Data Tech enterprises	18.18	51.52	30.30			
Access to a niche market.	27.12	28.81	44.07	2.970	4	0.563
Data Tech enterprises	19.23	30.77	50.00			
Non-Data Tech enterprises	33.33	27.27	39.39			
Reduce the operational costs.	10.17	69.49	20.34	2.719	4	0.606
Data Tech enterprises	7.69	65.38	26.92			
Non-Data Tech enterprises	12.12	72.73	15.15			
Support decision-making.	18.64	52.54	28.81	7.390	4	0.117
Data Tech enterprises	26.92	46.15	26.92			
Non-Data Tech enterprises	12.12	57.58	30.30			
Obtain a competitive advantage.	13.79	68.97	17.24	6.218	4	0.183
Data Tech enterprises	3.85	76.92	19.23			
Non-Data Tech enterprises	21.88	62.50	15.63			
Improve collaboration.	33.90	27.12	38.98	5.681	4	0.224
Data Tech enterprises	34.62	30.77	34.62			
Non-Data Tech enterprises	33.33	24.24	42.42			
Establish a new partnership.	40.68	32.20	27.12	5.741	4	0.219
Data Tech enterprises	38.46	42.31	19.23			
Non-Data Tech enterprises	42.42	24.24	33.33			

No goal.	31.03	0.00	68.97	1.394	2	0.498
Data Tech enterprises	38.46	0.00	61.54			
Non-Data Tech enterprises	25.00	0.00	75.00			

{1, Strongly disagree}; {2, Disagree}; {3, Neither agree nor disagree (neutral)}; {4, Agree}; {5, Strongly agree}.
Df: Degree of freedom
Asymp. Sign.: Asymptotic Significance (2-side) = P-value

The collected responses confirmed the following main goals:

- Improve or create a product (Yes with 77.97%, n= 46),

  The relation between the SME groups and to improve or create a product was not significant, χ^2 (4, N= 59) =5.683, P =0.224. (Null Hypothesis should not be rejected). Respondents from all sectors confirmed that improving or creating a product is a goal. In addition, most respondents from Data/Technology (n=24) and other industries (n=22) agree with this statement.

- Reduce the operational costs (Yes with 69.46%, n= 41),

  The relation between the SME groups and reducing operational costs was not significant, χ^2 (4, N= 59) =2.719, P =0.606. (Null Hypothesis should not be rejected). Respondents from all sectors confirmed that reducing operational costs is a goal. In addition, most respondents from Data/Technology (n=17) and other industries (n=24) agree with this statement.

- Obtain a competitive advantage (Yes with 68.97%, n=40),

  The relation between the SME groups and obtaining a competitive advantage was not significant, χ^2 (4, N= 59) =6.218, P =0.183. (Null Hypothesis should not be rejected). Respondents from all sectors confirmed that obtaining a competitive advantage is a goal. In addition, most respondents from Data/Technology (n=20) and other industries (n=20) agree with this statement.

- Create valuable data (Yes with 54.24%, n=32),

  The relation between the SME groups and creating valuable data was not significant, χ^2 (4, N= 59) =3.146, P =0.534. (Null Hypothesis should not be rejected). Respondents from all sectors confirmed that creating valuable data is a goal. In addition, most respondents from Data/Technology (n=15) and other industries (n=17) agree with this statement.

- Generate a revenue (Yes with 57.63%, n= 34),

  The relation between the SME groups and generating revenue was not significant, χ^2 (4, N= 59) =3.473, P =0.482. (Null Hypothesis should not be rejected). Respondents from all sectors confirmed that generating revenue is a goal. In addition, most respondents from Data/Technology (n=17) and other industries (n=17) agree with this statement.

- Improve or create a service (Yes with 42.37%, n=25, and neutral with 35.59%, n=21)

  The relation between the SME groups and to improve or create a service was not significant, χ^2 (4, N= 59) =4.248, P =0.373 (Null Hypothesis should not be rejected). Respondents from all sectors confirmed that improving or creating a service is a goal. In addition, most respondents from Data/Technology (n=10) and other industries (n=15) agree with this statement.

According to the result introduced in Table 4.1.4.1, none of the Chi-square tests are statistically significant.

The respondents were also asked to identify their results of experimenting with using OGD from the list on the list in Table 4.1.1.2. For questions related to the different results, such as, , being dropped, requiring more actions to make data valuable, requiring less time than other projects, requiring additional costs, requiring less costs than other projects, generating an income, generated a loss, requiring more training for employees, continuing for future projects, the chi-square test showed no significant difference between data/tech and other businesses, except for being a short experiment, requiring no training of employees. Table 4.1.4.2 shows those questions where there was or wasn't a significant difference between the Data/Technology and Non-Data/Technology enterprises (SME groups).

Table 4.1.4.2: Results of using OGD internally (Q20)

N of responses (n=68) (Valid: 59, missing: 9)	No (%)	Yes (%)	Neutral (%)	Chi-square	Df	Asymp. Sign.
Was a short experiment.	91.53	3.39	5.08	7.415	3	0.060
Data Tech enterprises	88.46	0.00	11.54			
Non-Data Tech enterprises	93.94	6.06	0.00			
Has been dropped.	94.92	0.00	5.08	1.502	2	0.472
Data Tech enterprises	96.15	0.00	3.85			
Non-Data Tech enterprises	93.94	0.00	6.06			
Requires more actions to make data valuable.	54.24	15.25	30.51	3.345	3	0.341
Data Tech enterprises	42.31	23.08	34.62			
Non-Data Tech enterprises	63.64	9.09	27.27			
Required additional time than other projects.	76.27	5.08	18.64	2.865	3	0.413
Data Tech enterprises	76.92	0.00	23.08			
Non-Data Tech enterprises	75.76	9.09	15.15			
required less time than other projects.	30.51	23.73	45.76	.240	4	0.993
Data Tech enterprises	30.77	23.08	46.15			
Non-Data Tech enterprises	30.30	24.24	45.45			
Required additional costs.	91.53	5.08	3.39	1.487	3	0.685
Data Tech enterprises	88.46	7.69	3.85			
Non-Data Tech enterprises	93.94	3.03	3.03			
Required less costs than other projects.	16.95	42.37	40.68	1.061	4	0.900
Data Tech enterprises	11.54	46.15	42.31			
Non-Data Tech enterprises	21.21	39.39	39.39			
Generated an income.	6.78	62.71	30.51	2.200	4	0.699
Data Tech enterprises	3.85	65.38	30.77			

Non-Data Tech enterprises	9.09	60.61	30.30			
Generated a loss.	86.44	0.00	13.56	.170	2	0.919
Data Tech enterprises	88.46	0.00	11.54			
Non-Data Tech enterprises	84.85	0.00	15.15			
Required more training for employees.	66.10	8.47	25.42	3.239	4	0.519
Data Tech enterprises	61.54	3.85	34.62			
Non-Data Tech enterprises	69.70	12.12	18.18			
Required no training of employees.	42.37	25.42	32.20	14.757	4	0.005
Data Tech enterprises	61.54	19.23	19.23			
Non-Data Tech enterprises	27.27	30.30	42.42			
Will continue for future projects.	1.72	81.03	17.24	1.326	3	0.723
Data Tech enterprises	0.00	84.62	15.38			
Non-Data Tech enterprises	3.13	78.13	18.75			

{1, Strongly disagree}; {2, Disagree}; {3, Neither agree nor disagree (neutral)}; {4, Agree}; {5, Strongly agree}.
Df: Degree of freedom
Asymp. Sign.: Asymptotic Significance (2-side) = P-value

Thus, companies from Data/technology and other industries confirmed using OGD …

- Will continue for future projects (Yes with 81.03%, n=47)

  The relation between the SME groups and continuing to use OGD for future projects was not significant, χ^2 (3, N= 59) =1.326, P=0.723. (Null Hypothesis should not be rejected). Respondents from all sectors agreed to continue using OGD for future projects. In addition, most respondents from Data/Technology (n=22) and other industries (n=25) agree with this statement.

- Generated an income (Yes with 62.71%, n=37),

  The relation between the SME groups and generating an income was not significant, χ^2 (4, N= 59) =2.200, P=0.699. (Null Hypothesis should not be rejected). Respondents from all sectors agreed that using OGD generates an income. In addition, most respondents from Data/Technology (n=17) and other industries (n=20) agree with this statement.

- Required less costs than other projects (Yes with 42.37%, n=25, neutral responses with 40.68%, n=24).

The relation between the SME groups and the requirement of lower costs than other projects was not significant, χ^2 (4, N= 59) =1.061, P=0.900. (Null Hypothesis should not be rejected). Respondents from all sectors agreed that using OGD Generates an income. In addition, most respondents from Data/Technology (n=12) and other industries (n=13) agree with this statement.

According to the result introduced in Table 4.1.4.2, the Chi-square tests and the obtained P-values for the list above are not statistically significant. This means that, as small or medium organizations, the companies surveyed have these three common goals to achieve. However, the surveyed respondents provided negative responses on the results of using OGD internally. The use of OGD:

- has been dropped (No with 94.92%, n=56)

  The relationship between the SME groups and the possibility of dropping the use of OGD was not significant, χ^2 (2, N= 59) =1.502, P =0.472 (Null Hypothesis should not be rejected). Respondents from all sectors confirmed that the use of OGD was not dropped. In addition, most respondents from Data/Technology (n=25) and other industries (n=31) do not agree with this statement.

- requires more actions to make data valuable (No with 54.24%, n=32)

  The relationship between the SME groups and the requirement for more actions to make data valuable was not significant, χ^2 (3, N= 59) =3.345, P =0.341 (Null Hypothesis should not be rejected). Respondents from all sectors confirmed that no more actions are required to make data valuable. In addition, most

respondents from Data/Technology (n=11) and other industries (n=21) do not agree with this statement.

- required additional time than other projects (No with 76.27%, n=45)

  The relationship between the SME groups and the requirement for additional time than other projects was not significant, χ^2 (3, N= 59) =2.865, P =0.413 (Null Hypothesis should not be rejected). Respondents from all sectors confirmed there is no need for additional time than other projects. In addition, most respondents from Data/Technology (n=20) and other industries (n=25) do not agree with this statement.

- required additional costs (No with 91.53%, n=54)

  The relationship between the SME groups and the requirement for additional costs was not significant, χ^2 (3, N= 59) =1.487, P =0.685 (Null Hypothesis should not be rejected). Respondents from all sectors confirmed there is no need for additional costs. In addition, most respondents from Data/Technology (n=23) and other industries (n=31) do not agree with this statement.

- generated a loss (No with 86.44%, n=51)

  The relationship between the SME groups and to generate a loss was not significant, χ^2 (4, N= 59) =2.200, P =0.699 (Null Hypothesis should not be rejected). Respondents from all sectors confirmed there is no loss. In addition, most respondents from Data/Technology (n=23) and other industries (n=28) do not agree with this statement.

- required more training of employees (No with 66.10%, n=39)

  The relationship between the SME groups and the requirement for more training of employees was not significant, χ^2 (4, N= 59) =3.2397, P =0.519 (Null Hypothesis should not be rejected). Respondents from all sectors confirmed there is no need for more training. In addition, most respondents from Data/Technology (n=16) and other industries (n=23) do not agree with this statement.

The obtained Chi-square results and the P-values for the list above are not statistically significant. This means that the opinion of SMEs from the data/technology sector does not differ with SMES from other sectors. However, companies from all sectors agree with the proposed goals, except for the following statements.

- required no training of employees (No with 42.37%, n=25 and neutral response 32.20%, n=19)

  The relationship between the SME groups and no training of employees is insignificant, χ^2 (4, N= 59) =14.757, P =0.005 (P=.05), (Null Hypothesis should not be rejected). The two groups disagree on this question. The responses provided are as follows: Data/technology enterprises responded “No” with 61.54% (n=16), and Non-Data Technology enterprises responded “Yes” with 30.30 % (n=10) with 42.42% neutral responses). The statement “training of employees is not required” is not applicable for all enterprises probably it depends on the activities of each company.

- was a short experiment (No with 89.4%, n=42)

The relation between the SME groups and using OGD as a short experiment was significant, χ^2 (3, N= 59) =7.415, P =.060 (Null Hypothesis should be rejected). Both groups responded negatively to this question: Data/technology enterprises responded “No” with 88.46% responses, and Non-Data Technology enterprises responded “No” with 93.94%. Most respondents from all sectors do not agree with using OGD as a short experiment. This is means that using OGD is not a short experience and continue.

4.2 Discussion

The survey carried out among Canadian SMEs provided a broad set of data on the use of OGD. Among respondents, two groups of companies (Data-technology enterprise and non-data-technology enterprise) based on the literature demonstrating that data technology companies tended to use OGD more so than companies in other sectors. In addition, from a theoretical perspective, one might imagine that data technology companies have more advanced information processing capabilities and thus would be better prepared to capture and integrate OGD and better understand the different OGD uses and needs.

Most survey respondents are CEOs, managers, and consultants/partners who set or contribute to their organization's strategy and have decision-making authority. Most companies were based in Ontario and Quebec an established between 2010 and 2022. The number of IT companies surveyed and created between 2013 and 2014 is higher than other types of companies. During this period, an updated version of the open government portal

was launched in 2013,[68] as well as an updated open government licence.[69] The increase in IT companies created during this period may be primarily due to the release and easy access to more OGD. Most of the companies surveyed have monthly or weekly access to the open datasets.

The findings from the survey indicate that companies in the Data/technology and other sectors do not hesitate to use open data and combine them with their own data. This interest is due to the fundamental nature of OGD: accessible, available online, free, etc.

The SMEs surveyed aim to market their products to both businesses and consumers. They operate in different industries and sectors, such as Economy & industry, science, technology & geospatial / cartography, education, environment/weather, business & legal services and more. The databases of interest of these companies are related to the following areas: Economics & Industry, Science & Technology, Nature & environment, Government & politics, and more. Depending on their business activities, SMEs are interested in different datasets available on the open government portal.

Most companies surveyed have several motivations for using open datasets, including responding to customer requests, visualizing data, gaining insights, and improving an existing product or service. However, enterprises encounter several impediments when accessing and using OGD, primary lack of OGD updates, incomplete data sets, and insufficient data quality.

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[68] See, News Release: Minister Clement Launches Next Generation Open Data Portal (June 2013) https://www.canada.ca/en/news/archive/2013/06/minister-clement-launches-next-generation-open-data-portal.html

[69] See, Case study (2013): Canada's Open Government Licence, https://www.opengovpartnership.org/documents/case-study-2013-canadas-open-government-licence/

From the survey, it was observed that enterprises process data differently, depending on their business's nature or needs. The preparation of OGD to be processed is done differently across the companies surveyed. Some companies select, extract the data, and combine it directly with their internal resources. Other companies will select, extract the data, clean it, correct it, classify it, combine it, store it, and then use it. Enterprises do not use OGD in the same way. The companies surveyed confirmed that they process OGD by calculating, comparing, sorting, classifying, and summarizing it internally, consistent with the literature (Hunter, 2015).

From a technology tools perspective, companies use different tools to process OGD data. They use commercial data visualization tools, free online mapping mash-up tools, and their own tools and software. The respondents also confirmed that they process data primarily to implement a project, write a report/analysis/evaluation, and create and update a map or software.

Some key findings include the motivation to capture OGD as an asset, the outcomes of use of this asset, and the skills needed to capture and gain advantage from the asset.

Motivation to use: Most respondents (approximately 80%) indicated that they use OGD to meet client needs. This suggests that they are not necessarily acquiring the asset on speculation that it can provide some form of benefit. It is being acquired to meet a specific need. One can imagine therefore two scenarios. First, a less uncertain asset acquisition environment exists than the situation where a firm is acquiring an asset that can provide a variety of different services to the organization as originally argued by Penrose (1959). In other words, the organization has a paid project for a client and then acquires the asset. Second, the organization might have past experiences with certain clients and therefore

anticipates that OGD might be needed to fulfill needs. In either case, the asset is acquired at some internal cost (staff time etc.,), but the risk is relatively low since expenses are not incurred. Both scenarios question the foundational RBV logic that implies careful assessments of an asset according to VRIO to determine its appropriateness. Client needs were identified as reports projects, specific analyses, or creation of an application. These examples suggest that asset acquisition is very much linked to delivery of a service or product for a client that is based on some level of certainty that the asset will produce value.

Outcomes: In line with the above related to meeting client needs, the question of achieving goals showed most organizations focusing on the use of OGD for improving or creating a product (78%), service (67%), or reducing operational costs (69%). These outcomes are inline with the RBV which suggests that value to the organization might include operational efficiencies or the creation of new products and services that enables the organization to deliver value to customers. Organizations also suggested that OGD does help to generate competitive advantage (69%).

Skills needed: The skills needed question showed the most difference between Data/technology companies and those in other sectors. The implication is that Data/technology companies tend to work with larger data sets and use more sophisticated tools to capture and manipulate the data. Moreover, they tend to be more focused on using OGD to innovate products and services. This finding aligns well with the RBV concept of companies investing in complementary assets (information systems) to enable the use of strategic assets (OGD).

4.3 Conclusion

The survey results demonstrate that the way Data/technology enterprises utilize and process data, is not necessarily the same as Non-Data Technologies enterprises. By applying the Chi-square method to the survey data, five practices were identified that the companies are divided on: responding to customer inquiries, insufficient data quality, calculation, and the lack of employee training. It is likely that these differences are due to the need for data (for example, in terms of quantity and quality) and the internal data processing practices of each company.

Through the survey, it was possible to collect preliminary information on using OGD from closed questions with the possibility of adding comments. However, respondents did not add enough comments to provide more details on the use and processing of OGD. In this case, the quantitative analysis is insufficient to bring evidence to our research question.

Furthermore, extending or generalizing the interpretations of the survey results to all Canadian firms is not possible at this stage. Given the context in which the survey was conducted (COVID-19), the number of respondents to our survey is relatively small compared to the number of SMEs surveyed. For this reason, we supplemented our research with case studies (qualitative data) to better understand how data is processed and used in more detail within companies in different sectors.

Chapter 5: Use Cases Discussion

This chapter presents the case studies and describes the results of comparing OGD use by Canadian companies. It is divided into three sections. The first section describes the use of OGD by seven companies operating in different sectors of the Canadian industry. To write these case studies, I gathered information about the companies through their websites (where available) and from company databases such as Crunchbase,[70] Clutch,[71] or registered company databases shared by the federal and provincial governments. I also rely on transcripts of interviews conducted with representatives of the selected companies. The second section includes a summary analysis of the cases. The third section is the conclusion of this chapter.

5.1. Case Studies

The interview invitation was sent to all companies targeted by our study. Nine (9) companies responded. Of these nine, seven (7) companies participated. The respondents of these seven organizations were interviewed between July 2022 and November 2023. Most are entrepreneurs, project managers, and CEOs (see Table 5.1.1).

Due to the context of the COVID-19 pandemic, these interviews were conducted remotely via MS Teams (a remote meeting tool). The interviews lasted between 30 minutes and one hour, with an average of 45 minutes. During the interviews, open-ended questions were used. This type of questioning allows the researcher to gather the participants' comments, perceptions, and experiences using OGDs. The responding enterprises are divided into different categories (see Table 5.1.1).

[70] See, https://www.crunchbase.com/
[71] See, https://clutch.co/ca/hr/recruiting/information-technology-industry

Table 5.1.1: Category and number of interviewed SMEs.

Users' category	Nbr of SMEs who agreed to conduct an interview	Nbr of SMEs who canceled the interview	Nbr of SMEs interviewed
Consultant / Entrepreneur	4	2	2
Small enterprises (Less than 99 employees)	4	0	4
Medium enterprises (100 to 499 employees)	1	0	1
Total	9	2	7

In the following section, the seven retained case studies are presented. Each case study begins with a short presentation of the company based on information provided by interviewees Additional information about the companies was gathered from online documents, such as reports, publications, contributions to certain events (conferences and exhibitions), press releases, professional social media (LinkedIn) and videos on their YouTube channel. Thus, the case studies presented in this section summarize the answers to the interview questions and the information gathered on each company.

Codes have been assigned to replace the names of the respondents and companies to respect the confidentiality of the names of the companies. For example, in the first case study, the company's name was replaced by "OGDU1", which means "Open Government Data User 1". The same codification was used for all case studies.

Case study 1

Open Government Data User 1 (OGDU1)

Geophysical Entrepreneur

The OGDU1 is a consultant and entrepreneur based in Ottawa with over 20 years of experience in the industry and research and development, both internationally and in Canada. He worked as a geophysicist for environmental, mining and oil exploration companies. Since 2018, his activities have consisted of making evaluations, interpretations, analyses, and comparative studies of geophysical data as part of research and project development for several partners. The OGDU1 integrates geophysical data from different sources and periods to identify favourable prospects and geologic trends and analyzes regional geology to develop future exploration plans.

This consultant uses the OGD available on the perimeters or regions when searching for evidence of the potential of subsoil. The approach adopted to exploit the collected data depends on its application fields. He explained that OGD allows for a regional and detailed approach when implementing geophysical projects. On the other hand, he stated that the OGD available on the open government portal, related to the geophysical domain, is more about the regions. [72]

OGDU1 selects and captures OGD depending on the type of data available, the objective of the project and the client's needs (a regional or detailed study). Before starting a project,

[72] See, Geophysical survey index datasets: https://open.canada.ca/data/en/dataset/78deec60-cc30-1450-7fba-0813e2b95a3e

the consultant must identify the available data by searching different databases, including the Open Government portal.

According to the OGDU1 consultant, verifying what kind of data is available in government databases and how they can be used in the project to achieve an outcome is essential and helpful. In this case, checking the data type, quantity, and quality in the target region is essential to deciding whether to use the data in the study. The OGDU1 consultant pointed out that the Open Government portal contains quantities of raw data collected on a subject without sorting or preprocessing. In addition, different types of data are available, which can be recent, old, detailed, and regional data and can be found according to various parameters. For example, data can be collected from aircraft at certain altitudes, trucks on the ground and ships at specific depths.

Moreover, the available data are heterogeneous. Sometimes, sorting or homogenizing the data is necessary before adding and exploiting it on a map. For example, while researching data on a specific area, the OGDU1 consultant found that some data were collected in 1960 and others in 1990, with different parameters. In this case, the consultant had to homogenize the data. He also explained that using OGD helps his small company save time, money, and effort since it allows access to an initial model anytime.

OGDU1 stated that using OGDs creates a base model for delineating areas of interest to start research[73]. Extracting OGD is often an initial basis for specific projects conducted by the company. The availability of OGDs allows for delimiting areas of interest instead of conducting studies over several kilometres. The available data enables him to focus on smaller areas or at a specific scale for detailed analyses, according to the OGDU1.

[73] See, a geophysical model: https://open.canada.ca/data/en/dataset/d6407ecb-5989-1376-8b3b-a2c354275cf1

Otherwise, the final products delivered by OGDU1 to clients are essentially maps and reports. Depending on the contract with clients, these maps and reports are the results of either an evaluative or interpretative study.

Some geophysical data are difficult and expensive to collect before processing and analyzing. For this reason, a partnership was established between companies and the government in the geophysical sector to share the data collected. Collecting this data is very expensive for small companies because it requires technical skills, specialized heavy equipment, and high costs. Even if the geophysical data is old (sometimes more than 20 or 30 years ago), it is still helpful because companies have better data analysis tools today. In addition, it is now possible to reprocess data collected with different standards in the 1960s and 1980s. Using the latest approaches and technology tools makes it possible to reinterpret this old data to extract useful information.

According to the OGDU1's consultant, processing geophysical data to extract useful information requires several steps, including data acquisition, processing, and interpretation. The result could reveal information that was different from what it had been in the past. OGDU1 explained that the interpretation also differs when old data are processed differently. Sometimes, this old data is combined with new data to complete the dataset and generate new results for a project.

The consultant explained that selected OGD (cleaned or not) is often combined with existing (internal) data. The use of OGD is not automatic in his projects because it depends on the quantity and quality of the data in the database. Therefore, OGD is used primarily when the data is of good quality, can complete their data and finalize the current project.

According to OGDU1, finding a large amount of data on specific regions in the government portal and less or nothing on other regions is possible. The consultant argued that this situation is due to the lack of interest in some areas compared to others. Within OGDU1, the internal processing of OGD depends on the type of data available, its quality and quantity.

First, OGD is sorted, selected, and cleaned. Based on the resulting datasets, OGD1 consultants enhance, upgrade, or homogenize (if necessary) to make the data usable and ready for exploitation. For example, these datasets could be used to create a base map. Once the map is prepared, various other treatments could be applied depending on the project objective. The internal processing of OGD allows for improving the OGDU1 products depending on the project's objectives. However, using and processing OGD requires time, money, and effort. The OGDU1 consultant explained that the costs are low compared to the benefits of using it, such as saving time or possible costs for acquiring this type of data.

Regarding the type of technologies and tools implemented, the OGDU1 representative asserts that the technical requirements necessitate using specialized software in processing a large amount of data for geophysical projects. Accordingly, OGDU1 company uses commercial software such as Oasis Montaj (to import, export and process data, draw maps and other functions),[74] Surfer (to draw maps)[75], and Global Mapper (to visualize and manage data).[76]

[74] See, https://www.seequent.com/products-solutions/geosoft-oasis-montaj/

[75] See, https://www.goldensoftware.com/products/surfer/

[76] See, https://www.bluemarblegeo.com/global-mapper/

The OGDU1 consultant masters and uses several technological tools to present demos and target regions in projects. He must demonstrate what he does with the data collected and his ability to process specific data in detailed studies. On the other hand, OGDU1 employees can:

1- understand the type of data and its usefulness in a study
2 - use the software mentioned or others
3- have basic knowledge of geophysical techniques
4- basic knowledge of mapping
5- some knowledge of data processing and representation.

Furthermore, data interpretation requires some technical expertise in the specific field of the study. Each type of data has its way of being represented and requires specialized knowledge to process and integrate open data.

OGDU1 performs quality control, sorting, selection, corrections, homogenization, and other steps to process the data. Each step is challenging for the consultant because some steps are necessary, and others are not from one project to another.

Each step of the data processing requires a good knowledge of the field techniques related to each project. Correcting data is extra work for OGDU1 because it requires time, effort, and expensive equipment. In addition, OGDU1 encountered other challenges in using OGD, such as the need for more data. For example, for some maps, there is no history or explanation of how maps were made and on what basis.

Some maps have been scanned without citing the references or the source. In this case, OGDU1 explained that processing and exploiting these data is complex without being able to return to the source. In addition, available datasets on regions still need to be completed.

Data collected on some regions can be found in quantity within the government database because of their economic interest. However, data is insufficient or missing because other regions are less studied.

OGDU1 believes that using OGD allows them to be competitive in the geophysical field. The results differ from competitor to competitor when using open data in case studies, assessments, and interpretations. Each analysis requires different knowledge and skills, while competitors use various tools and interpret the data differently. OGDU1 provides technical services and reports based on its own experience in the field.

The data used by OGDU1 is collected from multiple sources, not only from government databases but from all available sources. The ways of doing things within the companies differ, which could lead to different results. The companies sometimes achieve different results when downloading and using the same dataset. Data collected on regions in the 1950s or 1960s have been reinterpreted several times and have become limited by the tools and methods used to perform several operations and treatments.

With the development of new technologies, powerful tools can now process unlimited data. It is now possible to process data collected in the past differently to achieve a different result. According to ODGU1, new knowledge and tools allow for extracting different information along other dimensions that could not be done in the past.

Competitors adopt various tools and processes to reinterpret and re-evaluate all data collected. ODGU1 explained that the results are different when competitors study the same area. This was possible because competitors used data from various sources, approaches, and tools. Indeed, the study's methods, tools, and skills remain the key to the competition.

ODGU1 consultant claimed that there are no specific barriers to taking full advantage of OGD since the license allows one to do it freely. However, he stated that OGD could potentially increase future revenue and reduce the cost of data acquisition.

OGDU1 cannot estimate a percentage of revenue or dollars. However, he is confident that updated government data and business collaboration in the field will result in more and better data. According to OGDU1, the government continually shares data, which is a positive sign for the future. This situation could only lead to increased revenue for businesses, advancement of technology and science, and better economic growth.

Case study 2

Open Government Data User 2 (OGDU2)

IT Company

OGDU2 is a small company based in Ottawa (Ontario). It was launched in 2005 and is managed by an experienced entrepreneur. This company provides cost-effective solutions to businesses, institutions and "not-for-profits," using open-source technology, from a basic online presence to a fully interactive online marketing solution.

This company creates and develops websites and web portals, including content creation for various sectors, such as new technologies, lobbying, sales and purchasing, training, services, consulting, and community organizations. OGDU2 also offers other services, such as coaching and training.

This small company helps businesses launch turnkey websites with appropriate development and design adapted to their activities. In addition, OGDU2 offers support for web hosting solutions and design services ranging from informational brochures to e-commerce sites for online marketing purposes.

This company has three regular employees and uses the services of 5 to 10 consultants depending on client requirements. The company's consultants consist of self-employed designers, experienced developers, and experts in online markets. This company handles everything from domain name registration to website installation, including regular updates and maintenance. OGDU2 provides clients with high-quality turnkey website design and webmaster services.

The CEO of OGDU2 explained that his company mainly uses open data and information on the Internet and sometimes on the Government of Canada's websites. For example, the consultants use Termium Plus,[77] the terminology database, to review and compare translations of Web site content. The content of the client's websites requires translating specific technical or administrative terms or expressions from English to French or French to English.

The consultant recognizes that the free and open glossaries[78] on the Open Government Portal help prepare website content and translate technical or industry-specific content. He also accesses the open data portal to view contract award results and check average salaries for the industry.

This company generally uses OGD to complete or verify the information required for the final product or project. First, the project manager consults the available data to select the list or datasets, depending on the project ordered by the client. Then, he extracts the data by copying, pasting, or downloading the file. After that, data or information is selected according to the product or project to be carried out.

OGDU2 uses OGD because it is available, accessible, and free. According to the OGDU2 CEO, this data is often reliable and represents excellent support for a small business. The available data and documents exist in the same place, are permanent and perennial and can be found systematically. The sustainability of public information drives this small company to visit and explore the government website often. Sometimes, there is

[77] See, Termium plus, the Government of Canada's terminology and linguistic data bank. https://www.btb.termiumplus.gc.ca/tpv2alpha/alpha-eng.html?lang=eng&index=alt

[78] See, for example the aeronautics vocabulary: https://open.canada.ca/data/en/dataset/5d31f5b8-8bd6-48fc-aad8-f4f054f83a09

no need to download the data or store it on a computer. For example, the OGDU2 consultants recommend documents, reports, or training manuals to clients by sharing links that direct them to government websites. These documents are accessible and available anytime from any place and device under the Open Government Licence[79].

The information that the project manager consults and collects is often used as it is. For example, when creating the website contents, the project manager needs to get specific translations from English into French or the reverse and the lexicons accepted, approved or even official in the organizations and the various sectors. Only specific information is extracted and mixed with the company data to ensure the quality of our products.

Creating web content for business websites requires mastering technological tools and technical knowledge related to the SME sectors. This technical knowledge is based on specialized lexicons. To accomplish his task, the project manager must understand the industry well and be able to research and translate technical words.

To leverage OGD, the OGDU2 project manager must be proficient in Word, Excel, and PDF files. To use OGD, he selects and extracts the needed information and adds it to the content to prepare. The content of a website or a training program produced by OGDU2 is saved on local machines on Google Drive or the cloud (depending on the file sizes).

The OGDU2 manager observed some barriers when using OGD. He explained that OGDs are sometimes complex, challenging to use and not always of the best quality. For example, in Termium Plus, information could be presented better and easier to find. There is not enough information, and sometimes the available information is wrong. Sometimes, data needs to be completed and updated. It also happens that the data exists only in English.

[79] See, Open Government Licence – Canada https://open.canada.ca/en/open-government-licence-canada

The manager also observed that sometimes, it is indicated on the government website that the translation will follow. However, the equivalent in the second language needs to be populated afterwards. OGD is sometimes complex and takes a long time to process to get something useful. The OGDU2 manager expressed that it could be more interesting to spend time trying to understand how it is possible to exploit and benefit from other data sets.

OGDU2 agrees that OGD offers the possibility of obtaining additional content that can be used directly in creating and developing products or projects. Generally, the use of OGD is beneficial for this business but could be more helpful if the quantity and quality of the data are improved. OGD needs to be more attractive to entrepreneurs and companies. However, the OGDU2 manager confirmed that using OGD allows his company to remain competitive by diversifying data sources at low cost.

Using this data, the company could sometimes offer products and services that some clients consider unique resources on the market. Usually, OGDU2 clients are satisfied with the final product since it meets their expectations. Creating and translating a website and its content is challenging, especially when developing a business website in two languages. There are standards and norms to respect for each client.

To meet the client's needs. OGDU2 adds the OGD as external resources to his data. The combination of its resources allows it to offer quality products that are up-to-date and at competitive prices.

The OGDU2 manager explained that he uses OGD to reduce translation costs to be competitive in the market. He claims that some costs are associated with using OGD, but

they are not significant and not easy to estimate. The costs mainly relate to the time spent conducting research, selecting, and extracting the exact information needed.

OGDU2 manager asserts that the cost associated with these steps is much lower than hiring a consultant or buying this data online from a provider. However, he argues that using OGD reduces business costs but does not believe that OGD can potentially increase his business revenue in the future. The company's use of the OGD is occasional and limited and does not allow it to significantly increase its revenues.

Case study 3

Open Government Data User 3 (OGDU3)

Coaching and language training company

Founded in 2003, OGDU3 is a medium company with more than 120 regular employees. Located in Ottawa, this company has developed some tools to support learners across Canada who enroll in language training programs. The OGDU3 company is committed to empowering its learners to work and lead in their second language.

The company's main clients are public servants in Canada's federal-provincial and municipal governments. This company responds to public tenders on buyandsell.gc.ca to obtain second-language training contracts. In most of these contracts, government training materials and methods are required to deliver services to public servants. The final products are the customized training content developed by trainers to meet the needs of each learner.

Training content for federal government employees is designed according to the requirements and specifications indicated in the contracts. OGDU3 created an online platform to provide its clients easy access to learning activities and tools to reinforce the in-person training program during private or group sessions. This company offers virtual classrooms to provide coaching and training services through different platforms, such as Skype, Zoom and Hangout (depending on customer requirements).

The language training market in Ottawa is very competitive, given that several colleges and private schools offer these services. Therefore, providing and maintaining competitive and quality services is essential to winning contracts. With the COVID-19 pandemic, this company adapted quickly to the new environment and could provide its services without

significant disruption. Most trainers could use the manuals and audio recordings remotely and without difficulty. The training materials, available online for free access at publication.gc.ca,[80] allow learners to continue practicing and preparing for the evaluation language tests.

This company offers several training sessions and workshops to new employees upon hiring. Staff are trained to adopt the school's training approach and technology tools. OGDU3 trainers need to know how and where to access government resources and sites and, most importantly, be able to use Word, Excel, and PDF. Technical support is also provided to trainers and learners during their sessions. Trainers use many online resources daily to diversify topics and activities and to enable learners to acquire oral and written skills, such as audio, learning manuals, guides, press releases, etc. They primarily use federal government websites because much material is available and freely accessible.

OGDU3 encourages its trainers to use linguistic databases such as Termium Plus,[81] glossaries, press releases[82], and other tools accessible from government websites. [83] These resources benefit learners when they start learning a second language, as they can find the vocabulary used in each field and its translation. The free, open program manuals are ready to be used by trainers and learners. This saves time for trainers and consultants who only need to prepare and adjust the training plan according to the learners' pace and needs.

The OGDU3 marketing manager accesses the open government portal to view and collect data, such as standing offers results, civil servants' pass rates on second language

[80] See, Training material: https://publications.gc.ca/site/eng/browse/specializedCatalogues.html

[81] See, Glossaries and Vocabularies: https://www.btb.termiumplus.gc.ca/publications-eng.html

[82] See, Press releases in both languages https://www.canada.ca/en/news.html

[83] See, Language Portal of Canada: https://www.noslangues-ourlanguages.gc.ca/en/navigateur-navigator

tests (English or French), salaries, and new provisions or policies and regulations. The respondent explained that his company regularly accesses the open government portal to consult standing offers, training contract awards, or information published on the training market. In addition, the available data allows the company to assess market needs and adjust strategies and decision-making in the short and long term. The company continually seeks opportunities to improve training methods and tools to provide the best support to clients and differentiate itself in the marketplace.

Trainers select activities from the available open resources to update training plans. They consult the databases and choose the resources (documents or activities) according to the needs of the learners to achieve the training objectives. The trainers extract or download books, audio support, or specialized glossaries according to the learner's plan and professional field. Each trainer must adapt the content and learning strategies to meet the needs of each client. For this reason, trainers combine these resources with those created by the company to diversify the learning activities and allow learners to practice their language skills further.

When using OGD, OGDU3 faces some challenges. Trainers recognize that much data and information exist, but finding what they seek takes work. They need help finding specific resources or information because it needs to be better organized. Sometimes, web pages are moved or deleted and cannot be seen by trainers who regularly use them online. In addition, published documents and data are not always updated.

ODGU3's competitors also access and use the same documents and data that exist online. What sets ODGU3 apart from its competitors is the quality of service provided to clients and the skills of its employees and trainers. They are trained and experienced in

meeting the needs of clients. OGDU3 employees use, adapt, and leverage training materials available on Government of Canada websites to deliver training focused primarily on learner success. As a result, OGDU3's clients are satisfied with the services provided and recommend the trainers to other clients.

OGDU3 recognizes that there are costs associated with using OGD. These costs are related to training new trainers and consultants but have not been quantified. They are a small company without the resources for full cost accounting.

OGDU3 agrees that OGD has the potential to increase its revenue in the future. As the government continues to publish more documents and other types of training, the company will be able to deliver these training programs, find the people with the skills and then increase its income in the future.

Case study 4

Open Government Data User 4 (OGDU4)

Fundraising Company

OGDU4 is a Canadian consultancy firm that builds tools for the Canadian social and public sectors. Established in 2013, this private company is based in Montreal and has 25 employees. This small company gathers experts to advise community organizations on fundraising[84] and related public-interest technology. It seeks to capture the potential of data and its social impact when shared and used. The company's experts develop strategies that meet the data and information needs of Canadian social and public organizations. Specifically, OGDU4 helps clients implement their digital transformation, data management, data sharing, data and information architecture, data strategy and decision-making. According to OGDU4, only ten competing data management consulting firms use similar technologies to provide related services in Canada.

OGDU4 develops strategies to help its clients through successful digital transformation and data management by providing consulting and online services. The company's experts have created a research tool for funders by leveraging their technological expertise and experience in the social and community sectors. In addition, OGDU's experts have set up an online platform gathering selected data on project financing. This online platform allows clients to discover prospects through a comprehensive database based on a data-driven approach.

[84] See, what is fundraising? https://www.canada.ca/en/revenue-agency/services/charities-giving/charities/policies-guidance/fundraising-registered-charities-guidance.html#toc5

Through this platform, OGDU4 clients can explore the database on available funding. For example, the client can consult the list of funders and contact those who could support their respective projects. These funders are listed from various sources, such as open data, federal and provincial data, and annual reports of funding organizations.

The company also offers a support service to help customers make the most of the resources available on the platform and better understand their needs to improve services. In addition, platform users can take advantage of the extensive data by using advanced features when searching the database. In addition, OGDU4 experts can perform searches on behalf of their clients to ensure fast and effective results. For example, OGDU4 experts recommend other related services (new funding opportunities, updates, training, and strategic planning) to clients based on their funding needs.

This company tries to find different ways to collect information on fundraising to make it useful and valuable to customers. OGDU4 employees search, extract, and compile data on funders from various databases. They also use OGD on the open government portal[85] and the Revenue Canada website. They process data by extracting funding-related information.

The CEO of OGDU4 explained that the extracted data is not always analyzed. However, this data is compared and combined with other data available. OGDU4 collects and searches all available data from public and private sources, websites, press releases, annual reports, and financial statements. This data is collected regularly and updated on OGDU4's platform to make the information available to its clients.

[85] See for example, a listing of businesses, charities, and fundraisers in Alberta: https://open.canada.ca/data/dataset/1b6cb20b-5d1d-443d-8e04-28558e9277f3

The CEO of OGDU4 explained that it is sometimes necessary to correct some open-ended data by checking the numbers in some organizations' annual and financial reports. Once all the data is collected, it is essential to organize and categorize it to make it easier for our platform users to read. The OGDU4 team gathers data, extracts information that makes sense, and answers our customers' questions. OGDU4 primarily targets hundreds of clients working in the fundraising field by providing them with combined and comprehensive data on potential project funding sources.

OGDU4 has encountered several challenges when using OGD, such as a lack of data, irregular data updates, erroneous data, or errors in published data. For this reason, OGDU4 has created applications to organize, classify and manage data by programming and developing them to improve and process the collected data.

OGDU4 has a team of programmers and developers who regularly update the applications to process the data in greater quantity while ensuring their quality. In addition, OGDU4 managers and teams use and contribute to improving these tools. To do their job, OGDU4 employees must have a minimum of technical computer skills, the ability to understand client’s needs, knowledge of the non-profit and fundraising environment, and the ability to research on the Internet.

OGDU4 believes that there are different ways to exploit and use OGD and that it is possible to offer products that are different from those of its competitors. While OGD is open to all its competitors, many ways exist to leverage this data to make other products for customers in different markets.

According to the OGDU4 respondent, OGD is beneficial because it has helped launch the company by reducing the market entry cost. In general, OGDU4 does not have high costs when using open data. However, some expenses are sometimes necessary and are related to the technical skills required to process the available data.

OGDU4 claims that using OGD can increase its revenue in the future. Soon, this company would like to diversify and expand its activities by creating new products.

Case study 5

Open Government Data User 5 (OGDU5)

IT Company

Located in Toronto, OGDU5 is a small business founded in 2014 with over 50 employees. The teams have varied experiences, training, and skills (analysts, engineers, coders, developers, designers, data scientists, marketers, and more). However, they all work together to provide new products and solutions by gathering data resources (e.g., open data, OGD).

OGDU5 provides companies and public organizations with solutions to gather and improve their data assets from internal and external sources. This company uses open data and OGD to unlock its value. OGDU5 can connect data resources, maintain a catalogue interface, and provide a suite of data tools. OGDU5 collects raw and valuable data from different sources to enable organizations to enrich their datasets, enhance data analysis and insight, and monetize it. OGDU5 has built tools that connect the flow of information from multiple online sites while collecting meta-information, source information, and licensing information and making it available to organizations to use and leverage easily. OGDU5 has implemented several projects through its platform and the standard model. For example, this company prepared data products by collecting, processing, optimizing, and analyzing geographic data to make it ready for use by different organizations.

This company has designed a platform to manage the complexity of diverse data. This platform provides datasets that reduce costs, enable revenue growth and drive innovation. The platform includes a data catalogue in various areas, such as real estate, investment

trends, finances, environment, health, and statistics. In addition, OGDU5 collects data from all sources, wherever possible, such as data made available by governments, non-governmental organizations, and those resulting from data partnerships with several businesses. OGDU5 collects, processes, and transforms data into a usable data product, then proposes it to companies through its platform. This company provides the tools and helps Canadian companies make decisions and grow by unlocking and generating the value of available external data.

The CEO of the OGDU5 observed that the tools used by companies to process external data differ from one company to another or are often basic (trying to process the data manually or using Excel sheets). Most of the time, these tools do not make it possible to optimize data exploitation to extract value from it. Therefore, the CEO explained that companies could use the data catalogue depending on the data analysis layer. For example, clients select and use the collected data from the data catalogue and incorporate it into their internal data analytics. By combining this data, companies can gain more insight from the data and improve their risk model. It is the case, for example, for financial and insurance companies. OGDU5 employees' skills required to process OGD are understanding data roles and strong knowledge of computer science, statistics, and quantitative analysis.

Until the end of 2022, OGDU5 has predicted a massive demand for good data within enterprises. However, the main problem is that only some companies can fill this supply with reliable data. Therefore, during the COVID-19 pandemic, OGDU5 extended their

interest to other data sectors like health[86] and manufacturing[87] to help Canadian companies manage supply chains. As a result, OGDU5 proposed a new supply chain platform for manufacturers to avoid supply chain challenges. This company collects data from different sectors and industries and focuses on making it valuable. According to OGDU5, manufacturers have all the information on their supply chain on their internal network. Still, they need to capture unpredictable information and data, such as public and global signals data, which could significantly impact their operations and supply chain (e.g., Suez Canal obstruction (2021), weather, incidents, etc.).

Within the new supply chain platform, OGDU5 gathers all available data[88], creates links between internal and external data to simulate different scenarios, and analyzes, responds, and develops solutions to optimize the supply chain. Indeed, ODGU5 suggests that their clients turn internal and external information into machine-readable data to make it more valuable.

The company's CEO specified that all the open data collected on their platform is free and available for everyone who uses the platform. As it is a public good, the open data (including OGD) is not monetized. Instead, OGDU5 brings it together to make it easier for users to find and use from their platform.

[86] See available datasets on COVID-19: https://search.open.canada.ca/opendata/?sort=score+desc&search_text=COVID19&page=1&jurisdiction=federal

[87] See available datasets on manufacturing: https://search.open.canada.ca/opendata/?sort=score+desc&search_text=manufacturing+&page=1&jurisdiction=federal

[88] See available datasets on supply chain: https://search.open.canada.ca/opendata/?sort=score+desc&search_text=supply+chain&page=1&jurisdiction=federal

Regarding challenges, OGDU5 asserts that open data is not easily accessible. Even when data is accessible, it is difficult to find, use and market. OGDU5 suggests businesses should avoid wasting time and money searching for and processing data. It is now possible to find specific databases by relying on data management companies to access ready-to-use data. OGDU5 experts can find and collect data from multiple sources, convert found data into a common format via a standard model, and update and monitor assets.

However, ODGU5 acknowledges that it is challenging to bring open data to market for some reasons, as companies try to understand how open data can be helpful and valuable, how much data is needed, what level of data granularity is required, how to ensure that the use of the data is compliant with regulations. OGDU5 proposes an automation process to support companies and scientists by preparing the needed data. The companies could focus on analyzing data and reporting on findings to create new products or services to be competitive. Once the open data is collected and aggregated with other multiple resources in the OGDU5 platform, each customer can use and leverage it differently. In this case, OGDU5 may offer other tools and solutions to support them in data processing. Thus, each organization can use the data in its own way and according to its needs to derive a product or service that allows it to be competitive in the market.

Case study 6

Open Government Data User 6 (OGDU6)

Data Analytics Company

Founded in 2016, OGDU6 is a data analytics company based in St. Catharines, Ontario. This tech start-up is a privately held company with about ten (10) employees. This company provides several services to find market opportunities, research target markets, investigate big and open data, and conduct business data analytics and risk management. ODGU6 experts supply and update the company's databases daily. They always look for new data to meet customers' growing data quality and quantity needs. All collected data is added to the global database to produce new advanced proprietary tools and help customers find, organize, and make the best decisions from the available data.

OGDU6 gathers many data and develops several tools to clean and analyze it. The OGDU6 experts combine an extensive and global repository of business data with proprietary algorithms to reveal the connections between companies, owners, suppliers, competitors and more. The convergence of open data, new technologies, and creative analysis creates new business opportunities. In addition, OGDU6 drives customers to use predictive analytics, public data, and big data analytics to derive insights into business opportunities, especially in North America.

The respondent from OGDU6 claims it is essential to understand the type of information targeted before searching for data. For example, in the manufacturing sector, the OGDU6 teams need to identify specific information, such as the sector of activity, the competitors, the suppliers, the opportunities available, and the strategies adopted in the related market.

The teams also prepare charts that are a way to reflect on data and make connections between available information.

The respondent from OGDU6 explained that the Government of Canada's open data website was the main trigger for launching his business. He argued that he started the business in Canada because of the care and attention that the public sector gives to businesses, particularly to maintain a conducive business environment.

OGDU6 collects and acquires new data from updated public data (including OGD) to fill its advanced business database. This company primarily cleans, processes, and enhances data quality to deliver trusted information. OGDU6 experts perform robot programming and training. Furthermore, they create tools, provide risk models for banking and insurance, security models for public sector intelligence, and select models for market research and prospecting. OGDU6 processes global Open, public and alternative data about businesses and consumers[89], focusing on small and medium enterprises[90]. The collected data covers all business categories and sectors using specific tools and all major taxonomies to align with protocols emerging industry segments require.

The respondent from OGDU6 explained that his company finds, cleans, classifies, curates, and analyzes a large amount of data accessible online from various public and private organization websites. This company processes data and extracts meaning from it to help its customers understand the market and make decisions about their growth. Therefore, OGDU6 builds content to analyze, visualize, or investigate this data using

[89] See available datasets on consumers: https://search.open.canada.ca/opendata/?sort=score+desc&search_text=consumers&page=1&jurisdiction=federal

[90] See available datasets on SMEs: https://search.open.canada.ca/opendata/?sort=score+desc&search_text=SME&page=1&jurisdiction=federal

special cases. The respondent also explained that his company has data analysis capabilities to interpret the results.

According to OGDU6, Data on business can be gathered from different sources in Canada, such as 1- public data (e.g., social media company websites, business information companies); 2- open data (e.g., government data sources at federal, provincial, territorial, and municipal levels) 3- purchased, 4- restricted. OGDU6 makes a distinction between open data and public data. Open data has been licensed to be used for whatever purposes. However, public data is often licensed to be used for different purposes with restricted rights. Before using data available on the internet, OGDU6 needs to pay attention to different regulations and what customers need. Most of the data collected by ODGU6 on companies comes from government data, particularly from the Government of Canada's open government portal. This considerably reduces the cost of accessing data compared with the expense of accessing paid-for platforms. The enterprise registries are updated daily regarding the lists of businesses starting up and those closing.

Government data provides much information on many sectors of economic activity. OGDU6 can find business licenses, climate change reports, and recent data sets that experts dig in a machine-readable format through the portal. OGDU6 extracts the needed data to respond to their customer’s needs. Therefore, specific steps are necessary, such as particular skills and tools that the OGDU6 teams are continuously developing to exploit them and obtain the results requested by the clients. For example, it is possible to find data and information on businesses in the open corporate registers, such as size, directors, financial reports, products, target customers, contracts, competitors, new startups, etc. Other online sites may provide additional information on businesses, such as sales, contact

details of the employees, new products, partners, mergers and acquisitions, certifications, awards, etc. Indeed, all the information collected can be organized and linked to create a detailed description of a business or a market.

OGDU6 explained that their teams face some challenges when using OGD. He argued that the government of Canada releases a lot of data, but the organization is quite large, with different levels and departments. Sometimes, knowing which government agency is releasing the data is difficult. OGDU6 teams use other formats and create tools (including AI) to extract specific data to respond to customers' needs quickly.

OGDU6 cited another example of using open data in fraud detection. Investigators in a business fraud case were able to find and link different pieces of information by using open data and public business datasets. As a result, investigators, who are OGDU6 clients, uncovered more related individuals and companies responsible for the fraud.

Open data collected from different sources helped investigators speed up the investigation, obtain more information, and broaden the scope of the case's findings. The OGDU6 respondent believes that using open data published in Canada and worldwide is beneficial and can help solve many investigations.

Case study 7

Open Government Data User 7 (OGDU7)

Statistical consultants

The OGDU7 company was founded in 2018 by three statistical consultants. They work together regularly to conduct data analysis and research for clients from different business fields. They have been working on statistics and data for over 20 years. They have acquired experience in the private and public sectors in medium and large companies and various organizations. Two other software consultants occasionally join the team when OGDU7 receives specific projects simultaneously. The respondent who agreed to the interview is the CEO.

OGDU7 enterprise offers several services to businesses, and they help them bring together the full breadth of information available on a specific question of interest and find solutions that help fill their data gaps. OGDU7's consultants can provide statistical and data analysis, business plans, and specific reports depending on client requests. This small company delivers actionable data, researching data, and preparing reports and presentations according to customer requirements. They provided, for example, data analysis for Digital Advertising Tech Companies and Data Analytics and Custom Software Development for Logistics Solutions Companies.

The consulting team uses OGD and data from other sources. For example, the respondent confirmed using several datasets published, such as census data,[91] Labour Force

[91] See, 2021 Census Data https://www12.statcan.gc.ca/census-recensement/index-eng.cfm

Survey (LFS) data,[92] and key indicators related to the Canadian market, inflation,[93] unemployment[94], wages,[95] GDP growth,[96] etc. The OGDU7's respondent explained that collected data is used to prepare market research, business plans, and reports on various sectors of the Canadian economy requested by clients.

When the OGDU7's consultants need to collect available data in the public domain, they first search the web and open data sites such as municipal (cities) and provincial and federal government portals. They also use the available web data shared by partners who agree to share or exchange their data with them and other private and community organizations. However, the ODGU7's respondent explained that his company uses OGD but cannot rely only on OGD because some specific data is unavailable on the portal. To fill data gaps, the consultants access other platforms to purchase statistics and data, if necessary, to collect all usable data to meet the client's needs. In addition, the consultants collect more data by conducting different online surveys depending on demand. They perform several tests on the collected and combined data to extract the most helpful information. However, after processing the collected data and trying to extract information, the OGDU7 respondent confirmed that datasets (from the open government portal) complement their data collection and are often fully or partially included in their product as it is reliable and

[92] See, Labour Force Survey data: https://www.statcan.gc.ca/en/survey/household/3701

93 See, Historical (real-time) releases of Consumer Price Index (CPI) statistics, measures of core inflation - Bank of Canada definitions – Dataset: https://open.canada.ca/data/en/dataset/a71262e2-0cc3-4e07-9b0f-67ffc6762349/resource/d17a0cd9-1de9-470b-b09c-b561a62a79f6

[94] See, unemployment by type of work: https://open.canada.ca/data/en/dataset/f93e6cf9-f658-4c49-b8f4-3eeacb4d4805

[95] See Canadian Wages: https://open.canada.ca/data/en/dataset/adad580f-76b0-4502-bd05-20c125de9116

[96] See, Historical releases of Gross domestic product (GDP) - Dataset: https://open.canada.ca/data/en/dataset/4c53d593-6d84-46fc-af40-784721763116

valuable to get a final product. He also asserts that the first motivation of his company in using OGD is to reduce the cost of purchasing data.

The OGDU7's entrepreneur explained that many start-ups and SMEs in the market need to use statistics and data analysis in their work. Some customers who want to invest in new areas must create new business plans. To do this, ODGU7's consultants prepare market studies based on statistics and data gathered from different sources, which are aggregated and combined to produce up-to-date reports that reflect the realities of the market.

The OGDU7 respondent recognizes that OGD is available and regularly updated. However, it is still insufficient to complete their research and analyses. For example, they can find and analyze the available survey results that could be used and added to their reports. Often, OGDU7's consultants need more data to meet their client's requests, who increasingly require the quality and quantity of new data used in producing reports that help businesses make decisions and adopt new strategies.

The OGDU7's respondent discussed how his company processes OGD internally. He explained that the consultants regularly access the portal to find, select, and extract data that could be relevant. Often, they correct or modify the data before calculating or visualizing it. They visualize data to understand their relevance to fill data gaps needed to create the products. The OGDU7's consultants must adapt or modify how they manipulate and exploit the datasets. Sometimes, they ignore specific data that is irrelevant to their analyses. They carry out different types of tests by using various tools to analyze the data. When the consultants consider that the selected data can be helpful for their reports, they compare it to other collected data and combine it, if needed, with internal and collected

data from other sources. Once mixed and reorganized, the processed data allow us to obtain more precise results and information to formulate our recommendations and complete our reports.

The OGDU7's consultants use different commercial software solutions and analytics tools such as Excel, SPSS, Power BI, and Tableau to perform their tasks. They select and use the right tools according to the agreed approach to data analysis, considering the format of the deliverables requested by customers.

OGDU7 has a small group of consultants with technical backgrounds. According to the CEO of OGDU7, the skills required to use and process OGD or any data from other sources are those required of any statistician. The OGDU7's consultants search, collect, analyze, and interpret data; choose which methods are appropriate for answering the client's questions; identify relationships in data; draw conclusions; and make recommendations for decision-making. Another challenge for a statistical consultant is to combine his statistical knowledge with expertise in other fields. The ODGU7's consultants do their best to obtain all available data to produce high-quality analyses to meet customers' needs.

Some OGD datasets provide the consultants with initial data from which they can start their operations for a project. According to the respondent, the consultants consider that OGD remains reliable but is not regularly updated. Both quality and quantity need to be continuously improved. The available datasets do not always meet the needs of the OGDU7's consultant in terms of quantity. According to the CEO, the consultants have seen some positive changes, but there's room for improvement. The OGDU7 team has fewer challenges with Statistics Canada data. Following the release of Statistics Canada's Open

License[97] in 2018, it is possible to find more free Statistics Canada data to create products to offer customers without restrictions.

The OGDU7's respondent considers that their competitors also use OGD; in this case, his team needs to continue to use and leverage this data to achieve a competitive product. The CEO agreed that the datasets are accessible to all, but the key lies in analyzing and interpreting the collected data. In addition, by combining OGDs with internal and other collected data, the OGDU7 team can obtain products different from those of competitors. The CEO emphasized that his company's product quality and reputation set it apart from its competitors. The complexity of product preparation means that most customers recognize the quality of their products and return to them whenever they need their services.

The company uses a lot of data from different sources, which requires various software and skills. The CEO stated that costs are associated with exploiting all the data collected. He acknowledges that the company does not pay for OGD and other open data, but there is a cost involved in processing and analyzing this data. Nevertheless, the CEO acknowledges that OGD remains advantageous and contributes to increasing revenues.

[97] See Statistics Canada Open Licence (FAQ) https://www.statcan.gc.ca/en/reference/licence-faq

5.2 Discussion

Seven case studies were introduced in the previous section to demonstrate and provide evidence on Canadian SMEs' use of OGD. Adopting the case study method means that results can be compared between cases to study the same phenomena. Descriptive case studies of a phenomenon, such as using OGDs, provide more convincing evidence (Yin, 2013, 2017) on how exactly each firm uses and processes the selected data.

In this chapter, two companies, established between 2003 and 2005, offer web design, coaching, and training services. The other five companies, created between 2013 and 2018, operate in different sectors (Geophysics, fundraising, statistics, and IT). The selected firms in our corpus have varied sizes. Two entrepreneurs (case studies 1 and 2), three small firms (case studies 3, 4, 5, and 7) and one medium-sized firm (case study 6).

Each company has different reasons for using OGD depending on its products or services. For example, some companies collect data for specific and non-specific projects (see Table 5.1, Case Studies 1, 4, 5, 6, 7). The others consult the data and information available on the open government portal (see Table 5.1, Case Studies 2, 3).

- OGDU1 collects data to obtain a first model and to complete the historical dataset.
- OGDU2 consults glossaries to prepare web content and contract award results.
- OGDU3 consults training material, offers results, collects data and looks for new opportunities.
- OGDU4 collects data on fundraising to create and consolidate reports.
- ODGU5 collects data on business fields to create a data catalogue.
- OGDU6 gathers market and business data to supply and update the repository of business data.
- OGDU7 gathers statistical data to provide various reports.

Table 5.2.1: Comparative Summary of the seven case studies

Case studies / OGD	Case 1 OGDU1	Case 2 OGDU2	Case 3 OGDU3	Case 4 OGDU4	Case 5 OGDU5	Case 6 OGDU6	Case 7 OGDU7
Established in	2018	2005	2003	2013	2014	2016	2018
Field	Geophysical	IT& training	Coaching and training	Fundraising	IT Company	Data analytics Company	Statistical consultants
Size	Entrepreneur	Entrepreneur	Small firm	Small firm	Small firm	Medium firm	Small firm
Frequency	Depending on projects	Occasional, limited	Daily	Weekly	Daily	Daily	Monthly
Why? Reason to use OGD	Collect data to obtain a first model and to complete the historical dataset.	Consult glossaries to prepare web content and contract award results	Consult training material; standing offers results, collect data, and look for new opportunities.	Collect data on fundraising	Collect data on business fields	Gather market and business data	Collect statistical data
How? Internal process	Search, select, extract, clean, improve, compare, integrate, and combine data.	Search, select, extract, review and compare, and not always combine data.	Search, extract, select, and not always combine data	Search, select, extract, compare, integrate, organize, categorize, compile, improve and combine data	Search, extract, collect, compare, integrate, transform, improve, and combine data	Find, clean, classify, curate, visualize, analyze, improve, and combine data	Find, select, extract, correct, modify, calculate, visualize, compare, analyze, and combine data
Technologies and tools	Commercial software	Commercial software Open software	Excel, PDF, DOC	In house software	Commercial and in-house software	Commercial and in-house software	Commercial and in-house software

	Case 1 OGDU1	Case 2 OGDU2	Case 3 OGDU3	Case 4 OGDU4	Case 5 OGDU5	Case 6 OGDU6	Case 7 OGDU7
Skills Required to use OGD	Mastering software and analysis methods	Proficient in Word, Excel, and PDF	Proficient in Word, Excel, and PDF	Technical computer skills, Internet,	understanding data roles, computer science, statistics and quantitative analysis	Technical computer skills, Data analysis	Interpreting data, choosing methods, and making recommendations for decision-making.
Outcome (result)	Technical Reports, maps	Website content, Projects	Training content	Fundraising platform	Data catalogue, supply chain platform	Repository of business data	Business plans, market research, and various reports
Challenges when using OGD	Lack of data, Incomplete datasets,	Complex, poorly presented, unilingual, difficult to find, not the best quality, not updated, Incomplete datasets	Difficult to see it, poorly organized, deleted or moved, not updated, client satisfaction	Lack of data, irregular data updates, erroneous data	Not easily accessible, difficulty in finding, using and market	Difficulty in finding data	Datasets do not meet the quantity needed and are not regularly updated.
Competitivity	Yes Results differ from competitors	Yes Offer quality products at competitive prices	Yes maintain competitive and quality services	Yes offer products that are different from those of its competitors	Yes analyzing data and reporting on findings to create new products or services	Yes Gather and make data available to businesses from other sources	Yes Product quality and reputation set the company apart from its competitors
Benefits (Profit, value-added, economic value)	Increase future revenue, Reduce the cost of data acquisition, and Advance technology and science.	Free, Useful for preparing content, client satisfaction, and Reduced business costs.	Training material is available, free, accessible, and ready to be used, increase its revenue, No cost.	Reducing the cost of entry into the market, increasing its future revenue, and diversifying and expanding its activities.	Unlock and generate the value of OGD, derive a product or service, use and leverage it differently, Reduce cost.	Beneficial and helps solve many investigations, reducing the cost of accessing data.	Free, available, reliable, remains advantageous, and contributes to increasing revenues, with costs.

N.B.: Information introduced in each case study was collected from interviews, websites, published reports, PPT presentations and online videos.

Companies use OGD in different ways. Some companies do not prepare the data and use it as is to supplement their internal resources (see Table 5.1: Case Studies 2, 3). While other companies prepare the data, classifying, modifying, enhancing, and adapting it to their needs for use in their internal information system. For some enterprises, OGD complements their database and is combined with their resources to derive valuable information for creating a new product or service (See Table 5.1: Case Studies 1, 4, 5, 6, and 7).

OGD is processed differently from one organization to another. Within interviewed organizations, OGD can be internally subject to the following actions: searched, selected, extracted, cleaned, classified, examined, visualized, analyzed, compared, integrated, organized, categorized, compiled, enhanced, transformed and often combined.

The companies use different technological tools: commercial software (see Table 5.1, Case studies 1, 3, 4, 5, 7), Open software (Case study 2), and in-house software (Case studies 4, 5, 6, 7). To obtain a job in these companies, the employees have specific common skills, namely, mastering technical computer skills, researching on the Internet, knowing the methods of data analysis by area of specialization (qualitative & quantitative), and being proficient in specific computer software.

Different outcomes are achieved in each organization once OGD is processed internally within companies. Every company that has used open data gets other products and services

depending on their industry and planned products or services to meet customer needs, such as technical reports & maps (Case Study 1), Website content and projects (Case Study 2), Training content (Case study 3), Fundraising platform (Case study 4), Data catalogue & supply chain platform (Case study 5), Repository of business data (Case study 6), Business plans, market research and reports (Case study 7).

Respondents from the companies interviewed also mentioned several barriers to using OGD. Among the main challenges cited are the following: Lack of data, Incomplete datasets, complex, unilingual, low quality, not updated, Incomplete datasets (quantity), poorly organized, deleted or moved, erroneous data, not easily accessible, difficulty to find, use and market.

All companies believe that using OGD allows them to be competitive in the marketplace. Some feel their end products are of good quality and not similar to their competitors (Case Studies 1, 2, 3, 4). Others feel their products or services are unique and different from their competitors (Case Studies 5, 6, and 7). Indeed, SMEs remain competitive even when they use the same data source for multiple purposes.

Using OGD, most selected companies agree to reduce the data acquisition cost (case studies 1, 2, 4, 5, 6)— Only the respondent in case study 7 acknowledges that using OGDs entails costs for his company. Most companies cannot quantify the revenues generated by using OGD. However, by using OGDs, some companies see the possibility of increasing future revenue (case studies 1, 3, 4, and 7). In addition, other companies recognize through

the use of OGDs, the following benefits: Advance technology and science (Case Study 1), Useful for preparing content (Case Study 2), diversification and expand its activities (Case Study 3), reducing the cost of entry into the market (case study 4), Unlock and generating value of OGD (case study 5), help solve many investigations (case study 6), help to fill data gaps (case study 7).

In terms of exploring the motivation to capture OGD as an asset, the outcomes of use of this asset, and the skills needed to capture and gain advantage from the asset, the case studies help to explain the quantitative findings in that differences in the size and business model of the organization influence how OGD is used. The smaller organizations (Cases 1, 2) tend to capture and apply data in response to specific needs of the client. The larger organizations (3, 4, 5) appear to regularly capture OGD for integration into their internal products and services. It is likely then that the size and the product scope of the SME will influence the approach to capturing and integrating OGD, as well as the level of investment in skills and technologies (data base management for example).

5.3 Conclusion

Quantitative data collection and documentation provided a better understanding of Canadian SMEs' use of OGD. Further details were gathered on the internal processing of data, its combination, and its use as an internal resource to achieve a product or service. The next chapter will combine the qualitative and quantitative data outcomes to identify commonalities and provide evidence for our research question.

Chapter 6: Discussion and Implications

The previous chapter set out the data collection results and findings. This chapter summarises and analyzes the study findings to draw conclusions and highlight theoretical and practical contributions. This chapter is divided into three sections. The first section will interpret the survey analysis and case study findings relative to the research question. The discussion in section two focuses on the theoretical contribution, practical implications, limitations, and future directions. The last section will conclude this study.

6.1 Discussion

As there are no studies on this subject at the moment, the main objective of this dissertation is to explore the use of OGD by Canadian SMEs. The exploratory approach, which is the most appropriate for this type of research, was therefore adopted to answer the research question. the survey questionnaire, inspired by surveys conducted as part of "the Open Data 150 Canada" project (2016) and research such as Janssen, et al., 2012; Zuiderwijk et al., 2012; and Hunter, 2015.

As mentioned earlier, integration of the quantitative and qualitative elements of the study occurred at the design phase (the same questions used in the survey were used for the interviews) and at the interpretation phase since the interviews helped to better explain results of the survey. In fact, the interviews enabled us to validate the survey results and to gather further details on data use and processing. The results indicate that processes are specific to each company, depending on its sector of activity, size, employee skills and the results to be produced. The nature and relatively small sample size limit the possibility of

generalizing the research results to all types of SMEs as it depends also on the information system and processing steps adopted and applied within each organization.

Much of the mainstream literature has attempted to understand and identify the existing frameworks, models, and strategies for using open data. The overall objective is to demonstrate the potential economic impact of open data and highlight the contributions to the business environment. This dissertation builds on the literature to explore how Canadian SMEs use OGD through a mixed-method approach: a survey and interviews with respondents from several Canadian SMEs to investigate the OGD business environment.

The mixed method approach was adopted to balance the use of survey data with that of in-depth interviews with companies. In this study, this approach involved combining qualitative and quantitative research methods. The two methods prove to be complementary because both provide different insights even though the questions are the same. Quantitative methods have made it possible to collect data with a certain degree of statistical rigour, providing the researcher with valuable information to begin collecting qualitative data in a more targeted way, for example by focusing on specific questions relating to data use and processing.

The dissertation contributes to a better understanding of the role of OGD as an external resource for organizations. From a theoretical perspective, it contributes both to the literature on RBV and on OGD. Companies that use OGD tend to integrate it and combine it with internal resources. In fact, according to several authors, OGD can now be perceived as internal resources within SMEs once the data has been acquired and integrated (Magalhaes et al., 2014; Jetzek et al., 2013, 2014; Ubaldi, 2013; Attard et al., 2016; Janssen et al., 2012; Zuiderwijk et al. 2014, 2015; Gonzalez-Zapata & Heeks, 2015; Susha et al.,

2015; Zeleti et al., 2016a; Safarov et al., 2017). Given this phenomenon, the main research question guiding this dissertation was, *How do SMEs use OGD as a resource and leverage it to generate potential economic value?* Three sub-questions followed this question. The answer to these questions was provided by the evidence reported through the literature review, the survey findings, and the case studies describing different uses of OGD.

SQ1: To what extent is OGD being used by small and medium enterprises (SMEs) in Canada?

Based on the survey, it was possible to conclude that SMEs use OGD to varying degrees and that the specific use varies across SMEs. The survey results indicate that the reasons SMEs use OGD in order of priority are the need to meet the requests of their clients (79.66% of responding companies), visualize data and gain insight (76.27%), improve an existing product or service (66.10%), reduce operational costs to be more competitive (62.71%), conduct research (44.07%), and generate revenue (40.68%). This ranking suggests that the priority for Canadian SMEs is not revenue generation. The priorities appear to be improved client service and internal efficiencies. The use cases provided additional insight, for example, one of the smaller companies indicated,

When we need to provide a service, we first have to identify the customer's requirements, and then go and look for them in various databases. To begin with, we need to ascertain the type of data we need, and then see what data is available.

By contrast, the larger organizations suggest that they create their own applications by programming them to process the data. They gather data on a more regular basis to help develop and design new products and services.

SQ2: What are the impediments with which small and medium-sized enterprises (SMEs) must contend in seeking to use OGD as resources?

The survey and interviews identified fewer impediments than expected based on the literature review. The literature shows a long list of potential impediments (Janssen et al., 2012; Martin et al., 2013; Zuiderwijk et al., 2014; Safarov et al., 2017; Magalhães & Roseira, 2016), but in this study companies responded that they encounter a few impediments when accessing and using OGD, such as a lack of updating OGD (76.27%), incomplete data sets (42.37%), insufficient quantity of OGD (33.90%), existing errors in the data set (32.20%), insufficient quality of OGD (28.81%).

SQ3: What are the key considerations influencing OGD use in these enterprises?

The key considerations influencing the use of OGD in businesses are as follows: the value or potential value of the data, the outcome expected versus the cost of acquiring and integrating the data, and the potential competitive advantage that might accrue. Most companies surveyed responded that the use of government data enabled them to create a product (76.6%), reduce operational costs (63.8%), obtain a competitive advantage (66%) and create valuable data (61.7%).

Through the interviews, several observations emerged relative to this research question:

- OGD is processed internally differently from one organization to another, depending on their needs and business activities.
- Companies use different technological tools to capture and process OGD.
- From one enterprise to another, employees have common and distinct skills.
- Once OGD is processed internally, different business outcomes can be achieved.
- Businesses face several common and distinct barriers when using OGD.
- Using OGD helps businesses remain competitive in the marketplace.
- The use of OGD helps reduce business costs.

Considering the responses received through the survey and the interviews, Table 6.1.1 summarizes key insights of OGD usage by SMEs. The motivation to use OGD is primarily based on the fact that the data are generally reliable and free to access. Expected outcomes, as mentioned above, are primarily to address client needs, but most companies had some idea of improving internal processes to generate more efficiencies to increase profitability. Challenges or impediments related primarily to stale data and data quality in general.

Table 6.1.1 Summary - Use of OGD by SMEs

Motivation to use OGD	Challenges or impediments
• Meet client needs. • No cost, free licence. • Available 24/24h and accessible for all online. • Access the online market. • Visualize data and gain insight. • Improve an existing product or service. • Source of reliable information. • Can be downloaded, selected, processed, stored, and combined.	• Lack of updating data. • Incomplete datasets. • Insufficient data quality and quantity • Existing errors in the datasets. • Difficulty in processing OGD. • Business models. • Processing data • Misinterpretation. • Need for advanced digital skills/competencies. • Management software. • Loss of clients (e.g., Baby boomers). • Increased competition.
Expected outcomes	
• Develop and create a new product/service. • Obtain a competitive advantage. • Reduce the operational costs. • Support decision-making. • Obtain valuable data. • Generate a profit. • Benefit from OGD potential. • Develop a new Data processing. • Be a part of the data ecosystem. • Acquire more knowledge. • Improve organizational collaboration.	

6.2 Theoretical contribution

Using the RBV as a theoretical lens enables examination of the conditions under which OGD might help SMEs gain a competitive advantage. Resources are only of value to a firm when they contribute to its objective in terms of delivering a product or service while having the advantage of reducing its costs and increasing revenue (Penrose, 1959; Barney, 1991). The Information System conceptual framework (Hunter, 2015) helps to better understand how OGD is processed internally for use within the SME.

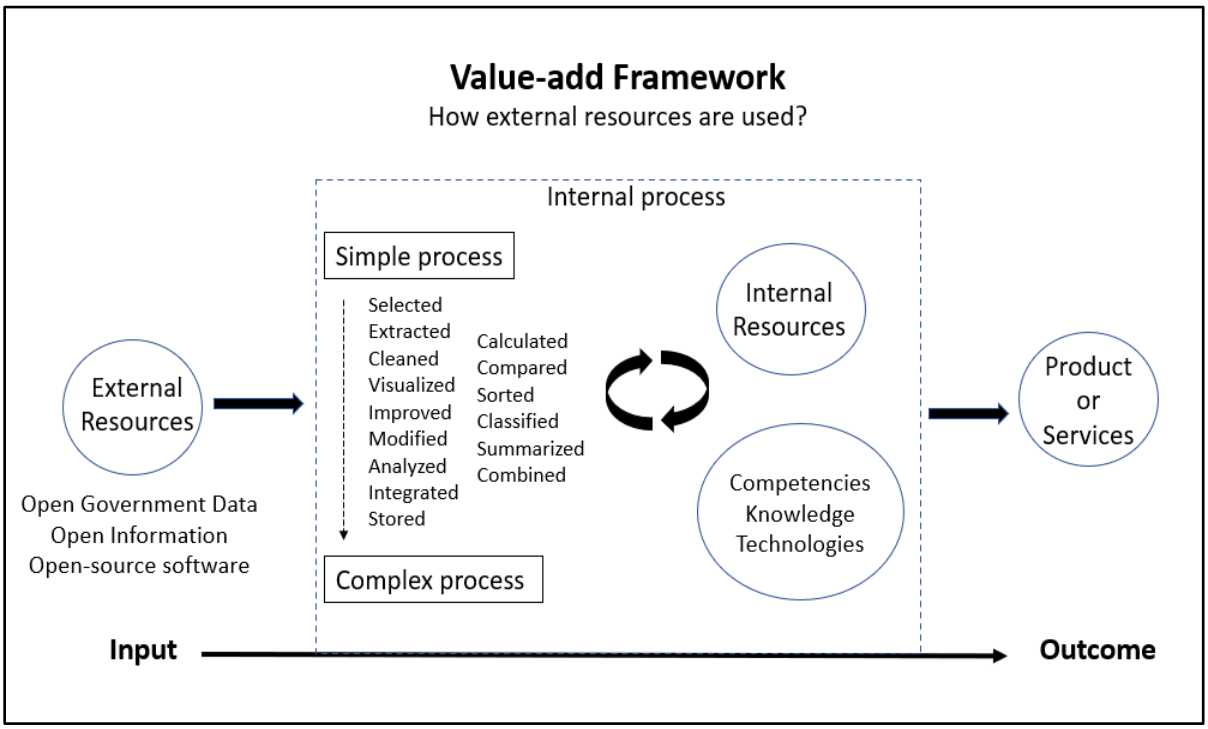

Figure 6.2.1: Value-add Framework when using external resources.

Recent studies on the RBV for the digital age (Alexy et al., 2018; Kim & Makadok, 2023; Cuthbertson and Furseth, 2022) suggests that the RBV should be slightly modified to take account of open resources and their particularities when companies decide to use

them and add them to their internal environment to combine them with their internal resources.

Figure 6.2.1 outlines a framework based on the RBV for companies using free and widely available resources. Moving from left to right in the diagram, external resources, such as OGD or open-source software, are free and accessible online. These resources are acquired and brought into the organization's internal processes which feature mechanisms for capturing and exploiting these resources. External resources (the input) are therefore processed by operations carried out in the organization's internal environment, i.e., selecting, extracting, cleaning, visualizing, improving, modifying, analyzing, integrating, storing, calculating, comparing, classifying, summarizing, and combining.

Figure 6.2.1, describes internal processing when a company considers external resources to be valuable, appropriates them and treats them as its own resources to achieve a competitive advantage.

A company may carry out one or more processes (one or more layers of transformation) to obtain the needed quality and quantity of data. The resulting data can be combined (or integrated) with internal data for various purposes (completing datasets, creating historical data, statistical or financial reporting, etc.). A company uses its skills, technologies, and knowledge to transform this data and achieve a result, such as a new product or service.

As discussed earlier, SMEs have the competencies to process OGD either in simple or complex ways. It is possible to distinguish between these two types of processing based on cost, skills, knowledge, and technology requirements.

1- The simple process can be defined as a few or no actions being conducted once the data has been selected, such as selecting, extracting, and combining the data. This process is

inexpensive for small enterprises. The company may also benefit from a competitive advantage once the result (product or service) has been achieved and commercialized. In a simple process, OGD acquires value not only because it has been selected and included in the internal environment of the firm or within a non-sophisticated information system (see interviews with organizations 1, 2, and 4). In most cases, the firm needs this data to run the business. Also, this data gains value when it is combined with the skills and know-how of employees depending on the way this data is presented and leveraged. A firm that offers a better product or service than any other firm to meet the client's needs, even if it is the same data, can obtain a competitive advantage. According to the RBV, internal competencies make the difference from one firm to another.

2- A complex process requires more actions (Select, extract, clean, calculate, compare, visualize, improve, modify, combine, analyze, interpret, store, and more). The complex process can be costly, depending on the different actions required. For example, medium-sized enterprises use large quantities of data (including open data and OGD), which requires high-performance software and hardware to run complex algorithms. In addition, these firms call upon the skills of specialists with the knowledge and know-how necessary to process large quantities of data with advanced technological tools. The competencies emerge in different ways from one firm to another, depending on the conditions and resources available, as well as the information system and environment. Several data processing operations may be required to extract information and derive value from these resources. In data analysis and Artificial Intelligence (AI) companies, information systems are more sophisticated to process increasing quantities of data (see

interviews with organizations 5 and 6). Data is also processed and interpreted differently from one company to another. Given that in-depth knowledge and specialized skills are required to process data and are specific to each company, the final product is bound to be different, unique, and competitive. In this case, data has necessarily followed distinct paths from one firm to another.

According to RBV, the generation of competitive advantage by using external resources requires a company to develop its capabilities to deploy these resources (Barney, 1991; Teece, 1997, 2018; Zuiderwijk, 2014, 2015). Through the interviews, the researcher has observed that some companies use commercial technology tools while others with large market shares prefer to create their own technology tools. For example, the programming of their platforms is managed by their own algorithms. This strategy likely allows these companies to be more competitive and maintain their leadership position in the market.

The RBV perspective suggests that a firm's resources, capabilities, profits, and growth can be a source of sustained competitive advantage (Penrose, 1959; Barney, 1991). The company's information system is one resource that can be organized to facilitate planning, control, coordination, and decision-making. It can be seen as unique capabilities in each organization according to its resources, human skills, and underlying technology. Information systems with their components (technology, people, and processes) could enable firms to create new products and services using OGD. This is possible because, as we have seen in the survey and case studies, OGD as a resource can be adapted, transformed, enhanced, and exploited in several forms to benefit a company (Barney 1991, 1999). For example, datasets can be used by a firm to update its data catalogues, which are made available to its customers. This firm can also diversify its services and offer support

for managing customer data or producing reports specific to their requests (see interviews of organizations 5, 6, 7).

The final product can differ from one company to another since the same resources are processed differently with different tools, knowledge, and skills. For example, in case study 1 (chapter 5), the use of OGD in geophysical projects can help to build different models for delineating areas of interest to start research. These models lead to different interpretations and, therefore, different outcomes. According to a study by Silberzahn et al. (2018), several research teams have used the same dataset to answer the same question. The teams were independent and processed the same data using analytical strategies of their choice.

The obtained analyses yielded variable effect sizes. Some teams found a statistically significant relationship, while other teams did not. For example, although the three companies (case studies 5, 6 and 7) use the same dataset (such as Canadian employment statistics), the end products will differ. Each company uses, interprets, and exploits the data differently to extract information aligned with the objective to create or improve a specific product. The knowledge, skills, tools, internal processes, and strategies (information systems) used for leveraging OGD cannot be identical from one company to another. In fact, the products and services can only be different and competitive when companies use the same open dataset.

The RBV suggests that generating a competitive advantage with any resource requires a company to have in-house capabilities and processing tools. Companies should combine their internal and external resources to accomplish the benefits (e.g., generate revenue and gain a competitive advantage). RBV is focused on the internal development and protection

of valuable resources (Bowman & Ambrosini, 2020), the basic tenet being that differential performance is based on resource heterogeneity and immobility (Barney, 1991).

Arguably, given the multitude of datasets available through open portals, OGD is a heterogeneous resource since firms might focus on different datasets, and some of these sets might be more valuable than others. However, how can an organization decide which datasets might benefit them uniquely? In addition, firms in the same field serving the same customers would likely focus on the same datasets. Cuthbertson and Furseth (2022) argue that in the digital age, firms are not limited to internal resources but by the networks they can plug into to support their business practices. This network might include partners or suppliers. With respect to OGD, one might argue that open portals represent a different form of network. All firms might "plug in", but only those who have the internal skills to recognize the value of the data and the IS to effectively capture and process it would be able to differentiate either in terms of cost or product quality.

With reference to Figure 6.2.1, "simple processing" might confer an advantage based on how quickly an organization can recognize the value of OGD. The advantage might be temporary, however, waning as soon as competitors catch on to the value of the data set.

"Complex processing," on the other hand, might be more reliant on internal skills to develop proprietary algorithms. Therefore, the capability to recognize the value of data and to process it in unique ways could confer a more lasting advantage for SMEs.

According to Barney (1991), four attributes of a firm's resources characterize the opportunity for using such resources to achieve a competitive advantage: valuable, rare, imitability, and organization (VRIO). By evaluating resources based on VRIO, companies can prioritize investments in resources that have the potential to provide a competitive

advantage. This RBV's approach focuses on internal resources and their role in achieving returns and guides firms in their investment decisions regarding beneficial resources to be processed.

Exploring the VRIO framework in the context of OGD yields insights that likely apply to any resource an organization can freely acquire (for example, open-source software and emerging online algorithms for machine learning and artificial intelligence). Once OGDs have been prepared within a company, the VRIO approach can be applied before using them as internal resources. Each component discussed below was evaluated based on definitions introduced under the theoretical section and responses collected from the survey and case studies.

6.2.1 Value

The value component focuses on the ability of resources to contribute to a firm's competitive advantage by increasing the value of a product or service (Barney, 2015). Valuable resources enable companies to attract customers, expand their market share, and improve operational efficiency. In this case, OGDs are valuable resources for a firm if they can be used to create or improve a product. The data collected for this dissertation indicated that the most important motivation for using OGD was to meet client needs. Accordingly, SMEs do tend to focus on this aspect of value as it relates to client demands. Secondly, many SMEs use OGD to enable internal processes such as lowering costs or improving process efficiency. As discussed above however, the potential value of the OGD must be realized, and organizations need to be aware that the data exists and that it can be accessed and processed to improve how it is read, visualized, and organized to facilitate analysis, interpretation, and exploitation.

Based on the case studies, it appears that the ability to recognize the value of OGD resides in the knowledge of internal company staff (usually the senior leadership team or engineers). Based on these skills, companies could then be in an advantageous position to "move first" in acquiring OGD before a competitor. Depending on the integration process capability, OGD resources would become part of the organization's internal environment after being selected, extracted, cleaned, stored, etc. It is possible that, as discussed earlier, even the first-mover advantage in recognizing the value of the data might be attenuated as competitors learn about the availability of a particular dataset. The integration capabilities of the organization might help to confer a longer-lasting advantage.

6.2.2 Rare

Initially, this attribute examines the uniqueness of the firm's resources compared to its competitors. Rare resources can potentially provide a competitive advantage as they are not accessible to other companies (Barney, 1991; Peteraf, 1993). However, rarity as a resource attribute is not applicable in the case of OGD. In fact, the logic of "open" resources implies a reduction or an elimination of the "rarity" component (Alexy et al., 2018) since the same dataset is available and accessible online to everyone from anywhere, including competitors (Jenssen et al., 2012; Gonzalez-Zapata & Heeks, 2015).

The concept of rarity, however, could lie in the skills and tools used to leverage OGD as a resource. Rareness obviously does not apply to OGD since it is freely available to all. The capabilities to identify the value of the data, capture and transform it to improve efficiency or differentiate products and services can be rare because they are developed within the firm and are indeed heterogeneous from firm to firm. Within the OGD or in fact, within any context in which resources can be freely obtained, the attribute "rare"

should likely be directed not to the resources per se, but to the organizational capabilities (i.e., complementary resources) that in contrast to Barney (1995), do confer some form of competitive advantage in and of themselves.

6.2.3 Inimitability

According to the RBV, inimitability refers to the difficulty competitors experience in reproducing a company's precious and rare resources. As rare resources are not available to competitors, Barney (1991) argues that barriers to imitation are essential to the long-term impact of a resource. However, easily imitable resources may still provide temporary advantages and value, according to Peteraf (1993).

Inimitability as a resource attribute does not apply to OGD. This data is available and accessible in different formats. This attribute can be applied only to the internal resources produced and protected by the firm. However, once the external open resources are combined with the internal resources, this attribute can exist since it would be difficult for competitors to copy the exact coordination of resources and capabilities. Using only open resources implies suppressing the “inimitability” component because these resources are available for all (Alexy et al., 2018, p: 1707).

This study suggests that “simple processing” might create a situation where competitors can easily copy the capabilities to work with OGD. More complex processing, however, might preserve inimitability given the causal ambiguity related to the specific ways in which organizations process OGD and convert the outputs into improved efficiency or into new products and services. Therefore, two scenarios regarding inimitability are possible depending on the adopted processing of resources.

1- If the company directly uses and exploits the open data available online without processing it in a complex way, imitation is not a barrier that guarantees competitiveness. In addition, competitors do not need to imitate OGD as these resources are available for all firms in the market and can be freely used. The “inimitability “attribute is, therefore, not valid for open resources.

2- If the company adopts a complex process when using OGD to obtain a new product or service, imitation by competitors will be costly and difficult on top of the legal protection (company-owned patents and intellectual property licenses). Given the costs, skills, knowledge, and technological tools available, imitation would be a real obstacle since data processing would require considerable effort to combine external and internal resources to obtain a product like that of competitors. In this case, the “inimitability “attribute is applicable to the combined (Internal and external) resources but not to the external open resources.

6.2.4 Organization

Barney (1995) argued that, under the VRIO model, the “O” (organization) includes complementary resources and might not confer a competitive advantage in and of themselves, but in combination with other resources, can help the organization optimize competitive advantage. Grant (1991) suggests that “…productive activity requires the corporation and coordination of teams of resources” (p.119). Furthermore, although resources are needed, it is the capability surrounding those resources which confers a competitive advantage.

The " O ", therefore, refers to how resources in the company are orchestrated and deployed (Barney, 1995; Kim & Makadok, 2023). The data collected for this study

suggests that, within each organization, certain individuals are focused on acquiring and deploying OGD, and each organization has developed a specific approach based on the needs of its clients. The specific processes, reporting relationships, and tasks involved vary from organization to organization thus suggesting, as discussed above, that this element of the VRIO framework is relevant and important when considering the use of freely acquired resources. Indeed, the capabilities of organizations are difficult to reproduce when employees have specific experience, knowledge, creativity, and leadership skills (Barney, 1991).

Kim and Makadok (2023) explored the impact of workflow on organizational performance, suggesting that different workflows would emphasize individual versus team performance. In smaller SMEs, it is not unusual for a single individual to be the OGD "expert." Clearly, this resource can be mobile; therefore, the entire process of working with OGD could easily be replicated in another organization that hires the employee. In contrast, workflows that feature high degrees of interdependency among employees are less mobile given the degree of coordination that is often embedded in organizational processes.

The practice of simple processing of OGD might well be the responsibility of a single individual, but complex processing would normally involve a team. In this case, the exploitation of OGD depends on the management system, internal processes, technology, and the collective ability of employees to process and leverage data. The tools and software do much of the work, but the team's know-how is essential. Human capital remains decisive, linked to skills and the ability to process, and interpret data. Thus, a strong interdependence exists between human capital, technologies, and related costs and investments that enable an organization to continue to produce and compete.

6.2.5 Summary

In today's fast-changing business environment, openness, which includes collaborating with external partners and sharing resources, is becoming more common. Alexy et al. (2018) propose a framework integrating the openness strategy with the RBV. They were motivated by the RBV's assertion that control is necessary for competitive advantage and the empirical observation of successful firms that voluntarily surrender control of a resource (Alexy et al., 2018, p: 1718).

From a business perspective, the authors argue that when firms choose to open their resources to their competitors, can significantly improve their performance and reduce costs while increasing demand for their internal resources (which are rare and inimitable). However, resource sharing implies an attenuation or even elimination of the "rarity" and "inimitability" attributes of the VRIO framework with respect to openly available resources. The focus shifts to the internal capabilities needed to leverage the resources, as well as the degree to which partners in the ecosystem collaborate to each receive benefits from sharing.

From the perspective of governments who publish open data, companies should generate economic benefits by improving their performance and reducing costs (Ubaldi, 2013; Jenssen et al., 2012). By publishing OGD, governments have created an open data ecosystem to meet the data needs of different actors and increase its potential (Ubaldi, 2013; Zuiderwijk et al., 2014). This OGD ecosystem involves a variety of actors, technologies, and policies that collectively contribute to the accessibility, transparency, and usability of government data. For companies, this external ecosystem has created an environment where data is available to all competitors with just a few clicks.

Open data platforms are fundamental interfaces with stakeholders within the OGD ecosystem since they represent a centralized space where datasets can be published (Zuiderwijk et al., 2012). These platforms are not shared per se, but they do represent a network of open data sources and partners that create opportunities for companies to develop new products and services, encouraging entrepreneurship and increasing competitiveness and economic growth (Zuiderwijk et al., 2014; Zeleti, et al., 2016). Ultimately, unless SMEs can find ways to improve performance by using OGD, they will likely move to other resources that provide strategic value. The research in this study suggests that if SMEs use OGD in simple processes, competitive advantage will be temporary at best. The use of OGD in more complex processes, however, can confer some degree of sustainable competitive advantage since the embedded processes of identifying, acquiring, and transforming OGD would be difficult for competitors to imitate.

Figure 6.2.2 summarizes the transformation process of OGD based on the survey and case studies. Companies take several actions in their internal environment to process this data, but these can be categorized in two ways, from the external environment to the internal environment and from the internal environment to the external environment (see Table 6.2.5.1). The firm's information system supports all these activities.

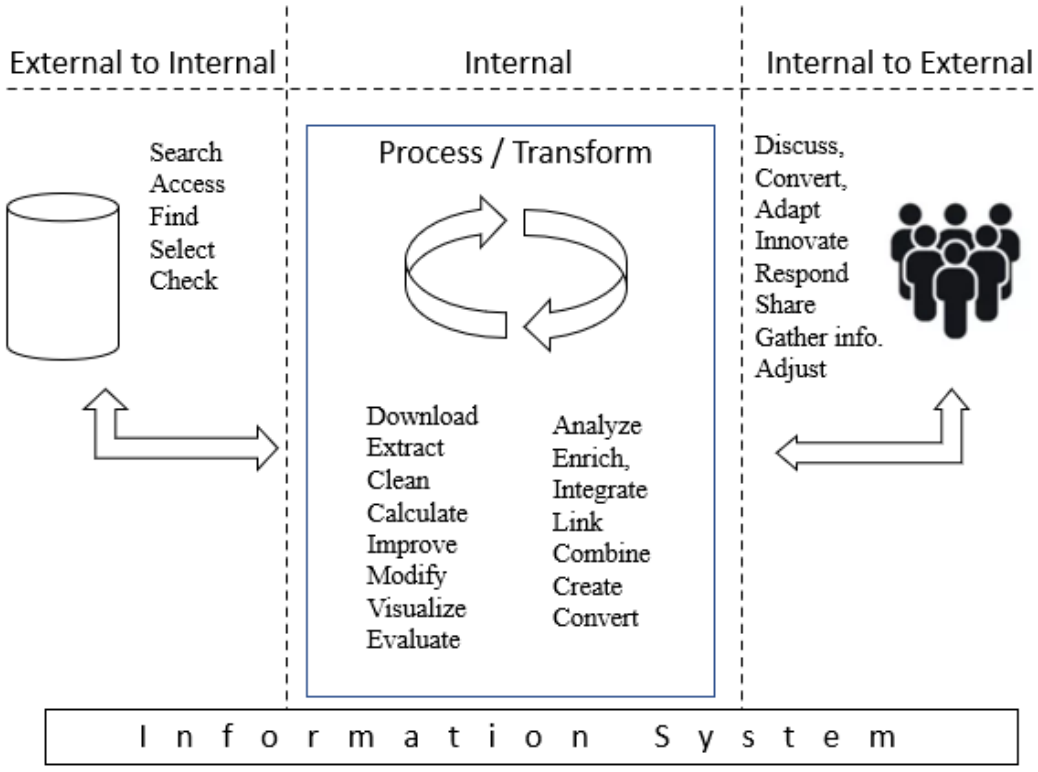

Figure 6.2.5.1: Processing OGD – simple/complex, individual/team.

Furthermore, within these categories of activities, SMEs may use OGD differently, and the specific processes also vary from one company to another. The following list offers more details and groups together the actions and processes confirmed by the respondents as represented in Figure 6.2.5.1:

From external to internal (Data user perspective)

- External

- Search for Data,
- Access data from the OGD portal,
- Find and select data,
- Check data licence.

- Internal (data processing depends on one company to another)

- Download data,
- Extract data,
- Ensure data quality and quality,

- Use tools and software,
- Clean, correct, calculate, improve, and modify data,
- Visualize, evaluate, and analyze data,
- Enrich, Integrate, and link data,
- Combine data to create products or offer services,
- Convert Data to information.

From internal to external (targeting the client perspective)

- Internal (information processing)

- Discuss, convert, and adapt data/information to the product or service,
- Innovate a new product or service,
- Respond to client needs.

- External

- Share product or service (data/ information) with the client,
- Gather information about client satisfaction,
- Adjust the product if needed.

- Resume internal and external steps as needed.

According to the responses received from respondents, this list of actions (Table 6.2.2) is not unique or exhaustive since each company may perform other actions depending on the skills of their staff, the technologies used, and the processing required (information system) to obtain the final product.

Based on Figures 6.2.1 and 6.2.5.1, three sources of potential competitive advantage exist complexity, team-based workflows, and sophistication of the IS. Figure 6.2.5.2 summarizes the ways in which competitive advantage can be created based on these sources. An organization might engage in simple or complex processing, using individuals or teams in the workflow. Complex, team-based processing supported by a sophisticated information system is more difficult for competitors to imitate and, therefore, has the potential to confer a longer-lasting competitive advantage even if the data being used is not rare or inimitable.

Organization	Processing	
	Simple	Complex
Team	Moderate competitive advantage	High competitive advantage
Individual	Low competitive advantage	Moderate competitive advantage

Figure 6.2.5.2 Understanding competitive advantage when using OGD.

The 2 x 2 matrix outlined above summarizes this conceptualization assuming that each organization has a capable information system. Otherwise, the sophistication of the IS itself can become a source of competitive advantage. For example, organizations with automated or semi-automated search and integration algorithms can more quickly capture and transform OGD.

The study suggests that organizations generate competitive advantage using OGD based on the level of processing, which can vary in intensity: low, moderate, and high. So, the more complex the processes are within an organization, the less likely it is that another company will be able to exactly imitate the process and the outcome.

Although OGD is a resource available to everyone, firms can distinguish through the "organisational" aspect of VRIO. The complexity of the way in which the firm organizes to process OGD can influence the degree of competitive advantage. In the matrix in Figure

6.2.5.2, individual simple processing, that is processing that does not change the data significantly, may confer some competitive advantage, but it might not last since if that one individual leaves or is hired by a competitor, the advantage disappears. On the other hand, when the work is team-based, it becomes more difficult to imitate its resources, and therefore, there is a low risk of losing its competitive advantage.

If the processing is complex, then the individual might rely on specific software and processes in the firm and thus even if they leave, they might not be able to replicate these processes in another firm. At the team level, even simple processing might be difficult for another firm to replicate since it depends on coordination among team members.

6.3 Practical Implications

Our research focused on small and medium-sized companies that are active in a wide range of fields and industries, including those working in data and technology (which make greater use of open government data). Data collection in different sectors has enabled us to understand and identify the different processes used by the SMEs we have surveyed and interviewed.

The RBV authors (Penrose, 1959; Wernerfelt (1984); Barney, 1991; Teece, 1997) suggested that the information system is where people, technologies and competencies come together to transform internal resources and capabilities to achieve a competitive advantage. However, they did not identify or describe the internal process on how to exploit external and internal resources. To ensure their survival, companies must continually adapt to changes in their internal and external environments. Their survival depends on their ability to adapt to changes which involve the use of resources within organizations and are now decisive for their existence.

Regarding the conceptual model adopted in this research, we find that, in addition to the five generic processes identified by Hunter (2015), other processes are applied to data from the external environment to inside the firm, internally and from the internal to the external environment to process data and unlock it value. The external data becomes internal data after being processed and combined with internal or unique data of the firm. The different processes applied depend also on the quantity and quality of the data to be integrated, enabling to obtain a product or service as an outcome.

The open data ecosystem is now a part of the business ecosystem, which emerges from the exchanges and interactions between companies, consumers, suppliers, competitors, and

more. All these participants contribute to the data market and add economic value. Within this ecosystem, companies influence each other, and their activities depend on each other (Zuiderwijk et al. (2014). However, extracting meaningful and usable information from OGD as external resources is one of the keys to distinguishing value for firms.

The conceptual framework based on information systems (IS) enables an understanding of how SMEs could produce benefits and acquire a competitive advantage by adding and using OGD with their resources. Information systems (which include information technology) could conserve the resources required to perform operational tasks (design, invoicing, estimating and marketing/sales and improve time to market. Laudon & Laudon (2013) proposed several tangible benefits of Information Systems (e.g., increased productivity, lower operational costs, reduced workforce, reduced facility costs, etc.) and intangible benefits (e.g., improved asset utilization and resource control, more timely information, improved decision making, improved operations, higher client satisfaction, better corporate image).

This research demonstrates that although an organization might make use of externally free resources available to all competitors, depending on its internal resources, particularly organizational systems and processes, it can freely access and benefit from these external resources to be more efficient and competitive. Our survey results effectively confirmed that Canadian companies use and process data using internal resources to extract information that can be leveraged by technological tools and the skills of their employees and managers. Companies confirmed that external resources have potential and can also be used to achieve results and generate income.

This research can also benefit companies since it is possible to see different uses of OGD in the findings. SMEs can find ideas or data processing models that enable them to leverage OGD. SMEs' adoption of OGD can, in turn, drive innovation and economic growth. The insights gathered in this study can also be used to guide SMEs in creating projects or initiatives. OGD becomes valuable when it is used and processed within organizations. However, companies should first familiarize themselves with OGD, understand its usefulness and see how it can contribute to their organization. Because OGD is a relatively new resource, companies as potential users may need more time to learn how to use this data effectively and produce valuable results. An important consideration is the development of capabilities to recognize, capture and integrate OGD into ongoing operations.

As seen in this research, OGD is used by a wide range of actors from the private sector and industries, such as IT companies, research companies, real estate agents, lawyer firms, HR companies, etc. Leveraging government open data could enable companies to create or improve their products or services to increase profits, compete in the marketplace, innovate, and contribute to economic value. However, there are many ways of exploiting OGD when companies operating in different sectors use it. When integrated into a team-based complex processing workflow, the data might deliver more value and the overall process would be more difficult to imitate or substitute (Wade & Hulland, 2004; Zuiderwijk et al. 2015).

Given that OGD becomes valuable when used (Janssen et al., 2012; Attard et al., 2016), value creation can be achieved only at the last stage of the processing. However, OGD can be treated and processed in a simple or complex way, depending on the organization's

needs, to extract valuable information from it. Through the case studies presented in Chapter 5, we also provided evidence of the different uses of OGD. For example, we concluded that when the same dataset is used by two companies (i.e., IT companies), it is obviously not used and exploited in the same way.

In practice, we highlighted some directions for further development to encourage data providers (federal government departments) to continue supplying data access. We also demonstrated how users operate in different sectors and value data in specific usage models. Governments (federal and provincial) can use the results of this study to assess the needs and the way SMEs use OGD. In this way, understanding how companies use open data through this research can help governments adopt the right guidelines to stimulate the use of OGD by SMEs in Canada.

Businesses sometimes need to add changes and adapt their organization to leverage new resources. Often, this implies that the organizations need to adopt a new business model that will allow them to adapt to the new economic context and operational requirements to achieve their objectives and, therefore, increase their income and even optimize their profit. Several business models are used in the context of open government, OGD, and re-use of open data have been identified through the literature. Table 2.4.2 (Chapter 2) summarizes the different existing business models in use.

6.4 Limitations and Future Research Directions

For this research, RBV was adopted as the theoretical framework and information systems as the conceptual framework. The results obtained from the survey and case studies confirmed that Canadian SMEs use and process OGD. The obtained results helped to reflect on the ways in which the RBV can be applied in a context of resources that are not exclusively tied to the firm. Given the lack of research in this area, there is plenty of scope for future research related to the use of OGD by SMEs in Canada. Exploratory and empirical studies are needed to understand the Canadian Open Data environment better.

The proposed model in this study is based on practical facts in the business environment that arose with open data publication. The results presented are in accordance with the observations gathered in the survey and case studies. The researcher has simplified the processes involved in using OGD and provided descriptions of how companies use and benefit from the cost and value advantages of OGD resources.

The theoretical and conceptual frameworks and contributions can be directly tested to see how they explain why and how companies exploit open data. Aligned with prior studies on RBV (Mata et al., 1995; Kraaijenbrink et al., 2010; Schlagwein et al., 2010; Zuiderwijk et al., 2015; Alexy et al., 2018), this theory is appropriate for explaining how companies manage their resources, but its present state does not adequately explain certain phenomena related to using open external resources, creating value, and achieving competitive advantage through these resources.

The RBV framework enables the information processing system to be seen as an environment where data processing capability, firm knowledge, and individual talents are merged to build a unique and customized system for processing business resources

(Barney, 1991). Using the conceptual framework based on business information systems (IS), it has been possible to understand how SMEs generate profits and gain competitive advantage by using OGD. As the literature shows (Hunter, 2015; Yaverbaum et al., 2004; Laudon & Laudon, 2013; Bourgeois et al., 2019), each firm operates according to its own information system. This also means that information systems differ from one firm to another, as seen through case studies (1, 2, 3, 4, 5, 6, 7), whether in the same sector or in a different sector.

As with every research project, this study featured certain limitations. The COVID-19 context in which the survey was conducted was not conducive to receiving many responses. However, the information derived from the 68 surveys did point to several key uses of OGD and ways in which it was being processed. Although, the SME's sample studied remains representative in terms of size and sector of industry, there may be particularities linked to the organizational, technological and regional aspects that limit the generalization of the results to a wider context. The companies that volunteered to answer the case studies questions operate in different sectors. This helps us to collect and obtain information on how the data is used and processed, but it does not allow us to generalize or draw a common model of OGD use. It was, however, less possible to compare the use of data by companies operating in the same sector. According to Krusenvik (2016), although the case study is an intensive approach, it has its strengths and limitations. The greatest concerns regarding case studies are rigour and the limit of generalization of the phenomenon studied. The available case studies did demonstrate different uses and values derived from OGD, which was the main focus of this study.

Given the wide range of challenges facing SMEs when it comes to using OGD, future research projects in this field could limit the scope of activity or sector carried out by companies to examine the phenomenon better, for example, a study on the use of OGD by IT companies only. This could make it possible to compare the paths of resources in the same sector and business environment, from the external to the internal and from the internal to the external of organizations. Such empirical studies could help identify basic business models by industry so that companies can implement and better exploit open resources to be more competitive. Thus, future studies should also attempt to identify other internal processes applied within organizations, as well as listing more uses of OGDs specific to each industrial sector in which SMEs operate.

Given the above limitations, futures studies should attempt to understand "how" competencies, knowledge and technologies could be developed when combined with internal resources to facilitate the processing of OGD within the information system of the firm. Finally, this study has pointed out the many ways in which SMEs use OGD. Future studies could seek to work with a larger sample of SMEs that might permit more detailed comparisons among companies of different sizes who use OGD either for new product development or for improving operational efficiencies.

Conclusion

This dissertation examined the use of OGD by Canadian SMEs. To collect evidence for the study, a mixed method was applied including a survey and interviews with respondents from several Canadian SMEs. This interdisciplinary and exploratory research has contributed to the debate on whether and in what ways OGD, can be used as internal resource to the firm to achieve competitive advantage and an economic value.

By applying the components of RBV to the data collected in this research, it was possible to identify the main lines of the strategy adopted by each company (see case studies in Chapter 5). Each company has adopted a strategy and an Information System consistent with its main objectives and business environment.

Combining internal data with external data, such as open data, gives each company equal access to the same government resources as its competitors and allows it to remain competitive. However, each company can differentiate itself from its competitors due to its know-how, the adopted technologies, and the skills possessed by its leaders and employees (Barney, 1991).

Adopting new technologies has become a significant requirement to maintain a company's position in the market and differentiate itself from its competitors. However, SMEs can use reliable, free, and accessible open data[98]. OGD is available in different formats, from commercial software (Microsoft, PDF, GIS, etc.) or compatible free software. The skills needed to exploit them can be essential for some companies or even specialized for others, depending on the fields of activity and the final products or services.

[98] See, Open Data 101 https://open.canada.ca/en/open-data-principles

Each company is free to exploit open data to derive the relevant information that will enable it to achieve an outcome that distinguishes it from other competitors and allows it to assign value to the combined resources, i.e., internal, and external resources. Unlike RBV, today's companies can no longer just produce and exploit their own data. Purchasing external data is an option but a costly one. Companies increasingly need reliable external resources to offer products and services of competitive quality while complying with the regulations and standards that shape the business environment. OGD can be an alternative, depending on the SMEs' needs.

The RBV framework does not describe how data is processed, transformed, and valued internally in the organization. Hunter's framework was therefore used in this research to describe and explain how SMEs could use and process OGD internally. The survey and interview questions were based on the main Internal process steps described by Hunter (2015). The proposed model by Hunter (2015) was used to identify the most important steps for processing data used within organizations. However, this study demonstrates, for example, that OGD, after being selected and extracted, does not always need to be calculated. According to some respondents interviewed, it can be used as it is (See case studies section). Indeed, each company chose and extracted specific datasets that can be processed differently and leveraged to help create or improve its product and service.

Following the survey, interviews were conducted, and documents were consulted to better understand the ways in which open data can help SMEs develop, grow, and maintain their survival. Most of the companies surveyed process and use data in different ways. Most companies exploit OGD by deriving direct and indirect benefits without being able to estimate the actual share of the profit generated by OGD.

Furthermore, the IS conceptual framework helps us to appreciate the internal processes adopted by each case study of this research. It also made it possible to see how open data is selected and combined with the internal data of each company and to understand how data can be used to generate value. According to Hunter (2015), small businesses are moving from an internal approach to relationships with external entities such as customers and suppliers to maintain a competitive advantage.

With this research, the researcher contributed to building on and extending the research on OGD by using RBV and Information Systems frameworks to enhance the understanding of Canadian SMEs' use of OGD and how they can gain benefits and generate competitive advantage. Indeed, the researcher has tried to bring evidence that an organization could exploit OGD as external resources by selecting and processing them as internal resources.

Appendix A: Numbers of visits and downloads - Open Government Portal

Year	Month	Visits	Downloads
2013	12	19487	6657
2013	11	23942	10156
2013	10	24616	10145
2013	9	21759	7031
2013	8	26571	7684
2013	7	48972	14656
2013	6	39072	2785
2014	12	34027	3641
2014	11	61206	12190
2014	10	75663	16006
2014	9	69625	12429
2014	8	28685	9259
2014	7	27574	10675
2014	6	28172	9339
2014	5	32879	11147
2014	4	33018	11395
2014	3	38368	17883
2014	2	38084	25761
2014	1	31176	11109
2015	12	31885	3313
2015	11	37046	4243
2015	10	35392	3716
2015	9	34270	3903
2015	8	28770	4158
2015	7	30027	4791
2015	6	30253	4343
2015	5	31541	4539
2015	4	29889	4810
2015	3	35361	4983
2015	2	37666	7273
2015	1	58482	5725
2016	12	65516	15860
2016	11	78899	21672
2016	10	45216	4785
2016	9	32711	95
2016	8	35522	3846
2016	7	40973	6163
2016	6	49014	7165
2016	5	47312	6861
2016	4	46352	7126

Year	Month	Visits	Downloads
2016	3	46174	7437
2016	2	39998	7170
2016	1	36951	4091
2017	11	134846	60158
2017	10	137767	60713
2017	9	142412	50234
2017	8	153199	44269
2017	7	102979	42656
2017	6	100766	26583
2017	5	109079	28859
2017	4	109445	29168
2017	3	125081	38095
2017	2	94873	30858
2017	1	87381	24845
2018	12	110011	46031
2018	11	170175	66161
2018	10	128446	57683
2018	9	127428	52850
2018	8	122546	48110
2018	6	61505	3
2018	5	71897	310
2018	4	70298	541
2018	3	73184	407
2018	2	67005	324
2019	12	140463	53318
2019	11	178965	78940
2019	10	195971	84078
2019	9	147413	65462
2019	8	124081	53353
2019	7	140326	61059
2019	6	155880	55866
2019	5	131312	56544
2019	4	143829	60625
2019	3	152337	64756
2019	2	151264	64759
2019	1	148388	62999
2020	12	174524	74529
2020	11	204271	87276
2020	10	184597	80076
2020	9	83613	41480

Year	Month	Visits	Downloads
2020	8	110712	43150
2020	7	123815	48756
2020	6	171526	59392
2020	5	172941	58844
2020	4	179229	61998
2020	3	179075	69377
2020	2	170178	75252
2020	1	188288	75225
2021	12	187242	92498
2021	11	228267	125064
2021	10	224056	118689
2021	9	214318	101258
2021	8	191322	91551
2021	7	184059	89360
2021	6	195249	101260
2021	5	203966	87985
2021	4	209568	95070
2021	3	228050	113365
2021	2	199766	102883
2021	1	203419	91803
2022	12	199321	82451
2022	11	263299	119851
2022	10	240218	104813
2022	9	230033	94247
2022	8	235900	98008
2022	7	212608	83516
2022	6	211167	87544
2022	5	222922	89410
2022	4	226722	96882
2022	3	255983	116366
2022	2	236119	112104
2022	1	250936	128089
2023	7	244078	84262
2023	6	246595	106948
2023	5	262804	113586
2023	4	218389	98956
2023	3	269028	130729
2023	2	248567	108384
2023	1	268339	128875

Appendix B: Timeline: Progress made in opening Canadian OGD

The following are the key milestones in the Canadian government's progress in making information available and opening up government data:

1983: Access to Information Act

1983: Privacy Act

2000: First project: 'Government On-Line'

2003: Proactive disclosure

2006: Federal Accountability Act

2010: Adopted 10 open data principles

2011: OGP: Open Government Initiative

2011: Open Data Pilot Project

2012: Access to information Request Summaries

2012: Modernize Values an Ethics Code

2013: G8 Open Data Charter

2012-14: Canada's Action Plan on Open Government

2014: Directive on Open Government, 'Open by default

2015: OGP: International Open Data Charter

2014-16: Canada's Action Plan on Open Government

2016: Ranked 2nd in the world by Open Data Barometer for publishing Open data

2016-18: Canada's Action Plan on Open Government

2018-20: Canada's Action Plan on Open Government

2020-22: Canada's Action Plan on Open Government

2022-24: Canada's Action Plan on Open Government

Sources:

Government of Canada, https://open.canada.ca/en

National Action Plan on Open Government, https://open.canada.ca/en/content/national-action-plan-open-government

Open Government Partnership, https://www.opengovpartnership.org/

Open Data Barometer, https://globaldatabarometer.org/

G8: Open data Charter, https://opendatacharter.net/our-history/

Appendix C-1: Survey Questionnaire (English)

Dear participant,

The purpose of this questionnaire is to **gather information on** the use of Open Government Data by Canadian Small and Medium Enterprises (SMEs). Open Government Data (OGD) refers to all data accessible from the Canadian federal government and in particular, the Open Government Portal https://open.canada.ca/en/open-data.

If your company is a Small and Medium Enterprise (SME) and has used or sought to use Open Government Data, we kindly invite you to share your experience in this questionnaire.

The questionnaire consists of 20 questions and will take about 15-20 minutes to complete. The information provided will be used as part of Ouassila Kherchouche's doctoral research, [*Towards an understanding of the public data evolution: An empirical study of Open Government Data and its use by SMEs in Canada*], which is being pursued at the University of Ottawa.
Thank you in advance for your participation!

Instructions:
Please answer the questions based upon your knowledge of your organization. This questionnaire is available in both official languages. If you wish to complete the form in French, please click on the following link: Français.

The information you provide will not be passed on to any third party. Your responses will be treated with confidentiality. Company names will not be reported, and the survey data will be aggregated to ensure your company's anonymity.

☐	**I have read the statement above.**

(Please tick the box)

Do you wish to participate?

☐	Yes
☐	No

If you select "No" you will be redirected to the thank you page of our questionnaire.

QUESTIONNAIRE SURVEY

Instructions:

Please answer the following questions by ticking the boxes and/or writing in the spaces provided. Instructions are provided in italics for each question.

What is the name of your company? (required)

……

As the respondent of your company what is your name (optional):

……

What is your position? (optional)

……

Section 1: Business Origins and Make-up

Small and Medium Enterprises (SMEs) are defined in Canada by the number of paid employees they have. A small business has one to 99 paid employees, and a medium-sized business has 100 to 499 paid employees.

1. **Please indicate the year in which your organization was established in Canada:**

   ……..……

2. **Please indicate the total number of people employed by your organization:**

   (*Please select the answers that apply to your company*)

☐	Just me (entrepreneur)
☐	Less than 99 employees (Small Enterprise)
☐	100 to 499 employees (Medium Enterprise)
☐	Don't know

3. **Please indicate the province and the city/town in which your organization is based in Canada:**

   Your Province:

☐	Alberta
☐	British Columbia
☐	Manitoba
☐	New Brunswick
☐	Newfoundland and Labrador
☐	Northwest Territories
☐	Nova Scotia
☐	Nunavut
☐	Ontario
☐	Prince Edward Island
☐	Quebec
☐	Saskatchewan
☐	Yukon

Your city/town:

Please write your answer here (optional):

4. **Please indicate the industry sector in which your organization operates.**
(*Please select all the answers that apply to your company*)

☐	Business & legal services
☐	Data/technology
☐	Education
☐	Electricity & energy transmission
☐	Environment & weather
☐	Finance & investment
☐	Food & agriculture
☐	Forestry
☐	Geospatial/mapping
☐	Governance
☐	Healthcare
☐	Housing/real estate
☐	Insurance
☐	Lifestyle & consumer
☐	Management consulting

☐	Media
☐	Oil & Gas
☐	Scientific research
☐	Transportation
☐	Other (Please specify below):

Please write your answer here (optional):

5. **Does your company access the Canadian Open Government Data on the portal (https://open.canada.ca/en/open-data)?**

☐	Yes
☐	No

If your company has not accessed the Open Government portal, please select "No". You will be redirected to the thank you page of our questionnaire.

6. **Please identify how often your company has access to Open Government Data on the Open Government Portal.**
(Please try to be as accurate as possible)

☐	Daily
☐	Weekly
☐	Monthly
☐	Once in a while
☐	Never

7. **Please indicate the categories of datasets for which your company has reviewed the Open Government Data.**
(*Please select all the answers that apply to your company*)

☐	Agriculture & Food
☐	Art, Music, Literature
☐	Economics & Industry
☐	Education and Training

☐	Government and Politics
☐	Health and Safety
☐	History and Archeology
☐	Information and Communications
☐	Labour
☐	Language and Linguistics
☐	Law
☐	Nature and Environment
☐	Processes
☐	Science and Technology
☐	Society and Culture
☐	Transport
☐	Other (Please specify below):

Please write your answer here (optional):

Section 2: Use of Open Government Data

This section is about your use of Open Government Data. If you are using Open Government Data, for example, to create a product or complete a project, please discuss it in this section.
If you would like to provide additional information about your use of Open Government Data, please write your comments at the end of this questionnaire.

Open Government Data is recognized as being used when it has been either accessed, reviewed, modified, combined, processed, or transformed by users.

8. Please indicate whether your company uses Open Government Data by reviewing and capturing data of interest.

☐	Yes
☐	No
☐	Prefer not to disclose
☐	Don’t know

If your company has not made any use of Open Government Data, please select "No". You will be redirected to the thank you page of our questionnaire.

9. Please identify how often your company uses Open Government Data.
(Please try to be as accurate as possible)

☐	Daily
☐	Weekly
☐	Monthly
☐	One in a while
☐	Never

10. Please indicate the motivation of your company for using Open Government Data.
(*Please select all the answers that apply to your company*)

My company has used Open Government Data to ….

	Strongly disagree (1)	Disagree (2)	Neither agree nor disagree (3)	Agree (4)	Strongly agree (5)
visualize data and gain insight	☐	☐	☐	☐	☐
analyze it by testing its potential	☐	☐	☐	☐	☐
meet the requests of clients	☐	☐	☐	☐	☐
improve an existing product or service	☐	☐	☐	☐	☐
create a new product (e.g., report, map, application)	☐	☐	☐	☐	☐
conduct research (e.g., statistical/economic/ environmental research)	☐	☐	☐	☐	☐
create a new service (e.g., consulting, web service)	☐	☐	☐	☐	☐
generate revenue	☐	☐	☐	☐	☐
reduce operational costs to be more competitive	☐	☐	☐	☐	☐
access a niche market and make a secure investment	☐	☐	☐	☐	☐
without any motivation	☐	☐	☐	☐	☐
I don’t know	☐	☐	☐	☐	☐
Other (please specify below):	☐	☐	☐	☐	☐

Please write your answer here (optional):

11. Please indicate if your company has encountered any impediments when using Canadian Open Government Data

(*Please select all the answers that apply to your company*)

	Strongly disagree (1)	Disagree (2)	Neither agree nor disagree (3)	Agree (4)	Strongly agree (5)
Difficulties in accessing to OGD	☐	☐	☐	☐	☐
Challenge related to legislation & policies	☐	☐	☐	☐	☐
Insufficient Quantity of OGD	☐	☐	☐	☐	☐
Insufficient Quality of OGD	☐	☐	☐	☐	☐
Lack of updating of OGD	☐	☐	☐	☐	☐
Existing of Errors in the data set	☐	☐	☐	☐	☐
Incomplete data sets	☐	☐	☐	☐	☐
Difficulties in processing OGD	☐	☐	☐	☐	☐
Need for more advanced Digital skills / competencies	☐	☐	☐	☐	☐
Increasing operational costs	☐	☐	☐	☐	☐
I don't know	☐	☐	☐	☐	☐
Other (please specify below):	☐	☐	☐	☐	☐

Please write your answer here (optional):

12. Who are the target customers of the product or service for which the Open Government Data was used?

(*Please select all the answers that apply to your company*)

	Strongly disagree (1)	Disagree (2)	Neither agree nor disagree (3)	Agree (4)	Strongly agree (5)
Consumer	☐	☐	☐	☐	☐

Enterprises	☐	☐	☐	☐	☐
Consumer and Enterprises	☐	☐	☐	☐	☐
Federal Government	☐	☐	☐	☐	☐
Provincial Government	☐	☐	☐	☐	☐
Other (please specify below):	☐	☐	☐	☐	☐

Please write your answer here (optional):

Section 3: Processing Open Government Data

This section is about your processing of Open Government Data (OGD) If you are processing OGD for a project, please discuss it in this section. If you would like to provide additional information about your processing of OGD, please write your comments at the end of this questionnaire.

Data processing consists of collecting raw data and translating it into usable information. Data processing is also a series of operations on data, such as collecting, organizing, protecting, and storing data to be analyzed and used for business decisions.

13. Please indicate if your company processes Open Government Data internally.

☐	Yes
☐	No
☐	Prefer not to disclose
☐	Don’t know

If “No", You will be redirected to questions of section 4

14. Please indicate how Open Government Data is prepared before being processed within your organization.

Data processing is a series of operations on data, such as collecting, organizing, protecting, and storing data to be analyzed and used for business decisions.
(*Please select all the answers that apply to your company*)

Open Government Data is ….

(If your company use other actions, please cite them with a brief description.)

	Strongly disagree (1)	Disagree (2)	Neither agree nor disagree (3)	Agree (4)	Strongly agree (5)
selected by determining the appropriate data type and source	☐	☐	☐	☐	☐
extracted by collecting or retrieving data from the categories of OGD	☐	☐	☐	☐	☐
cleaned by fixing or removing incorrect, duplicate or incomplete Data	☐	☐	☐	☐	☐
visualized by using visual elements like charts, graphs, and maps	☐	☐	☐	☐	☐
improved by meeting the requirements for the intended use	☐	☐	☐	☐	☐
Combined by merging OGD with another dataset	☐	☐	☐	☐	☐
integrated by consolidating OGD from different categories	☐	☐	☐	☐	☐
Modified by changing the contents of tables	☐	☐	☐	☐	☐
Analyzed by transforming, and modeling data to discover useful information	☐	☐	☐	☐	☐
Stored by saving it in a storage system	☐	☐	☐	☐	☐
Not prepared	☐	☐	☐	☐	☐
Other (please specify below)	☐	☐	☐	☐	☐

Please write your answer here (optional):

15. Please indicate how Open Government Data is processed internally by your organization.

When Open Government Data is manipulated and combined with other data, it produces new data with a new meaning and value.
(*Please select all the answers that apply to your company*)

To be valuable, Open Government Data needs to be ….

(If your company use internally other actions, please provide more operations with a

	Strongly disagree (1)	Disagree (2)	Neither agree nor disagree (3)	Agree (4)	Strongly agree (5)
Calculated by combining data from any Data Source to create new Calculated Metrics.	☐	☐	☐	☐	☐
Compared by identifying differences and similarities with other data	☐	☐	☐	☐	☐
Sorted by arranging data into meaningful order	☐	☐	☐	☐	☐
Classified by organizing it by relevant categories and making it easy to locate and retrieve	☐	☐	☐	☐	☐
Summarized by describing it in simple terms with a short conclusion	☐	☐	☐	☐	☐
I don't know	☐	☐	☐	☐	☐
More actions (Please specify below):	☐	☐	☐	☐	☐

brief description.)

Please add your answer here (optional)

16. Please indicate the technological tools (For example, Excel spreadsheet, Tableau, Power BI, Python, Google Charts…) your company uses to process Open Government Data.
(*Please select all the answers that apply to your company*)

☐	Online mapping mash-up tools (free)
☐	Online data visualisation tools (free)
☐	Commercial data visualisation tools
☐	Commercial mapping tools
☐	Statistical software (e.g., SPSS, Stata)
☐	Artificial intelligence (AI)
☐	Other (please specify below)

Please write your answer here (optional):

17. Please indicate if your company has improved or created a product or service after processing and using Open Government Data

(*Please select all the answers that apply to your company*)

My company has processed Open Government Data in ….

☐	creating an application (software)
☐	developing a website
☐	developing a mobile application
☐	writing a report / an analysis / an assessment
☐	creating and updating a map
☐	implementing a project
☐	No product or service was improved or created
☐	Other (please specify below)

Please write your answer here (optional):

Section 4: Impacts of using Open Government Data

18. Please identify the employee skills required to use Open Government Data in your company.

(*Please select all the answers that apply to your company*)

	Strongly disagree (1)	Disagree (2)	Neither agree nor disagree (3)	Agree (4)	Strongly agree (5)
Testing the OGD Platform	☐	☐	☐	☐	☐
Manipulating a large amount of OGD	☐	☐	☐	☐	☐
Using database management system	☐	☐	☐	☐	☐
Mastering database software	☐	☐	☐	☐	☐
Visualizing OGD	☐	☐	☐	☐	☐
Combining OGD with other data	☐	☐	☐	☐	☐
Conducting an OGD Analysis	☐	☐	☐	☐	☐

Innovating with OGD	☐	☐	☐	☐	☐
Other (please specify below):	☐	☐	☐	☐	☐

Please write your answer here (optional):

19. Please indicate if the use of Open Government Data has enabled your company to achieve any of the following goals:

(*Please select all the answers that apply to your company*)

	Strongly disagree (1)	Disagree (2)	Neither agree nor disagree (3)	Agree (4)	Strongly agree (5)
Improve or create a product	☐	☐	☐	☐	☐
Improve or create a service	☐	☐	☐	☐	☐
Create valuable data	☐	☐	☐	☐	☐
Generate a revenue (or a profit)	☐	☐	☐	☐	☐
Access to a niche market	☐	☐	☐	☐	☐
Reduce the operational costs	☐	☐	☐	☐	☐
Support decision-making	☐	☐	☐	☐	☐
Obtain a competitive advantage	☐	☐	☐	☐	☐
Improve collaboration	☐	☐	☐	☐	☐
Establish a new partnership	☐	☐	☐	☐	☐
No goal	☐	☐	☐	☐	☐
Other (please specify below):	☐	☐	☐	☐	☐

Please write your answer here (optional):

20. Please indicate the results of using Open Government Data internally.

(*Please select all the answers that apply to your company*)

Our use of Open Government Data …..

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree

	(1)	(2)	(3)	(4)	(5)
was a short experiment	☐	☐	☐	☐	☐
has been dropped	☐	☐	☐	☐	☐
requires more actions to make data valuable	☐	☐	☐	☐	☐
required additional time than other projects	☐	☐	☐	☐	☐
required less time than other projects	☐	☐	☐	☐	☐
required additional costs	☐	☐	☐	☐	☐
required less costs than other projects	☐	☐	☐	☐	☐
generated an income	☐	☐	☐	☐	☐
generated a loss	☐	☐	☐	☐	☐
required more training of employees	☐	☐	☐	☐	☐
required no training of employees	☐	☐	☐	☐	☐
will continue for future projects	☐	☐	☐	☐	☐
Other results (please specify below)	☐	☐	☐	☐	☐

Please write your answer here (optional):

Your comments

If you have any other comments, please write your answer here (optional):

If you would like to receive a complimentary summary of the results of this survey please write your email here:

Your attention please!

Would you agree to an interview with the researcher to help create a case study on your organization's use of Open Government Data?

☐	Yes
☐	No

Your responses will be treated with confidentiality.
Company names will not be reported

If yes, please provide the name, the phone number and/or the email address of the person who is authorized to meet the researcher:

Please don't forget to submit your answer by clicking on the submit button

Thank you page

Thank you very much for answering above the questions and participating in this research!

Annexe C-2: Questionnaire (Français)

[Ce sondage a été partagé sur Google Forms]

Cher participant,

L'objectif de ce questionnaire est de recueillir des informations sur l'utilisation des données gouvernementales ouvertes (OGD) par les petites et moyennes entreprises (PME) canadiennes. Les données gouvernementales ouvertes (OGD) désignent toutes les données accessibles du gouvernement fédéral canadien et notamment du Portail du gouvernement ouvert https://ouvert.canada.ca/fr/donnees-ouvertes
Si votre entreprise est une petite et moyenne entreprise (PME) et a utilisé ou essayé d'utiliser les données gouvernementales ouvertes, nous vous invitons à partager votre expérience dans ce questionnaire.
Le questionnaire se compose de 20 questions et prendra environ 15 à 20 minutes à remplir. Les informations fournies seront utilisées dans le cadre de la recherche doctorale de Ouassila Kherchouche, [*Vers une compréhension de l'évolution des données publiques : Étude empirique sur les données gouvernementales ouvertes et leur utilisation par les PME au Canada*], qui se poursuit à l'Université d'Ottawa.
Merci d'avance pour votre participation!

Instructions:
Veuillez répondre aux questions en fonction de votre connaissance de votre organisation. Ce questionnaire est disponible dans les deux langues officielles. Si vous souhaitez remplir le formulaire en anglais, veuillez cliquer sur le lien suivant : English.

Les informations que vous fournissez ne seront transmises à aucun tiers. Vos réponses seront traitées avec confidentialité. Les noms des entreprises ne seront pas communiqués et les données de l'enquête seront agrégées pour garantir l'anonymat de votre entreprise.

☐	**J'ai lu la déclaration ci-dessus.**

(Veuillez cocher la case)

Souhaitez-vous participer?

☐	Oui
☐	Non

Si vous sélectionnez "non", vous serez redirigé vers la page de remerciement de notre questionnaire.

QUESTIONNAIRE DU SONDAGE

Instructions:

Veuillez répondre aux questions suivantes en cochant les cases et/ou en écrivant dans les espaces prévus. Les instructions sont fournies en italique pour chaque question.

Section 1: Origines et information sur l'entreprise

Nom de la compagnie:

……

Nom du répondant (optionnel):

……

Fonction :

……

1. **Veuillez indiquer l'année de création de votre organisation au Canada:**

   ……

2. **Veuillez indiquer le nombre total des employées de votre organisation:**

   Les petites et moyennes entreprises (PME) sont définies au Canada par le nombre d'employés rémunérés qu'elles ont. Une petite entreprise compte entre 1 et 99 employés rémunérés, et une entreprise de taille moyenne compte entre 100 et 499 employés rémunérés.
   (*Veuillez sélectionner toutes les réponses qui s'appliquent à votre entreprise*)

☐	Juste moi (entrepreneur)
☐	Moins de 99 employés (Petite entreprise)
☐	De 100 à 499 employés (Moyenne entreprise)
☐	Je ne sais pas

3. **Veuillez indiquer la province et la ville dans laquelle votre organisation est basée au Canada:**

   Votre province:

☐	Alberta
☐	Colombie britannique
☐	Île-du-Prince-Édouard
☐	Manitoba
☐	Nouveau-Brunswick
☐	Nouvelle-Écosse
☐	Nunavut
☐	Ontario
☐	Québec
☐	Saskatchewan
☐	Terre-Neuve-et-Labrador
☐	Territoires du nord-ouest
☐	Yukon

Votre ville:

Veuillez écrire votre réponse ici (optionnel):

4. Veuillez indiquer le secteur d'activité dans lequel votre organisation opère
(*Veuillez sélectionner toutes les réponses qui s'appliquent à votre entreprise*)

☐	Services commerciaux et juridiques
☐	Données/technologie
☐	Éducation
☐	Transport d'électricité et d'énergie
☐	Environnement & météo
☐	Financement & investissement
☐	Alimentation et agriculture
☐	Foresterie
☐	Géospatial/cartographie
☐	Gouvernance
☐	Soins de santé
☐	Logement/Immobilier
☐	Assurance
☐	Mode de vie & consommateur
☐	Conseil en gestion
☐	Médias

☐	Gaz & pétrole
☐	Recherche scientifique
☐	Transport
☐	Autre (veuillez préciser ci-dessous):

Veuillez écrire votre réponse ici (optionnel):

5. Est-ce que votre entreprise accède aux données ouvertes du gouvernement canadien sur le portail (https://ouvert.canada.ca/fr/donnees-ouvertes)?

☐	Oui
☐	Non

Si votre entreprise n'a pas consulté les données du portail du gouvernement ouvert, veuillez sélectionner "non". Vous serez redirigé vers la page de remerciement de notre questionnaire.

6. Veuillez indiquer à quelle fréquence votre entreprise a accès aux données ouvertes sur le Portail du gouvernement ouvert.
(Merci d'être aussi précis que possible)

☐	Quotidiennement
☐	Hebdomadaire
☐	Mensuel
☐	Une fois de temps en temps
☐	Jamais

7. Veuillez indiquer les catégories de jeux de données pour lesquelles votre entreprise a examiné les données ouvertes du gouvernement.
(*Veuillez sélectionner toutes les réponses qui s'appliquent à votre entreprise*)

☐	Agriculture
☐	Arts, Musique, Littérature
☐	Économie & Industrie
☐	Éducation et formation
☐	Gouvernement et politiques
☐	Santé et sécurité

☐	Histoire et Archéologie
☐	Information et Communications
☐	La main d'œuvre
☐	Langue et linguistique
☐	Loi
☐	Nature et Environnent
☐	Processus
☐	Science et Technologie
☐	Société et Culture
☐	Transport
☐	Autre (veuillez préciser ci-dessous):

Veuillez écrire votre réponse ici (optionnel):

Section 2: Utilisation des données gouvernementales ouvertes

Cette section concerne votre utilisation des données gouvernementales ouvertes. Si vous utilisez des données gouvernementales ouvertes, par exemple, pour créer un produit ou réaliser un projet, veuillez en discuter dans cette section.
Si vous souhaitez fournir des informations supplémentaires sur votre utilisation des données gouvernementales ouvertes, veuillez ajouter vos commentaires à la fin de ce questionnaire.

Les données gouvernementales ouvertes sont reconnues comme étant utilisées lorsqu'elles ont été soit consultées, examinées, modifiées, combinées, traitées ou transformées par des utilisateurs.

8. Veuillez indiquer si votre entreprise utilise des données gouvernementales ouvertes en examinant et en capturant les données qui l'intéressent.

☐	Oui
☐	Non
☐	Préfère ne pas divulguer
☐	Je ne sais pas

Si votre entreprise n'a pas utilisé les données gouvernementales ouvertes, veuillez sélectionner "non". Vous serez redirigé vers la page de remerciement de notre questionnaire, ou vous pouvez simplement fermer la fenêtre de votre navigateur.

9. Veuillez indiquer à quelle fréquence votre entreprise utilise les données gouvernementales ouvertes.
(Merci d'être aussi précis que possible)

☐	Quotidiennement
☐	Hebdomadaire
☐	Mensuel
☐	Une fois de temps en temps
☐	Jamais

10. Veuillez indiquer la motivation de votre entreprise à utiliser les données publiques ouvertes.
(*Veuillez sélectionner toutes les réponses qui s'appliquent à votre entreprise*)

Mon entreprise a utilisé les données publiques ouvertes pour

	Pas du tout d'accord (1)	Pas d'accord (2)	Ni d'accord ni en désaccord (3)	D'accord (4)	Tout à fait d'accord (5)
Visualiser les données et en tirer des enseignements.	☐	☐	☐	☐	☐
Analyser et tester leur potentiel.	☐	☐	☐	☐	☐
Répondre aux demandes des clients.	☐	☐	☐	☐	☐
Améliorer un produit ou un service existant.	☐	☐	☐	☐	☐
Créer un nouveau produit (par exemple, un rapport, une carte, une application).	☐	☐	☐	☐	☐
Mener des recherches (par exemple, des recherches statistiques, économiques ou environnementales).	☐	☐	☐	☐	☐
Créer un nouveau service (par exemple, un service de conseil, un service web).	☐	☐	☐	☐	☐
Générer des revenus	☐	☐	☐	☐	☐
Réduire les coûts opérationnels afin d'être plus compétitive.	☐	☐	☐	☐	☐
Accéder à un marché de niche et faire un investissement sûr	☐	☐	☐	☐	☐
Sans aucune motivation	☐	☐	☐	☐	☐

Je ne sais pas	☐	☐	☐	☐	☐
Autre (veuillez préciser ci-dessous) :	☐	☐	☐	☐	☐

Veuillez écrire votre réponse ici (optionnel):

11. Veuillez indiquer si votre entreprise a rencontré des obstacles lors de l'utilisation des données ouvertes du gouvernement canadien.

(*Veuillez sélectionner toutes les réponses qui s'appliquent à votre entreprise*)

	Pas du tout d'accord (1)	Pas d'accord (2)	Ni d'accord ni en désaccord (3)	D'accord (4)	Tout à fait d'accord (5)
Difficulté à accéder aux données gouvernementales ouvertes	☐	☐	☐	☐	☐
Défi lié à la législation et politiques	☐	☐	☐	☐	☐
Insuffisance de la quantité de données gouvernementales ouvertes	☐	☐	☐	☐	☐
Insuffisance de la quantité de données gouvernementales ouvertes	☐	☐	☐	☐	☐
Manque de mise à jour des données gouvernementales ouvertes	☐	☐	☐	☐	☐
Existence d'erreurs dans les jeux de données	☐	☐	☐	☐	☐
Jeux de données incomplets	☐	☐	☐	☐	☐
Difficultés de traitement des données gouvernementales ouvertes	☐	☐	☐	☐	☐
Besoin d'aptitudes / compétences numériques plus avancées	☐	☐	☐	☐	☐
Augmentation des coûts opérationnels	☐	☐	☐	☐	☐
Je ne sais pas	☐	☐	☐	☐	☐
Autres (veuillez préciser ci-dessous) :	☐	☐	☐	☐	☐

Veuillez écrire votre réponse ici (optionnel):

12. Quels sont les clients ciblés du produit ou du service pour lequel les données gouvernementales ouvertes ont été utilisées?

	Pas du tout d'accord (1)	Pas d'accord (2)	Ni d'accord ni en désaccord (3)	D'accord (4)	Tout à fait d'accord (5)
Les consommateurs	☐	☐	☐	☐	☐
Les entreprises	☐	☐	☐	☐	☐
Les consommateurs et les entreprises	☐	☐	☐	☐	☐
Le gouvernement fédéral	☐	☐	☐	☐	☐
Le gouvernement provincial	☐	☐	☐	☐	☐
Autre (veuillez préciser ci-dessous):	☒	☐	☐	☐	☐

Veuillez écrire votre réponse ici (optionnel):

Section 3: Traitement des données gouvernementales ouvertes

Cette section concerne votre traitement des données gouvernementales ouvertes. Si vous traitez des données gouvernementales ouvertes dans le cadre d'un projet, veuillez en parler dans cette section. Si vous souhaitez fournir des informations supplémentaires sur votre traitement des données gouvernementales ouvertes, veuillez écrire vos commentaires à la fin de ce questionnaire.

Le traitement des données consiste à collecter des données brutes et à les traduire en informations utilisables. Le traitement des données est également une série d'opérations sur les données, telles que la collecte, l'organisation, la protection et le stockage des données afin qu'elles soient analysées et utilisées pour des décisions commerciales.

13. Veuillez indiquer si votre entreprise traite les données gouvernementales ouvertes en interne.

☐	Oui
☐	Non
☐	Préfère ne pas divulguer
☐	Je ne sais pas

Si "non" Vous serez redirigé vers les questions de la section 4.

14. Veuillez indiquer comment les données gouvernementales ouvertes sont préparées au sein de votre organisation avant d'être traitées.

Le traitement des données est une série d'opérations sur les données, telles que la collecte, l'organisation, la protection et le stockage des données en vue de leur analyse et de leur utilisation pour des décisions commerciales.

(Veuillez sélectionner toutes les réponses qui s'appliquent à votre entreprise)

Les données gouvernementales ouvertes sont ….

	Pas du tout d'accord (1)	Pas d'accord (2)	Ni d'accord ni en désaccord (3)	D'accord (4)	Tout à fait d'accord (5)
Sélectionnées en déterminant le type et la source de données appropriés	☐	☐	☐	☐	☐
Extraites en collectant ou en récupérant des données à partir des catégories de données gouvernementales ouvertes	☐	☐	☐	☐	☐
Nettoyées en corrigeant ou en supprimant les données incorrectes, dupliquées ou incomplètes	☐	☐	☐	☐	☐
Visualisées en utilisant des éléments visuels tels que des diagrammes, des graphiques et des cartes	☐	☐	☐	☐	☐
Améliorées en répondant aux exigences de l'utilisation prévue	☐	☐	☐	☐	☐
Combinées en fusionnant les données gouvernementales ouvertes avec un autre ensemble de données	☐	☐	☐	☐	☐
Intégrées en consolidant les données gouvernementales ouvertes de différentes catégories	☐	☐	☐	☐	☐
Modifié en changeant le contenu des tableaux	☐	☐	☐	☐	☐
Analysées en transformant et en modélisant les données pour découvrir des informations utiles	☐	☐	☐	☐	☐
Stockées en les sauvegardant dans un système de stockage.	☐	☐	☐	☐	☐
Non préparées	☐	☐	☐	☐	☐
Autre (veuillez préciser ci-dessous)	☐	☐	☐	☐	☐

(Si votre entreprise utilise d'autres actions, veuillez les citer en fournissant une brève description).

Veuillez écrire votre réponse ici (optionnel):

15. Veuillez indiquer comment les données gouvernementales ouvertes sont traitées à l'interne par votre organisation.

Lorsque les données gouvernementales ouvertes sont manipulées et combinées avec d'autres données, elles produisent de nouvelles données avec une nouvelle signification et une nouvelle valeur.
(Veuillez sélectionner toutes les réponses qui s'appliquent à votre entreprise)

Pour acquérir de la valeur, les données gouvernementales ouvertes

doivent être .....

	Pas du tout d'accord (1)	Pas d'accord (2)	Ni d'accord ni en désaccord (3)	D'accord (4)	Tout à fait d'accord (5)
Calculées en combinant les données de n'importe quelle source de données pour créer de nouveaux indicateurs calculés.	☐	☐	☐	☐	☐
Comparées en identifiant les différences et les similitudes avec d'autres données.	☐	☐	☐	☐	☐
Triées en organisant les données dans un ordre significatif.	☐	☐	☐	☐	☐
Classées en les organisant par catégories pertinentes et en les rendant faciles à localiser et à récupérer.	☐	☐	☐	☐	☐
Résumées en les décrivant en termes simples avec une courte conclusion.	☐	☐	☐	☐	☐
Je ne sais pas	☐	☐	☐	☐	☐
Autres actions (veuillez préciser ci-dessous) :	☐	☐	☐	☐	☐

(Si votre entreprise utilise en interne d'autres actions, veuillez fournir plus d'opérations avec une brève description).

Veuillez écrire votre réponse ici (optionnel):

16. Veuillez indiquer les outils technologiques (Par exemple, feuille de calcul Excel, Tableau, Power BI, Python, Google Charts...) que votre entreprise utilise pour traiter les données gouvernementales ouvertes.

(Veuillez sélectionner toutes les réponses qui s'appliquent à votre entreprise)

☐	Outils cartographiques en ligne (gratuits)
☐	Outils de visualisation de données en ligne (gratuits)
☐	Outils commerciaux de visualisation de données
☐	Outils commerciaux de cartographie
☐	Logiciels statistiques (par exemple, SPSS, Stata)
☐	Autres (veuillez préciser ci-dessous)

Veuillez écrire votre réponse ici (optionnel):

17. Veuillez indiquer si votre entreprise a amélioré ou créé un produit ou un service après avoir traité des données gouvernementales ouvertes.
(Veuillez sélectionner toutes les réponses qui s'appliquent à votre entreprise)

Mon entreprise a traité des données publiques ouvertes pour

☐	Créer une application (logiciel).
☐	Développer un site web.
☐	Développer une application mobile.
☐	Rédiger un rapport, d'une analyse ou d'une évaluation.
☐	Créer et mettre à jour une carte géographique.
☐	Mettre en œuvre un projet.
☐	Aucun produit ou service n'a été amélioré ou créé
☐	Autre (veuillez préciser ci-dessous)

Veuillez écrire votre réponse ici (optionnel):

Section 4: Impacts de l'utilisation des données gouvernementales ouvertes

18. Veuillez identifier les compétences des employés requises pour utiliser les données gouvernementales ouvertes dans votre entreprise.

(Veuillez sélectionner toutes les réponses qui s'appliquent à votre entreprise)

Les employés doivent avoir des compétences pour ……..

	Pas du tout d'accord (1)	Pas d'accord (2)	Ni d'accord ni en désaccord (3)	D'accord (4)	Tout à fait d'accord (5)
Tester la plateforme de données du gouvernement ouvert	☐	☐	☐	☐	☐
Manipuler une grande quantité de données gouvernementales ouvertes	☐	☐	☐	☐	☐
Utiliser un système de gestion de base de données	☐	☐	☐	☐	☐
Maîtriser le logiciel de base de données	☐	☐	☐	☐	☐
Visualiser les données gouvernementales ouvertes	☐	☐	☐	☐	☐
Combiner les données du gouvernement ouvert avec d'autres données	☐	☐	☐	☐	☐
Réaliser une analyse des données du gouvernement ouvert	☐	☐	☐	☐	☐
Innover avec les données publiques ouvertes	☐	☐	☐	☐	☐
Autre (veuillez préciser ci-dessous) :	☐	☐	☐	☐	☐

Veuillez écrire votre réponse ici (optionnel):

19. Veuillez indiquer si l'utilisation des données gouvernementales ouvertes a permis à votre entreprise d'atteindre l'un des objectifs suivants :

(Veuillez sélectionner toutes les réponses qui s'appliquent à votre entreprise)

	Pas du tout d'accord (1)	Pas d'accord (2)	Ni d'accord ni en désaccord (3)	D'accord (4)	Tout à fait d'accord (5)
Améliorer ou créer un produit	☐	☐	☐	☐	☐
Améliorer ou créer un service	☐	☐	☐	☐	☐
Créer des données de valeur	☐	☐	☐	☐	☐
Générer un revenu (ou un profit)	☐	☐	☐	☐	☐

Accès à un marché de niche	☐	☐	☐	☐	☐
Réduire les coûts opérationnels	☐	☐	☐	☐	☐
Soutenir la prise de décision	☐	☐	☐	☐	☐
Obtenir un avantage concurrentiel	☐	☐	☐	☐	☐
Améliorer la collaboration	☐	☐	☐	☐	☐
Établir un nouveau partenariat	☐	☐	☐	☐	☐
Aucun objectif	☐	☐	☐	☐	☐
Autre (veuillez préciser ci-dessous):	☐	☐	☐	☐	☐

Veuillez écrire votre réponse ici (optionnel):

20. Veuillez indiquer les résultats de l'utilisation des données gouvernementales ouvertes en interne.

(Veuillez sélectionner toutes les réponses qui s'appliquent à votre entreprise)

Notre utilisation des données gouvernementales ouvertes…….

	Pas du tout d'accord (1)	Pas d'accord (2)	Ni d'accord ni en désaccord (3)	D'accord (4)	Tout à fait d'accord (5)
était une courte expérience	☐	☐	☐	☐	☐
a été abandonnée	☐	☐	☐	☐	☐
nécessite plus d'actions pour rendre les données utiles	☐	☐	☐	☐	☐
a demandé plus de temps que d'autres projets	☐	☐	☐	☐	☐
a demandé moins de temps que d'autres projets	☐	☐	☐	☐	☐
a nécessité des coûts supplémentaires	☐	☐	☐	☐	☐
a nécessité moins de coûts que d'autres projets	☐	☐	☐	☐	☐
a généré un revenu	☐	☐	☐	☐	☐
a généré une perte	☐	☐	☐	☐	☐
a nécessité plus de formation des employés	☐	☐	☐	☐	☐
n'a pas nécessité de formation des employés	☐	☐	☐	☐	☐
se poursuivra pour les futurs projets	☐	☐	☐	☐	☐
Autres résultats (veuillez préciser ci-dessous)	☐	☐	☐	☐	☐

Veuillez écrire votre réponse ici (optionnel):

Vos commentaires

Si vous avez d'autres commentaires, veuillez les écrire ci-dessous (Optionnel) :

Si vous souhaitez recevoir un résumé des résultats de cette enquête, veuillez inscrire votre courriel ici ::

Votre attention s'il vous plait!

Seriez-vous d'accord d'avoir un entretien avec le chercheur pour l'aider à créer une étude de cas sur l'utilisation des données gouvernementales ouvertes par votre organisation?

☐	Oui
☐	Non

Vos réponses seront traitées en toute confidentialité.
Les noms des entreprises ne seront pas communiqués.

Si oui, veuillez fournir le nom, le numéro de téléphone et/ou l'adresse courriel de la personne qui est autorisée à rencontrer le chercheur:

N'oubliez pas de soumettre votre réponse en cliquant sur le bouton "soumettre".

Page de remerciement

Merci beaucoup d'avoir répondu aux questions ci-dessus et d'avoir participé à cette étude.

Appendix D-1: Interviews questions (English)

(French will follow)

Open questions for interviews:

Topic: Use of Open Government Data (OGD) by SMEs in Canada

Duration: 45 minutes on average

Your organization

1- Can you please introduce your enterprise?

2- Can you specify your customers' final products or services?

Use of Open Government data

3- Please describe how your enterprise is currently approaching the use of OGD?

4- Can you explain how your organization selects and captures OGD?

5- What motivates your firm to use OGD?

Internal Process of Open Government Data

6- Can you please describe how your enterprise processes OGD internally?

7- Does your enterprise combine or mix OGD with your internal data?

8- What technologies and tools are implemented in your enterprise for processing OGD?

9- To what extent are managers making use of these tools?

10- What human skills are required in your enterprise to process OGD?

11- Did the processing of the OGD result in a better or new product or service?

Impacts

12- What challenges do you face in using OGD in your enterprise?

13- Can you explain how using OGD may benefit your firm?

14- Does the use of OGD allow your company to remain competitive in the market?

15- As OGD is accessible to all competitors, how does your company benefit and remain competitive?

16- Are there barriers that prevent your enterprise from taking full advantage of using OGD?

17- Are there any costs associated with using and processing OGD?

18- Do you think that OGD has the potential to increase your revenue in the future?

Annexe D-2: Questions des entrevues (Français)

Questions sur l'utilisation des données gouvernementales ouvertes par les PME au Canada

Durée : 45 minutes en moyenne

Votre organisation

1- Pourriez-vous présenter votre entreprise ?

2- Pourriez-vous préciser les produits finis ou les services que vous offrez à vos clients ?

Utilisation des données gouvernementales ouvertes

3- Veuillez décrire comment votre entreprise aborde actuellement l'utilisation des données gouvernementales ouvertes?

4- Pouvez-vous expliquer comment votre entreprise sélectionne et capture les données gouvernementales ouvertes ?

5- Qu'est-ce qui motive votre entreprise à utiliser les données gouvernementales ouvertes?

Traitement interne des données gouvernementales ouvertes

6- Pouvez-vous décrire comment votre entreprise traite en interne les données gouvernementales ouvertes?

7- Votre entreprise combine-t-elle ou mélange-t-elle les données gouvernementales ouvertes avec vos données internes ?

8- Quels types de technologies et d'outils sont mis en œuvre dans votre entreprise pour traiter les données gouvernementales ouvertes?

9- Dans quelle mesure les managers utilisent-ils ces outils ?

10- Quelles compétences humaines sont nécessaires dans votre entreprise pour traiter les données gouvernementales ouvertes?

11- Est-ce que le traitement des données gouvernementales ouvertes permet d'améliorer ou de créer un nouveau produit ou service ?

Impacts

12- Quels sont les défis que vous rencontrez pour utiliser les données gouvernementales ouvertes dans votre entreprise ?

13- Pouvez-vous expliquer comment l'utilisation des données gouvernementales ouvertes peut être bénéfique pour votre entreprise ?

14- L'utilisation des données gouvernementales ouvertes permet-elle à votre entreprise de rester compétitive sur le marché ?

15- Étant donné que les données gouvernementales ouvertes sont accessibles à tous les concurrents, comment votre entreprise en bénéficie et reste compétitive ?

16- Y-a-t-il des obstacles qui empêchent votre entreprise de tirer pleinement parti de l'utilisation des données gouvernementales ouvertes?

17- Y-a-t-il des coûts associés à l'utilisation et au traitement des données gouvernementales ouvertes?

18- Pensez-vous que les données gouvernementales ouvertes ont le potentiel d'augmenter

Appendix E: Table 4.6

Table 4.6: Technological tools used to Process Open Government Data (Q16)

N of responses (n=68) (Valid: 43, missing: 25)

Sectors Q-16 Technological Tools to process Open Government Data	Data/ technology	Other industries	Total
Artificial intelligence (AI)	1		1
Commercial data visualisation tools	1	1	2
Commercial data visualisation tools;Commercial mapping tools	3	4	7
Commercial data visualisation tools;Commercial mapping tools;Artificial intelligence (AI)	1		1
Commercial data visualisation tools;Commercial mapping tools;Statistical software (e.g., SPSS, Stata)		1	1
Commercial data visualisation tools;Commercial mapping tools;Statistical software (e.g., SPSS, Stata);Artificial intelligence (AI)	1		1
Commercial data visualisation tools;Statistical software (e.g., SPSS, Stata)	2		2
Commercial data visualisation tools;Statistical software (e.g., SPSS, Stata);Artificial intelligence (AI)	1		1
Online data visualisation tools (free)		2	2
Online data visualisation tools (free);Commercial data visualisation tools	3	2	5
Online data visualisation tools (free);Commercial data visualisation tools;Commercial mapping tools		1	1
Online data visualisation tools (free);Commercial data visualisation tools;Commercial mapping tools;Artificial intelligence (AI)	1		1
Online data visualisation tools (free);Statistical software (e.g., SPSS, Stata)		1	1
Online mapping mash-up tools (free)	1		1
Online mapping mash-up tools (free);Online data visualisation tools (free)	1		1
Online mapping mash-up tools (free);Online data visualisation tools (free);Artificial intelligence (AI)	1		1
Online mapping mash-up tools (free);Online data visualisation tools (free);Commercial data visualisation tools	2	1	3
Online mapping mash-up tools (free);Online data visualisation tools (free);Commercial data visualisation tools;Commercial mapping tools	2	4	6
Online mapping mash-up tools (free);Online data visualisation tools (free);Commercial data visualisation tools;Commercial mapping tools;Artificial intelligence (AI)	2	1	3
Statistical software (e.g., SPSS, Stata)		1	1
Statistical software (e.g., SPSS, Stata);Artificial intelligence (AI)	1		1
Total	**24**	**19**	**43**

Table 4.7: Outcomes of Processing Open Government Data (Q17)

N of responses (n=68) (Valid: 43, missing: 25)

Étiquettes de lignes	Data/ technology	Other industries	Total
creating an application (software);creating and updating a map	1		1
creating an application (software);developing a mobile application	1		1
creating an application (software);developing a mobile application;creating and updating a map;implementing a project	1		1
creating an application (software);developing a mobile application;implementing a project		1	1
creating an application (software);developing a website	1		1
creating an application (software);developing a website;creating and updating a map;implementing a project	1		1
creating an application (software);developing a website;developing a mobile application;writing a report / an analysis / an assessment;implementing a project		1	1
creating an application (software);developing a website;implementing a project	1		1
creating an application (software);implementing a project	3		3
creating an application (software);writing a report / an analysis / an assessment;creating and updating a map	1		1
creating an application (software);writing a report / an analysis / an assessment;creating and updating a map;implementing a project	2		2
creating an application (software);writing a report / an analysis / an assessment;implementing a project	1		1
creating and updating a map	1		1
creating and updating a map;implementing a project		3	3
developing a mobile application;creating and updating a map;implementing a project	1		1
developing a website	1	1	2
developing a website;developing a mobile application;creating and updating a map;implementing a project		1	1
developing a website;writing a report / an analysis / an assessment;creating and updating a map;implementing a project	1		1
developing a website;writing a report / an analysis / an assessment;implementing a project		1	1
implementing a project	1	1	2
No product or service was improved or created		1	1
writing a report / an analysis / an assessment	1	5	6
writing a report / an analysis / an assessment;creating and updating a map;implementing a project	3	2	5
writing a report / an analysis / an assessment;implementing a project	2	2	4
Total général	**24**	**19**	**43**

Appendix F: Certificate of Ethics Approval
(Page 1)

16/03/2022

Université d'Ottawa
Bureau d'éthique et d'intégrité de la recherche

University of Ottawa
Office of Research Ethics and Integrity

CERTIFICAT D'APPROBATION ÉTHIQUE | CERTIFICATE OF ETHICS APPROVAL

Numéro du dossier / Ethics File Number	S-02-22-7813
Titre du projet / Project Title	Towards an understanding of the public data evolution: An empirical study of Open Government Data and its use by SMEs in Canada
Type de projet / Project Type	Thèse de doctorat / Doctoral thesis
Statut du projet / Project Status	Approuvé / Approved
Date d'approbation (jj/mm/aaaa) / Approval Date (dd/mm/yyyy)	16/03/2022
Date d'expiration (jj/mm/aaaa) / Expiry Date (dd/mm/yyyy)	15/03/2023

Équipe de recherche / Research Team

Chercheur / Researcher	Affiliation	Role
Ouassila KHERCHOUCHE	École de gestion Telfer / Telfer School of Management	Chercheur Principal / Principal Investigator
Gregory RICHARDS	École de gestion Telfer / Telfer School of Management	Superviseur / Supervisor

Conditions spéciales ou commentaires / Special conditions or comments

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Certificate of Ethics Approval (Page 2)

16/03/2022

Université d'Ottawa
Bureau d'éthique et d'intégrité de la recherche

University of Ottawa
Office of Research Ethics and Integrity

Le Comité d'éthique de la recherche (CÉR) de l'Université d'Ottawa, opérant conformément à l'*Énoncé de politique des Trois conseils* (2014) et toutes autres lois et tous règlements applicables, a examiné et approuvé la demande d'éthique du projet de recherche ci-nommé.

L'approbation est valide pour la durée indiquée plus haut et est sujette aux conditions énumérées dans la section intitulée "Conditions Spéciales ou Commentaires". Le formulaire « Renouvellement ou Fermeture de Projet » doit être complété quatre semaines avant la date d'échéance indiquée ci-haut afin de demander un renouvellement de cette approbation éthique ou afin de fermer le dossier.

Toutes modifications apportées au projet doivent être approuvées par le CÉR avant leur mise en place, sauf si le participant doit être retiré en raison d'un danger immédiat ou s'il s'agit d'un changement ayant trait à des éléments administratifs ou logistiques du projet. Les chercheurs doivent aviser le CÉR dans les plus brefs délais de tout changement pouvant augmenter le niveau de risque aux participants ou pouvant affecter considérablement le déroulement du projet, rapporter tout évènement imprévu ou indésirable et soumettre toute nouvelle information pouvant nuire à la conduite du projet ou à la sécurité des participants.

The University of Ottawa Research Ethics Board, which operates in accordance with the *Tri-Council Policy Statement* (2014) and other applicable laws and regulations, has examined and approved the ethics application for the above-named research project.

Ethics approval is valid for the period indicated above and is subject to the conditions listed in the section entitled "Special Conditions or Comments". The "Renewal/Project Closure" form must be completedfour weeks before the above-referenced expiry date to request a renewal of this ethics approval or closure of the file.

Any changes made to the project must be approved by the REB before being implemented, except when necessary to remove participants from immediate endangerment or when the modification(s) only pertain to administrative or logistical components of the project. Investigators must also promptly alert the REB of any changes that increase the risk to participant(s), any changes that considerably affect the conduct of the project, all unanticipated and harmful events that occur, and new information that may negatively affect the conduct of the project or the safety of the participant(s).

Riana MARCOTTE
Responsable d'éthique en recherche / Protocol Officer
Pour/For **Barbara GRAVES** Président(e) du/ Chair of the **Comité d'éthique de la recherche en sciences sociales et humanités / Social Sciences and Humanities Research Ethics Board**

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(Certificate Renewal)

21/09/2023

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Bureau d'éthique et d'intégrité de la recherche

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Coordonateur / COORDINATOR
Coordonnateur de l'éthique / Ethics Coordinator
Pour/For **Barbara GRAVES** Président(e) du/ Chair of the **Comité d'éthique de la recherche en sciences sociales et humanités / Social Sciences and Humanities Research Ethics Board**

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Appendix G: Recruitment poster

Recruitment poster

UNIVERSITY OF OTTAWA

RESEARCH PARTICIPANTS ARE NEEDED FOR A SURVEY

- Are you working for a Canadian small and medium enterprise (SME)?
- Does your enterprise use Open Government Data (OGD)?

If yes, you are eligible for this important research on Canadian OGD.

Why?

This important research seeks to engage a broad group of people representing their firms in answering questions on the use of Open Government Data by SMEs in Canada. It will assess different case studies to understand the interest in using OGD in Canada and identify SMEs' challenges.

Note: Participation is voluntary. The protection of all research participants' rights, including confidentiality, is a priority. All necessary precautions are taken to ensure a positive and safe experience for everyone who participates in research. Therefore, all information provided for the survey is confidential and will not be disclosed. The procedures used for this research have been reviewed by the University of Ottawa Research Ethics Board (REB).

The survey may take approximately 15 to 20 minutes to complete. You can complete the online form and submit it (here), or you can request a Word copy of the questionnaire by email to complete and return to the Principal Investigator.

If you are interested, please contact the principal investigator:

Ouassila Kherchouche
Ph.D. Candidate – University of Ottawa

Appendix H: Selected groups on OGD in Canada

List of selected groups on big data, open data and open government data.
Available on http://meetup.com

Groups	Cities	Page on Meetup
Third Tuesday Ottawa	Ottawa	https://www.meetup.com/third-tuesday-ottawa/
Open Data Ottawa	Ottawa	https://www.meetup.com/fr-FR/Open-Data-Ottawa/
Ottawa Data Visualization	Ottawa	https://www.meetup.com/fr-FR/OttawaDataVisualization/
Data for Good - Ottawa	Ottawa	https://www.meetup.com/fr-FR/DataforGood-Ottawa/
Ottawa Data User Group	Ottawa	https://www.meetup.com/fr-FR/OttawaDataUserGroup/
Open Toronto	Toronto	https://www.meetup.com/opentoronto/
Data for Good	Toronto	https://www.meetup.com/DataforGood/
Civic Tech Toronto	Toronto	https://www.meetup.com/Civic-Tech-Toronto/
Toronto - Cognitive, AI & Data Science Meetup	Toronto	https://www.meetup.com/Cognitive-Toronto/
Data + Visualization Toronto	Toronto	https://www.meetup.com/Data-Visualization-Toronto/
MTLDATA	Montreal	https://www.meetup.com/fr-FR/mtldata/
Big Data Montréal	Montreal	https://www.meetup.com/fr-FR/Big-Data-Montreal/
Data Driven Montréal	Montreal	https://www.meetup.com/fr-FR/DataDrivenMTL/
Big Data Developers in Montreal	Montreal	https://www.meetup.com/fr-FR/Big-Data-Developers-in-Montreal/
Vancouver Data Visualization	Vancouver	https://www.meetup.com/Vancouver-Data-Visualization/
Vancouver R Users Group (data analysis / statistics)	Vancouver	https://www.meetup.com/Vancouver-R-Users-Group-data-analysis-statistics/
Big Data Developers in Vancouver	Vancouver	https://www.meetup.com/Big-Data-Developers-in-Vancouver/
Learn Data Science	Vancouver	https://www.meetup.com/LearnDataScience/

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