Corporate Use of Open Government Data

Economic values through OGD

Master Thesis submitted in fulfillment of the Degree Master of Business Administration in New Media Technology and Management

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AFFIDAVIT

I hereby affirm that this Master's Thesis represents my own written work and that I have used no sources and aids other than those indicated. All passages quoted from publications or paraphrased from these sources are properly cited and attributed.

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ABSTRACT

Open Government Data was born in an initiative in 2009 towards greater democracy with the main objectives of increasing transparency, participation, and collaboration. Since its early days of development OGD has become a topic of high priority in the agendas of many political and economic settings. Many stakeholders greatly estimate the potential for OGD to become a key driver within firms in addition to the possible business models which can be created on the basis of OGD.

This study has been guided with a conceptual framework in which three distinct structures were introduced as the pillars of the research hypotheses. The central problem of the research focuses on how companies could benefit from OGD, which of the datasets have the greatest potential in terms of adding value, and which strategies firms might follow.

The study adopted a pragmatic mixed-method approach in collecting primary data through in-depth, face-to-face interviews, which are complemented with secondary data from an online survey and participant observation.

This study shows that OGD supports the short-term and long-terms decisions within a firm. Another finding demonstrates how OGD enables business models which are innovation driven and have a high level of attractiveness within industry. The third finding is that OGD can serve as a real driver for a firm in gaining a competitive advantage.

KEYWORDS: OGD, economic theory, competitive analysis, expert interviews, online survey, and business implications.

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To my parents and to my brother, I say thank you for your sincere wishes and for your great standing by me!

Table of Contents

List of Tables

List of Figures

1 INTRODUCTION

The purpose of this chapter is to establish the foundation and background of OGD as a new phenomenon and provide the basis for the research problem, methodology, and the structure of thesis.

1.1 Background: Open Government Data as a rising phenomenon

In the democratic world, after the election of a new president people usually expect him/her to announce new tax reductions or some major economic plans. After he won the election in 2009, President Barak Obama on his first day in the presidency surprised millions of people with the announcement of Open Government Data (Obama, 2009). The initiative in and of itself was a brand new phenomena and pledged the release of non-personal governmental data for the objectives of increasing transparency, participation, and collaboration.

A lot of researchers and firms wanted to know more about OGD and each of them sought to understand the common good associated with OGD. O'Reilly set the radar[1] on OGD, and nearly at the same time we read that Professor Tim Berners-Less and Professor Nigel Shadbolt founded a community of over 2,400 specialists to develop the Semantic Web OGD portal in the UK (SETsquared, 2010). The phenomenon of OGD replicated itself very quickly in other countries such as Canada, Australia and Austria, among others.

Afterwards many thoughts on how OGD can be leveraged as a money generating machine were published in the media. The Europe Commission, for example, forecasted that OGD could result in possibly $40 billion in economic growth (Guardian, 2011). McKinsey included OGD in his report "Big data: The next frontier for innovation, competition, and productivity" (Manyika, et al., 2011).

MODUL University Vienna joined a selected group of institutions as forerunners by offering research avenues dedicated to the OGD topic and the aim in this study is to explore how firms could benefit from the OGD movement.

[1] http://radar.oreilly.com/gov2/

1.2 Research Problem

The research problem centers on OGD as a new phenomenon that calls for an answer to the question: **What are the business implications of OGD?**

The study narrows the broad scope of the research question through a set of three hypotheses that will be validated through the use of mixed-methods in qualitative research. The ultimate validations and discussions surrounded these hypotheses will lead to the formulation of a concise answer to the main research question, i.e., "what are the business implications of OGD?"

The research hypotheses are based on the literature review as well as the exploratory research (Chapter 2 and Chapter 3 describe in detail the literature and theoretical frameworks of the research hypotheses).

RH1: OGD Datasets support optimal solutions to managerial decision problems. This hypothesis, which builds on a theoretical framework in managerial economics, aims to address the implications of OGD within a firm. The validation of the hypothesis is expected to result in a clear understanding about the positive implications of OGD datasets within a firm.

RH2: OGD is an open platform that enables the creation of attractive business models. This hypothesis builds on Michael Porter's framework that measures business attractiveness of the possible OGD business models. It is assumed that through the validation of this hypothesis one can form a holistic picture on the implications of OGD through the creation of attractive new business models.

RH3: OGD reinforces competitive advantage(s) within a firm. The third hypothesis looks to apply Porter's generic competitive strategies to OGD datasets and their exiting web applications. The findings along with the collected data are expected to come up with strong arguments on the implications of OGD as a resource that enables or reinforces competitive advantage within a firm.

1.3 Research aim and objectives

This section provides some highlights of the main aims and objectives of this study.

The aim of the thesis is to pursue an exploratory research that follows a scholarly framework in studying the nature and scope of OGD. The author hopes to derive at concrete arguments which be applied to business implications of OGD such as how OGD could be harnessed within a firm.

One objective in this study is to contribute some new knowledge on how OGD might be used in a business context to the overall discussion. Another objective is to build the research hypotheses on models that can be reenacted in the real world. In an attempt to realize these objectives, the study will first focus on carrying out an exploratory research that will additionally exploit the knowledge gained in the courses at the university. This step was expected to lead to a *grounded theory* on which the author could state his research hypotheses. The next step in the strategy is to design the research and the methodology following models that provide a high degree of coherence among the research components such as sustaining coherence between research methods and the research hypotheses. Included in this step is the choice of the proper research methods to use in order to collect valid and reliable primary and secondary data. Participant observation, an online survey, and in-depth expert interviews describe the mixed methods that will be used in collecting primary and secondary data.

Once the data has been collected, activities will focus on extracting the knowledge that will be used as the measure in validating the research hypotheses. It is important to mention that the ultimate objective of this research is to come up with a holistic framework which offers firms many possibilities in exploiting OGD. Furthermore, a set of recommendations on some specific OGD datasets or OGD applications is, albeit not a major output of the study, will be addressed through the introduction of a framework that absorbs all categories of OGD datasets and leaves the applications and strategies to the firm to decide.

Figure 1 below resembles a road map of the thesis, its chapters, on how the research objectives will be approached. The ultimate outcome of the objectives is to provide an answer to the main

research question: “What are the business implications of OGD?” Chapter 4 is reserved for a detailed explanation of the research design and methodology.

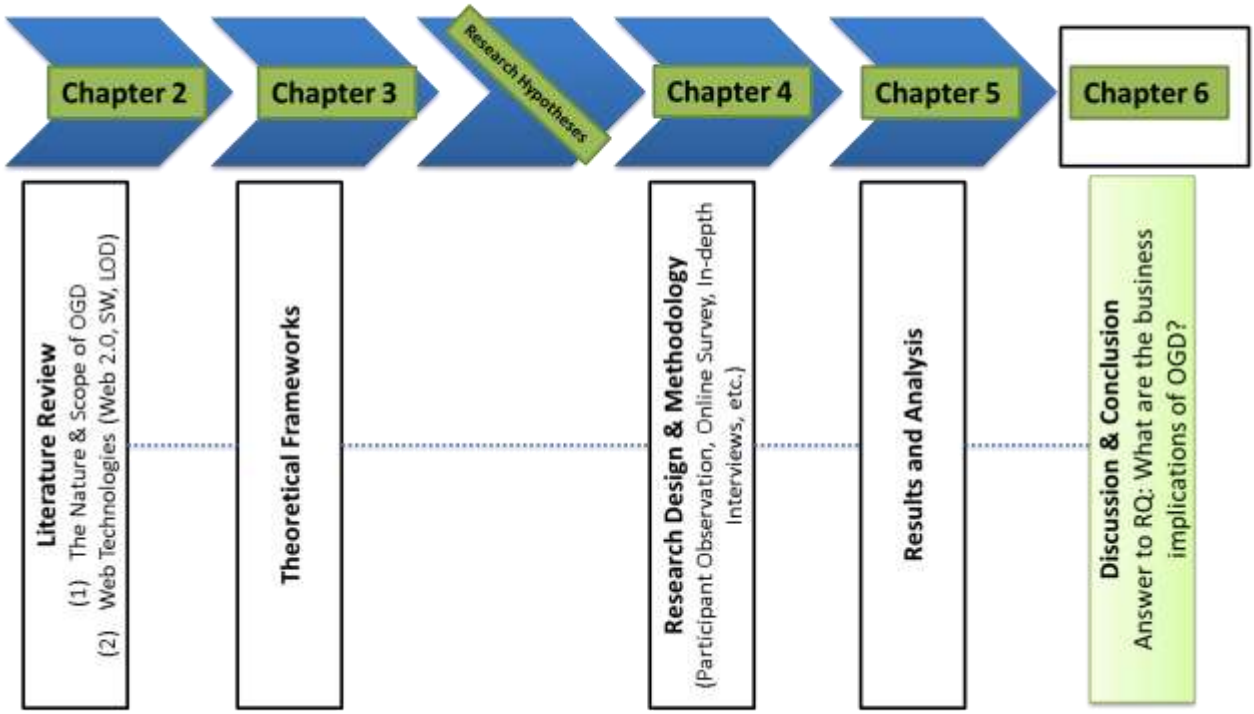

Figure 1: Road map of the research methodology

1.4 Outline of the Thesis

An outline of the thesis structure is provided in the following brief description of the forthcoming chapters:

Chapter 2 covers the literature review, tackling the nature and scope of OGD in addition to the web technologies most important to OGD, mainly Web 2.0 Semantic Web and Linked Data.

Chapter 3 presents the three frameworks upon which the research hypotheses are stated. The research hypotheses are listed at the end of the chapter.

Chapter 4 focuses on the research design and methodology. In individual sections, there is description provided on the methods used for data collection and analysis. The validity and

reliability of the data as well ethical considerations are described in respective sections. The chapter closes with the ethical considerations.

Chapter 5 presents the collected data and analysis.

Chapter 6 discusses the results and analysis in the light of the research hypotheses. Furthermore, the chapter summarizes the findings, implications, contributions of the research, and the recommendations for further research.

Appendix 1 includes the interview questionnaire that was designed, and the transcription of the in-depth interviews conducted.

Appendix 2 includes the online survey questions and participants' responses.

Appendix 3 presents the documented participant observations from various OGD events which were attended.

2 LITERATURE REVIEW

The research topic is characterized as a new phenomenon and as a new web media technology. Therefore, reviewing the nature of OGD and its technologies are the first step towards building a holistic understanding of OGD as a whole. This acquired knowledge will prepare the basis for the conceptual frameworks on which the author has developed the research hypotheses.

This chapter has been organized into two main sections. Section 2.1 sheds light on the nature and scope of OGD. Section 2.2 addresses the web technologies around OGD.

2.1 THE NATURE AND SCOPE OF OGD

This section is further subdivided into sub-sections that tackle OGD from different angles. In the sub-section 2.1.1, definitions, principles, and the objectives of OGD form the first step towards explaining the nature of OGD. A further step in studying similarities and differences between OGD and E-Government extends the knowledge on the nature of OGD as a new stage of traditional E-Government. In sub-section 2.1.2, the history of OGD will be covered through the initiatives and implementations of OGD in the U.S., the U.K., and Austria.

2.1.1 Definition and Principles of OGD

"An important motivation for OGD is to make the data more easily accessible and to enable citizens and organizations to work with the data in an efficient way that serve the main purpose of processing OGD. For example, organizations could leverage available OGD to increase profits which bring more wealth to stockholders combined with economic values to the hale society. On the individual level citizens can participate interactively via OGD with future decisions in the country, for example." (USACM, 2009)

Access Info Europe[2] and the Open Knowledge Foundation[3] define OGD as:

"The two main elements of open government data can be defined as follows:

[2] http://www.access-info.org/
[3] http://okfn.org/

- *"Government data" is any data and information produced or commissioned by public bodies.*
- *"Open data" is defined as material which anyone can use for any purpose.*

To qualify as –open-, it must be possible for the government data to be freely copied, shared, combined with other material, or republished as part of websites which allow users to explore, analyze, visually represent, or comment on the material, as well as transform it into other formats. Examples of the datasets held by governments which can, potentially, be opened up range from national statistics to budgetary information, from parliamentary records to data about the locations of schools, hospitals, crimes, or post boxes." (Access Info Europe and the Open Knowledge, 2011, p. 8)

Another short **definition of OGD** is given by Sir Tim Berners-Lee, the director of the W3C[4] (World Wide Web Consortium) and the inventor of the WWW (World Wide Web). In a conference[5] about Government 2.0 in Washington, D.C. in December 2010, Berners-Lee distinguished OGD from WikiLeaks Documents:

> *"Open government data is the data about a country which is not personally identifiable information about individuals. It does not have privacy issues associated with it. And it does not include military or state secrets."* (Howard A., 2010)

Furthermore, the definitions above and all other published definitions of OGD agree on a **number of principles** that have been set by a common consensus from different associations and open government working groups. These principles are mainly set to qualify "data" as open and provide general guidelines on how the data should be made available online. In December 2007, thirty advocates[6] of OGD developed a set of eight principles of OGD. These principles are reproduced in Table 1 (O'Reilly & Malamud, 2007).

[4] http://www.w3.org/
[5] http://www.huffingtonpost.com/alexander-howard/tim-bernerslee-on-wikilea_b_798671.html
[6] https://public.resource.org/open_government_meeting.html

Table 1: Principles of Open Government Data (OGD)

No.	Principle	Description
1	Complete	All public data is made available. Public data is data that is not subject to valid privacy, security or privilege limitations.
2	Primary	Data is as collected at the source, with the highest possible level of granularity, not in aggregate or modified forms.
3	Timely	Data is made available as quickly as necessary to preserve the value of the data.
4	Accessible	Data is available to the widest range of users for the widest range of purposes.
5	Machine-Processable	Data is reasonably structured to allow automated processing.
6	Non-discriminatory	Data is available to anyone, with no requirement of registration.
7	Non-proprietary	Data is available in a format over which no entity has exclusive control.
8	License-free	Data is not subject to any copyright, patent, trademark or trade secret regulation. Reasonable privacy, security and privilege restrictions may be allowed.

Source: (O'Reilly & Malamud, 2007)

While most of the principles in Table 1 are easily understandable, some further clarification is needed when it comes to the intellectual property rights and licenses. Principle 8 does not strictly imply that the data always have to be made online available without any associated copyright, but it has to be clearly understood that the licenses must be of the type that permits the information to be accessed, redistributed, and reused[7].

[7] http://www.opendefinition.org/okd/

Based on above definitions and principles of OGD, it is important to emphasize the main **objectives of OGD**. The objectives include the economic potential of OGD, promotion of transparency and accountability of governments, participation, collaboration, in addition to the role of OGD in reforming and reshaping the delivery of public services (Davies, 2010, p. 2). Furthermore, the research on economies of OGD is a key input in answering the main question of the thesis at hand which is how firms could benefit from OGD.

In the social context, the directives on OGD reinforce transparency by pushing to get government's raw data out of their silos and making the data online. The nature of OGD and new web technologies enable the draw and presentation of knowledge from opened raw data. Social networks, e.g., Twitter and Facebook, provide online collaborative tools like Wikis and blogs that enable participants to interact with actors inside and outside the governments. Other Web 2.0 technologies like search engines, e.g., Google, and data visualization websites stimulate citizens to participate and collaborate on topics of common interest (Gotze & Pedersen, 2009, p. 211). Wheredoesmymoneygo.org[8] is an example of a real-world case of an application that uses OGD from the UK and Web 2.0 technologies, on which transparency, participation, and collaboration are being realized. "Where does my money go" provides online analysis and visualizations about the UK public spending such as taxpayers' daily spending, spending per region or the spending per department. Such OGD application draws the attention and participation of the public, which increases government accountability and anti-corruption.

Furthermore, OGD is part of the revolution in how governmental public services will be delivered in the future. Financial crises and shortages in budgets led governments to re-think in how they deliver public services in more cost-efficient ways. Cloud computing and Web 2.0 technologies, even with the big challenges associated with data security and privacy, have been found to be very effective and minimize costs. In the future, governments will depend more on crowd sourcing to deliver public services. Hence, in the future OGD will be the virtual database on which technologies of Web 2.0 and Semantic Web enable governments to provide public services in a cost-saving manner. (Maio, 2009, pp.7-8)

[8] http://wheredoesmymoneygo.org/about/

2.1.2 OGD: a new stage of E-Government

The wide range of E-Government online services which citizens and firms can access represents the governments' success in achieving the strategic goal of reaching their constituents via the Web. With the take-off of the Internet in 1990s, governments sought to present their data online for the same main reasons of launching OGD. Transparency, sharing of information about the country and other parts of the world, and efficiency in the process of governmental transactions, nevertheless, remain common motivations that explain both initiatives in E-Government and OGD. (Alonso et al., 2009)

In a research report on E-Government in 2000, Gartner **defines E-Government** as:

> *"The transformation of public-sector internal and external relationships through Net-enabled operations, IT and communications to optimize government service delivery, constituency participation and governance"* (Maio, 2009, p. 4).

Revolutions in technology, downturn in IT, budgetary constraints, and the wealth of information that governments and public organizations provide on a daily basis are important drivers which explain the convergence in E-Government and the emergence of OGD. In short, it could be stated that OGD is the new revolution in traditional E-Government.

In both E-Government and OGD, there are a number of similar interaction points and relationships that governments have towards their constituencies. Theses interaction points include: Government to Citizen (G2C) and Citizen to Government (C2G) in which, respectively, governments provide online information and services to the public, while C2G calls for citizens' participation and interaction. Government to Business (G2B) and Business-to-Government (B2G) in which, respectively, governments provide online information and services to firms, while in B2G firms electronically supply information requested or required by governments. Government to Government (G2G) describes the communications between E-Government parties like, for example, interactions between the Federal Ministry of Finance and the labor office organization. (Khosrow-Pour, 2005, pp. 345-346)

In a research report in 2009, Gartner (Maio, 2009) classifies E-Government based on historical evolution in technology and the changes in the environments around E-Government. These changes led to reshaping the services provided by governments to become citizen-driven rather than in the past with the citizen-centric E-Government.

The citizen-driven E-Government is the model that in short fits with OGD and most topics addressed in this thesis apply to this model. In the citizen-driven government, citizens and firms interact with E-Government services in ways which serve the specific purposes of a user or firm. Examples include the personalized portals and integrated applications that use web services to automate access to specific E-Government service. In this model, the architecture of E-Government follows a federated approach which is based on external agencies. For example, intermediaries develop mash-ups or mobile applications that offer service delivery to stakeholders. Users in this model determine the access model which suites them best, e.g., online communities on Facebook, and do not necessarily use the traditional one-stop-shop access method. The service model is configurable, meaning services can be configured by citizens and firms themselves, e.g., the use of Web 2.0 technologies in customizing a service. (Maio, 2009, pp. 2-6)

2.1.3 The start of OGD

A short look into the history of OGD in the U.S. and in the U.K. as well as in Austria provides insights into the development of OGD in these countries in addition to an outlook into the web services and applications developed upon OGD datasets. In the context of this thesis, realized economic values and OGD business models in those countries reinforce the hypothesis that firms could benefit from OGD.

OGD in the U.S.

OGD is a new chain in the development of E-Government in the U.S. The principles upon which E-Government has been envisioned were guided are scientifically motivated in a working paper by Professor G. Zhiyong Lan (Lan, 2006). He explained in his paper that the technology revolution and the trust crisis between governments and citizens are main drivers for the revolution in governments of the twentieth century. E-Government is determined to be an effective transformative force in the revolution of traditional government, and not merely as online portals of public administration. **E-Government's objectives** in increasing transparency, participation, efficiency, and *positive* **economic returns** could be enabled through the application of new technology (Lan, 2006, p. 5). Initially and in the early days of the World Wide

Web and E-commerce in the 1990s, Carl Malamud (in 1993) put the SEC (Securities and Exchange Commission) data online. Carl Malamud is considered to be the father of the movement on E-Government, and his initiative proved the public's interest in accessing governmental data online (O'Reilly, 2010).

However, the U.S. federal government didn't establish an official E-Government website until the year 2000. In September 2000 the portal FirstGov.gov was launched and some years later it was officially renamed as USA.gov in January 2007 (USA.gov, 2011). The E-Government Task Force managed the strategic action plan by prioritizing 24 initiatives among more than 350 accumulated projects (Daniels, 2000, p. 9). The deployment of the 24 initiatives had successfully transformed the agency-centered E-Government into citizen-centric E-Government (see section 2.1.2). Within the 18 to 24 months deployment period, transformation into the citizen-centric E-Government had included more than 35 million web pages on more than 22,000 federal websites. (Daniels, 2000, p. 12)

On his first day in January 2009 as the new president of the U.S., President Barak Obama announced in a new directive the launch of the "Open Government Data" initiative. The president issued memorandum established three main objectives: transparency, participation, and collaboration (Obama, 2009). **On 21 May 2009, DATA.gov was launched** as the central platform of OGD with 76 datasets and 11 tools. In less than a year, 118,000 datasets were opened by different government offices. Vivek Kundra, the CIO of the U.S., aimed to push the release of more datasets that are of interest and could as well add value to outsiders (Lakhani et al. 2010, p. 1).

With a budget of $50,000, Kundra staged the "APPs for Democracy" competition with the objective of solving problems within less than two years. He announced half of the budget would be awarded as prizes for the best applications to solve data problems in his department. 47 apps were developed in 30 days, and an estimated $2.6 million in costs were saved considering the potential costs of having the 47 apps contracted by developers (Lakhani et al. 2010).

Within a very short period, realization of the main objectives of OGD could be seen in DATA.gov. More transparency was achieved through the unlocked datasets and the presentation of knowledge via applications and tools from channels outside the government. Designed metadata catalogs enable many stakeholders such as researchers, citizens, or businesses to get the information they needed. Shared storage services in DATA.gov are also a part of the new added values. Participation is also being realized via the tools offered or via public, e.g., hackers, participations in the development of applications. Collaboration has been realized through the wide range of channels, e.g., community platforms that work as communication mediums with public bodies. (Lakhani et al. 2010, p. 9)

Further progress is being achieved through the creation of new applications inside the government as well as outside the government. Inside the government, for example, the success in DATA.gov reinforced replicating those best practices in solving the problems in Reccovery.gov, which is responsible for informing citizens on the spending of $787 billion. Another example is the IT Dashboard[9], which tracks $76 billion in IT investments within the federal government. Non-governmental applications were developed using the released datasets, for example, Datamacher.org[10], an innovative application which allows anyone to mash up different datasets resulting in specific kinds of knowledge supported by many features such as visualization (Lakhani et al. 2010, pp. 10-11). Furthermore, the number of apps and datasets at Data.gov are dynamically increasing. For example, on 27 March 2012 Data.gov had 90,804 raw and geospatial datasets, 1,204 government apps, 236 citizen-developed apps, and 85 mobile apps, which are based on datasets from 172 agencies and sub-agencies.

Data.gov not only became the showcase on the realization of its objective and the power of new web technologies, it has also received strong attention from large companies such as Microsoft, Google, and Amazon. Creating profitable business models through the exploitation of OGD is the vision brought forward by executives in these organizations. Microsoft's project code named "Dallas" aimed to commercialize OGD through platforms and services that, for example,

[9] http://www.itdashboard.gov/
[10] http://www.datamasher.org/

work on standardizations, production, analytical, or visualization of datasets (Lakhani et al. 2010, p. 13).

OGD in the UK

Since the early 2000s the UK has set a precedent through the realization of their achievements towards establishing some framework for open government. For example, in the early 2000s various third-party software packages, e.g., Digita TaxSaver the self-assessment package from Microsoft, were adopted in the marketplace in which services were offered based on the provision of open government interfaces and data formats (CTPR, 2010, p. 28).

The FOI (Freedom of Information) Act of 2000 is another earlier example of progress that describes the political commitment in the UK towards open government (The National Archives, 2000).

Early achievements made towards open government in the UK were realized through many innovative and collaborative online platforms delivering added value services made possible by government data. For example, www.mysociety.org[11] was started in 2006 and through its community it provided many participatory public services, ranging from Patient Opinion to FixMyStreet[12] and TheyWorkForYou[13]. Such innovative initiatives refine and improve public services as well provide timely feedback that enable improvements to the wider policymaking process ((CTPR), 2010, p. 26).

In June 2009, Prime Minister Gordon Brown asked Professor Tim Berners-Lee and Professor Nigel Shadbolt about how to transform public access to government data. Professor Berners-Lee provided the concept of:

> *If data can be published under a Freedom of Information request, why not publish it online? By releasing this data, we can unlock new ideas for delivering public services, help communities and society work better, and let talented entrepreneurs and engineers create new businesses and services.* (SETsquared, 2010, p. 30)

And in describing the ambition for open government data, Professor Shadbolt commented:

[11] http://www.mysociety.org/about/
[12] http://www.fixmystreet.com/
[13] http://www.theyworkforyou.com/about/#history

> *The vision is that citizens, consumers and Government can create, re-use and distribute public information in ways that add value, support transparency, facilitate new services and increase efficiency. We believe we can achieve this with the emergence of a new generation of web techniques and standards.* (SETsquared, 2010, p. 30)

Berners-Lee and Shadbolt led the development community of over 2,400 people to implement the beta portal of OGD data.gov.uk, which went online in September 2009. The beta version of data.gov.uk was developed with open source software and open standards and had nearly of 1,100 datasets (SETsquared, 2010, p. 30).

On 21 January 2010, the UK **launched the OGD platform data.gov.uk**, which from the beginning was built on semantic technology with nearly of 2000 datasets being hosted (Access Info Europe and the Open Knowledge , 2011, p. 17).

Recently and at the time when data.gov.uk was last accessed[14] for the purpose of this thesis, over 8,500 datasets had been released by different administrative bodies such as 787 datasets from the Department for Communities and Local Government. The UK OGD platform includes hundreds of developed applications for mobile devices as well for other information systems. Linked Data is another important area in the portal, in which rich information is provided on how the datasets can be interlinked using Linked Data technology with other systems. The platform includes many other resources such as tools which support analysis, adaptation, and sharing of data. Moreover, the platform has rich video interviews, blogs, and other features that enable someone to get more out of the OGD website.

OGD in Austria

The E-Government initiative in Austria can be dated back to the mid-1990s and specifically since December 1998 when "help.gv.at[15]" was launched as the central portal for electronic governmental services (Schussel, 2003, p. 85). For a period of time E-Government in Austria ranked number one among EU member countries. The benchmarking usually measures twenty

[14] http://data.gov.uk/ (accessed on 15th of April 2012)
[15] http://www.help.gv.at

basic services in the categories of: full online availability, service sophistication, user experience, and E-Procurement (Capgemini, 2007, p. 29). “Transparency" and "Open Government” are new criteria in future benchmarking throughout the EU (Krabina & Prorok, 2011, p. 8).

In November 2010, **OGD in Austria** had the government’s approval for the design and implementation of the initiative by spring 2011[16]. The approval of the initiative was associated with the release of thirty datasets such as statistics, budgets, and map contents[17]. A process model for OGD in Austria has been developed and published by KDZ[18] (Center for Public Administration Research), which describes the strategic implementation of OGD in Austria (Krabina & Prorok, 2011).

The initial implementation of OGD has gone through four phases. In phase 1 the aim was to increase data transparency and open data management. Many OGD conferences were held and a number of web portals were lunched to support the aims set forth in phase 1. Websites such as www.ogd2011.at, offener.datenkatalog.at, and OGD Digest[19] (magazine) are some examples of hosted sites that support the OGD initiative (Krabina & Prorok, 2011, pp. 4, 10).

In phase 2 the aim was to enhance participation through open participation by calling upon the public to submit ideas and share knowledge. Open type of participation, also realized through the use of social media, served an important role in connecting people and enabling them to post their ideas. In this phase more collaboration was realized via open3.at and the start of OGD applications such as budget visualization[20] for the city of Vienna (Krabina & Prorok, 2011, pp. 10, 17).

In phase 3 the aim was extended to allow for open collaboration via improving open cooperation between public administrations as well as among public and private sectors (Krabina & Prorok, 2011, p. 17).

[16] http://data.wien.gv.at/neuigkeiten/wege/beginn.html
[17] http://data.wien.gv.at/neuigkeiten/wege/launch.html
[18] http://www.kdz.eu/de/english-information
[19] http://www.ogd2011.at/ogd-digest/janner-2011
[20] http://data.wien.gv.at/apps/budget-koller.html

In phase 4 the aim was to implement a more comprehensive level of involvement by including other cities and towns. In Vienna, **Open Government Portal**[21] was launched on **17 May 2011**. Other federal states followed Vienna's OGD initiative such as Commons Project Open (Open Source, Open Content, Open Government) in Linz and the discussion framework of "Dialogue city of Salzburg" (Krabina & Prorok, 2011, pp. 10,17).

The OGD initiative in Austria is not limited to the previous four phases only. Rather there are future phases still to come according to the stage requirement and the developments planned as part of the initiative. For example, phase 5 already began on 30 March 2012 with the release of more datasets in the fields of environment, public transport and statistics[22].

Stimulating the economy and supporting firms are major objectives in the strategic implementation of OGD in Austria. The administration is committed to strengthening the economy and promoting innovation through the provision of public information. OGD is seen as a key resource to economic growth and providing a better environment for business. Special emphasis is placed on equal access for all businesses to the datasets and the lowest possible administrative burden. In addition, the administration acknowledges its responsibility for the high quality of public data and public confidence in the public data (Krabina & Prorok, 2011, p. 11).

As part of the OGD strategy many principles have been decided upon which support the use and re-use of OGD by business stakeholders. These principles include:

Equal treatment: data with accordance to OGD principles (Table 1) are made available and without any preferences towards individual companies or interest groups (Krabina & Prorok, 2011, p. 12).

Fairness: firms are treated fairly and firms' proposals on the release of new datasets remain confidential. This principle is in particular important because it prevents disclosure of information about the business models being developed or the products that individual firms plan to introduce. Moreover, the administration developed procedures for submitting proposals from companies in which many aspects are taken into account to ensure support of businesses (Krabina & Prorok, 2011, p. 12).

[21] http://www.wien.gv.at/ikt/opengov/

[22] http://data.wien.gv.at/neuigkeiten/wege/phase5.html

Responsibility: this is the third principle which provides citizens and firms with a level of guarantee about the responsibility of public administrations to ensure the quality of the data (Krabina & Prorok, 2011, p. 12).
User charges: it is recommended to use the creative commons license on released datasets, in which firms do not incur fees for licenses (Krabina & Prorok, 2011, p. 12).

2.2 WEB 2.0, SEMANTIC WEB, AND LINKED OPEN DATA

Among the many innovations, the Internet is still considered to be the most influential, revolutionary invention in history. It has remarkably revolutionized computing, communications, business, governments, education, and other domains of society (Chan, 2003, p. 3). Web technologies account for a huge domain in and of themselves and the research in this domain dates back to the early days of the Internet, in the 1960s, and the Web, in the 1980s. In the context of this study, the main focus will be on trying to understand web technologies within OGD. This objective focuses on how OGD can be used within an enterprise or how business models can exist based upon OGD. Revolutions and advancements made in ICT and the WWW, in addition to the political decisions made about opening government data describe, respectively, the technical infrastructure and the strategic implementation of OGD.

Table 2 (Lan, 2006, p. 4) summarizes the evolution of technology and the prevailing governmental structure associated with each era. The concept of information superhighways (Lan, 2006, p. 5) and new Internet technologies such as Web 2.0 and Semantic Web describe the technology enablers of the twentieth century.

Table 2: Technology and Human Evolution

	Agricultural	**Industrial**	**Informational**
Enabling Technology	Bronze	Steam Engine	Information Technology
Impact on Humans	Limited. Extension of Capacity	Massive Extension of Physical Capacity	Extended Mental Capacity and Hence, Human Power

Impact	Survival	Affluence	Freedom
Forms of Society	Rural	Urban	Virtual
Values	Land is Life	Money makes the devil go	Knowledge is Power
Pace of Change	Slow	Medium	Fast
Governmental Structure	**Feudal**	**Bureaucratic**	**Networked**
Public Service Level	**Limited**	**Improved**	**Extensive**

Source: (Lan, 2006)

2.2.1 The Emergence of Web 2.0

What characterizes the Web 2.0 from the early World Wide Web (or Web 1.0) is mainly the dramatic shift in the Web from a static platform to a more dynamic and smarter platform. For example, E-Government websites in Web 1.0 and for many years took the form of electronic brochures without intensive online interactivity between the citizens and these websites (Greengard, 2009, p. 16). In contrast to Web 1.0, Web 2.0 technologies and applications enabled more participation and interactions among citizens, intermediaries, and firms with E-Government websites or what became known as E-Gov. 2.0 (Maio, 2009).

Furthermore, Web 2.0 had enabled the creation of new digital distribution platforms which are revolutionary in the way content are nowadays produced and distributed. Based on these new digital platforms the creators of content, e.g., games or media reports connect directly to consumers and audiences. Profitable firms like Apple, Microsoft, and Amazon, among many others, offer online IT-Infrastructures that initially support the creation of digital content as the core product in these growing online business models. (Swain, 2009)

Bob Metcalfe, the inventor of the Ethernet and founder of 3Com, introduced in the early 1980s Metcalfe's law for measuring the network effects of communication technologies and networks

such as the Internet and social networking. The network effect which is generated by social networks like Twitter and Facebook are examples of Metcalfe's Law. In such Web 2.0 systems, the network effect describes the value of a link, e.g., a video on YouTube, which arises from the number of users accessing the same link. Hence, the value of a web service or link increases as more users access the link where its density becomes greater. (Hendler, 2009)

Figure 2: The First Internet President

In the context of OGD, followers of the elections (Figure 2) of President Barak Obama might not be surprised by the president directive on opening government data. During his election the Obama campaign exploited the power of Web 2.0 in a new way never seen before. For example, the campaign team mined email addresses and then built a database of more than 13 million citizens which formed 10% of the total number of voters in the presidential election. They turned to social networks like Facebook and posted videos on the campaign website Barak-Obama.com and on YouTube (Greengard, 2009, p. 16). Participation and collaboration features in Web 2.0 resulted in gaining more votes. In contrast to Web 2.0, old campaigns in Web 1.0 were lacking participation capabilities and the campaign websites just served as e-brochures about the candidates (Greengard, 2009, p. 16).

2.2.2 The Semantic Web (Web 3.0)

In a paper about technology, Kroeker explained SW (Semantic Web) along with real newly developed web applications and platforms that not only explain SW technology but also lists great examples of the role of SW in OGD. The article provides many examples of SW, and the following have been included just to mention a few: billions of triples on supercomputers; in another project 800 million triples per week; **US releases thousands of datasets in Semantic Web formats and as open linked data**; Internet developers such as Microsoft; and the acquisition of Powerset's semantic technology and the Yahoo Search Monkey (Kroeker, 2010).

> *The **Semantic Web** is not a separate Web but an extension of the current one, in which information is given well-defined meaning, better enabling computers and people to work in cooperation* (Berners-Lee et al. 2001, p. 37).

Two important technologies for developing the Semantic Web are extensible Mark-up Language (XML) and the Resource Framework Description (RDF). Tags in XML allow arbitrary structure without meaning or semantics. Meaning is expressed by RDF in a set of triples. A triple is constructed of a subject, verb and object which can then be identified by a Universal Resource Identifier (URI). The triples of RDF form web pages of information about related things. Ontologies are the third component in SW technology. Ontology is structured in classes, subclasses and relations, where relations among terms can be identified (Berners-Lee et al. 2001, p. 38).

Developers of SW such as Watson-API[23] provide SW-based services that enable knowledge discovery and mash-up among different applications. However, SW itself can be designed from bottom to top within closed domains such as inside a firm (d'Aquin et al., 2008). This leads to the elicitation of OGD datasets to be exploited via SW technology.

2.2.3 Linked Open Data

Linked Open Data (LOD) is a subtype of the big term "Linked Data" that refers to the publishing and interlinking of proper structured data on the web. The syntax of the RDFs in Semantic Web describes the meaning of proper structured data (Heath & Bizer, 2010, p. 10).

Tim Berners-Lee (Berners-Less, 2009) coined what have become known as the Linked Data principles. These principles are the following:

1. "Use URIs as names for things.
2. Use HTTP URIs, so that people can look up those names.
3. When someone looks up a URI, provide useful information, using the standards (RDF, SPARQL).
4. Include links to other URIs, so that they can discover more things."

Moreover, in 2010 Tim Berners-Lee introduced the five stars scheme in which "opened data can be marked with more stars as it is made more powerful and becomes easier for people to use:

[23] http://watson.kmi.open.ac.uk/REST_API.html

★ Available on the web (whatever format) but with an open license, to be open data

★★ Available as machine-readable structured data (e.g., excel instead of image scan of a table)

★★★ As (2) plus non-proprietary format (e.g., CSV instead of excel)

★★★★ All of the above plus use open standards from W3C (RDF and SPARQL) to identify things, so that people can point at your stuff

★★★★★ All of the above plus: link your data to other people's data to provide context" (Berners-Less, 2009)

OGD datasets, e.g., datasets in data.gov, which have been internetworked using semantics of linked data, are known as Linked Open Data. LOD is not only found within the scope of OGD as it can be implemented in any domain as long as data has been made open with principles of linked data. The information reproduced in table 3 below shows that LOD is the technology most commonly used in the government domain.

Table 3: Number of datasets, amount of triples, and amount of RDF links per topical domain

Domain	Data Sets	Triples	Percent	RDF Links	Percent
Cross-domain	20	1,999,085,950	7,42	29,105,638	7,36
Geographic	16	5,904,980,833	21,93	16,589,086	4,19
Government	25	11,613,525,437	43,12	17,658,869	4,46
Media	26	2,453,898,811	9,11	50,374,304	12,74
Libraries	67	2,237,435,732	8,31	77,951,898	19,71
Life sciences	42	2,664,119,184	9,89	200,417,873	50,67
User Content	7	57,463,756	0,21	3,402,228	0,86
	203	26,930,509,703		395,499,896	

Source: (Heath & Bizer, 2011, p. 31)

A prominent example is the early adoption of LOD in the UK OGD portal data.gov.uk, whereas the US OGD data.gov was built on formats such as Adobe's PDF. Later on and more specifically in May 2010, data.gov was re-launched in Semantic formats (RDFs) (MILLER, 2010, p. 5). Moreover, at the start of data.gov.uk the datasets were partially published as Linked Open Data, but the main aim was to promote the Linked Data approach and provide tools for better leverage of the data (Thacker, 2011, p. 36).

At the enterprise level, Bauer and Kaltenböck recommend LOD for strengthening the competitiveness of a firm in many ways such as information mash-ups among distributed systems, while the replication or double storage of data is not a challenge since the data can be reached via URIs in another system. Furthermore, LOD enables the creation of new knowledge out of interlinked data, in which LOD could be an important source for innovation. (Bauer & Kaltenböck, 2011, p. 36)

3 Theoretical Frameworks

This chapter introduces the three theoretical frameworks upon which the research hypotheses will be presented. Section 3.1 describes a model in managerial economics in which we explain the vision on the role of OGD datasets in supporting optimal solutions to managerial decision problems. Section 3.2 describes Michael Porter's Five Forces Model which we apply in the analysis of business models that could exist on OGD as an open platform. Section 3.3 summarizes Porter's generic strategy model on which we predict that OGD reinforces the competitive advantage of a firm. The chapter closes with section 3.4 which lists the research hypotheses.

3.1 OGD in Managerial Economics

At the beginning of his book, Salvatore talks about the shift from traditional economy to know-how based economy. He explains that revolutions in web technologies and the spread of information have their impacts in the way businesses are conducted and have created a competition among societies on gathering the know-how as the main driver in most economies nowadays. In this new era, the economic environment has many new aspects such as globalization, the spread of information technology, shortening managerial hierarchies, and many more. (Salvatore, 2007, p. 10)

We start the explanation of the theoretical model with Salvatore and his definition of a firm, and gradually proceed from inside a firm in which the motivations for merging OGD with the model become clearer.
Salvatore defines a firm as *"an organization that combines and organizes resources for the purpose of producing goods and/or services for sale"* (Salvatore, 2007, p. 11).

Uncertainty is one of the most common risks that firms face in daily operations. Firms have to decide on the size of the production capacity, what price to charge, advertising budgets, in addition to developing the plan for the future growth of the firm. Therefore, a firm must employ economic forecasting in order to reduce the risk or uncertainty. The firm has to carefully study

decisions that will affect both the short-term as well the long-term. Short-term decisions concentrate on the operational procedures within short periods, e.g., the first two years after starting up a company. The long-term decisions concentrate on the future growth of a firm, e.g., in five or twenty years from now. (Salvatore, 2007, p. 164)

The definition of managerial economics is another important citation taken from Salvatore, in which he defines managerial economics as:

> *"Managerial economics refers to the application of economic theory and the tools of analysis of decision science to examine how an organization can achieve its aim or objectives most efficiently" (Salvatore, 2007, p. 4).*

Figure 3 provides a visualization of the definition of managerial economics, and based on this definition we have introduced OGD as an integral part in managerial economics. Figure 3 shows that the **economic theory** builds on two pillars of macroeconomic and microeconomic. In our adapted model, we propose OGD as a core resource in macroeconomics where the forecasting of demands and sales in a firm begins.

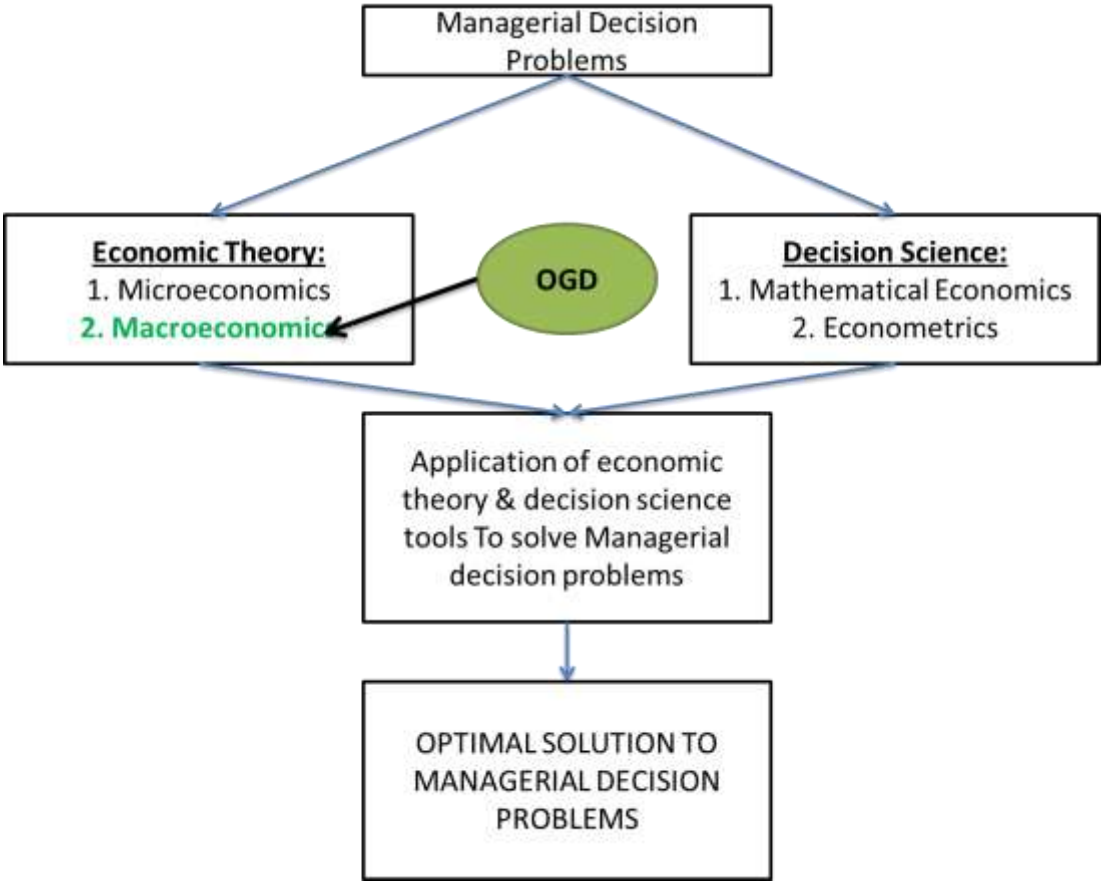

Figure 3: OGD in Managerial Economics

Source: adaptation of FIGURE 1-1 (Salvatore, 2007, p. 5)

General forecasts for the economy as a whole are routinely provided by government agencies. For example, in the US economic forecasts are given by the President's Council of Economic Advisors. In Austria economic forecasts are given by the Chamber of Commerce. While incredibly important, these are not the agencies in either of the countries to produce such forecasts. Firms use the macro-forecasts of economic activity as inputs into their micro-forecasts, which will be processed using tools of analysis taking from the decision sciences in order to estimate demands and sales. (Salvatore, 2007, pp. 164)

In Figure 3, **mathematical economics** in the decision sciences refer to the formula model in which, for example, the production quantity will be expressed in an equation. **Econometrics** in

the decision sciences refers to the statistical tools such as regression in data analysis (Salvatore, 2007, p. 7).

The above definition of managerial economics and Figure 3 are all that is necessary to form the basic theory on which we submit our findings on the application of OGD within a firm. Therefore further discussion in the area of managerial economics will only lead to a diversion away from the main focus of this study. The following presents a case scenario which clarifies how OGD can be leveraged within a firm.

Case Scenario:

A cigarette firm faces the problem that they want to know how the demand on its product (both in the short-run and long-run) might change. This could be, for example, a real case a firm faces during a financial crisis or period of inflation.

Solution:

Arguably if the firm could estimate the short-run and long-run change in cigarette demand then the firm management could decide prudently, for example, saving costs by reducing workers' shifts when the demand becomes less.

In practice, the demand on cigarettes follows the general production equation:

$$Q = f(P, Y, Pc, Ps)$$

In the demand equation above: P is the cigarette price, Y is the consumer income, Pc and Ps are respectively the prices of complementary and substitutes commodities (Salvatore, 2007, p. 6). The production equation above resembles the **mathematical economics** in Figure 3.

The firm then has to apply **econometrics**, e.g., data analysis such as regression, in order to determine required parameters for P, Y, Pc, and Ps in the demand equation. Here emerges the role of **OGD datasets** as one of the main data inputs in the **econometrics** from which a firm can build its demand equation.

To conclude the case scenario, it is necessary to emphasize that the firm could follow three main steps in order to estimate the change in the demand of cigarettes. First, the firm has to search OGD datasets that include information about related variables of the demand equation for cigarettes. For example, if the firm is located in the US then OGD datasets such as the

Consumer Price Index[24] dataset can be downloaded from Data.gov which provides the firm with raw data on the cigarette prices within long periods of time. Another dataset that can be useful in studying future demand of cigarettes is the Current Population Survey Tobacco Use Supplement[25] which informs the firm about consumer behavior such as how they use tobacco products. Furthermore, and as an aside it is worthwhile to mention that while searching some of the relevant OGD datasets applicable to the demand equation we found that the World Bank[26] hosts the "Economics of Tobacco Control Toolkit"[27] which includes, for example, Tobacco Data[28]. Specific to the cigarettes case scenario, it can be very beneficial for the cigarette producers to leverage the OGD datasets from the World Bank as well. The second step that the firm has to follow in forecasting future demand is to employ econometrics using computer software for data of those aggregated or merged datasets. The third step requires the application of the newly resulting statistical coefficients to the demand equation. For more details, please refer to Salvatore's book that describes in several chapters each step in detail.

In conclusion to this sub-section, we predict that the managerial economics model presented above offers firms a very cost effective way of integrating and exploiting OGD datasets not only to forecast the demand of a product/service, rather, the model could serve other strategic objectives in a firm such as business intelligence and data-warehouse enrichment.

Based on the previous discussion we could begin to work towards answering the first research hypothesis and the main research question, i.e., what are the business implications of OGD?
RH1: OGD Datasets support optimal solutions to managerial decision problems.

3.2 Michael E. Porter's Five Forces Model

In 1979, Harvard Business Review published the article "How Competitive Forces Shape Strategy" by Michael E. Porter. Since then the article has revolutionized the field of strategy and in later decades Porter developed his model to include strategy for corporations, regions,

[24] https://explore.data.gov/Prices/Consumer-Price-Index/aqam-5uet
[25] https://explore.data.gov/Health-and-Nutrition/Current-Population-Survey-Tobacco-Use-Supplement/d6iv-myhn
[26] http://www.worldbank.org/
[27] http://go.worldbank.org/9MVBNV0JO0
[28] http://siteresources.worldbank.org/INTPH/Resources/2TobaccoData_Letter.pdf

nations, as well as strategy for health care and philanthropy. Recently, the framework is commonly known as "Porter's Five Forces" (Porter, 2008, p. 2).

Figure 4 reproduces the framework of Porter's Five Competitive Forces.

Figure 4: Michael Porter's Five Forces of Competition Framework

Source: (Porter, 2008, p. 4)

In this section, OGD business models will be analyzed using Porter's framework. Furthermore, we assume in our analysis that OGD is an "Open Platform" on which a multitude of business models can be created. At the end of the analysis through which we aim to determine the attractiveness of the OGD business models, our vision of OGD as an open platform will be further explained.

Industry Rivalry:

OGD as it has been examined in the previous sections, as well in its web form, e.g., OGD portals and applications, can be identified as a big sector in IT industry. The following section provides a description of the six factors, identified by Porter, which play an important role in determining the intensity of competition within established OGD firms:

Concentration: OGD is a new phenomenon that only started in 2010. Therefore, the total number of OGD business models is still relatively small in comparison to the number of firms or

business models in other industries. High levels of competition and price wars can be seen in the market saturation, which is not the case in OGD business models (Porter, 2008, p. 79).

Diversity of competitors: The diversity of organizational cultures embracing different strategies reinforces competition and price wars (Porter, 2008, p. 79). However, in the OGD IT-sector we perceive that there are no barriers for new entrants. One reason for making our argument is that OGD business models are dependent upon the level of innovation and differentiation a firm can have.

Product differentiation: Again we argue that OGD with its eight principles (Table 1) offer the start-up of diverse business models, each with a differentiated service or application based upon OGD datasets (Porter, 2008, p. 80).

Excess capacity and exit barriers: Having access to OGD datasets for free or at low, transparent fees make the exit barriers not a major problem. For example, new entrants could build innovative OGD visualization applications based on open source software, nevertheless, when the firm decides to end the OGD business there are no major sunken costs or other compelling barriers (Porter, 2008, p. 80).

Cost conditions: Substantial costs are not a requirement anymore for new entrants in the segment of the OGD industry (Porter, 2008, p. 81). Through joint ventures and collaborations capital costs can be minimized. E-Business, open source software and the Internet work as the main drivers in cost-saving.

Threats of Entry:

In the past and before the initiative of OGD, entry into E-Government business models was surrounded by high monopoly barriers. In contrast to the past, OGD is surrounded by the revolution of web technologies, e.g., Linked Open Data, in addition to the nature of openness in OGD, which has many factors making entry to OGD business possible and barrier-free. However, entry into the OGD sector is still subject to following structural variables of entry.

Economies of scale: Entry into the OGD sector depends on the know-how and degree of innovation of the entrepreneurs or the start-up company. Therefore economies of scale are

considered to be very low costs, i.e., huge investments are not a condition of entry into OGD sector (Porter, 2008, p. 76).

Absolute cost advantages: For new entrants or entrepreneurs, not like in the past, absolute cost advantages are not a major issue (Porter, 2008, p. 77).

Capital requirements: With open source systems, e.g., Linux Operating System, firms do not have to incur huge capital investments (Porter, 2008, p. 76).

Access to distribution channels: Through web technologies new entrants, e.g., e-business, can save costs and bypass conventional distribution channels. Another possibility to gain access to distribution channels is through cooperation and collaboration with already established firms (Porter, 2008, p. 77).

Government and legal barriers: OGD is an initiative started and supported by governments, and the ten principles that describe an opened OGD dataset put the legal stamp on the use and re-use of a dataset. Therefore, government and legal barriers are not an obstacle for OGD businesses (Porter, 2008, pp. 77-78).

Retaliation by established producers: Although we could not come up with a scenario of retaliation among OGD competitors as a case, we think that avoiding retaliation can be achieved through collaboration and creation of shareholder values (Porter, 2008, p. 78).

Threats of Substitutes:

We believe that OGD datasets are not like commodities which could be substituted by other vendors or other distributed technologies. Therefore, threats of substitutes in the case of OGD business models are not an issue (Porter, 2008, p. 73).

Buyer Power:

We observe how OGD business models operate in markets for inputs and outputs. In input markets, OGD firms or entrepreneurs are fortunate to obtain OGD datasets either for free or with minimal fees. In output markets, OGD firms sell their innovative solutions or services. Buyers' price sensitivity and relative bargaining power measure the buyer's power faced by firms. In the case of OGD business models, we think that buyers have strong bargaining power;

however, the degree of innovation and added value by an OGD firm is the best measure against the bargaining power of the buyers. (Porter, 2008, p. 81)

Supplier Power:

The bargaining power of suppliers in the OGD "market" is low compared to other industries. The main supplier of OGD datasets is the government, in which the datasets are offered for use and re-use for free. Furthermore, suppliers of open source software, licenses, or complementary products will rely on OGD firms as a channel to reach the mass market. (Porter, 2008, p. 83)

From previous analysis, it can be concluded that the attractiveness of the OGD industry sector is very high (Figure 5) where low competition and potentially high profits can be expected.

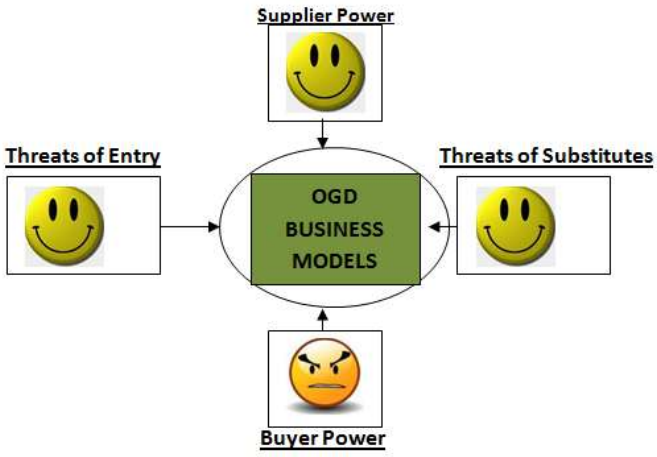

Figure 5: Attractiveness of OGD Business Models

In the rest of this sub-section, we present our vision of **OGD as an open platform**.

In a webcast in 2010, as well in his book (Lathrop & Ruma, 2010), Tim O'Reilly presented his vision of Gov2.0 as it is all about the power of platforms, e.g., eBay and open source software, which should describe future of E-Government (O'Reilly, 2010).

During this study we were mostly loyal in following the articles and webcasts published by O'Reilly[29] and we support O'Reilly's vision of E-Gov. 2.0 as an open platform.

While explaining his vision, Tim O'Reilly makes an analogy between open source software and open government. In open source software, developers and programmers are invited and given

[29] http://oreilly.com/

the freedom to access the source code and apply their own modifications and customization. The concept of participation and collaboration in open source software has led to higher values where new innovations and new ways of using the same source software have been realized (O'Reilly, 2010).

Applying the concept of participation and collaboration from open source software into open government, nevertheless, means that the citizens' role is not only to observe or to just have access to reading governmental data. Instead, they have to participate and interact with the government in an efficient way, i.e., read-write rights on OGD (Lathrop & Ruma, 2010, xxi). This supports O'Reilly's vision of open government as a "platform provider" instead of an "applications provider" (Chopra, 2010). Leveraging powerful capabilities of computing and Internet technologies, O'Reilly suggests that Government 2.0 should become a platform that might look similar to successful platforms in other industries. For example, firms like Apple and IBM have enabled their technology-infrastructure to become innovative platforms for Apple iPhone APPs and IBM PC, respectively. Apple and IBM each have a strong competitive advantage and they differentiate themselves from their competitors which decided to practice in a closed business environment. For example, iPhone has thousands of APPs which Apple's competitors fail to provide. The same can be seen in the PC industry where IBM developed standard PCs with the support of diverse operating systems (Lathrop & Ruma, 2010, pp. 12-14). Furthermore, eBay and Amazon provide another example of successful platform providers from the E-Commerce sector. Nevertheless, O'Reilly's platform vision of Government 2.0 reinforces the key role of OGD as an important resource in a government's assets that could be employed as a source for innovations and better economic returns.

The principles of OGD (Table 1) highlight many similarities between open source and OGD; however, a number of the differences between them are noteworthy. Both software code and OGD datasets can be identified as 'material' artifacts (Kuk & Davies, 2011). In the case of open source software the material is used by developers or programmers with the objective of developing the software for a specific function(s), whereas the material in the case of OGD

describes the contents of a dataset from which a specific knowledge or service is the ultimate objective.

Based on the previous discussions we state the second hypothesis of the research at hand as:

RH2: OGD is an open platform that enables the creation of attractive business models.

3.3 Porter's Generic Strategies on Competitive Advantage

Figure 6 reproduces Porter's framework for sources of competitive advantage. While this framework works hand-in-hand with previous analysis, in which new entrants in the business of OGD need to reconsider how the firm will be positioned in its competitive environment. However, in this study we build on Porter's generic strategy of competitive advantage as the theoretical framework for the hypothesis that OGD is an enabler in the generic strategy. We predict that OGD reinforces a firm's ability to cut costs and create competitive advantage.

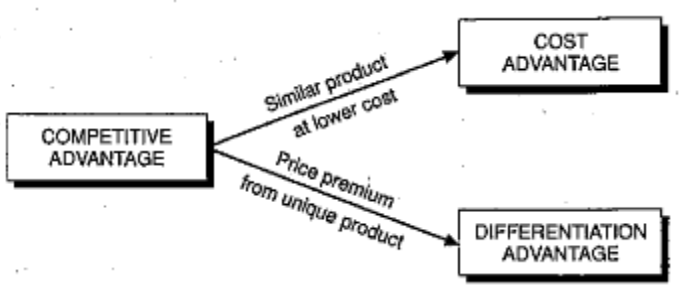

Figure 6: Sources of competitive advantage

Source: (Grant, 2007, p. 242)

Competitive scope is another important dimension which determines the scope in which the firm competes and determines the type of competitive advantage (Grant, 2007, p. 242). A firm might compete in its local market or in global markets (Figure 7).

> *"By combining the two types of competitive advantage with the firm's choice of scope – broad market versus narrow segment – Michael Porter has defined three generic strategies: cost leadership, differentiation, and focus"* (Grant, 2007, p. 242).

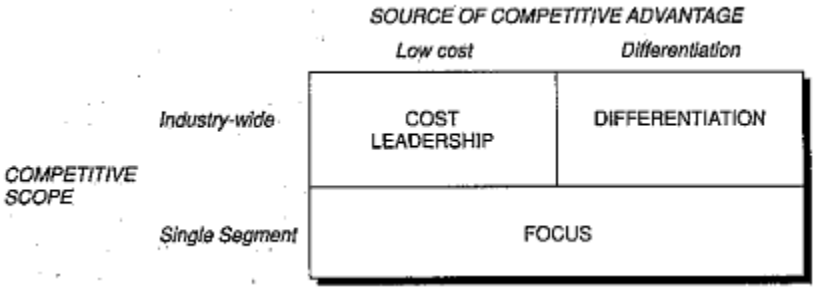

Figure 7: Porter's generic strategies

Source: (Grant, 2007, p. 243)

In this study we position OGD datasets at the centre of both frameworks (Figure 6 and Figure 7). Firms could exploit OGD datasets for achieving the main objectives set forth in Porter's frameworks.

Moreover, the above strategies can be applied to OGD business models themselves. Global differentiation is possible for OGD firms which offer solutions or services that could be replicated in other countries, e.g., IT pioneers such as Microsoft with the Azure Platform[30]. Low costs in acquiring, using and re-using OGD reinforce competitiveness of a firm in building a cost leadership by focusing on non-OGD related operations, where costs can be saved. Some firms could engage in the OGD sector by setting the focus on a niche market or by excelling in the provision of specific services or solutions, e.g., Semantic-Web Company[31].

The conclusion of this section introduces the third research hypothesis as:

RH3: OGD reinforces competitive advantage(s) within a firm.

3.4 Research Hypotheses

This research is primarily inductive and has been reinforced by the literature review in addition to other knowledge gained about OGD during this study and the development of the research hypotheses (Kaplan & Maxwell, 1994, p. 30).

The research hypotheses can be stated as:

RH1: OGD Datasets support optimal solutions to managerial decision problems.

[30] http://www.microsoft.com/industry/government/opengovdata/default.aspx
[31] http://www.semantic-web.at/

RH2: OGD is an open platform that enables the creation of attractive business models.

RH3: OGD reinforces competitive advantage(s) within a firm.

We will further investigate these hypotheses throughout the remainder of this thesis.

4 RESEARCH DESIGN AND METHODOLOGY

This chapter is the backbone of the study upon which various aspects of the research (type, design, methodology, validity, and reliability) are decided.

This study is an **exploratory qualitative research** that investigates the new phenomenon of Open Government Data. Qualitative research allows for the use of procedures and mixed-methods which are, primarily, suitable in researching a new phenomenon and offer flexibility in how it can be approached (Kaplan & Maxwell, 1994, p. 37).

4.1 Research Design

The design of the research has been positioned within a paradigm of pragmatism. The choice of the paradigm is a very critical decision especially because it helps to understand (epistemology) assumptions that tend to be shared by researchers in OGD, in addition to understanding the methodological strategies that are linked to these assumptions (Maxwell, 2007, p. 223).
Professor Josef Maxwell introduced a modern model (Figure 8) for the design of a research (Maxwell, 2007).

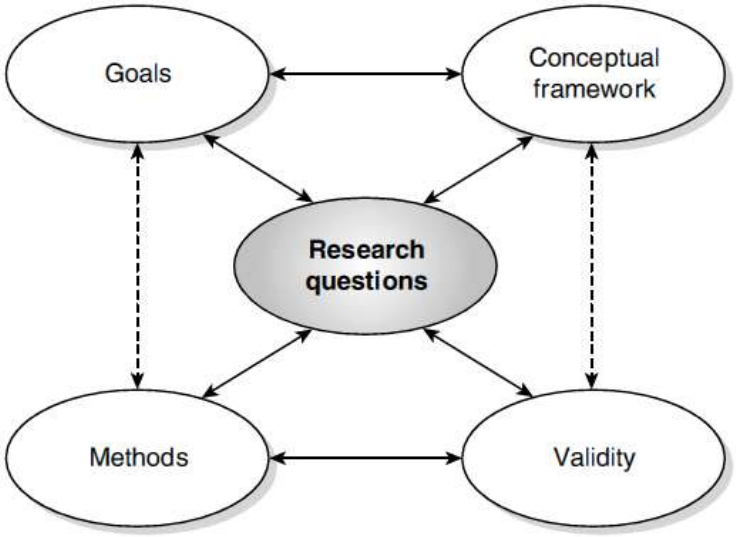

Figure 8: An Interactive Model of Research Design
Source: (Maxwell, 2007, p. 217)

This study has benefited positively from the chosen model, which provided coherence among the research components centering on the research hypotheses. In the reference model **goals** refer to the personal, practical, and intellectual goals (Maxwell, 2007, p. 217). Respectively, in the context of this research the main goals are curiosity in learning more about E-Government and OGD, to investigate OGD business models, and to find well-informed answers to the research questions.

Miles and Huberman describe a **conceptual framework** as: *"A conceptual framework explains, either graphically or in narrative form, the main things to be studied—the key factors, concepts, or variables—and the presumed relationships among them"* (Miles & Huberman, 1994, p. 18). During the period of this research, the conceptual framework has been dynamically developed. Theory is the main module; especially those theories focused on during courses at the university and had a strong contribution to building the conceptual framework that we described in Chapter 3. Moreover, the research problem is from the beginning a part of the conceptual framework (Maxwell, 2007, p. 223).

4.2 Research Methods

This study employs a **mixed-methods approach** that includes both qualitative and quantitative methods. These methods include an exploratory and literature review, participant observations, online survey, and in-depth expert interviews. The interactive methods are especially effective in understanding the meaning and the context of OGD phenomena. Achieving such an understanding is a goal of qualitative research and can be achieved by eliciting the points of view of the participants, in which the aggregated textual data remain in its inherited format (Kaplan & Maxwell, 1994, pp. 31-32).

This study is primarily an inductive research, which starts first by looking at particular phenomena through diverse methods, e.g., in-depth interviews leading to a grounded theory on which the research hypotheses can be stated. In contrast to inductive research, deductive methods first start with a hypothesis based upon an existing theory (GREENER, 2008, p. 16).

Figure 9 depicts a general outline of the methods employed along a timeline, in addition to the main objective(s) of each method. The reversed pyramid should indicate how we have approached the broad scope of OGD.

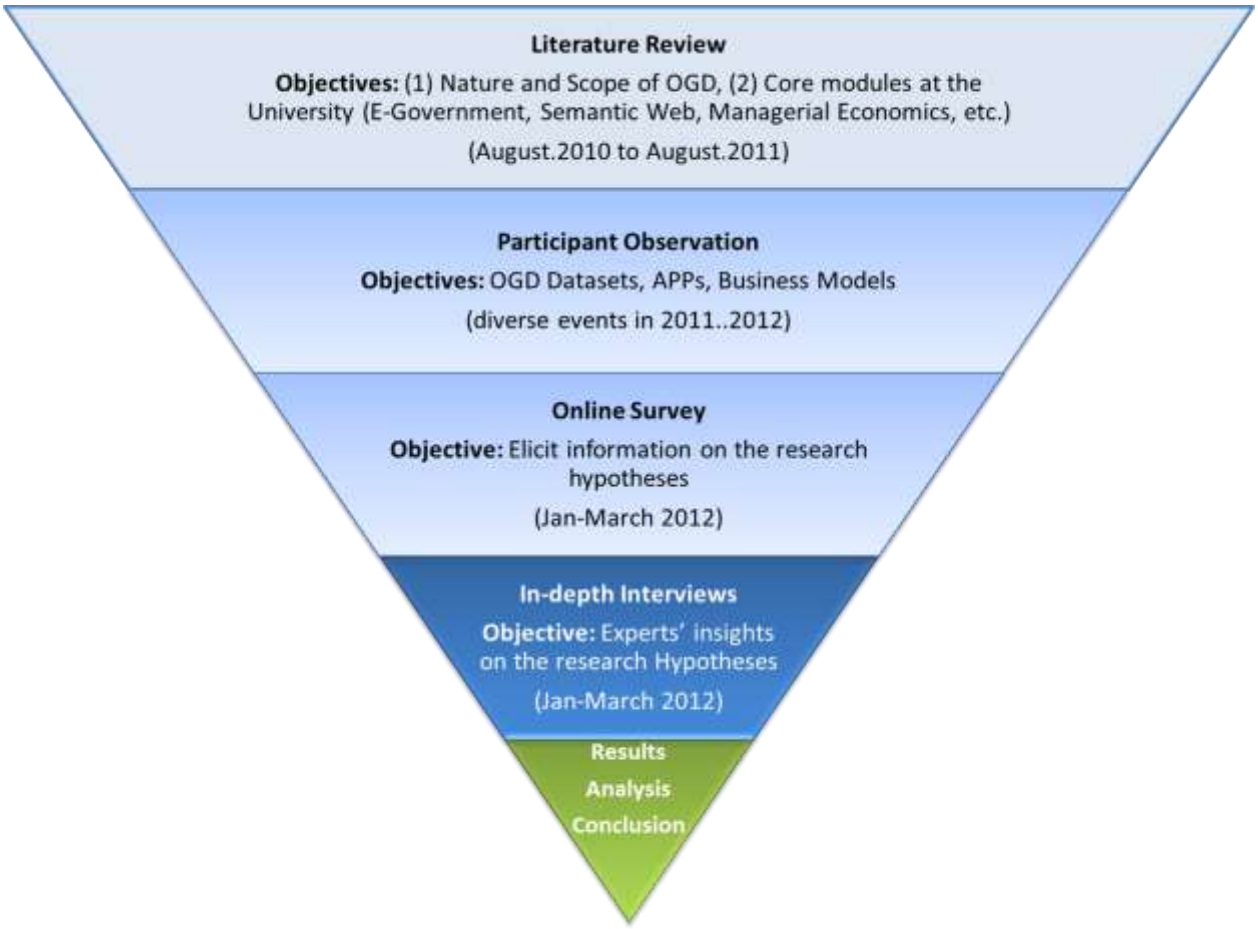

Figure 9: Research Methods in Timeline and Objectives

4.2.1 Literature Review

OGD is an interdisciplinary topic and this research has benefited from the previous study of fields such as semantic web, managerial economics and many more. This explains the long period indicated in Figure 9 in the literature review. Furthermore, extensive readings from authentic resources such as books, online media, lectures, etc. were explored for building a holistic understanding on OGD.

4.2.2 Participant Observation

With its roots in traditional ethnographic research, participant observation is a qualitative method that is necessary at the early stages of a research study. It builds relationships among different stakeholders, and the data collected through participant observation bring effective inputs into the design of other methods, such as online surveys and interviews (Mack, et al., pp. 13-14).

Luckily, this research was conducted at the early days of the OGD initiative in Austria, which allowed the author a lot of opportunities to participate in events in Vienna, where he resides. Information and observations on OGD datasets, possible business models, economic values, and developed applications were documented at the end of each event visited. Furthermore, the "Open Government Data Platform Vienna"[32] was a rich source of information not only about the schedule of the events but also with the provision of published or archived media on OGD events. Table 4 provides a short summary of the major events attended combined with the main observations that relate to the research hypotheses.

Table 4: Summary of Participant Observations

Attended Event	Participant Observations
Meeting Mr. Thomas Thurner[1] at the Semantic Web Company on the 5th of October 2010.  [1]***Thomas Thurner*** *is coordinating Semantic Web Company's Transfer Division as well as in public relations and campaigns. Thomas is also heavily engaged at Semantic Web*	Linked Data as the future technology for a national government and for the digital infrastructure of a country. The OGD is a promising economic resource that will lead to the emergence of new business models. Direct economic effects of OGD apps and services which lead to additional tax revenues. Indirect economic effects such as savings in society, in health, transport, time, etc. OGD could strengthen competitive advantage(s) within a firm through market intelligence solutions and data warehousing.

[32] http://data.wien.gv.at/veranstaltungen/index.html

Company's Open-Data-Strategy-Branch, where he is active in community building, and consulting for a growing Linked Open Government Data scene for Austria.	
First Vienna Gov2.0 Camp on the 3rd of December 2010.	Raising awareness about the benefits of OGD is one of the objectives that the Gov2.0 Camp sought. Collecting ideas from the participants on how OGD could be utilized. More than one hundred participants were discussing the theme of "open government data", Apps ideas, and initiatives. Best Apps were presented such as the application for informing and reporting about defective elevators and escalators in Vienna's subway.
Government Linked Data: A Tipping Point for the Semantic Web by Professor Nigel Shadbot at the TU-University on the 14th of March 2011	LOD (Link Open Data) was presented as the future Web technology and OGD is taking momentum where governments, local authorities, cities are releasing more data. Transparencies, accountability, and engagement improve public services, efficiency, in addition to economic and social values are among main drivers behind OGD. Principles of OGD and the five stars model of open data describe the pillars of properly opened datasets. Cloud computing, privacy, and quality of data are among the challenges that experts are working on.
OGD platform Vienna on the 29th of September 2011	There are ongoing projects on the Meta data of OGD as linked data. More datasets have been released in the sectors of transportation and forestry in Vienna. Visualization solutions that are based on open source technologies and Google maps. The question on how OGD could benefit firms was raised to the panel speakers, and in short, the answer to the research question was pointing to the apps market and to the level of innovations that will be based on OGD. Moreover, and as a

	mandatory requirement for the success of OGD business models, the quality of datasets is a pre-requisite.
EBC " Open Data: How to spur administrative data, the digital economy " on the 26th of January 2012	Raising economy via leveraging OGD capabilities is at the top of the agenda in most countries. Further confirmations on OGD as non-personal opened datasets, which are based on the principles of machine-readable formats, license-free, etc (Table 1). Very interesting is the presentation of possible OGD business models which can be organized in the following categories: - OGD as a resource for BI (Business Intelligence), MI (Management Information), and Data warehousing. For example, Media and Publishing or Transportation can benefit a lot from OGD - Applications (APPS) such as smart phone applications that run on top of OGD - Data Enrichments in which business models can provide services and solutions on integrating OGD with enterprise solutions, an ERP system with tax or financial authorities is an example - Data visualization and analytical service, e.g., Google maps - Infrastructure in which OGD services can run based on cloud computing - Open data innovation which opens the door for any possible innovative solutions that make leverage of OGD, e.g., crowd sourcing

Appendix 3 reports in more detail on the events attended and the most frequently documented observations.

4.2.3 Online Survey

The online survey is a quantitative research method that offers a very cost-efficient way in gathering information from a large number of people (Walonick, 2010). Careful consideration has been taken in the design of the survey questions and it was made available online through the free subscription in the surveymonkey.com[33]. The survey might still be hosted under the link [34](i.e., we did not delete the survey after having collected the results, however, we are not sure for how long it will last before it is removed from the website). The survey was promoted first via the mailing list in OKFN-AT[35] (Open Knowledge Forum- Austria), which was published at a later date on open3.at[36] (Network for the promotion of Open Society, Open Data and OpenGov in Austria). The survey was online for nearly two months (11. January – 15.March.2012) and collected only 27 responses. However, although the size of the sample is statistically considered as not very significant, the fact is the profiles of the participants indicate that they are experts in diverse domains. A summary of the profiles includes professionals such as computer scientists, researcher, developer, and stakeholders from other governmental areas. Therefore, we believe that the participants with their annotated comments have made the sample rich and the data valid and reliable. Appendix 2 provides the details of the online survey questionnaire and the responses.

4.2.4 In-depth Interviews

Open-ended or face-to-face semi-structured interviews pose two distinctive features. First, the respondent's views, experiences, and expertise can be elicited naturally in his or her terms, rather than to collect data in static form such as the multiple choice questions in a questionnaire. Second, the interviewer has more space in the question(s) posed to the interviewee in order to elaborate, follow up or probe for more information, and the interviewer is not bound to a constant set of questions (Kaplan & Maxwell, 1994, p. 39).

[33] http://www.surveymonkey.com/
[34] http://www.surveymonkey.com/s/5Z699LM
[35] http://lists.okfn.org/mailman/listinfo/okfn-at
[36] http://www.open3.at/2012/01/open-government-data-news-mix

Four semi-structured interviews were conducted with experts from different domains (academia, IT industry, and public administration). Table 5 provides a list of the experts who were interviewed.

Table 5: Interviewed Experts in E-Government & OGD

Experts in E-Government/OGD	Short Profile
	***Mag. Dr. Bernhard Schandl*** *has been a researcher at the University of Vienna since 2004 and has been actively driving development towards the semantic desktop in the SemDAV and MobiSem project. He finished his PhD thesis in the field of semantic desktop infrastructures, for which he won the Award of Excellence by the Ministry of Science and Research in 2009. He has published numerous papers about semantic technologies and gives multimedia and semantic web technology lectures at the University of Vienna and the University of Applied Sciences Technikum Wien*[37]*.*
	***Martin Kaltenböck*** *in 2000 was co-founder of punkt. netServices - an Austrian company specialized on information- & knowledge management as well as on Enterprise 2.0 solutions.* *He is managing partner of the Semantic Web Company and as CFO is responsible for financial and organizational issues.* *He is a Certified Management Consultant since 2006, member of the Executive Board of the Austrian Chapter of the Open Knowledge Foundation & the OGD Austria. He is working as an invited expert of W3C*[38]*.*
	***Mag. Dr. Gregor Eibl*** *is a consultant at the Austrian Federal Chancellery, and he is responsible for Usability and Accessibility, Mobile signature and expansion of signature applications, E-government innovations, and EU eGovernment benchmark*[39]*.*

[37] http://www.getrefinder.com/about/content/company
[38] http://www.semantic-web.at/de/users/martin-kaltenb%C3%B6ck
[39] http://www.digitales.oesterreich.gv.at/site/5601/default.aspx

	**Ing.[in] Brigitte Lutz** *is working in the Office of the CIO, City of Vienna. In her employment history she is listed as ICT expert for various fields, project manager, Senior Process Manager (SPcM) and E-Government expert. She is founding member of the "Cooperation Open Government Data (OGD) Österreich", where federal, state, cities and towns want to lay the groundwork for cooperation with communities, science, culture and economy for the future of Open Government Data in Austria.*

These interviews enabled us to conduct comparisons with the previously collected data. Because of the experts' flexibility and help it was possible to conduct all the interviews face-to-face and also to record the interviews. The questionnaire was designed in four sections, in which each expert was presented with a minimum of three questions related to each hypothesis.

The recorded interviews were transcribed and sent back to the interviewees for validation and approval. The data collected from these interviews is the primary data in this research. The primary data is complemented by secondary data from the online survey and participation in relevant events. Appendix 1 provides details about the profiles of the interviewed experts in addition to the final versions of the transcribed interviews.

4.3 Data Collection and Analysis

Regardless of which data collection method is used in a qualitative research, Maxwell explained two key design issues that have to be considered in the choice of a data collection method. First, *"the relationship between research questions and data collection methods"* (Maxwell, 2007, p. 235). For the purpose of this study, the questions did not follow a mechanical translation of the research hypotheses; rather in each method the questions were designed based on a holistic understanding of the topic with the main objectives in mind to elicit participants' insights. The second issue is *"the triangulation of different methods"* (Maxwell, 2007, p. 235). The data collection from the anticipated research methods result in triangulating the findings in such a way that allows cross-comparisons among the three empirical methods.

Data analysis goes hand-in-hand and simultaneously with data collection, which allows the researcher to progressively give more attention to the interviews and observations and to ultimately reinforce a decision upon which those conclusions that emerge can be tested (Maxwell, 2007, p. 236). This applies as the general rule of data analysis in this study and in each stage as we were collecting the data and analyzing it simultaneously. This can be noticed in how the interview questions look different than the survey questionnaire. Furthermore, qualitative analysis in general follows strategies that fall into three groups: categorizing strategies, connecting strategies, and the strategies of memos and displays. (Maxwell, 2007, p. 236)

In this research we have employed a mix of those strategies. Coding is an important instrument that has been used after collecting the data. Data segmentation and categorization based on the most apparent themes provide concrete insights and facilitate comparisons. Analytical memos are frequently used as another instrument that helps in interconnecting relationships among captured themes. "Displays" is the third instrument which offers data reduction through analyzing data using visual techniques such as depicted diagrams. (Kaplan & Maxwell, 1994, pp. 238-239).

4.4 Validity

Validity is a basic component in Maxwell's research design (Figure 8). At the start of describing his design model, Maxwell raised the following questions on validity:

> *How might your results and conclusions be wrong? What are the plausible alternative interpretations and validity threats to these, and how will you deal with these? How can the data that you have, or that you could potentially collect, support or challenge your ideas about what's going on? Why should we believe your results?* (Maxwell, 2007, p. 216)

This study follows a validity strategy that takes into account the check list provided by Maxwell, in which validity threats are avoided and conclusions can be withdrawn with higher credibility and reliability (Maxwell, 2007, p. 236). *Intensive and long term involvement* is the first measure against validity threats. During this study we found ourselves often in many settings of OGD, and out of these diverse activities the threat of getting stuck on one specific observation was avoided by evaluating other alternatives and hypotheses. *"Rich" data* refers to the data that we

collected during the intense involvements and interviews were made "rich" through recorded interview, transcribing, and the final approval from the interviewees. *"Respondent validation"* assumes that all interviewees gave unbiased, e.g., ambiguity in the question, responses to the questions asked. In the survey, respondent validation was taken into account in the design of the questionnaire, which was formulated in the best way possible to ensure that the participant correctly understands the question. "Searching for discrepant evidence and negative cases" during the study, both supporting and discrepant data were evaluated and examined before giving a final conclusion. *"Triangulation"* is the fifth measure against any threats in validity and the mixed-methods planned in the study have made triangulation part of data collection. "*Quasi-Statistics"* is where the results are withdrawn based on some implicit quantitative statistics. Quasi-Statistics do not apply to this study as there is no inherited numerical-statistics on OGD, simply because it is new phenomena. *"Comparison"* is the last measure in the checklist, which also does not apply to our study. Comparison is mostly used in quantitative research as well in *multisite* qualitative research. (Maxwell, 2007, pp. 244-245)

4.5 Ethics Considerations

"I believe that ethical concerns should be involved in every aspect of design"
(Maxwell, 2007, p. 216).

Throughout this study ethics have been taken into account either in activities carried out as part of the study at hand or in the design of the survey and in-depth interviews. For example, care has been given in preserving anonymity of survey participants and the confidentiality of participants' private data. Ethics have been taken into account as well before and after the interviews.

5 RESULTS AND ANALYSIS

This chapter reports on the results collected and simultaneously analyzes them. In our study, as is the case in many other qualitative researches, the results and analysis go hand-in-hand especially when there are no in-depth computer-based results. Therefore, the results and their analysis will be presented together.

In order to make it easier for the reader to follow the results and analysis, Table 6 is a highly consolidated summary of the whole chapter, which presents the common themes, results of collected data from each method, and a short conclusion.

Table 6: Consolidated Results and Analysis

Common Theme	Empirical Methods: 4 In-depth Interviews (Primary Data)	Empirical Methods: Online Survey (Secondary Data: 27 Respondents)	Empirical Methods: Participant Observation (Secondary Data)	Conclusion
Economic Benefits of OGD	Indirect + direct benefits	100% indicated economic benefits	Indirect + direct benefits	High economic benefits
The role of OGD within a firm + number of firms already using OGD	(very important role: data enrichment, business intellegence,etc.) + currently there are few firms use OGD		(Panel talks on economic potential) + very few, e.g., niche segment such as Statistics Austria	Very important + use of OGD within firms still at the start
OGD Business Models (BM)	In practice there are very few but trends show high potential in the future	65.4%: "there are OGD BMs" 34.6%: "no existing BMs"	Niche market: such as government agencies, a few in early stages, possible BMs through innovation	BMs are few, innovation and know-how driven
OGD as an open platform	One expert supported the argument, one rejected it, and two experts partially supported it		Open Platform was not a big issue, strategic implementation of OGD and release of datasets is at most	Partially supported
OGD is a source of competitive advantage	Two experts supported the argument while two others only partially did	Optimizing their operations: 66.7% Saving costs 58.3% Acquiring new projects 41.7% Forecasting demand 33.3% Minimizing risk 12.5% 5	Never observed as a topic	Partially supported
Recommended Strategy	Company specific	N/A	Company specific	Company specific

From the brief overview in Table 6, the results and analysis will progress forward by elaborating on each theme separately and under the guidelines of the citations taken from the transcribed primary and secondary data.

5.1 Economic benefits of OGD:

This section focuses on the most common theme of economic benefits of OGD. This theme addresses the three hypotheses in many ways. In general, the results, as presented below, confirm that OGD provides direct and indirect economic benefits as described in the hypotheses, i.e., the use of OGD datasets within a firm and the possible OGD business models as well the creation or reinforcing of competitive advantage(s) within a firm.

Mr. Kaltenböck, when looking back to the evolution of the E-Government up to today's OGD, what were/are some major economic benefits that resulted from E-Government/OGD initiatives?

> *"Well, in principle there are indirect national economic effects coming up first or at this moment out of OGD, and business economic benefits are still at the beginning because publishing of OGD was the first thing. I know something that is always very interesting that is influenced me in the United Kingdom, because they have the law that they have to give the data all people who request it, and by opening the data they only open it and publish at once and those thousands and thousands of requests on opening data are not necessary anymore. So that was really big benefit to the U.K government, in which huge costs savings are achieved. In contrast to the law of freedom of information in the U.K, in Austria people have to proactively request a data holder to publish the data, and then the data holder decides whether to publish the data or not."* (Kaltenboeck, 2012)

In his answer Mr. Kaltenboeck has summed up many facts all at once in connection to the economic benefits of OGD as well as to the requirements of a national directive that reinforces the release of the data. Indirect economic benefits are the first outcome of OGD. One example is the reduction in taxes or costs that some stakeholders had to incur –before OGD- in acquiring old proprietary data. We agree with him on the fact that OGD datasets are the first to come in order for entrepreneurs or firms to start commercializing them. Back to Kaltenboeck's answer, regarding the FOI (Freedom of Information) law in the UK, which provides a great example of the power of opening data. Specifically, the UK is known as the world's pioneers in the development of Semantic Web and Linked Data technologies. This answer can be linked in many ways to different areas of the thesis such as the literature review about OGD in the UK or to the section about web technologies, or if someone wants to observe OGD as a whole in the macroeconomics domain.

Other valuable insights were given by Mr. Eibl when answering the same question:

"Well, there are some major common economic benefits which resulted from E-Government and OGD; however, in my listing to these benefits I will separate them into E-government and OGD benefits, respectively.
For E-government, there are the major benefits that are resulting from digitalization. In former days someone had to go to government offices and to do a lot of paper-work, in which costs of time and money not to ignore. In contrast to the past, with digitalization we have faster processes and 24-hours open virtual offices which of major economic benefits for people and companies, especially, without local necessities (you don't have to come to the office). Of course these are the benefits of digitalization in general, no matter if it is e-government or if a company goes digital ready!

For OGD initiatives, I think one of the main benefits is that the government itself and the ministries become more transparent. And though it is hard to quantize the value of transparency, it has an enormous economic value. Moreover, opening data and working with outsiders, e.g. third party companies, results in the great benefit of the cooperation effect. New business models, Apps, and feedbacks are examples that explain the benefits of cooperation effects based on opening data. The opening process brings new inputs and feedbacks to the governments." (Eibl, 2012)

In his answer Mr. Eibl highlighted the key role of digitization, i.e., E-Commerce in our case, as the main enabler to initiatives of E-Government/OGD. This supports the research and especially the sections dedicated to web technologies, i.e., understanding -without necessarily being experts in SW or Linked Data- the technology around OGD is a pre-requisite for firms that want to work on OGD datasets. Transparency is another important fact. "*And though it is hard to quantize the value of transparency, it has an enormous economic value,*" which brought with it the "*cooperation effect.*" These arguments serve two objectives; the initiative of OGD itself and they shed light on the "*cooperation effect*" as a principle for startups in the OGD business sector.

How does OGD contribute to the economy?

"As mentioned earlier, OGD is a public resource and — though I am not an economist — according to the "limited resources" theory, the more resources made available the more economic benefits are expected. That is simply applies to OGD as well. I consider OGD as being a limited resource, because it cannot be generated arbitrarily — it depends on the public authority to collect and provide these data. Still, OGD as a resource and in comparison to other natural resources like water or oil, OGD has the big advantage that it can be copied arbitrary times, so anyone can benefit from it without restrictions." (Schandl, 2012)

Mr. Schandl's answer, in particular, sheds light on another "*"limited resources theory*" which could be the basis for another study on the economic values of OGD. In our research, "economic theory" is chosen as the root theory for the hypothesis addressing the key role of OGD in managerial economics. Both theories seem to theoretically advocate the real economic values of OGD. Moreover, considering OGD as an inexhaustible resource reinforces the ambition of

many stakeholders to invest time and know-how in leveraging the possibilities arising from OGD.

From the online survey, the answers to the question: "**3. Which economy sectors benefit the most from OGD?** " have resulted in: 69.2% Government's Agency, 65.4% IT and Communications, 61% Tourism, 53.8% Education and Transportation, 30.8% Health and Law. Although the survey had only 27 responses, which could be classified as an insufficient sample, the profiles of the participants make these results very reliable and trusted. The participants reflect a wide range of expertise from researchers, lecturers, developers and CEOs. One participant has inserted a comment on the economies of OGD:

> *This depends on the particular data that government has released, and the wider economic and legislative context. There are different opportunities in each sector. For example, if a country is liberalising it's health and education markets, then open data has a powerful role to play in helping efficiency of the markets in those sectors. By contrast, if health and education are primarily state-provided, with little roles for a competitive market, open data will have different effects (e.g. creating patient / student pressure on institutions, the success of which depends on political rather than economic factors). In most contexts, Transport data stands to have a big impact on that economic sector. Governments have the possibility of obtaining significant efficiency gains through OGD if managed correctly. IT is likely to benefit from increased investment in data processing skills and capacity. Source: (Survey-Participant)*

5.2 The role of OGD within a firm

This section analyzes the results on the objectives of using OGD within a firm, and answers the question of which datasets should most often be used. The experts' recommendations not only tell which technologies have to be used when dealing with OGD, but also indicate how many companies already make use of OGD. The outcomes of this theme, in particular, contribute a great deal to the RH1: OGD Datasets support optimal solution to managerial decision problems.

In survey question 4: " **In your opinion, how does OGD enable companies to achieve higher competitive advantages?**", participants expressed their opinions for the objectives as follows: 66.7% Optimizing their operations, 58.3% Saving costs, 41.7% Acquiring new projects, 33.3% on Forecasting demand, and 12.5% on Minimizing risk.

While the question was meant purely to elicit information on the competitive advantages, it also draws on how OGD can be used in practice within a firm. Other valuable comments were inserted by two participants:

> *"We need local, useful, daily data such as rent, information about local supermarkets: product and its features, medical center and services. Open data should help people to make daily decision around them."*

> *"Companies can use OGD to Enhance the own sales detail to generate more details and focus sale plans."*

Datasets and which OGD categories are of greatest benefit to firms are probed in the survey question: "5. Which types of OGD would provide the highest benefit for companies?"Looking at the answer to this question, the highest rate recorded is 79.2% for Transportation Networks, followed by 66.7% for datasets of Cultural, Society, and Demographics. 58.3% chose datasets for Business and Economic & Utilities and Communication & Imagery and Base Maps. 41.7% indicated datasets for Locations and Geodetic Networks, and 33.3% for Facilities and Structures. Less valued are Datasets of Military, Inland Water Resources, as well as Elevation and Derived Products.

These datasets are included in the LOD2 survey[40] for the question: "**Q3: What domains of data are you interested in?"** (Nagy, Thurner, & Kaltenboeck, 2011, p. 9).

Furthermore, the comment in our survey: "I believe all these types could have the same opportunity to provide benefit, it depends on the level of competitiveness and maturity of a specific sector in a specific country or jurisdiction" was found to be true. We agree with the participant that OGD datasets, in general, should be used in various ways in the business context. However, that could be the case when thousands and thousands of datasets have already been released. The results and rates produced in this study also reflect which categories of datasets there are.

In terms of the technology, we have a consensus that Linked Open Data is the recommended technology that properly leverages OGD datasets. Interviewed experts, participant observation, and in many other settings such as webinars on OGD, have all in many ways explained the advantages and capabilities of Linked Data. Visualization, data analytics, cloud computing, and other disciplines can be put together via Linked Data which ultimately become part of the Ecosystem. Schandl explained important facts about OGD and Linked Open Data:

Are there any specific recommendations on technologies that companies should employ for better leveraging OGD? (e.g., Linked Data, Semantic Web, etc.)

> *"My first recommendation is that, regardless on specific technology such as Semantic Web or LOD, the data itself must be 'web relevant" and not "technology relevant". Second recommendation is to use open formats instead of proprietary ones. My third recommendation is to have a look at the LOD five stars model, which was recommended by Sir Tim Berners-Lee* (see section 2.2.3)

[40] http://wiki.lod2.eu/display/LOD2OGD/Interest+in+Domains+of+Data

> *More to mention is about LOD as a web technology that enables data providers to establish links between datasets and therefore makes data discoverable. With respect to the Semantic Web, I would say that the expectations that were put on SW were overloaded. The core issue of the Semantic Web is simply to make data machine-readable, and to make it possible to gain knowledge out of the data that is published on the Web."* (Schandl, 2012)

Mrs. Lutz described Linked Open Data as a technology that has already been implemented in Austria for both OGD datasets and their Meta data:

> *"Linked open data is the aim for technology used for OGD in the cities of Vienna and Linz. Others will follow; Salzburg and Graz in addition to the Austrian portal are to come in the beta version of data.gv.at in April 2012. Additionally, on the Austrian portal there will be the Meta data from all cities at the Austrian portal. Linked open data will be interesting with the European Portal which again will be the central portal for all EU member states."* (Lutz, 2012)

Regarding the number of companies that already use OGD, we have another consensus that the statistics show very few firms using OGD. Mr. Kaltenböck estimated nearly ten firms make use of OGD in Austria:

Based on your knowledge, how many companies do already use OGD?

> *"About ten not so much, because most of the people based on a previous comparison before are in the open source area, hacker area, and a lot of things have been developed by one-man companies or by some people who are playing around with OGD and they have other jobs. In the Europe level there are more companies in the U.K, Finland, or the Scandinavian in comparison to the number of OGD companies in Austria."* (Kaltenboeck, 2012)

Moreover, in her answer to a similar question Mrs. Lutz pointed to the central portal of the apps as a measurement of the number of companies that use OGD. She pointed as well to a study that reflects an estimated increase in the number of firms that will work on OGD.

Are companies in Austria/Vienna interested in using OGD?

> *"The 26 OGD Apps, i.e. http://data.wien.gv.at/apps/, could be a good indication on how many companies already use OGD in Vienna. These apps reflect a mix of private and companies' developers both have interest and make use of OGD. Additionally there is a study which had shown that there are between 100 and 150 companies in Vienna that could make use of OGD"* (Lutz, 2012)

5.3 OGD Business Models

This section provides the results and analysis serving the second part of the RH2: OGD is an open platform that enables the creation of attractive business models. Both primary and secondary data has provided rich information in support of the RH2 on the potential to create attractive OGD business models.

Details and categories of business models have been explained by Mr. Kaltenboeck during the interview when he was asked:

> Thank you, and are there any business models on which revenues are based on OGD/E-Government?
> *"……..there are three areas or possibilities for OGD business models. The first one is the content production of OGD or public administration, in which there is a value chain of content production in addition to other services …"*
> (Kaltenboeck, 2012)

From the explanations that were provided by Mr. Kaltenboeck, we can cite the following possible areas for OGD business models. Additionally, the transcribed interview with Mr. Kaltenboeck is available in Appendix 1.

Content production of OGD is an area in which OGD business models can be part of the value chain. Examples of business models in this area are:

1.1 Business models that focus on the collection of OGD from public administration
1.2 Business models that work on the production of the OGD itself
1.3 Business models that focus on the standardization and harmonization of produced OGD
1.4 Business models that focus on the delivery of the IT-infrastructure

Published OGD is the second area in which OGD business models focusing on the use and re-use of the OGD could exist. Examples of business models in this area are:

2.1 Business models that leverage OGD as an open resource and provide services such as business intelligence, market research, enriching the enterprise data-warehouse, mashing-up data, and large scale data integrations.
2.2 Business models that develop mobile Apps, such as smart phones applications which build geospatial data.
2.3 Business models that work hand-in-hand with editors and publishers. For example, publisher information will be enriched from knowledge drawn out of OGD.
2.4 Business models that specialize on data visualization and analysis.

Open Data, in general, in which collaborative business models could co-exist among OGD and other data released by enterprises. As an example there is a new trend for some enterprises to open their data for innovation and for the benefit promised by LOD.

In the survey, some participants provided examples of existing OGD business models. For example, datamarket.com[41] is a business model which provides access to thousands of datasets from governmental and private providers such as the United Nations and the World Bank.

[41] http://datamarket.com/

Searching visualizations and comparing facts are some of the functions possible for users of their portal. Another participant pointed out, *"I have only seen a few, walkscore.com is the best example of taking an app from a competition and moving it to a commercial venture."* Exploring walkscore.com[42] shows their engagements in data manipulation, which includes OGD. A third participant noted that *"Yes Socrata, mycityways.com and chromaroma,"* from which we found Socrata.com, a leader in the development and delivery of Open Data Services. Socrata.com also provides services to Data.gov - the OGD portal in the US. MYCityWay.com[43] is an innovative business model that provides mobile solutions for navigating cities. MyCityWay.com extends its functions to include exploring other cities around the world. Locating a nearby restaurant or the nearest wireless hotspot, or buying tickets are some of the possibilities made real with the use of OGD data. Chromaroma.com[44] exploits transportation datasets in London and displays the journey one has to make.

The analysis of OGD business models is very interesting. However, if we proceed with such an analysis then we will be running outside the boundaries of this thesis. Therefore, we conclude with a final comment from a fourth survey-participant:

> *"A) Enrichment of OGD to get valuable data products to re-sell B) Hosting of unstructured OGD from various sources and provide common, harmonized interfaces (Socrata, Factual, Google) C) Micro-entrepreneurship using OGD in mobile Apps."*

5.4 OGD is an open platform

A part of the hypothesis (RH2: OGD is an open platform that enables the creation of attractive business models), we have in section 3.2 explained our support for the vision of OGD as an open platform. Therefore, the analysis of the results presented in this section report on the data collected and an analysis of them in connection to OGD as an open platform.

What is your opinion about the argument that OGD is an "Open Platform"?

> *"Yes I think OGD is an open platform because we use open data format, it is open licensed, and the data itself is open for use and re-use. If you look in the documentation of our strategy and the OGD model you will find out that the document principles and technical specifications are all compatible with the principles of an open platform."* (Lutz, 2012)

Mrs. Lutz referred to the framework published on the strategic implementation of OGD in Austria. The document focuses on the strategy and entails not only the open commons such

[42] http://www.walkscore.com/professional/research.php
[43] http://www.mycityway.com/
[44] http://www.chromaroma.com/

Open Source, Open Content, Open Government, but it states that OGD should be an enabler of economic success through the open access to OGD resources such as the datasets (Krabina & Prorok, 2011, pp. 10-11).

Mr. Schandl does not see OGD as an open platform, rather, as another web resource:

> *"I do not consider OGD as a "platform"; instead, I think it's a sort of application of the Web, which is a truly open platform. OGD, like many other resources, can be accessed via the web, but it's not a platform as such."* (Schandl, 2012)

Furthermore, one expert added an important comment to the survey question: **1. Open government data (OGD) is an "Open Platform" which enables the creation of a multitude of business models:**

> *"If multitude is taken to mean 'many' - then the statement is true. But if multitude is interpreted as meaning 'virtually unlimited', then the statement is not true. Open data enables certain forms of business model; but also undermines others."*

'Virtually unlimited' is actually what we meant in this question. One reason for our optimistic vision with the multitude of business models is that we think that OGD has the capacity to unleash innovation for unlimited business models.

5.5 OGD as a resource for competitive advantage(s)

This section provides details of the results that feed into the RH3: OGD reinforces competitive advantage(s) within a firm.

Can you please explain how OGD enables companies to build competitive advantages and optimize their operations?

> *"This is a tricky question. For an example, look at companies who get their data from the government and such companies earn their money by simply selling hard copies of specific governmental data such as new laws. These companies currently have an unfair competitive advantage since no other publisher has access to these documents. OGD can change that.*
> *Just contrary: I think that OGD cannot give a competitive advantage to a single player on the market, because by definition OGD is open to be used by everyone, and therefore all players have the same opportunities. However, I think that a country that provides OGD has a competitive advantage against other countries who do not offer OGD, because it will make the economy and the private sector more educated and more efficient."* (Schandl, 2012)

In his answer Mr. Schandl makes it clear that OGD is not a panacea for a firm, but it does provide competitiveness at the macro-level of a country. Kaltenboeck sees possible competitive advantages through OGD: *"I think it is similar little bit to what we have been talking before; it is the*

data enrichment and data mash-up possibilities. You get your own data-warehouse and you can enrich it from the outside and you can build up some mash-ups and put data together and create new knowledge out of it. New ideas, find new better basics for decision making and the like are great advantages when starting to use OGD." (Kaltenboeck, 2012)

To refer to some of the comments to the survey question: "**4. In your opinion how OGD enables companies to achieve higher competitive advantages?"** one expert described it as such: "This varies significantly by sector and size of company." Whereas a second expert wrote, "Companies can use OGD to Enhance the own sales detail to generate more details and focus sale plans."

5.6 Recommended Strategy

This section presents the final theme amongst those receiving the greatest attention in the data collected. Actually, the recommended strategy was in many cases researched during the study to determine the general goal that OGD can be beneficial to the three research hypotheses, i.e., possible, precise recommendations for the strategic realization of the RH1, RH2, and RH3.

What strategies firms have to be deploying for monetizing OGD?

> *"Strategies differ from one firm to one another on how OGD can be leveraged. However, there is a huge Apps market on the international level which is expected to grow, and OGD Apps could be such business models in the future. Theory and literature, e.g. the Personal MBA Book, recommend diverse strategies to include OGD business models, but the empirical business models of OGD are still considered to be at the start."* (Eibl, 2012)

Enlightened by the theory and literature, Mr. Eibl recommends leaving the choice of which strategy to apply up to the firm itself to make. Another important argument is that the empirical business models of OGD are still in their very early stages.
Also Lutz sees that there is no ready-made strategy that fits all firms, and she agrees with the opinions of others who say that the strategy depends on the company itself.

> *"This depends on the firm itself and own strategy. I think there are a lot of business models because they can take the data and re-publish it in another way. For example, last week I saw from New York City, ("I send another link" http://nyc.pediacities.com/facets/), that is a company which distributes the data in another Semantic formats and over timelines and so on.*
> *Another possibility for an OGD business model can be explained in the following scenario:*
> *City of Vienna runs the Open data catalogue on her own ICT-infrastructure. So we can afford to publish OGD by ourselves, but maybe for smaller cities who lack to IT-infrastructure resources that creates possibilities for companies to monetize OGD via business models that publish OGD for smaller cities or host data with very high service levels."* (Lutz, 2012)

Furthermore, Mrs. Lutz pointed out the re-production of data in other formats, as well the delivery of IT-Infrastructure as a possible business models within a firm strategy.

6 DISCUSSION AND CONCLUSION

In the light of the research hypotheses and their theoretical frameworks, this chapter discusses the results and analysis presented.

6.1 RH1: OGD Datasets support optimal solution to managerial decision problems.

Data enrichment, business intelligence, forecasting demand, and market research all could be strategic units within a firm. The results and analysis have shown that OGD can exist as free resource in all those units and even more. These findings reinforce the validity of the hypothesis on the role of OGD in the model of managerial economics (Figure 3). The raw data from OGD datasets can be exploited as inputs of macroeconomics inside the economic theory. The raw data could be then processed with the application of econometrics, e.g., regression analysis. The outcome of this application could be valuable knowledge that reinforces an optimal managerial decision for a specific problem(s).

Furthermore, new technologies, such as Linked Data, visualization, or Google analytics, could be used to present the results of econometrics on OGD in a very useful manner, e.g., dashboards, which lead to optimized operations and support decisions made in a firm.

This leads to a conclusion on the validity of the hypothesis that OGD datasets support optimal solutions to managerial problems.

6.2 RH2: OGD is an open platform that enables the creation of attractive business models.

Whilst this study has focused on a few real cases and companies employing OGD business models, e.g., datamarket.com, in reality there are hundreds of already developed and hosted thin and thick applications. Each of these applications might be seen as a business model by itself, nevertheless, they show a strong entrepreneurial spirit that motivates the development

of such innovative applications and solutions on top of OGD. Porter's five competitive forces framework (Figure 4) is a known reference model that shapes strategy and measures the attractiveness of a business within industry. We have found that our findings to some high extent reinforce the theoretical analysis conducted using Porter's Five Forces Model (section 3.2). Moreover, the explored business models on OGD have also shown how their concepts are innovation-driven and based on know-how in many domains.

The hypothesis that OGD is an "Open Platform" was initially based on our support of O'Reilly's vision on Government 2.0 as an open platform, and it was further discussed in this research in discussion with other stakeholders, i.e., mainly in the survey and in-depth interview. The findings on OGD as an "Open Platform" were found to be contradictory, although there are a greater number of supporters of the idea. Based upon these opinions we came to the conclusion that OGD, in its current state, is an "enabler" to business models rather than an "open platform," as initially stated in the hypothesis. An open platform can be realized in the future when thousands and thousands of datasets have been released, in addition to the important criteria on the materiality of the datasets, i.e., datasets are released and ready to use without any extra steps. It is important to ensure that the users do not have to export the data first and then update the exported contents to make it possible to complete the task planned.

Therefore, we believe that the hypothesis that "OGD is an open platform that enables the creation of attractive business models" is only partially true at this moment in time.

6.3 RH3: OGD reinforces competitive advantage(s) within a firm

In section 3.3, based on Porter's generic strategy, we have concluded with the assumptions that OGD reinforces the competitiveness of a firm through cost savings and differentiation.

The findings delivered with this hypothesis were found to not always support what we have stated. However, more supporting feedback suggested that OGD reinforces the competitiveness of a firm in many ways, such as optimizing operations and through the acquisition of new projects. Some others have limited competitive advantage through OGD when applied to

specific sectors, e.g., tourism, and in some cases to oligopoly firms such governmental contractors.

Furthermore, in our hypothesis we include OGD business models that could create competitive advantages, which in most cases should be innovation-driven. Therefore, we believe that the hypothesis stating that "OGD reinforces competitive advantages in a firm" is true.

6.4 Implications

Implications of the study as a whole, including the previous chapters, and the discussion of the results and analysis are important to highlight. In the real world we anticipate that the model of OGD introduced within managerial economics will be technically implemented in many enterprises. The hypothesis that "OGD Datasets support optimal solution to managerial decision problems" is found to be true based on our exploratory research. If we would have had the chance to validate the hypothesis in a real setting then we would have considered key solutions, such as mash-ups, web services, or to work with a web designer in order to have OGD datasets somehow fed inside the firm's CRM system or to another decision making application. Another implication in practice is that the topic "OGD" will be part of the agenda for meetings held by enterprises. OGD is still in its infancy and in the near future we predict it will be an important issue for an enterprise and its employees. A third implication is the replication of OGD itself as a showcase and successful implementation of Linked Data. We predict that firms will follow suit by evaluating how to link their data (without undermining security or competitiveness) with public data.

On the theoretical side implications could be more than what we expect here. The reader might discover ways to link this study to other theoretical domains. Nevertheless, we expect the theoretical frameworks already referenced will be consulted with other methodologies in studying the impacts of OGD in some other conceptual frameworks. The interviewed experts have mentioned two other theories "limited resources in economy" (Schandl, 2012) and "Personal MBA Book" (Eibl, 2012), which could be employed in future studies.

6.5 Contributions and Conclusion

This study contributes to the future of OGD'S economic values in three ways. Firstly, the proposed theoretical managerial economics framework can be used within a firm for optimal solutions to problems. Secondly, Michael Porter's Five Forces of Competition provided theoretical analysis of the attractiveness of OGD business models. Real world cases have also shown evidence in successful OGD firms that support the analysis presented in this study. The third contribution is the integration of OGD datasets in Porter's frameworks in generic strategies and sources of competitive advantage. Through these contributions we further conclude that the main research question, "What are the implications of OGD?" has been answered.

The implications of this study are concluded by highlighting the application of the findings within a firm and a suggestion for more focused research in the future.

6.6 Directions for further research

This study has theoretically explored the use of OGD within a firm as well OGD as its very own business model. Future research needs to test and validate the theory within a firm. Another recommendation is to focus on datasets from a particular sector. For example, future research might take place within a tourism firm where tourism datasets are mostly used in the IT-infrastructure of a hotel.

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APPENDICES

Appendix 1: In-depth Interviews

Interview Questionnaire:

Interview questions for an expert in OGD

In the picture below, each chapter represents one hypothesis on how OGD could benefit companies. The survey and interviews try to gather inputs for each hypothesis/chapter.

Chapter1: Literature on the origins of OGD

A. When looking back to the evolvements of the E-Government reaching to today's OGD, what some major economic benefits were/are the result of E-Government/OGD initiatives?
B. Is it of your goals to support economic development by publishing open data?
C. What common strategies have to be deployed for monetizing OGD?

Chapter2: Technologies used in OGD

a) Do you offer support for companies who want to use OGD? What kind of support (e.g., helpline, special data formats etc.)?
b) Are there any specific recommendations on technologies that companies have to employ for better leveraging of OGD? (e.g., Open Data, Semantic Web, etc.)

Chapter3: OGD as an open Platform

i. What is your opinion about the argument that OGD is an "Open Platform"?
ii. Which economy sectors depend heavily on OGD? How these sectors make use of OGD?
iii. The Guardians on the 12th of December 2011 has reported the following about "EU gets open data strategy":

"The commission said that if adopted, these steps could boost the EU's economy by up to €40bn a year."[1]

Does Vienna/Austria align its strategy in OGD with the EU open data strategy? What do you think about the European movement?

[1] http://www.guardian.co.uk/government-computing-network/2011/dec/12/eu-open-data-strategy-neelie-kros-european-commission

Chapter4: Economy Theory and the role of OGD

1) In general how OGD contributes to economy?
2) Are companies in Austria/Vienna interested in using OGD?
3) How many companies do already use OGD?
4) Can you please in short explain how OGD enables companies to build competitive advantages and optimize their operations?

Appendix 1: In-depth Interviews

(1) Interview with Dr. Bernhard Schandl on the 10th of January 2012

"Mag. Dr. Bernhard Schandl has been a researcher at the University of Vienna since 2004, and has been actively driving development towards the semantic desktop in the SemDAV and MobiSem project. He finished his PhD thesis in the field of semantic desktop infrastructures, for which he won the Award of Excellence by the Ministry of Science and Research in 2009. He has published numerous papers about semantic technologies and gives multimedia and semantic web technology lectures at the University of Vienna and the University of Applied Sciences Technikum Wien. He is also an active musician and enjoys playing drums and violin"[45].

Dr. Schandl, when looking back to the evolution of the E-Government up to today's OGD, what were/are some major economic benefits that resulted from E-Government/OGD initiatives?

Well, I can answer this question from both economic and private prospects. First, through e-government services and government data that is published using web-based technologies, both economy and private people can benefit by saving a lot of time and money. Online services such as tax/custom declarations, medical insurance, or registering a new firm, are a few examples that resulted from these initiatives in which time and costs are saved.
Second, more transparency, accessibility to data, knowledge delivery to the people are among other important benefits of these initiatives. For example, the one-stop-shop is an innovative implementation in E-Government, in which a huge number of diverse online governmental tasks can be easily performed. Moreover, security features, such as the "Bürgerkarte" or digitally signed documents, promote society to going digital through the guaranteed levels of security and privacy.

Is it one of your goals to support economic development by publishing open data?

Well, in the short-term this is not part of ongoing projects in my company, and that is mainly because most of our customers demand our technology solutions to be implemented in closed domains. However, in the future we might become technology enabler in publishing open data or in providing consultancy services.

What strategies firms have to be deploying for monetizing OGD?

Strategies differ from one firm to one another, and a concrete strategy depends on how a firm might be using OGD. I would look at OGD just as a resource like many other resources. Strategically, firms that build on OGD have to consider the right technology among other main goals.

[45] http://www.getrefinder.com/about/content/company

I think business models that offer added values on top of OGD will continue to emerge. Such firms could leverage OGD by providing services such as data mining or data provisioning to other marketing or advertising companies. Statistics Austria is a good example of a firm that could make proper use of OGD, but there may be lots of companies that have the know-how to do this.

Do you offer support for companies who want to use OGD? What kind of support (e.g., helpline, special data formats etc.)?

For our current customers this is not an issue, and yet OGD is not a main line of business in my company. Nevertheless, we as a high-tech company will be willing and ready to provide consulting and support to other companies that aim to make use of OGD.

Are there any specific recommendations on technologies that companies should employ for better leveraging OGD? (e.g., Linked Data, Semantic Web, etc.)

My first recommendation is that, regardless on specific technology such as Semantic Web or LOD, the data itself must be "web relevant" and not "technology relevant". Second recommendation is to use open formats instead of proprietary ones. My third recommendation is to have a look at the LOD five stars model, which was recommended by Sir Tim Berners-Lee:

Is your Linked Open Data 5 Star?

(Added 2010). This year, in order to encourage people -- especially government data owners -- along the road to good linked data, I have developped this star rating system.

Linked Data is defined above. Linked *Open* Data (LOD) is Linked Data which is released under an open licence, which does not impede its reuse for free. Creative Commons CC-BY is an example open licence, as is the UK's Open Government Licence. Linked Data does not of course in general have to be open -- there is a lot of important use of linked data internally, and for personal and group-wide data. You can have 5-star Linked Data without it being open. However, if it claims to be Linked Open Data then it does have to be open, to get any star at all.

Under the star scheme, you get one (big!) star if the information has been made public at all, even if it is a photo of a scan of a fax of a table -- if it has an open licence. The you get more stars as you make it progressively more powerful, easier for people to use.

- ★ Available on the web (whatever format) *but with an open licence, to be Open Data*
- ★★ Available as machine-readable structured data (e.g. excel instead of image scan of a table)
- ★★★ as (2) plus non-proprietary format (e.g. CSV instead of excel)
- ★★★★ All the above plus, Use open standards from W3C (RDF and SPARQL) to identify things, so that people can point at your stuff
- ★★★★★ All the above, plus Link your data to other people's data to provide context

How well does your data do? You can buy 5 star data mugs, T-shirts and bumper stickers from the W3C shop at cafepress: use them to get your colleagues and fellows conference-goers thinking 5 star linked data. (Profits also help W3C :-).

Now in 2010, people have been pressing me, for government data, to add a new requirement, and that is there should be metadata about the data itself, and that that metadata should be available from a major catalog. Any open dataset (or even datasets which are not but should be open) can be registered at ckan.net. Government datasets from the UK and US hosted be registered at data.gov.uk or data.gov respectively. Other countries I expect to develop their own registries. Yes, there should be metadata about your dataset. That may be the subject of a new note in this series.

Source: http://www.w3.org/DesignIssues/LinkedData.html

More to mention is about LOD as a web technology that enables data providers to establish links between datasets and therefore makes data discoverable. With respect to the Semantic Web, I would say that the expectations that were put on SW were overloaded. The core issue of the Semantic Web is simply to make data machine-readable, and to make it possible to gain knowledge out of the data that is published on the Web.

One question which is related to SW and LOD, please! Do you agree on the arguments that suggest SW/LOD as the technologies for resolving storage space on the web?

Not really, and that is simply because even if these technologies enable people to find the knowledge on specific topic, still they will store these data somewhere else to be independent of the data provider's availability — at least for business-critical data.

What is your opinion about the argument that OGD is an "Open Platform"?

I do not consider OGD as a "platform"; instead, I think it's a sort of application of the Web, which is a truly open platform. OGD, like many other resources, can be accessed via the web, but it's not a platform as such.

Tim O'REILLY once earlier expressed his vision on OGD as an "Open Platform", and he gave examples of Open Platforms such as Apple iPhone Apps, IBM PC, eBay: (http://ofps.oreilly.com/titles/9780596804350/defining_government_2_0_lessons_learned_.html)

Any comments on O'Reilly's vision?

Well, the provided examples are not consistent with the basic definition of openness. Open Platform should be "open" in a sense that they allow for limitless innovations and without being compelling on how the platform might be used. The iPhone is not an open platform: iPhone Apps have to be approved by Apple before they can be published and installed, and they might be removed by Apple at any time without giving reasons, and without the option to object.

Which economy sectors depend heavily on OGD? How do these sectors make use of OGD?

At the moment, I don't know of any economy sector that actually depends heavily on OGD in the sense that it would not be able to make its business without OGD; nonetheless, I am confident that in the future sectors will emerge that depend on OGD.

The Guardian on the 12th of December 2011 has reported the following about "EU gets open data strategy":
"The commission said that if adopted, these steps could boost the EU's economy by up to €40bn a year."
http://www.guardian.co.uk/government-computing-network/2011/dec/12/eu-open-data-strategy-neelie-kros-european-commission

Does Vienna/Austria align its OGD strategy with the EU open data strategy? What do you think about the European movement?

I hope all EU member countries will have consensus on this strategy which entails potential economy benefits of OGD.

How does OGD contribute to the economy?

As mentioned earlier, OGD is a public resource and — though I am not an economist — according to the "limited resources" theory, the more resources made available the more economic benefits are expected. That is simply applies to OGD as well. I consider OGD as being a limited resource, because it cannot be generated arbitrarily — it depends on the public authority to collect and provide these data. Still, OGD as a resource and in

comparison to other natural resources like water or oil, OGD has the big advantage that it can be copied arbitrary times, so anyone can benefit from it without restrictions.

Are companies in Austria/Vienna interested in using OGD?

Answered in previous question too.

Based on your knowledge, how many companies do already use OGD?

There are not so much companies, and there is a handful of active companies in the market. These companies form a small group who are the core of the OGD movement in Austria. Moreover, the success development of OGD in Austria has created more potential and interest in the direction of OGD. It's important that companies need to raise the level of awareness and knowledge about capabilities of OGD.

Can you please explain how OGD enables companies to build competitive advantages and optimize their operations?

This is a tricky question. For an example, look at companies who get their data from the government and such companies earn their money by simply selling hard copies of specific governmental data such as new laws. These companies currently have an unfair competitive advantage since no other publisher has access to these documents. OGD can change that.

Just contrary: I think that OGD cannot give a competitive advantage to a single player on the market, because by definition OGD is open to be used by everyone, and therefore all players have the same opportunities. However, I think that a country that provides OGD has a competitive advantage against other countries who do not offer OGD, because it will make the economy and the private sector more educated and more efficient.

Dr. Schandl, thank you so much for your time!

Appendix 1: In-depth Interviews

(2) Interview with Marten Kaltenböck on the 24th of January 2012

"Martin Kaltenböck studied communication, psychology and marketing at the University of Vienna. In 2000 he was co-founder of punkt. netServices - an Austrian company specialized on information- & knowledge management as well as on Enterprise 2.0 solutions.

He is managing partner of the Semantic Web Company and as CFO responsible for financial and organizational issues. Furthermore he leads and works in several national and international research, industry and projects in public administration - mainly in the area of project management.

He is tutor and publishes in the fields of Enterprise 2.0, Social Semantic Web, Linked (Open) Data as well as Open (Government) Data. Furthermore he is lecturer at national and international conferences and business events in the mentioned topics.

He is Certified Management Consultant since 2006, member of the Executive Board of the Austrian Chapter of the Open Knowledge Foundation & the OGD Austria. He is working as invited expert of W3C."[46]

Mr. Kaltenböck, when looking back to the evolution of the E-Government up to today's OGD, what were/are some major economic benefits that resulted from E-Government/OGD initiatives?

Well, in principle there are indirect national economic effects coming up first or at this moment out of OGD, and business economic benefits are still at the beginning because publishing of OGD was the first thing. I know something that is always very interesting that is influenced me in the United Kingdom, because they have the law that they have to give the data all people who request it, and by opening the data they only open it and publish at once and those thousands and thousands of requests on opening data are not necessary anymore. So that was really big benefit to the U.K government, in which huge costs savings are achieved. In contrast to the law of freedom of information in the U.K, in Austria people have to proactively request a data holder to publish the data, and then the data holder decides whether to publish the data or not.

[46] http://www.semantic-web.at/de/users/martin-kaltenb%C3%B6ck

Thank you, and are there any business models on which revenues are based on OGD/E-Government?

Based on our research, we think that there are three areas or possibilities for OGD business models. The first one is the content production of OGD or public administration, in which there is a value chain of content production in addition to other services, e.g. evaluation of collected data which a process that can be outsourced and creates an own business model. A second business model in the value chain of content production is the production of the data itself. A third business model can be focused on the standardization and harmonization of produced data or media. Moreover, a fourth business model can set on the IT-infrastructure and services provider for the public administration.

The second area for OGD business models comes after publishing OGD, in which the use, re-use, and integration of OGD are sub-areas for possible business models. Large-scale data integration, business intelligence, marketing research, mashing-up data, enriching the enterprise data-warehouse all are open possibilities for business models that could make leverage of published datasets of OGD. A second type of business models in this area is the Apps market, e.g. web and smartphone applications, which mostly developed based on some areas of interest and geospatial data. A third classical business model is the business information from editors and publishers, in which own data enriched with other OGD and then the new combined version of data is offered for sale. The business information is a common type of business in Europe, however, with OGD some companies have to re-think their business models and align them with the nature of free OGD, i.e. companies have to offer new innovative and differentiated enriched data in order to retain their business. The fourth business model in the area of already published OGD is data visualization and analysis service. Data analytics could be a business model by itself, while providing IT-infrastructure with guaranteed levels of performance and 24x7 availability could be another business model that fulfills the requirements of data visualization.

The third area of business models out of my opinion is when talking about Open Data and not OGD, in which innovative and collaborative business model could exist. Enterprises start to consider open the data which opens the door for new business models that tackle diverse aspects and implementations of Open Data at the enterprise market.

Is it one of your goals to support economic development by publishing open data?

For sure it is, absolutely! and we are heavily involved and working in the area of linked open data and semantic web technologies. OGD is huge interesting thing because you get all the data now that you work with, play with, and try things out. So maybe OGD pushes the area of linked open data and vice-versa.

What strategies firms have to be deploying for monetizing OGD?

We don't offer specific strategies, and what we offer is professional service in the area of linked open data, data management, data standardization and harmonization. For example, we supported the Austrian Government with the first recommendation for of

the Meta data structure they made for open data, and I am in the W3C Government-Linked Data Group working there to try to find standardization. To be honest, there is no big business at the moment but it comes up slowly and surly, especially, the PSI directive and the things mentioned earlier are pushing the sector and we have to take a look in Austria maybe there comes support from the politicians or the government to establish this sector a little better because at the moment awareness is not that high in the economy of OGD business models.

Do you offer support for companies who want to use OGD? What kind of support (e.g., helpline, special data formats etc.)?

For sure, we do consulting on their open of data on both sides; on how to publish it and on how to consume it, but mainly our focus is linked open data. We are supporting linked open data strategies and publishing end consumption data, for example. Moreover, we are doing the implementations of linked open data in addition to knowledge-transfer on how linked open data is working as a new approach has its own model that differs from relational database.

Are there any specific recommendations on technologies that companies should employ for better leveraging OGD? (e.g., Linked Data, Semantic Web, etc.)

As mentioned before, linked open data is the technology to recommend. Maybe what is important too is not to forget and think about open data format and not property format if possible because you speak about open data and you have property format and in the next day there is the possibility there is some company puts the finger on it and it is not open anymore. That is the thing to keep in mind and never forget about meta data which describes the information about open datasets.

What is your opinion about the argument that OGD is an "Open Platform"?

I am not so familiar with the concept but it is very interesting. So I would agree that there could be some benefits but if you take a look into reality there are providers of commercial software and there are open source like CKAN. Moreover, I would agree with Tim O´Reilly on his vision on E-Government as an open platform and it fits well in the area of OGD.

Which economy sectors depend heavily on OGD? How do these sectors make use of OGD?

I think what we had before it is data enrichment, so taking some data from OGD and enriching it and re-selling it. I know that some companies and publishers in Austria are trying for many years to open up more data to make use and re-use of it and to lower the fees in using this data, company data, for example.

Tourism is an important sector works in this area that needs OGD. Infrastructure is another sector that benefits a lot from OGD. Environment is a third sector that depends also on OGD. Health could be a fourth important sector; however more datasets still have to be opened foe the development of e-health applications. From the branches visualization and analyzation are huge markets for OGD.

The Guardian on the 12th of December 2011 has reported the following about "EU gets open data strategy":
"The commission said that if adopted, these steps could boost the EU's economy by up to €40bn a year."
http://www.guardian.co.uk/government-computing-network/2011/dec/12/eu-open-data-strategy-neelie-kros-european-commission

What do you think about the European movement?

There is a PSI (Public Sector Information) directive in Europe that was built in 2003, and in short it says if somebody or public administration opens some data then it has to be fair to give it with the same conditions to everybody who wants it. So if I sell you the data as the City of Linz then I have to give the same prices and conditions to somebody else. However, the directive was very week from the commission in which each EU member country did it in its own way, but it was the starting point for OGD.
Now the commission sees OGD as a very strong movement and has strong potential in it, so they built a new PSI directive. The interesting thing is that new datasets are coming, e.g. datasets of libraries, museums and archives will be included in the new directive. I think the new PSI directive will come up in 2012 or 2013, which then has to become a national law. So this new PSI directive will be the center of PSI open data policy. So the new directive is at the moment inside the 27 EU member states and there will be feedbacks in next months, followed with a directive. This is very interesting because the directive strengthens the power of OGD in Europe and enables more and more open data business, because then we have more interesting information that needs to be opened up then can be used, reused, and in machine-readable formats.

Regarding the estimated €40 billion, there are different figures as I know. For example, yesterday in the evening I found €27 billion, and out of these figures you feel that the policy in the commission is getting stronger, for example, there is more than this because if you take a look at all the research programs you see the OGD topic pops up more and more in the calls for proposals. The second thing is that the commission has announced 100 million Euros for R&D in the area of OGD.

How does OGD contribute to the economy?

What we have been talking before it is one side the huge benefits for the national economy which is happening at the moment, so we can call it in-direct economic impacts. On the other side, we have the direct economic impacts, e.g. taxes, or the microeconomics impacts.

Are companies in Austria/Vienna interested in using OGD?

I think it is slowly growing at the moment. The awareness is not that high, and what we are trying to do is some activities for awareness building for the business sector and for the economy in Austria.
Thank you, a question to add here please!

Do you think that in the future there will be the job assignment of for example "OGD specialist" in some companies to exist?

I think they need more experts in data analysis because the amount of data and information is growing, and a good analysis has to take data from outside the company, and as mentioned it at the beginning, this data has to be merged with data-warehouse in the company for purposes such as business intelligence or market research. Therefore there will a need of experts in data analysis, and that is unfortunately is still missing in the media literacy in Austria while in the U.K, for example, there are thirteen summer schools at the universities which focus on literacy and applications of Data Analyzation. Moreover, if you look at the "Big Data" report from McKinsey[47] of on May 2011, I don't the figures exactly but they say that in five year in the U.S you need thousands of data analysts we do not have these days. So this is a skill that comes up for sure.

Based on your knowledge, how many companies do already use OGD?

About ten not so much, because most of the people based on a previous comparison before are in the open source area, hacker area, and a lot of things have been developed by one-man companies or by some people who are playing around OGD and they have other jobs. In the Europe level there are more companies in the U.K, Finland, or the Scandinavian in comparison to the number of OGD companies in Austria.

Can you please explain how OGD enables companies to build competitive advantages and optimize their operations?

I think it is similar little bit to what we have been talking before; it is the data enrichment and data mash-up possibilities. You get your own data-warehouse and you can enrich it from the outside and you can build up some mash-ups and put data together and create new knowledge out of it. New ideas, find new better basics for decision making and the like are great advantages when starting to use OGD.

Mr. Kaltenböck, thank you so much for your time!

47 http://www.mckinsey.com/Insights/MGI/Research/Technology_and_Innovation/Big_data_The_next_frontier_for_innovation

(3) Interview with Mag. Dr. Gregor Eibl on the 24th of January 2012

Mag. Dr. Gregor Eibl is a consultant at the Austrian Federal Chancellery, and he is responsible for Usability and Accessibility, Mobile signature and expansion of signature applications, E-government innovations, and EU eGovernment benchmark[48].

Mag. Dr. Eibl, when looking back to the evolution of the E-Government up to today's OGD, what were/are some major economic benefits that resulted from E-Government/OGD initiatives?

Well, there are some major common economic benefits which resulted from E-Government and OGD; however, in my listing to these benefits I will separate them into E-government and OGD benefits, respectively.
For E-government, there are the major benefits that are resulting from digitalization. In former days someone had to go to government offices and to do a lot of paper-work, in which costs of time and money not to ignore. In contrast to the past, with digitalization we have faster processes and 24-hours open virtual offices which of major economic benefits for people and companies, especially, without local necessities (you don't have to come to the office). Of course these are the benefits of digitalization in general, no matter if it is e-government or if a company goes digital ready!

For OGD initiatives, I think one of the main benefits is that the government itself and the ministries become more transparent. And though it is hard to quantize the value of transparency, it has an enormous economic value. Moreover, opening data and working with outsiders, e.g. third party companies, results in the great benefit of the cooperation effect. New business models, Apps, and feedbacks are examples that explain the benefits of cooperation effects based on opening data. The opening process brings new inputs and feedbacks to the governments.

Thank you, and could please additionally list other economic benefits for companies?
Yes, in the past companies who work on government data had to incur costs which mostly related to the nature of property data, while with one principle ODG companies could seamlessly use the data free of charge. On the other hand, we have now new datasets which were not available in the past, and until now there is no concrete business models that gain revenues based on OGD. For example, there are a number of Apps which are based on OGD in Vienna and Linz, and these applications offer free of charge

[48] http://www.digitales.oesterreich.gv.at/site/5601/default.aspx

services to people. Moreover, OGD opens the door for more Apps, innovations; mash-up services such as map services to other companies, and enables business models that are subject to emerge in the future.

Is it one of your goals to support economic development by publishing open data?

Yes, it is one of the goals to make successful economic developments based on published datasets. However, enabling innovation on OGD is a pre-requisite and a major goal that comes first for a possible economic development.

What strategies firms have to be deploying for monetizing OGD?

Strategies differ from one firm to one another on how OGD can be leveraged. However, there is a huge Apps market on the international level which is expected to grow, and OGD Apps could be such business models in the future. Theory and literature, e.g. the Personal MBA Book, recommend diverse strategies to include OGD business models, but the empirical business models of OGD are still considered to be at the start.

Do you offer support for companies who want to use OGD? What kind of support (e.g., helpline, special data formats etc.)?

We at the Austrian Federal Chancellery have in plan a central portal which will be available this year, and it will serve as an umbrella over open datasets and catalogues. With this portal there will be support line, however, our framework of recommendations and coordination's will be mainly within the Austrian Federal Chancellery and outsiders, e.g. companies, will have access to opened datasets via the central portal. Moreover, the datasets and metadata will be in raw data format, in which the metadata describes the dataset in each portal.

Are there any specific recommendations on technologies that companies should employ for better leveraging OGD? (e.g., Linked Data, Semantic Web, etc.)

As mentioned in the previous question, the datasets and metadata will be available from the Austrian Federal Chancellery in raw data format with complete descriptions of each dataset in the catalogs. Moreover, we do not restrict the users in the use of specific formats, but there is a strong recommendation on the use of linked open data which leads to more creativity and innovations as being described in the five stars model by Tim Berners-Lee. In nutshell, our recommendations to public bodies and not to companies is to address the use of linked open data, e.g. full URIs, common licenses, and raw data format.

What is your opinion about the argument that OGD is an "Open Platform"?

Obama in his memorandum defined OGD based on three pillars of; transparency, participation, and collaboration. I think it is an aspect of collaboration, in which as

datasets become published there will be new inputs and new requirements from consumers of OGD to the administration of these datasets. For example, the dataset of public toilets in Vienna was initially opened to help people in locating a nearby toilet. Soon later after opening this dataset, new requirements are posted to include additional data about the status of these toilets, e.g. usage and cleaning condition.

Which economy sectors depend heavily on OGD? How do these sectors make use of OGD?

Web companies, e.g. Semantic-Web Company, developers of applications, and we are working on an initiative that suggests journalism as one of major consumers of OGD. However, the raw data nature of OGD explains that software companies and journalism companies as major sectors that heavily use OGD.

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http://www.guardian.co.uk/government-computing-network/2011/dec/12/eu-open-data-strategy-neelie-kros-european-commission

Does Vienna/Austria align its OGD strategy with the EU open data strategy? What do you think about the European movement?

In OGD strategy we are aligned in some points faster than the EU commission, and in some other points we still have to adapt later on for better alignment. What I see for the moment is that there is new revision of the PSI (public sector information) in Europe. The new directive goes strongly with the proposal in the direction of OG, nevertheless, I would prefer to see an own data strategy of the commission and not the PSI. However, there are ongoing discussions and initiatives at the commission such as a central portal of datasets in Europe, and the technical and legal alignments.

How does OGD contribute to the economy?

Based on OGD, some companies not only using OGD but they manage to make profits out of OGD. For example, map services companies get their data from local authorities and aggregate these data to create profits out of new added value services to customers. So OGD expected to contribute positively to economy either directly with new innovative business models or indirectly via transparency, participation, and collaboration.

Based on your knowledge, how many companies do already use OGD?

I think the best guess is to look at the Apps list of OGD, in which a more precise statistics on the number of companies who develop such Apps can be estimated. Moreover, in reality the real number of companies who use OGD goes beyond just developing companies to include other organization, e.g. analytical companies, and small groups who create more added values on top of OGD.

Can you please explain how OGD enables companies to build competitive advantages and optimize their operations?

I think a competitive advantage depends very much on the company itself in addition to available datasets, and therefore it is difficult to give a general answer to this question.in general, OGD is a new resource for companies that can be used, and of course possibilities can be more and not less!

Dr. Eibl, thank you so much for your time!

(4) Interview with CEO Ing.in Brigitte Lutz on the 7th of March 2012

Ing.in Brigitte Lutz is working in the Office of the CIO, City of Vienna. In her employment history she is ICT expert for various fields, Project manager, Senior Process Manager (SPcM) and E-Government expert. She is founding member if the "Cooperation Open Government Data (OGD) Österreich", where federal, state, cities and towns want to prepare a fertile soil in cooperation with the communities, science, culture and economy for the future of Open Government Data in Austria.

Mrs. Lutz, when looking back to the evolution of the E-Government up to today's OGD, what were/are some major economic benefits that resulted from E-Government/OGD initiatives?

Vienna's E-Government online services, the „virtual administrative office" are in use by companies for many years in Austria, and time-saving is the most clear economic benefit out of this initiative. Vienna extends and improves the E Government offer for the benefit of the citizens and as an added value for the business location Vienna. Open Government is the consistent refinement of E Government

The City of Vienna launched an open Government portal (http://www.wien.gv.at/ikt/opengov/) and the Open Government Data catalogue (http://data.wien.gv.at/) in May 2011. The good thing in Vienna is the political commitment from the beginning, which led to the fast progress and the launch of OGD portal. The major thing for this year is how companies will benefit from OGD. Last year had shown very good progress in the OGD movements, and Vienna won many prizes among German-speaking countries (Austria, Germany, Switzerland, and South Tyrol). For example, Vienna's OGD Catalogue won the first place in the E-Government competition of and an award in the PSI Alliance 5 Stars competition". *That was great start of OGD Moreover, there are 26 applications published at* http://data.wien.gv.at/apps/

Is it one of your goals to support economic development by publishing open data?

Sure, Vienna offers 125 datasets and many still will follow for the business location.

What strategies firms have to be deploying for monetizing OGD?

This depends on the firm itself and own strategy. I think there are a lot of business models because they can take the data and re-publish it in another way. For example,

last week I saw from New York City, ("I send another link" http://nyc.pediacities.com/facets/), that is a company which distributes the data in another Semantic formats and over timelines and so on.
Another possibility for an OGD business model can be explained in the following scenario: City of Vienna runs the Open data catalogue on her own ICT-infrastructure. So we can afford to publish OGD by ourselves, but maybe for smaller cities who lack to IT-infrastructure resources that creates possibilities for companies to monetize OGD via business models that publish OGD for smaller cities or host data with very high service levels.

Do you offer support for companies who want to use OGD? What kind of support (e.g., helpline, special data formats etc.)?

We have no help line, but we have other possibilities: Twitter, Email, online forum, in addition to the live platforms in which the experts of the City of Vienna invite everybody such as communities to come to the event, for example the sixth event is in 29th of March. I think we will have four platforms this year and will invite the people and they have the chance to discuss and learn more about the formats of OGD and any related topics.
Moreover, the City of Vienna is very active in giving panel speeches, lectures and this year some big companies want to make Open Government collaborations with us.

Are there any specific recommendations on technologies that companies should employ for better leveraging OGD? (e.g., Linked Data, Semantic Web, etc.)

Linked open data is the aim for technology used for OGD in the cities of Vienna and Linz. Others will follow; Salzburg and Graz in addition to the Austrian portal are to come in the beta version of data.gv.at in April 2012. Additionally, on the Austrian portal there will be the Meta data from all cities at the Austrian portal. Linked open data will be interesting with the European Portal which again will be the central portal for all EU member states.

What is your opinion about the argument that OGD is an "Open Platform"?

Yes I think OGD is an open platform because we use open data formats, it is open licensed, and the data itself is open for use and re-use. If you look in the documentation of our strategy and the OGD model you will find out that the document principles and technical specifications are all compatible with the principles of an open platform.

The Guardian on the 12th of December 2011 has reported the following about "EU gets open data strategy":
"The commission said that if adopted, these steps could boost the EU's economy by up to €40bn a year."
http://www.guardian.co.uk/government-computing-network/2011/dec/12/eu-open-data-strategy-neelie-kros-european-commission

Appendix 1: In-depth Interviews

What do you think about the European movement?

To the strategy: In collaboration with the City of Vienna, the KDZ has developed a process model for the implementation of open government initiatives. It is based on the 4-phase model of Lee / Kwak 2011 and has been adapted for administrations in Austria. In particular, a model for an internal monitoring data is presented which can be identified with the appropriate databases. http://www.open3.at/2011/09/kdz-veroeffentlicht-open-government-vorgehensmodell-v1-1

In short, the Austria strategy is aligned with European movement and we are working with other EU countries on the set agenda for OGD.

Are companies in Austria/Vienna interested in using OGD?

The 26 OGD Apps, i.e. http://data.wien.gv.at/apps/, could be a good indication on how many companies already use OGD in Vienna. These apps reflect a mix of private and companies' developers both have interest and make use of OGD. Additionally there is a study which had shown that there are between 100 and 150 companies in Vienna that could make use of OGD

Can you please explain how OGD enables companies to build competitive advantages and optimize their operations?

The remarkable competitive advantage for companies is that they can exploit OGD datasets which are published for free. For companies who employ OGD datasets for BI (Business Intelligence) and data enrichment, such operations lead to better competitiveness for companies.

Mrs. Lutz, thank you so much for your time!

Appendix 2: Online Survey Questions and Responses

1. Open government data (OGD) is an "Open Platform" which enables the creation of a multitude of business models.

Create Chart | Download

	Response Percent	Response Count
Agree	77.8%	21
Do not agree	22.2%	6
	Comments: Hide Responses	5

Responses (5) | Text Analysis | My Categories (0)

GOLD FEATURE: Text Analysis allows you to view frequently used words and phrases, categorize responses and turn open-ended text into data you can really use. To use Text Analysis, **upgrade to a GOLD or PLATINUM plan**. Learn More | Upgrade »

Showing 5 text responses — No responses selected

The business is in the long tail and will complement existing models. While entirely new might emerge, they will fit niches.
3/8/2012 8:00 AM View Responses

If multitude is taken to mean 'many' - then the statement is true. But if multitude is interpreted as meaning 'virtually unlimited', then the statement is not true. Open data enables certain forms of business model; but also undermines others.
1/17/2012 10:16 AM View Responses

I don't consider OGD as "platform". OGD is a resource that can be used for a multitude of business models. The platform on which OGD is realized is the Web.
1/13/2012 11:43 AM View Responses

Not a multitude. The use cases are quite narrow in focus since the content provided is typically not very deep. Most use can be made of geographic materials, but not as a basis for a business model.
1/11/2012 3:16 PM View Responses

Open data won't alter existing business models. But it will provide resources on which new business can be built.
1/11/2012 1:47 PM View Responses

answered question	27
skipped question	0

Appendix 2: Online Survey (Questions and Responses)

2. How many companies do you know that make use of OGD to support their business processes? Create Chart Download

	Response Percent	Response Count
None	37.0%	10
Less than five	**44.4%**	**12**
Between five and ten	14.8%	4
More than ten	3.7%	1
Please mention the names of these companies and add further comments, if any (Hide Responses)		3

Responses (3) | Text Analysis | My Categories (0)

GOLD FEATURE: Text Analysis allows you to view frequently used words and phrases, categorize responses and turn open-ended text into data you can really use. To use Text Analysis, **upgrade to a GOLD or PLATINUM plan**. Learn More Upgrade »

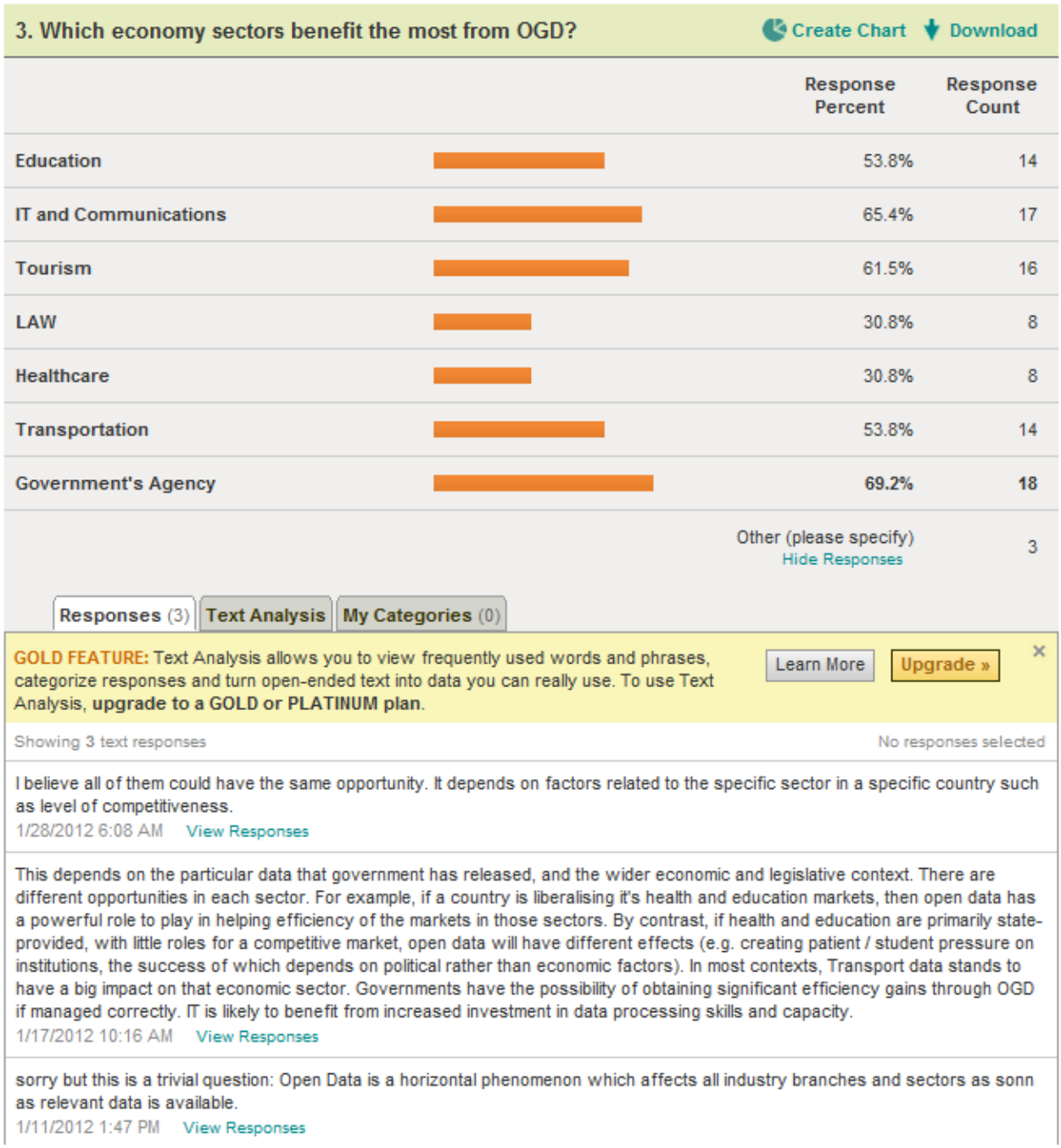
Showing 3 text responses — No responses selected

datamarket.com
1/31/2012 6:48 PM View Responses

Nike is the only corporation I'm aware of that is doing any open data work.
1/28/2012 9:07 AM View Responses

Many of the businesses I'm aware of using OGD were using paid for government data prior to it becoming open.
1/17/2012 10:16 AM View Responses

Appendix 2: Online Survey (Questions and Responses)



3. Which economy sectors benefit the most from OGD?

Create Chart | Download

	Response Percent	Response Count
Education	53.8%	14
IT and Communications	65.4%	17
Tourism	61.5%	16
LAW	30.8%	8
Healthcare	30.8%	8
Transportation	53.8%	14
Government's Agency	**69.2%**	**18**
Other (please specify) Hide Responses		3

Responses (3) | Text Analysis | My Categories (0)

GOLD FEATURE: Text Analysis allows you to view frequently used words and phrases, categorize responses and turn open-ended text into data you can really use. To use Text Analysis, **upgrade to a GOLD or PLATINUM plan**.

Learn More | Upgrade »

Showing 3 text responses — No responses selected

I believe all of them could have the same opportunity. It depends on factors related to the specific sector in a specific country such as level of competitiveness.
1/28/2012 6:08 AM View Responses

This depends on the particular data that government has released, and the wider economic and legislative context. There are different opportunities in each sector. For example, if a country is liberalising it's health and education markets, then open data has a powerful role to play in helping efficiency of the markets in those sectors. By contrast, if health and education are primarily state-provided, with little roles for a competitive market, open data will have different effects (e.g. creating patient / student pressure on institutions, the success of which depends on political rather than economic factors). In most contexts, Transport data stands to have a big impact on that economic sector. Governments have the possibility of obtaining significant efficiency gains through OGD if managed correctly. IT is likely to benefit from increased investment in data processing skills and capacity.
1/17/2012 10:16 AM View Responses

sorry but this is a trivial question: Open Data is a horizontal phenomenon which affects all industry branches and sectors as sonn as relevant data is available.
1/11/2012 1:47 PM View Responses

4. In your opinion, how does OGD enable companies to achieve higher competitive advantages? Create Chart Download

	Response Percent	Response Count
Forecasting demand	33.3%	8
Minimizing risk	12.5%	3
Acquiring new projects	41.7%	10
Optimizing their operations	**66.7%**	**16**
Saving costs	58.3%	14
Other(s): Hide Responses		5

Responses (5) | Text Analysis | My Categories (0)

GOLD FEATURE: Text Analysis allows you to view frequently used words and phrases, categorize responses and turn open-ended text into data you can really use. To use Text Analysis, **upgrade to a GOLD or PLATINUM plan**. Learn More Upgrade »

Showing 5 text responses — No responses selected

G
1/28/2012 11:34 PM View Responses

This varies significantly by sector and size of company.
1/17/2012 10:16 AM View Responses

We need local, useful, daily data such as rent, information about local supermarkets:product and its features, medical center and services. Open data should help people to make daily decision around them.
1/12/2012 5:53 PM View Responses

Companies can use OGD to Enhance the own sales detail to generate more details and focus sale plans
1/12/2012 3:30 PM View Responses

Developing new products
1/11/2012 2:04 PM View Responses

Appendix 2: Online Survey (Questions and Responses)

5. Which types of OGD would provide the highest benefit for companies? Create Chart Download

	Response Percent	Response Count
Business and Economic	58.3%	14
Biology and Ecology	8.3%	2
Administrative and Political Boundaries	33.3%	8
Atmospheric and Climatic	33.3%	8
Elevation and Derived Products	12.5%	3
Environment and Conservation	37.5%	9
Agriculture and Farming	16.7%	4
Geological and Geophysical	33.3%	8
Human Health and Disease	37.5%	9
Imagery and Base Maps	58.3%	14
Inland Water Resources	12.5%	3
Military	8.3%	2
Locations and Geodetic Networks	41.7%	10
Cultural, Society, and Demographics	66.7%	16
Facilities and Structures	33.3%	8
Transportation Networks	79.2%	19
Utilities and Communication	58.3%	14

Other (please specify) 2

Hide Responses

Responses (2) | Text Analysis | My Categories (0)

GOLD FEATURE: Text Analysis allows you to view frequently used words and phrases, categorize responses and turn open-ended text into data you can really use. To use Text Analysis, **upgrade to a GOLD or PLATINUM plan**.

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Showing 2 text responses — No responses selected

This is almost impossible to answer on a definite basis. Who knew in advance that the light bulb would change the world? Or the Tamagotchi? Usage and uptake are very much evolutionary and it is hard to say which business possibilities are behind eg "Inland Water Resources". May have more importance in, say, Namibia than Central Europe.

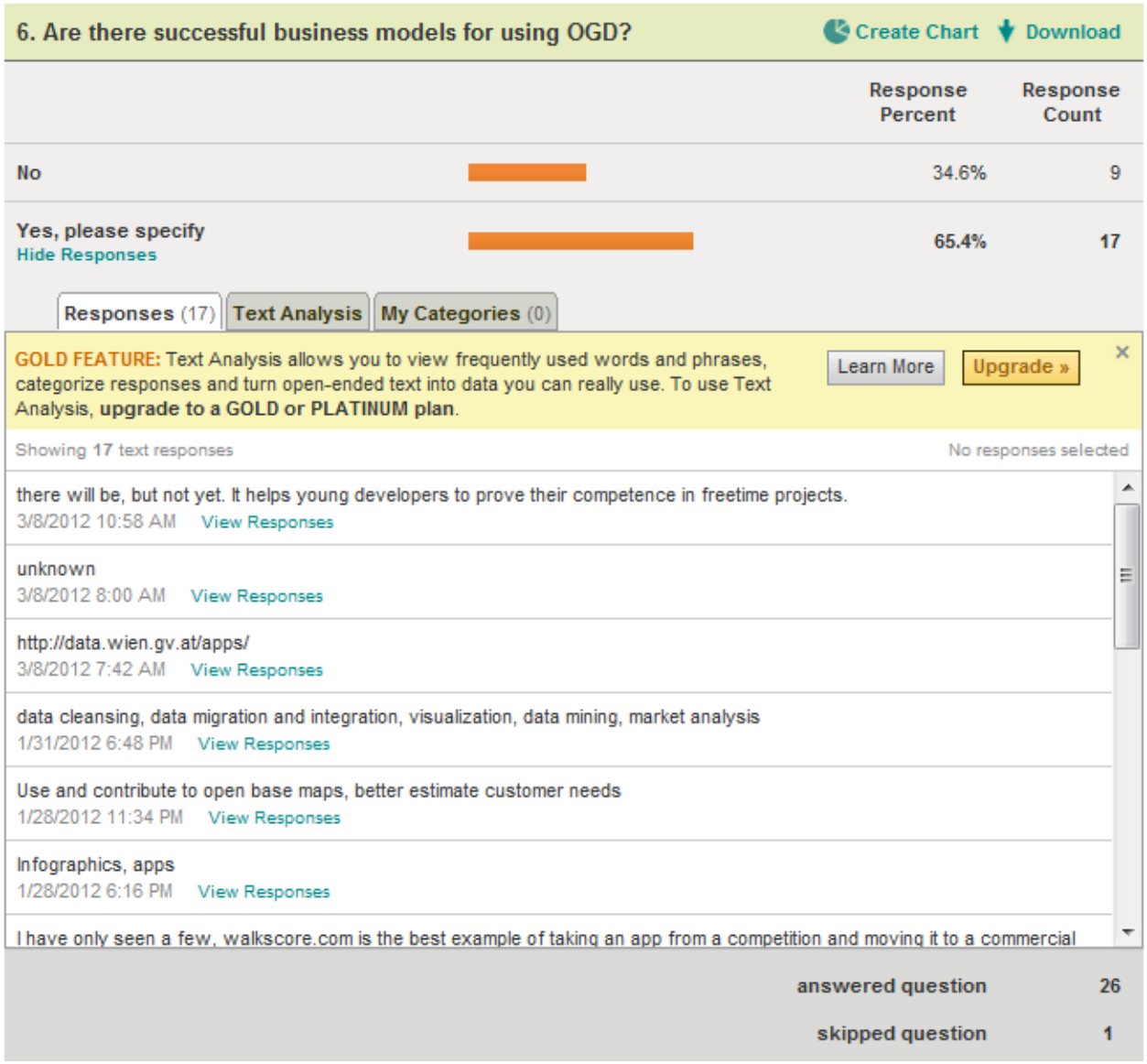
3/8/2012 8:00 AM View Responses

I believe all these types could have the same opportunity to provide benefit, it depends on the level of competitiveness and maturity of a specific sector in a specific country or jurisdiction

1/28/2012 6:08 AM View Responses

answered question	**24**
skipped question	**3**

Appendix 2: Online Survey (Questions and Responses)



6. Are there successful business models for using OGD?

Create Chart | Download

	Response Percent	Response Count
No	34.6%	9
Yes, please specify	65.4%	17

Hide Responses

Responses (17) | Text Analysis | My Categories (0)

GOLD FEATURE: Text Analysis allows you to view frequently used words and phrases, categorize responses and turn open-ended text into data you can really use. To use Text Analysis, **upgrade to a GOLD or PLATINUM plan**.

Learn More | Upgrade »

Showing 17 text responses — No responses selected

there will be, but not yet. It helps young developers to prove their competence in freetime projects.
3/8/2012 10:58 AM View Responses

unknown
3/8/2012 8:00 AM View Responses

http://data.wien.gv.at/apps/
3/8/2012 7:42 AM View Responses

data cleansing, data migration and integration, visualization, data mining, market analysis
1/31/2012 6:48 PM View Responses

Use and contribute to open base maps, better estimate customer needs
1/28/2012 11:34 PM View Responses

Infographics, apps
1/28/2012 6:16 PM View Responses

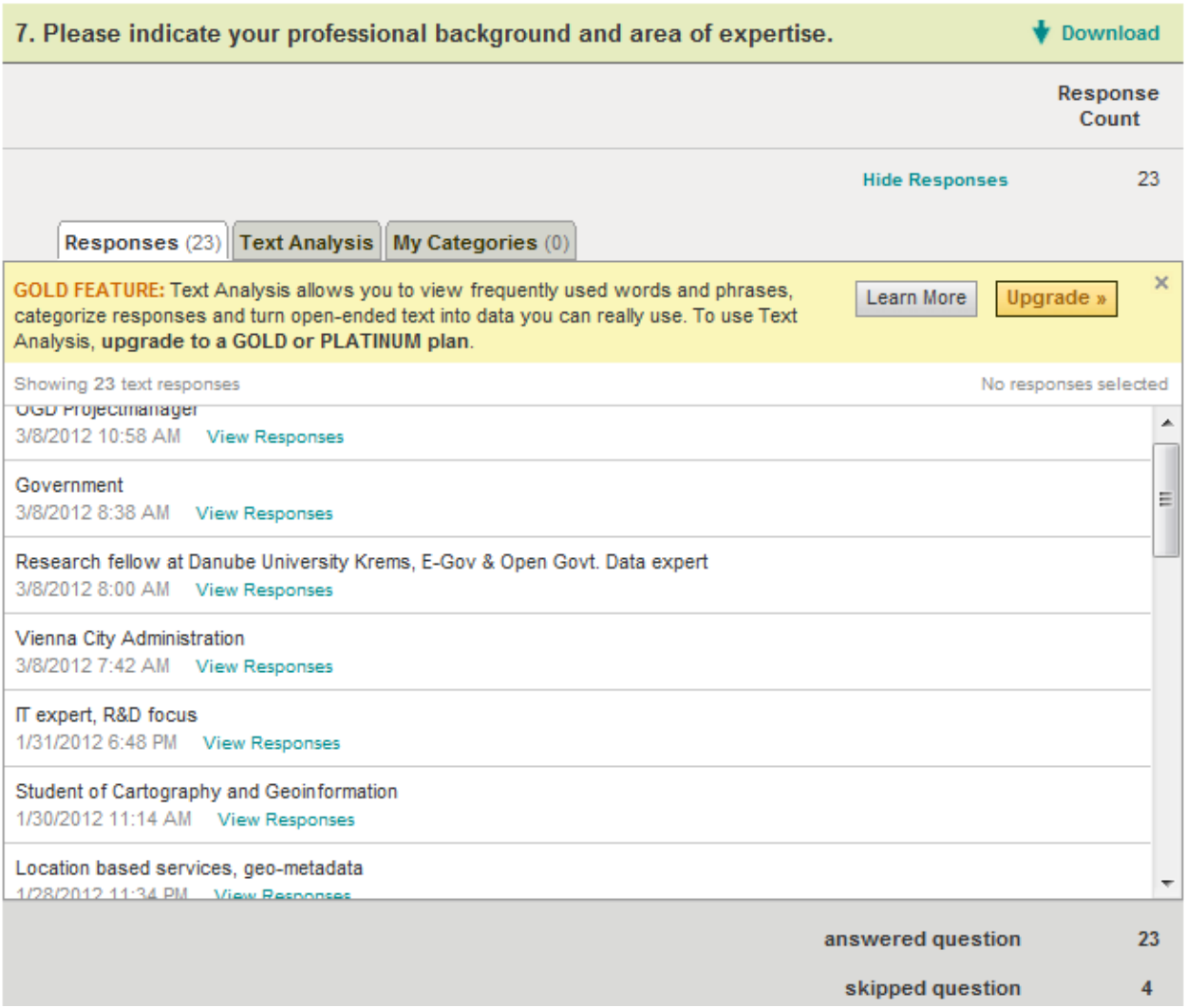
I have only seen a few, walkscore.com is the best example of taking an app from a competition and moving it to a commercial

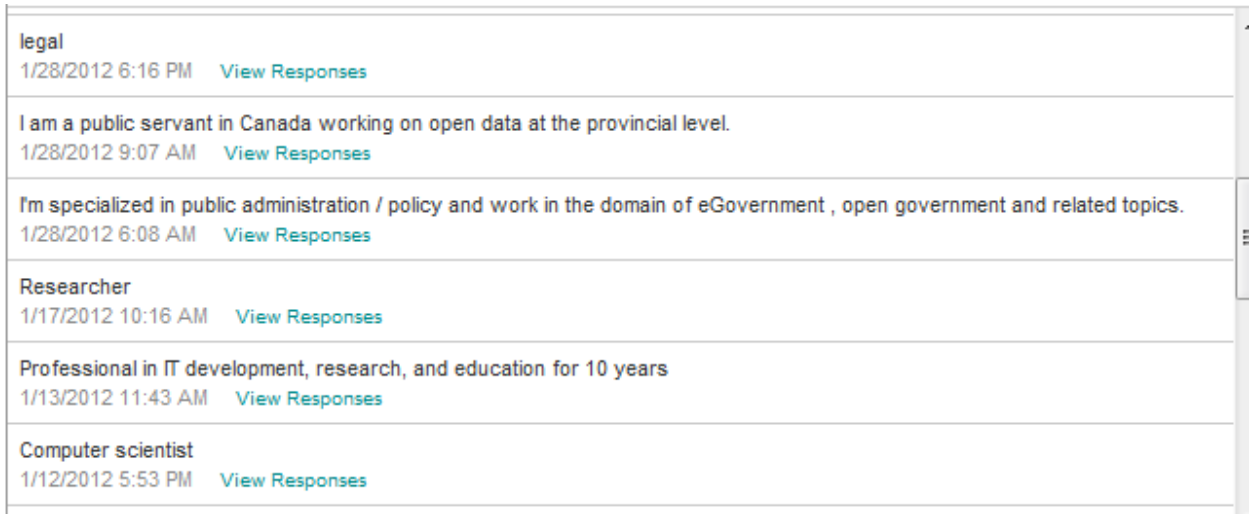
answered question	26
skipped question	1

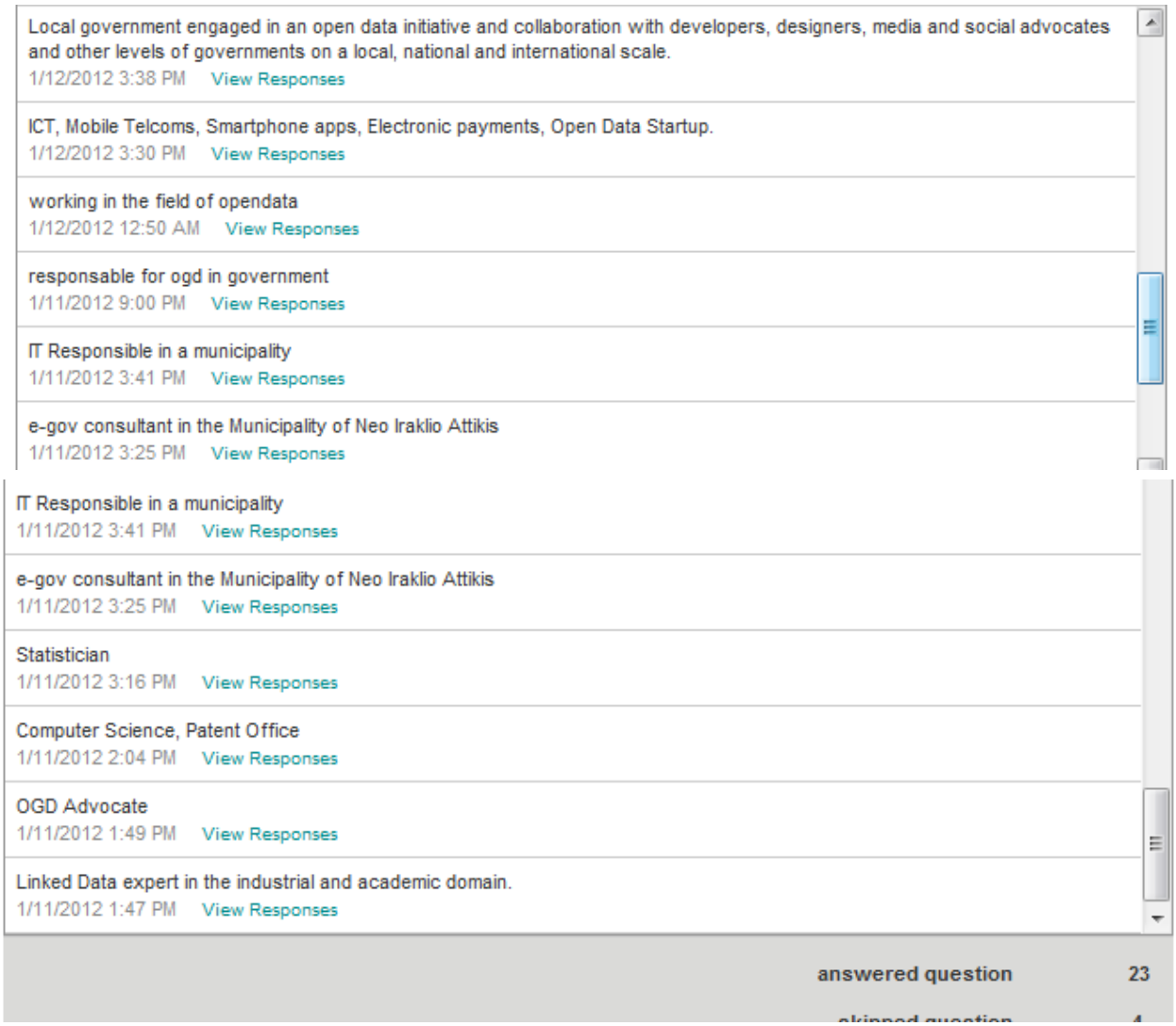
I have only seen a few, walkscore.com is the best example of taking an app from a competition and moving it to a commercial venture. 1/28/2012 9:07 AM View Responses	
I would say i don't know. I haven't come across such models here where i live. 1/28/2012 6:08 AM View Responses	
There are various models - depending on the content and type of data, and the markets involved. 1/17/2012 10:16 AM View Responses	
yes, I thing 1/12/2012 5:53 PM View Responses	
Yes Socrata, mycityways.com and chromaroma 1/12/2012 3:30 PM View Responses	
www.vantrash.ca 1/12/2012 12:50 AM View Responses	
answered question	**26**
skipped question	**1**

www.vantrash.ca 1/12/2012 12:50 AM View Responses	
OS Business Models 1/11/2012 9:00 PM View Responses	
e- governance - g.i.s. projects 1/11/2012 3:25 PM View Responses	
I suppose so 1/11/2012 2:04 PM View Responses	
A) Enrichment of OGD to get valuable data products to re-sell B) Hosting of unstructured OGD from various sources and provide common, harmonized interfaces (Socrata, Factual, Google) C) Microentrepreneurship using OGD in mobile Apps 1/11/2012 1:49 PM View Responses	
how do you define "success"? 1/11/2012 1:47 PM View Responses	
answered question	**26**
skipped question	**1**

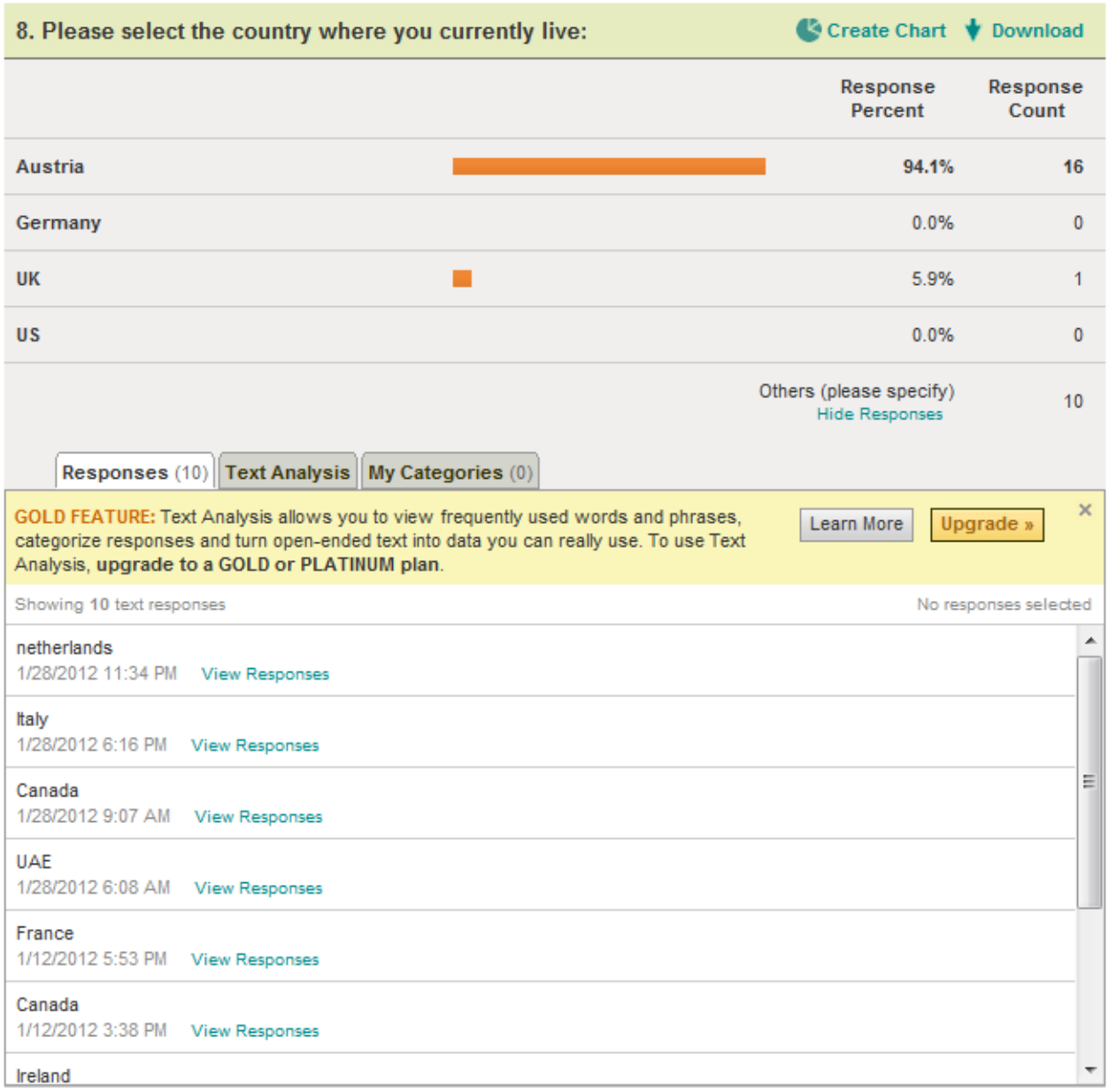
Appendix 2: Online Survey (Questions and Responses)






Local government engaged in an open data initiative and collaboration with developers, designers, media and social advocates and other levels of governments on a local, national and international scale.
1/12/2012 3:38 PM View Responses
ICT, Mobile Telcoms, Smartphone apps, Electronic payments, Open Data Startup.
1/12/2012 3:30 PM View Responses
working in the field of opendata
1/12/2012 12:50 AM View Responses
responsable for ogd in government
1/11/2012 9:00 PM View Responses
IT Responsible in a municipality
1/11/2012 3:41 PM View Responses
e-gov consultant in the Municipality of Neo Iraklio Attikis
1/11/2012 3:25 PM View Responses
IT Responsible in a municipality
1/11/2012 3:41 PM View Responses
e-gov consultant in the Municipality of Neo Iraklio Attikis
1/11/2012 3:25 PM View Responses
Statistician
1/11/2012 3:16 PM View Responses
Computer Science, Patent Office
1/11/2012 2:04 PM View Responses
OGD Advocate
1/11/2012 1:49 PM View Responses
Linked Data expert in the industrial and academic domain.
1/11/2012 1:47 PM View Responses
answered question 23

Appendix 2: Online Survey (Questions and Responses)



8. Please select the country where you currently live:

Create Chart | Download

	Response Percent	Response Count
Austria	94.1%	16
Germany	0.0%	0
UK	5.9%	1
US	0.0%	0
Others (please specify) Hide Responses		10

Responses (10) | Text Analysis | My Categories (0)

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Showing 10 text responses — No responses selected

netherlands
1/28/2012 11:34 PM View Responses

Italy
1/28/2012 6:16 PM View Responses

Canada
1/28/2012 9:07 AM View Responses

UAE
1/28/2012 6:08 AM View Responses

France
1/12/2012 5:53 PM View Responses

Canada
1/12/2012 3:38 PM View Responses

Ireland

Ireland 1/12/2012 3:30 PM	View Responses
Brazil 1/11/2012 4:48 PM	View Responses
Greece 1/11/2012 3:25 PM	View Responses
France 1/11/2012 3:16 PM	View Responses

answered question	17
skipped question	10

9. If you would like to know the results of this survey, please enter your email in the following text-box. Note that your email address will not be used for any other purposes except the requested dissemination of the survey results. Download

	Response Count
Show Responses	20
answered question	20
skipped question	7

Appendix 3: Participant Observations

At the Semantic-Web Company on the 5th of October 2010

At the early stage of our research we sought to get in touch with the companies that work on OGD. Semantic-Web Company[49] is a pioneer consultant in E-Government and OGD, and a contact with Company had been initiated. Mr. Thurner had shown great help by devoting the time slot in clarifying us on going activities at his company in the scope of OGD. Below a summary of the main inputs that Mr. Thurner had provided: (Kaltenböck, Linked Government Data als nachhaltige Maßnahme für die digitale Infrastruktur eines Landes, 2011)

(1) Linked Data as the future technology for a national government and for the digital infrastructure of a country!

(2) The OGD is a promising economic resource that will lead to the emergent of new business models.

Mr. Thurner continued by explaining the planned agenda for the OGD conference on the 16th June 2011 (Figure 14). Additionally he listed the following main advantages of using LOD (Linked Open Data):

(1) Reducing transaction costs as a result of timely and more concrete access or query to LOD is possible

(2) Interoperability and Data Integration: Comparability of datasets and simple data integration is made possible

(3) Direct economic Effects of apps and services: mentioned the additional tax revenue for the state and economy in addition to Gartner Report on Apps market which could rise to $20 billion in 2013.

(4) Indirect economic effects: such as savings in society in health, transport, time, etc.

Moreover, Mr. Thurner highlighted as well a number of direct and indirect impacts of OGD. Below a list of some of those listed OGD economic benefits:

[49] http://www.semantic-web.at/

Examples: direct economic impact Applications (APPS)

• Direct revenue from license fees for use of data

• Direct tax revenue from new jobs, better economy etc.

• Direct sales to the economy through new products and services Data integration for business

He mentioned as other examples on the benefits of OGD per industry sector:

First he talked about the general benefit out of OGD such as strengthen of competitive advantage through market intelligence solutions and data warehousing.

• In the sector of Media and Publishing, OGD leads to cost savings through access to content they need

• In the sector of Property, searching is made better via representation and visualization of objects

• In the sector of commercial real estate, direct access to land registry data is possible

• In the sector of Transportation / Traffic, live information and better utilization

Other direct effects of OGD will be the reduction of costs for responding to requests from public and media.

Furthermore, Mr. Thurner had talked also about the indirect economic effects of OGD. Examples such as selection of safe bicycle routes and thus fewer accidents Savings in the health system and on the part of insurance, reducing barriers to accessibility for work, and again the indirect benefits of OGD in Transportation / Traffic which improves experience when someone made aware of the actual time plane for a bus or train.

Finally, from Mr. Thurner it was possible to learn more about the OGD forum in Austria, the mailing list in order to be automatically notified in what is new in the movement of OGD in Austria, and many other valuable resources that already benefited our study.

At the First Vienna Gov2.0 Camp on the 3d of December

Attending the first Vienna Gov2.0 Camp had benefited the research via exchanged talks with some of the experts in OGD, e.g. hackers and researchers, in addition to the main topics in the given talks on OGD in general. Below a summary of the main activities during the event:

(1) Raising awareness about the benefits of OGD is one the objectives that the Gov2.0 Camp sought of.

(2) Collecting of ideas from the participants on how OGD could be utilized.

(3) More than one hundred participants were discussing the theme of "open government data", Apps ideas and initiatives.

(4) Best Apps were presented such as the application for informing and reporting about defective elevators and escalators in Vienna's subway.
(5) More panels were presenting the ongoing movements on OGD in the universities and in the EU commission as well.

At the TU-University: Government Linked Data

Via the mailing list of OGD Initiative in Austria in addition to the published OGD Digest[50]t by Semantic-Web Company, the lecture by Professor Nigel Shadbolt at the TU-University was announced to take place the 14th of March 2011 at the Technical University of Vienna.

Attending the lecture by Prof. Shadbolt had greatly benefited the research by citing following notes (Shadbolt, 2011) from a computer scientist, especially that Prof. Nigel with Tim Berners-Lee are the experts who created the OGD platform in the UK (http://data.gov.uk/):

(1) LOD (Link Open Data) had been presented as the future Web technology
(2) OGD is taking momentum where governments, local authorities, cities are releasing more data
(3) Transparencies, accountability, engagement, improve Public Services, efficiency, in addition to economic and social values are among main drivers behind OGD.
(4) Principles of OGD and the five stars model of open data describe the pillars of properly opened datasets.
(5) Cloud computing, privacy, and quality of data among the challenges that experts are working on.

At OGD platform Vienna on the 29th of September 2011

The event was organized with the main focus on OGD Phase 3, in which the speakers were briefing on newly opened datasets and services in OGD (Austria, 2011).
The Video stream of the event is available at the website[51] of OGD in Austria; however, following facts had positively contributed into our research:

[50] http://www.ogd2011.at/ogd-digest
[51] http://video.a1.net/streamplayer/vss/ma14_20110929_vod.html

(1) Austria won the prize with the place number one in the competition of the best OGD data catalog among German speaking countries, mainly Austria, Germany, Switzerland, and south part of Italy.
(2) There are ongoing projects on the Meta data of OGD as linked data
(3) More datasets have been released in the sectors of transportation and the trees in Vienna
(4) Visualization solutions that are based on open source technologies and Google maps.
(5) The question on how OGD could benefit firms was raised to the panel speakers, and in short the answer to the research question was pointing to the apps market and to the level of innovations that will be based on OGD. Moreover and as a mandatory requirement for the success of OGD business models, the quality of datasets is a pre-requisite.

At EBC "Open Data: How to spur administrative data"

The event[52] EBC "Open Data: How to spur administrative data, the digital economy" on the 26th of January 2012 was sponsored by pioneered firms in ITC, e.g. Microsoft, and following briefs on the main presented facts on OGD. At the event permission had been granted on recording the panel talks, from which the listed facts were cited:

Figure 10: Experts in OGD are interviewed on the research questions

[52] http://www.open3.at/2012/01/e-business-community-open-data-wie-verwaltungsdaten-die-digitale-wirtschaft-befluegeln (last accessed 12.03.2012)

Appendix 3: Participant Observations

(1) An overview on the OGD from origins to openness, which had briefed on the first directive from President Barak Obama, followed with suites of OGD initiatives in other countries. Austria is one of the early started countries in opening their data, in which the strategic implementation of OGD is in coordination with all Federal states in Austria, IT organizations, and in collaboration with other EU member states. Raising economy via leveraging OGD capabilities is on the top agenda in most countries.
(2) Further confirmations on OGD as non-personal opened datasets which based on the ten principles machine-readable formats, license-free, etc.
(3) OGD takes international momentum, and in Austria OGD has priority among diverse stakeholders.
(4) Marin Klatnböck from SEMANTIC-WEB Company presented his vision on OGD from economic perspective supported with an example of a business models on top OGD.

Figure 18 brings up almost all sectors (public sectors, NPS and NGO, and private business) in which OGD can be a core resource that enables the creation of new business models.

Figure 18 presents also the following set of possible OGD business models:

(1) OGD as a resource for BI (Business Intelligence), MI (Management Information), and Data warehousing. For example, Media and Publishing or Transportation can benefit a lot from OGD
(2) Applications (APPS) such as smart phone applications that run on top of OGD
(3) Data Enrichments in which business models can provide services and solutions on integrating OGD with enterprise solutions, an ERP system with taxing offices is an example
(4) Data visualization and analytical service, e.g. Google maps
(5) Infrastructure in which OGD services can run based on cloud computing
(6) Open data innovation which opens the door for any possible innovative solutions that make leverage of OGD, e.g. crowd sourcing

Moreover, OGD offers another possible business models that focus on the production and the distribution of the datasets themselves.