University of Twente

School of Management and Governance

Final project of the Business Administration master's programme

eGovernment: a driving force for innovation in the public sector?

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Management Summary

Innovation in the public sector is one of the central aspects of public sector reforms. An innovative public sector is relevant for increasing the productivity and quality of public services, which are becoming more important in the competition between regions and states. Given the procedural nature of many government tasks, the adoption of new information and communication technologies (ICT), especially electronic government (eGovernment) has become critical for government organizations. In the last years there is a growing recognition to investigate the relationship of eGovernment and innovation in the public sector. Moreover there is a lack in research on factors, mainly public sector workforce skills, organizational barriers and decision-making strategies, which are assumed to affect this relationship. Such research efforts are crucial for formulating policies and strategies for effective governance as well as for monitoring and evaluating the impact of eGovernment on public sector innovation. Therefore the main research question of the assignment is as follows:

What is the influence of eGovernment on innovation in the public sector and how do public sector workforce skills, organizational barriers and decision-making strategies affect this relationship?

Based on the results of the Innobaromter 2010 report published by the European Commission and Gallup Europe, a research-based performance-management consulting company, this master assignment investigates via correlation and moderated regression analysis the relationship between the supply-side of eGovernment and process innovation in the public sector and whether public sector workforce skills, organizational barriers and the decision-making strategy (top-down / bottom-up) affect this relationship. The findings show that public sector organizations which implement eGovernment solutions from the supply point of view are more successful in terms of process innovation. Moreover the moderation effect of public sector workforce skills delineates an inverse u-curve relationship. The relationship between eGovernment and process innovation is more strongly with medium workforce skills and weaker with low and high workforce skills. In addition the results also show that eGovernment negatively and weaker influences process innovation when more organizational barriers exist. With a look on the decision-making strategy as moderator, the findings illustrate that the decision-making strategy of public sector organizations moderate the relationship between eGovernment and process innovation such that the relationship will be positively and slightly stronger with bottom-up strategies and weaker with top-down strategies.

All in all this paper contributes to the debate towards the influence of eGovernment on public sector innovations and highlights some academic and practical implications as well as direc-

tions for future research. The findings of the assignment can be used by policy makers as well as public sector managers and taken as necessary information to create effective public sector governance and use of eGovernment to stimulate public sector innovation under certain conditions. In addition the findings cannot only be used by people from the public sector but also by managers from the private sector. For instance, managers of IT service provider can recognize the needs of the public sector and the importance of eGovernment. This could be a hint and motivation to develop further software products, consulting as well as training approaches in the field of eGovernment in collaboration with public sector organizations.

Preface and Acknowledgment

The thesis is a part the my double-diploma master course 'Innovation Management and Entrepreneurship' offered at the University of Twente, the Netherlands, and the Technische Universität Berlin, Germany. It describes the results of a Master of Science project for the study of Business Administration, in the School of Management and Governance (MB) at the University of Twente. This project has been carried out as final assignment of this master study from August 2011 up to August 2012 and was supported by the Fraunhofer Institute for Open Communication Systems in Berlin.

All of this could not have been possible without the persons that helped me during this assignment - therefore I would like to thank them:

Most of all I want to thank both supervisors Dr. ir Jeroen Kraaijenbrink and Dr. Michel Ehrenhard from the University of Twente and Prof. Dr. Knut Blind and Prof. Dr. Jan Kratzer from the Technische Universität Berlin for their help through fruitful discussions, encouragements and other help I received. I also want to thank them for revising texts and engaging in numerous, conducive meetings.

Additionally, I would like to thank the Fraunhofer Institute which gave me the opportunity to execute this assignment. Especially I also like to express my gratitude to Dr. Mike Weber who has made available his support in various ways.

Last but not least, I offer my regards and blessings to all of those who supported me in any respect during the completion of the master in Business Administration.

After five months work, I am proud to present my master thesis. Many of the findings within this thesis can be used to conduct further research on the relationship between eGovernment and public sector innovation. And I hope that this thesis can contribute to further research on this particular field of eGovernment.

All in all I enjoyed my time working on this thesis and I hope you will enjoy reading it.

Kind regards,

Andreas Lohmeier

Berlin, August 08th, 2012

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1 Introduction

This chapter introduces the master assignment by discussing its research background, research goal, research questions, approach and structure.

1.1 Research background and goal

Innovations in and supported by the public sector at all level (local, regional and national) are crucial for tackling the so called megatrends like climate change, energy safety, health, demography and security (Barber et al. 2007; Thenint 2010; Blind 2012a). In addition an innovative public sector is also relevant for increasing the productivity and quality of public services, which are becoming more important in the competition between regions and states (Choi & Chang 2009). For instance demands for services that reach citizens even better, along with pressures to reduce costs, form the core justifications for why innovation in the public sector is so important (Proskuryakova et al. 2011; Vander Steen 2009).

However, innovation research has focused so far on the private sector and only little on public sector and there are only few studies on factors influencing innovation in the public sector (Weehuizen et al. 2008; Hollanders & Arundel 2008; Blind 2012a). In this regard innovation in the private sector is mainly driven by competition, the market forcing firms to become more successfully through technological and organizational innovation (Weehuizen et al. 2008). In the public sector, this market incentive is in general missing (Weehuizen et al. 2008; Scheuer & Langergaard 2009). Furthermore, while the private sector has a clear, quantifiable goal (maximizing profits) and has relatively clear-cut constraints (laws, regulation, budget), the public sector has a variety of complex goals. These goals are challenging to quantify and evaluate and are often not easily causally attributable to the activities of the public sector, which makes it rather difficult to compare them in terms of costs-benefits in order to decide on allocation of resources (Weehuizen et al. 2008). Due to these circumstances combined with the nature and diversity of public sector organizations and services, describing and measuring innovation in the public sector thus is typically more difficult than in the private sector (Hughes et al. 2011; Hollanders & Arundel 2008) and designing strategies to stimulate innovation in the public sector is a challenge (Weehuizen et al. 2008; Hollanders & Arundel 2008). Subsequently there are only few conceptual and theoretical studies and analysis on innovation in the public sector available (Arfeen & Khan 2009; Hartley 2005; Pärna & Tunzelmann 2007; Vigoda-Gadot et al. 2008).

In this regard an upcoming topic in public sector innovation research is information and communication technology (ICT), especially electronic government (eGovernment) (Hackney et al. 2008; Potnis 2010; Blind 2011). Citizens, businesses as well as governmental institu-

tions demand more individualized assistance, at all times access to information and effective paperless interaction to accomplish administrative processes electronically (Aichholzer & Westholm 2003). The changed requirements towards government and administration result in implementations of eGovernment strategies at various levels of government (Aichholzer & Westholm 2003). In addition there is a growing recognition that effective and innovative public sector governance will require the use of ICT, mainly eGovernment, for more efficient and speedy services (Choi & Chang 2009; Dunleavy et al. 2006; Opoku-Mensah 2011). Effective use of eGovernment improves the internal workings of the public sector institutional linkages between different government agencies and promotes the delivery of public services to the citizen, the private sector and the civil society (Chadwick & May 2003). In this regard Xu (2010, p. 242) expresses the importance of eGovernment as "*a driver of the innovation process in the public sector.*" Despite this growing recognition, there is a need to investigate the relation of eGovernment and innovation in the public sector (Xu 2010; Margetts et al. 2003; Blind 2012a). Moreover there is a lack in research on factors which influence this relationship, mainly public sector workforce skills, organizational barriers and decision-making strategies (Mulgan & Albury 2003; Blind 2012b). Human, cultural and organizational factors have received relatively little attention in research on eGovernment and public sector innovation in the past years (Detert et al. 2000; Bradley & Parker 2006; Pillay 2008). Such research efforts are crucial for formulating policies and strategies for effective governance as well as for monitoring and evaluating the impact of eGovernment on public sector innovation. Especially research on factors, which affect this relationship, could be used as a starting point for the introduction of measures to foster innovation in the public sector.

Derived from the above mentioned context the research goal of the assignment is *to investigate the influence of eGovernment on innovation in the public sector and how public sector workforce skills, organizational barriers and decision-making strategies could affect this relationship.*

1.2 Research Questions

Based on the research background and goal, the central research question is as follows:

What is the influence of eGovernment on innovation in the public sector and how do public sector workforce skills, organizational barriers and decision-making strategies affect this relationship?

To answer this main research question four sub-research questions are formulated which must be answered before the main research question can be answered. Below the sub-research questions are introduced.

Generally, within the main research question there are two domains, which must be determined in more detail before the question can be answered. The first domain contains innovation in the public sector whereas it is important to know what public sector innovation is, also in comparison to private sector innovation and which different types of innovation in the public sector must be taken into account. The second domain within the main research question is eGovernment, which can have an influence on public sector innovation. Due to the fact, that eGovernment has different dimensions and occurrences it is necessary to determine the relevant dimensions and specifications of eGovernment. After both domains have been identified it has to be determined if there is a relationship between these domains, which leads to the following sub-research question:

1. *To what extent has eGovernment influence on innovation in the public sector?*

With a look on the second part of the main research question, three further sub-research questions can be formulated:

2. *To what extent do public sector workforce skills affect the relationship between eGovernment and public sector innovation?*
3. *To what extent do organizational barriers of the public sector affect the relationship between eGovernment and public sector innovation?*
4. *To what extent do public sector decision-making strategies affect the relationship between eGovernment and public sector innovation?*

In chapter 2 of the research proposal I will elaborate on the relevant definitions of the key terms in order to avoid misunderstandings and have a clear view on the opinions of different scholars. In this part I will also develop the hypothesis derived from the sub-research questions as well as literature and narrow the research focus of each variable due to the fact that the above mentioned sub-research questions are formulated rather general and open.

1.3 Structure of the master assignment

The master assignment is structured as follow (see figure 1):
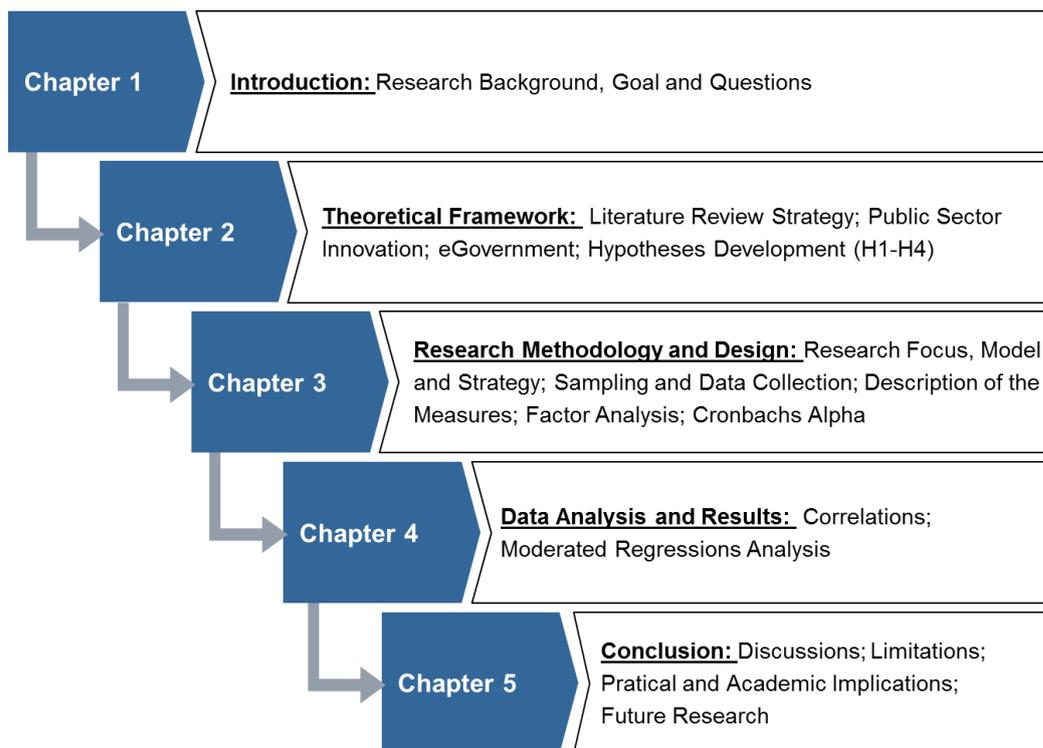
Figure 1 - Structure of the master assignment

To answer the main research question and its sub-research questions a theoretical framework will be constructed in the second chapter of the master assignment. At the beginning of chapter 2 I will shortly describe my literature review strategy, so that the readers gets familiar with my approach to systematically collect and asses information about a new and unknown research topic. Then the notion of public sector innovation will be elaborated, which will be one of the main fields of observation of this work. On the one hand this will increase the understanding of important constructs and terms around the notion of innovation and on the other hand it will work out the attributes and characteristics, which shape the public sector. Based on this knowledge I will outline some definitions on eGovernment, its dimensions and its relationship to public sector innovation described in the literature. Furthermore I will present the three factors (public sector workforce skills; organizational barriers; decision-making

strategy) which are supposed to moderate the relationship between eGovernment and public sector innovation. All in all chapter 2 gives definitions and explanations about the core variables in order to avoid misunderstandings and have a clear view on the opinions of different scholars and on the hypotheses derived from the review.

After building the theoretical framework the research design will be elaborated in more detail based on the chosen methodology and empirical procedures in chapter 3. In addition to that the measures used in this assignment will be described and tested regarding their reliability and validity. Upon the research design and methodology the analysis of the data and hypothesis will be done in chapter 4. In this chapter I will analyze the available data set and present the results, which deliver the basis for the conclusion in chapter 5. This last chapter will shortly summarize the key findings and discuss the present work. Furthermore practical and academic implications and limitations will be critically elaborated. It will also picture some directions for future research.

2 Theoretical Framework

2.1 Literature review strategy

For carrying out scientific work, there is a vast of research methods available. Depending upon the intended goal, suitable instruments have to be chosen. One of the most important methods, which is used in almost every kind of research and also in this master thesis, is the literature review (Randolph 2009). A literature review uses reports of original or primary scholarship as its database and is itself not a report of primary scholarship (Cooper 1988). The reports that are used in the review are in most cases written documents but can also be verbal (Cooper 1988). In general, the literature review aims at describing, summarizing, evaluating, clarifying and/ or integrating the content of primary reports which can be empirical, theoretical, critical/ analytic, or methodological in nature (Cooper 1988).

As just mentioned, a literature review is applicable in nearly all kinds of research projects, though the extent can vary depending upon the research goal (Grinnell & Unrau 2010). Boote & Beile (2005, p. 6) even argue that "a researcher cannot perform significant research without first understanding the literature in the field". Consequently, reviewing the literature plays an important role in science (Webster & Watson 2002), particularly in writing journal articles but also in preparing a viable master thesis (Randolph 2009).

In general, the literature review is an instrument which authors can use to demonstrate knowledge in a specific field of study, such as vocabulary, theories, key variables & phenomena, as well as the methods and the history (Randolph 2009). In line with Gall et al. (1996), Randolph (2009) states that this method is particularly useful, when the goal is to:

- Delimit a research problem or question and avoid irrelevant approaches (e.g. see chapter 1.2, chapter 2.3.1 or chapter 3.1)

- Identify new inquires and get familiar with new topics (see chapter 2)

- Gain insights about methodology (see chapter 3.2.3 or chapter 3.3)

- Develop recommendations for future research (see chapter 5.4)

Taking these points into consideration, the overall goal is to synthesize the knowledge of a subject, like eGovernment and public sector innovation, into a model or conceptual framework that facilitates a new perspective on a topic (Torraco 2005). Often, the overview that has been gained acts as a starting point for subsequent work, e.g. for empirical studies (Randolph 2009; Torraco 2005). Consequently, the literature review is not limited to certain

topics or fields but is an appropriate means for almost all subjects and supports the investigation of various research questions.

Following Coopers (1984) approach, the critical steps of a literature review are the research background and problem formulation, data collection, data evaluation, analysis and interpretation, and public presentation. Since the literature itself is the data basis, particularly its identification, selection and analysis are of interest in the literature review (Torraco 2005; Webster & Watson 2002).The reviewed literature must be complete and relevant but also focused (Webster & Watson 2002). For good research, it is necessary to carefully describe the strategy for identifying and selecting the literature, in order to improve the credibility, and guarantee the replicability of the results obtained (Torraco 2005). In this regard I will look generally for topics about public sector innovation, eGovernment as well as about the three factors which are assumed to influence the relationship between eGovernment and public sector innovation. The idea is to get a first overview about the research theme and literature streams. Every search will be done by using ISI Web of Knowledge/Science, Google Scholar and the library and (online) archive of the University of Twente, TU Berlin and Fraunhofer Institute. The articles will be chosen by the number of citations or the adaptability to the authors' research questions and topic. Moreover the focus is on scientific material, published in English or German language. The content of the found articles will be then reviewed and in the following either included or excluded from the literature review.

All in all among a variety of research methods to be carried out while conducting academic studies, the literature review is one of the most frequently used methods. To almost all research papers whether theoretical, methodological or empirical, a literature review is not only applicable but it also constitutes the core element of a framework upon which the research is based in order to tackle a problem, answer a question or providing recommendations. In sum the literature review helps me to understand the new research fields and to develop the hypothesis. Moreover I decided to do a literature review because according to Marelli (2005) the literature review is a versatile method, which does mean that it "(...) can be conducted for almost any topic and can provide information either at the overview level or in-depth" (Marelli 2005, p. 43). Furthermore, concerning the data collection, a large amount can be collected efficient and quickly at minimal cost (Marelli 2005). Often, there is no cooperation required, researchers (e.g. master students) could go to a library or perform an online based search for literature without collaborating with others (Marelli 2005).

2.2 Public Sector and Innovation

This chapter will help to understand what is meant by public sector innovation by reviewing different definitions, types of innovation and why innovation is increasingly important in the public sector.

2.2.1 Innovation in the public sector and its importance

The emergence of research in public sector innovation stems from the confluence of a number of factors, some internal to the public sector and others of a wider context (Matthews et al. 2009). In this regard Bugge et al. (2010) and Bloch (2011) also stated that public sector innovation may be derived from a number of political, economic and personal factors. Across Europe, the public sector is coming under mounting pressure from many directions - rising demand from citizens, demographic shifts, environmental challenges and resource constraints (Barber et al. 2007; Thenint 2010; Blind 2012a). Therefore, sustaining the quality, fair access and efficacy of public services is increasingly difficult. The need for action has only become more visible following the financial crisis and subsequent worsening of government budget deficits (Blind 2011). In this regard the OECD (2011) also indicate some main catalysts for public sector innovation, which often come in the form of challenges and perceived shortfalls that require a reaction. For example the need to contain costs and improve efficiency due to tighter budgets and fiscal constraints (e.g. as a result of the financial crisis) and the change of the demand in the private and the public sector with people, who wants to be better informed and new government reform programs are one of the main drivers (OECD 2011). Especially tackling the opportunity offered by new ICTs to create innovation and new service delivery is also a main driver for public sector innovation (OECD 2011). All in all innovation in the public sector is crucial in managing these challenges (Barber et al. 2007; Blind 2012a) and the interest in public sector innovation has been increasing over the last twenty years (Borins 2001 and 2006; Grady 1992; Thenint 2010). In addition public sector organizations around the world are viewing innovation as one of the most important method to successfully deal with up-coming issues and old long-standing unsolved problems, which result in a political prioritization of public sector innovation research (e.g. Barroso 2011; Clark et al. 2008; European Commission 2011).

However, what is meant as 'public sector innovation' and how innovation takes place in the public sector requires some definitions and explanations. One may start with defining the public sector in general and how it relates to innovation. According to the Frascati manual (OECD 2002) a public sector is not defined but the "government sector". It covers basically two entities:

- "*All departments, offices and other bodies which furnish, but normally do not sell to the community, those common services, other than higher education, which cannot otherwise be conveniently and economically provided, as well as those that administer the state and the economic and social policy of the community;*
- *NPIs [non-profit institutions] controlled and mainly financed by government, but not administered by the higher education sector*". (OECD 2002 p. 62)

In this regard, according to the OECD's Glossary of statistical terms the public sector *"comprises the general government sector plus all public corporations including the central bank."* (OECD 2001, p. 1) These related definitions which are widely used for the purpose of collecting primary data on the sector, indicate its scope and variety (Bloch 2011; Technopolis 2012). In general, several approaches of using different public sector definitions are feasible and much of the work conducted in this assignment is instructive for the development of different approaches. However, the focus of this project will be on the public sector defined by the OECD (2001).

With a look on innovation it is not anymore entirely a private sector characteristic, since public sector innovation is also increasingly widespread. The public sector is in many countries a driver for innovation and economic growth, but there has hardly been any systematic statistical evidence showing scope and the nature of public sector innovation, nor its impact on private sector innovation (Technopolis 2012). But as Nelson (2008), one of the leading academic researchers in the innovation studies area, has noted, whilst there is a vast literature on how the public sector operates, very little of this literature has been elaborated self-consciously with innovation in the public sector. The few literature about public sector innovation often mention that public sector organizations traditionally have been considered conservative, bureaucratic and reluctant to change (Borins 2002; Mulgan & Albury 2003; Vigoda-Gadot et al. 2008; Windrum 2008; Wise 1999). This notion of the public sector as poor at innovating is however considered poorly founded or simply wrong (Mulgan & Albury 2003; Walker 2007) and as something which needs to be challenged or investigated further (Vigoda-Gadot et al. 2008; Wise 1999). The view on the public sector as non-innovative is in other words being challenged in the recent years, and the interest in doing research in public sector innovation is, as mentioned, increasing. Not only because innovation in the public sector is about generating and implementing new ideas that aim to increase efficiency and effectiveness (McDonald 2008; Vander Steen 2009).

In this regard Currie et al. (2008, p. 989) define public sector innovation as "*the quest for creative, unusual or novel solutions to problems and needs, including new services, new or-*

ganizational forms and process improvements" in the public sector. In addition to that, recent measurement work within the European Union (EU) and the OECD (Organization for Economic Co-Operation and Development) utilizes the following public sector innovation definition, which includes the same basic criteria as the recognized definition of innovation in the private sector, that innovations are significant changes that have been implemented in the organization: "*An innovation is the implementation of a significant change in the way your [public sector] organization operates or in the products it provides. Innovations comprise new or significant changes to services and goods, operational processes, organizational methods, or the way your organization communicates with users. Innovations must be new to your organization, although they can have been developed by others. They can either be the result of decisions within your organization or in response to new regulations or policy measures.*" (Bloch 2011, p. 20).

Both definitions from Currie et al. (2008) and Bloch (2011) show that innovation can be defined in a number of ways and the innovation theory as well as the literature on public sector innovation offers a variety of definitions. Common for all of these definitions are that innovation means newness, e.g. new ideas, services, processes, and that the new element is implemented and results in a new practice (Scheuer & Langergaard 2009). In regard to newness, the innovation is new to the respective public sector organization, and not necessarily new in all senses. All in all I would like to combine both definitions from Currie et al. (2008) and Bloch (2011) and define innovation in the public sector according to Walker (2007, p. 592) as "*a process through which new ideas, objects and practices are created, developed and reinvented, and which are new for the unit of adoption.*"

The above mentioned definitions and characteristics of innovation exhibit four different types of innovations, in terms of what is the object of renewal and what is being innovated. According to the OECD (2011, p. 12) these different types are describes as follows:

1. "*A product innovation is the introduction of a service or good that is new or significantly improved compared to existing services or goods in the organisation. This includes significant improvements in the service or good's characteristics, in customer access or in how it is used.*

2. *A process innovation is the implementation of a method for the production and provision of services and goods that is new or significantly improved compared to existing processes in the organisation. This may involve significant improvements in for example, services, equipment and/or skills. This also includes significant improvements in support functions such as ICT, accounting and purchasing.*

3. An organisational innovation is the implementation of a new method for organising or managing work that differs significantly from existing methods in the organisation. This includes new or significant improvements to management systems or workplace organisation.

4. *A communication innovation is the implementation of a new method of promoting the organisation or its services and goods, or new methods to influence the behaviour of individuals or others. These must differ significantly from existing communication methods in the organization."* (OECD 2011, p. 12)

Especially process innovation itself came to prominence in the public sector as a result of the quality and continuous improvement movements and refers to the way new internal procedures, functions (e.g. supply of new eGovernment solutions), policies and organizational forms may be required for supporting process innovation (Vander Steen 2009; IDeA 2005). But in contrast to the continuous improvement movement public sector process innovation is also about giving employees the freedom to explore new approaches and processes as they see, whereas with continuous improvement there is likely an established process for making changes (Liu 2008). Moreover, process innovation is often related with ICT in the literature (Bloch 2011; OECD 2011) and the other way around (Nepelski 2010), which provide the foundation to forge a link between eGovernment and process innovation. In addition Bloch (2011) presents in his study that interviews in the public sector "*with potential respondents where ICT is a central element in their innovation activities suggested that focus in promoting innovation should be generally on process innovation*" (Bloch 2011, p. 40). Thus, due to the above mentioned arguments the focus of the master assignment will be on public sector process innovation although there could be found different classifications and breakdowns of innovation types in the public sector in the literature (see e.g. OECD 2011, p. 12; Scheuer & Langergaard 2009, p. 11-12; Bloch 2011, p. 20). Nevertheless, the reader should notice that there are also other typologies of innovation in the public sector but with a look on the focus of the assignment, it is not necessary to deepen the different classifications.

All in all the prevailing view is that the public sector problems faced today are not the same as those from the past and that new innovative approaches and initiatives will be required in order to solve them (Vander Steen 2009). Therefore public sector innovation is "not an optional luxury", it is instead a "core" and must be "institutionalized as a deep value" (Albury 2005, p. 51). Not innovating is more risky than innovating and has the very serious consequence of causing a loss of "public confidence in government and the public service" (Bartos 2002, p. 13), along with decreased efficiency and effectiveness (Moore 2005; Mulgan & Albu-

ry 2003). This is because innovation is increasingly seen as being at least part of the answer to solve many of the perceived shortcomings of the public sector (Vander Steen 2009). Although innovation is often associated with the private sector because of the fact that the public sector is often criticized for lacking the right environment for promoting innovation, the discussion above demonstrate that creating a culture of innovation in the public sector is actually important. Especially the need to identify factors (e.g. eGovernment) which affect (process) innovation in the public sector is increasing. In order to be able to improve our knowledge and understanding of drivers for innovation in the public sector, as well as about its processes and impact, there is now an increasing awareness of the need for more systematic and empirical data on drivers for innovation in the public sector.

2.2.2   Distinguishing from private sector innovation

This section will also help to understand what is meant by public sector innovation by reviewing how public sector innovation distinguishes from private sector innovation and the challenges it faces to innovate (e.g. organizational barriers).

The definition of innovation for the public sector does not substantially differ from that used for the private sector, as the definition is in many respects similar. Still, it is important to appreciate the similarities as well as the differences between private and public sector innovation to understand the context in which innovation occurs (OECD 2011). However, there are a variety of aspects that make innovation in the public sector and its promotion very different from innovation in the private sector. Innovators in the public sector may have different incentives and drivers as well as face different barriers to developing and implementing new approaches. The absence of market incentives and the possibility of competition and choice (in many areas, government is the only provider of public services. This implies that users – unlike in a market context – do not have a choice to go to another provider of the actual service if they are not satisfied), could be seen as the most important difference between the public and the private sector (Halvorsen et al. 2005; OECD 2011).

With a look on innovation the main motivation in the private sector is the need to increase profitability, which in turn provides an incentive to innovate to cut costs by optimizing processes and to create new products and services (Mulgan & Albury 2003). Indeed, the public sector has some similar views "*but value in the public sector is different from value in the private sector, and can be more complex and more difficult to measure.*" (Mulgan & Albury 2003, p. 6) It aims on the one hand on quantifiable outcomes (such as less crime, poverty or violence (Jorgensen 1999) and on the other hand on some softer outcomes such as the quality of services, including improved efficiency, in order to increase public value (Hartley

2005) and trust between service providers and users (Mulgan & Albury 2003). Furthermore public institutions typically "*are the primary supplier of services and are not – as within the private sector – competing in order to maximize profits.*" (OECD 2011) In this regard Koch & Hauknes (2005) assume that in the public sector some of the drivers which promote innovation in the private sector are partly not applicable, such as economic pressure, competition as well as interestingly new technologies. Therefore this master assignment can disprove this assumption by investigating the influence of new technologies (such as the introduction of eGovernment) on public sector innovation.

Furthermore typical structures and the public accountability of the public sector can hinder innovation that involves risk and uncertainty. Limiting factors (i.e. organizational barriers) include delivery pressures and administrative burdens which can limit time for innovative thinking, poor risk management skills, short term horizons and budgets, reluctance to close down failing programs or organizations, constraining cultural or organizational arrangements (e.g. risk-aversion culture), and over-reliance on high performers as source of innovation. Furthermore, the impacts of these innovations, be they incremental or radical, will be minimal unless they are diffused and taken up by other organizations. The challenge for public sector innovation is to generate both a significant progress and an equal distribution of its impact across the public sector.

Public sector innovation also has multiple objectives which can be conflicting. Often, for example, initiatives to widen the range or improve the efficiency of public services have distributional consequences. Consequently, public sector organizations need to include a focus on social aspects in their innovation activities to ensure that innovations implemented in individual organizations benefit all constituents equally or at least help to alleviate social imbalances. Finally, in the public sector we have multi-level structures, which are leading to different types of innovations, different drivers, barriers and impacts. An important challenge for innovation is thus taking into account the complex organizational context of public sector organization and how it can impact innovation processes at the different levels of public sectors, e.g. new regulations set centrally have to be also implemented at a local level.

All in all innovation in the public sector may be motivated by a number of economic, industrial, political, relational and personal factors (Bugge et al. 2010) and is to some extent different from private sector innovation. Nevertheless, in order to be able to increase the knowledge and understanding of public sector innovation, as well as about its influencing factors, such as eGovernment, there is an increasing awareness of the need for more systematic data on these relationships. This was one of the key recommendations of Koch & Hauknes (2005) in their research on innovation in the public sector. Thus, the assignment will elaborate in the

following on several factors, especially eGovernment, influencing public sector innovation to close the gap in literature.

2.3 eGovernment as a driving force for innovation in the public sector

This chapter introduces the concept of eGovernment, its origin, dimensions and objectives. It also investigates the relationship between public sector innovation and eGovernment.

2.3.1 Multi-faceted definitions of eGovernment, its importance and origin

This section will present an overview of current state-of-affair researches in the field of eGovernment focusing on theoretical and practical papers. The goal of this literature review is to keep a broad view of eGovernment at all times and to provide a definition for eGovernment as it will be used throughout the assignment.

Government organizations have public functions that are of general interest to citizens and business. While exercising their tasks like research, policy making, policy execution, democratic control, communication with citizens as well as businesses and internal administrative processes, information will emerge. The use of ICT increased the possibility of providing this information regardless of place and time. The rapid development of ICT has made many services dependent upon technology and the investment in ICT as well as its developments has increased significantly. In the literature ICT has been seen as an instrument of administrative reforms in government for the past several decades (Gasco 2003; Fountain 2001; Moon 2002; Garson 2004). All over the world governments have focused on ICT and eGovernment in different forms (OECD 2007) to improve government and service provision (MacInnis & Madill 2003; Holland et al. 2005; West 2004) as well as reduce costs and redundancy (Jaeger 2003). Public sector organizations are currently facing challenges such as tight budgets, the need for improving service quality and cutting costs, and providing legal certainty. An increasing flood of data, new tasks and heterogeneous system landscapes which have grown over a period of years have to be mastered. Effective and efficient eGovernment improve government processes, increase service quality, enhance transparency and reduce costs (Seifert & Peterson 2002). Nevertheless from many investigations on citizen values, one clear conclusion is that citizens are more often disillusioned than enthusiastic about their governing institutions (Clark & Hoggart 2000). This seems to be related to inevitable comparisons with services provided by the private sector and specially to rapid changes in citizens' values, which became more volatile with the presence of digital technologies (Clark & Hoggart 2000). The public sector can meet these demands by the application of new ICTs, especially eGovernment, to promote the development of society and to address the increasing expectations of the users, citizens and businesses.

However, the potential of IT-related technologies and the internet to reform the public sector is often derived from the transformation of private sector organizations using ICT and especially the internet during and after the dot.com boom (Brynjolfsson & Hitt 2003; Dedrick & Kraemer 2005; Madsen 2009). In addition, in the literature it could be found that the term eGovernment arises by analogy to the concepts and practices of electronic commerce (eCommerce) applied to the public sector, referring to the delivery of government services to the public online (typically over the internet), to web-related front-office technologies (see for example Fountain 2001; Reddick 2004; Grönlund & Horan 2005) or to the technological infrastructure required to deliver those services (Li 2010). As you can see the initial concept or origin of eGovernment took off years ago, mostly as the mirror image of eCommerce in the private sector (Chochliouros & Spiliopoulou-Chochliourou 2006) and often simplified as 'eCommerce by government'. However, even if both concepts are based on the same technology, comparing the business models, several distinguishing characteristics emerge. eCommerce refers to the commercial use of internet technology to sell and purchase goods or services while eGovernment focuses on delivering and providing information as well as services to citizens, businesses and users electronically (Jorgensen & Cable 2002). Moreover the public sector offers heterogeneous products to a heterogeneous target group and is following policy and legal requirements instead of market demand. The transfer of concepts like defining relationships should therefore be made cautiously (see Gisler & Brüchner 2002, p. 7-8).

However, the employment of ICT in the public sector has lagged behind that of the private sector (Clark & Hoggart 2000; Schoeniger 2000; Scholl 2005) and what the term eGovernment exactly means is a controversial issue in research (Andersen & Henriksen 2006). There are several definitions of eGovernment due to the different perspectives of experts when they describe this concept and it seems as though there are as many different terms (e.g. eGovernment, mGovernment, iGovernment etc.) and definitions of eGovernment as there are people working with the topic (e.g. Fountain 2001; Danziger & Andersen 2002; Garson 2004 and 2006; Rossel & Finger 2007; Li 2010; Haldenwang 2004; Potnis 2010; Abdelghaffar & Magdy 2012; Bekkers & Homburg 2005 and 2007; Tambouris & Tarabanis 2008; Grönlund 2005; Andersen & Henriksen 2006; Leitner 2003; Carter & Bélanger 2005; Layne & Lee 2001; Dunleavy 2002; Heeks 2006). Until now, researchers have not been able to come up with a universally and broad accepted definition to describe the concept of eGovernment (Halchin 2004). In this regard Moon (2002, p. 425) describe the situation to the point: eGovernment "has not been clearly defined and understood among scholar and practitioners of public administration." Also Li (2010) states that although eGovernment was introduced in

the public sector in the nineties, it has not been clearly defined and understood by scholars and practitioners of the public sector.

In this regard Leitner (2003, p. 14) state that "*electronic government information can be acquired by the use of a computer and a network. It therefore allows easier policy coordination among ministerial departments, public agencies, and layers of government*." But this definition does not contain the strategic focus of eGovernment and also exclude the relevance of eGovernment for citizens and business. In contrast, Li (2010) denotes eGovernment as the strategic, coordinated use of ICT in the public sector and policy decision-making. Moreover, according to Carter & Bélanger (2005) eGovernment is the use of information technology to enable and improve the efficiency with which government services are provided to citizens, employees, businesses and agencies. These services, such as the distribution of forms or submissions of bids and proposals (GAO 2001), are beneficial to both citizens (incl. business) and government. Governmental institutions realize cost reductions and improved effectivity and innovation, while citizens, including business, receive faster, more convenient services (Trinkle 2001). Moreover Haldenwang (2004, p. 417) defines eGovernment and its applications, similar to Li (2010), as "[…] the strategic, coordinates use of information and communication technologies". These ICTs could help lead to new and better government (Halenwang 2004; Trinkle 2001), since they may be used to restructure existing institutional processes and to ensure that these (process) innovations thrive over time (Yeloglu & Sagsan 2009; Bekkers & Homburg 2007).

All in all eGovernment covers many areas of the government and the definition of eGovernment varies from the very generic use of ICTs and its application by the government for provision of information and public services to the people (Curtin 2007; Heek 2006) – to the more specific – "the delivery of government information and services online through the internet or other digital means" (West 2004, p. 16) and the "delivery of government services over the internet in general and the Web in particular" (Bannister 2007, p. 172). Reasons for the implementation of eGovernment are the ability to improve the efficiency of government agencies and enhance business processes, which in their turn will lead to higher quality and customer oriented service delivery. The reason for the implementation of eGovernment lie also in the possibility to involve citizens and businesses in certain decision-making processes as well as administrative processes. According to Lenk et al. (2005), eGovernment can provide a standardized window to citizens, which enable them to have access to any public service, regardless of which organization is in charge of it and where it is generated.

However, in this assignment Heeks' (2006, p.12) broad definition of eGovernment is used to include all "use of information technology by public sector organisations." This broad per-

spective will be applied because large back-office management and computing systems are based on ICT infrastructure and other applications which account for the majority of government IT spending and procurement (Dunleavy et. al 2006). Furthermore the introduction of new ICTs such as entire computing systems and applications, promises to leverage and manage the entire IT landscape in government and not just web-based technologies and the internet.

2.3.2 Specification and dimensions of eGovernment

Nevertheless, it is important to have a deeper look into eGovernment research and narrow its focus for the empirical part. In the literature it could be found that the term eGovernment is used to cover preliminary two main dimensions (figure 2): electronic administration (eAdministration) and electronic democracy (eDemocracy) (Macintosh 2008; Hach 2005; Heeks 1999 and 2001; Millard et al. 2004):
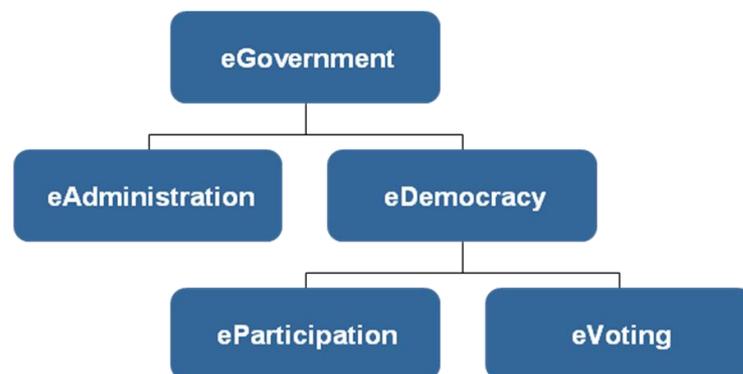
Figure 2 - Dimensions of eGovernment

1) eAdministration "*is a mechanism providing, supporting and facilitating the process of communication among Government, citizens and businesses*" through ICT (Millard et al. 2004, p. 21). It refers to the direct supply of on-line services direct to its users, citizens, businesses, private and non-profit organizations. In general it comprises both ICT support of traditional market services of goods and governmental services.

However, in the area of eAdministration, aiming at the optimization of administrative processes, three different target groups of interaction could be identified. Analogous to the concept of eCommerce, relationships in eGovernment are differentiated into Government to Consumer (G2C), Government to Business (G2B) and Government to Government (G2G), which could be found in the literature (Bonham et al. 2001; Brown & Brudny 2004; Ndou 2004). These three target groups of eAdministration (G2C, G2B, G2G), will probably benefit from eGovernment and its innovation enabling characteristic.

- Government to Citizens (G2C) refer to the interaction between government and the citizens (Ndou 2004), including dissemination of information to the public and basic services in various sectors. For example citizens can use eGovernment services to communicate electronically with the local tax office to file their tax return (Träger 2005, p. 16).

- Government to Government (G2G) refer to the interaction between the agencies within the department (inter-government relationship) and interactions between different government level and attached agencies (intra-government relationship) (Ndou 2004; Mehlich 2002). A classical example of a government to government relationship is the exchange of data between the citizen registration (local level) office and the regional tax office (regional level).

- Government to Business (G2B) refer to interaction between government and business stakeholders (Ndou 2004), including disseminations of rules, policy and regulations, within small, medium or large enterprises. From the perspective of business, it will be reducing cost, through improvement of electronic procurement (Fang 2002), increased competition and streamlined regulatory processes.

2) eDemocracy "*represents those aspects of eGovernment which aim to improve participation of citizens and businesses in democratic decision building by facilitating access to relevant information and knowledge and by facilitating public discourse.*" (Millard et al. 2004, p. 21) In this regard, it should be also noticed that eDemocracy could be divided into two subdimensions, eParticipation and eVoting (Beckert et al. 2011; Kampen & Snijkers 2003):

2.1 Electronic Participation refers to "*the use of information and communication technologies to broaden and deepen political participation by enabling citizens to connect with one another and with their elected representatives*" (Macintosh 2006, p. 365).

2.2 Electronic Voting refers to the use of computers or computerized voting equipment to cast ballots in an election (Cetinkaya 2007). Even though the distinction between deliberative processes ("eParticipation") and decision-making ("eVoting") can be found in the literature, it has to be noted that a voting process can be a part of any of the above stages (Rupp 2004).

Beside this division of dimensions in eAdministration and eDemocracy there were other slightly different approaches developed in the last years to structure eGovernment which could be found in the literature (e.g. Hach 2005; EIPA 2003). Nevertheless, the reader should notice that there are also other typologies but with a look on the focus of the assign-

ment, it is not necessary to deepen the different classifications. Moreover the different typologies remain the same at its core and are almost similar in their objectives and functions in comparison with eAdministration and eDemocracy. Therefore my elaborated model, which is grounded by the literature, will be taken as a starting point for my further elaborations on eGovernment.

In this regard with a user-centric view eGovernment, as well as its dimensions, could be also divided in terms of the "supply" of electronic public services (e.g. Introduction/Purchasing of new ICT equipment or systems) and the "demand" for these services ("Governmental on-line services usage by individuals") (Centeno et al. 2004; Maria et al. 2011; Lee-Kelley & Kolsaker 2004). In general, also Millard et al. (2004) argues that activities conducted by the government could be analyzed from the supply and demand point of view. In addition Arduini et al. (2010) also divide eGovernment in a supply and demand side and assume that the provision of digitalized front-office services to the citizens, firms and other institutions (supply-side of eGovernment) could be a measure to stimulate public sector innovation.

All in all the above mentioned definitions and specifications of eGovernment help to narrow the focus of my empirical research and to categorize my work in the context of the literature. In this regard I will look on the eAdministration dimension of eGovernment, because it deals inter alia with governmental relationships and aims at the optimization of administrative processes through ICT (Macintosh, 2008). Therefore, due to its process optimization focus, eGovernment initiatives which are assumed to stimulate public sector process innovations (see next chapter 2.3.3) belong to the eAdministration dimension. Furthermore due to the fact that the Innobarometer survey did not observe eGovernment services in the context of eDemocracy, I will focus on the eAdministration dimension. All questions in the Innobarometer survey concerning eGovernment or more generally ICT could be assigned to the eAdministration dimension. Moreover all of the questions belong to the supply-side of eGovernment and on eGovernment systems used in the public sector internally (G2G). This fact is quite interesting and conducive for my research because according to Realini (2004), G2G is an emerging area of research. This might be because of the lack of models and research concerning eGovernment within the public sector (G2G). Therefore I focus only on the public sector internally (G2G perspective) and not on G2B or G2C. Thus, the results of this master assignment will mainly belong to the G2G perspective within the eAdministration dimensions and treat eGovernment from the 'supply' point of view.

2.3.3   The role of eGovernment in public sector innovation

Since much of the topic and studies on innovation are focusing only on the private sector, it is the goal of the assignment to investigate the influence of eGovernment on innovation in

the public sector. As described in chapter 2.2 innovation in the public sector is not only about bringing a new breakthrough product or process to the people, but also to bring in changes to the culture in the governmental organization, the way a decision is made, and perhaps more importantly, how it can use technology, such as eGovernment, to strengthen its innovation potential. Indeed, it is essential for public sector organizations to use eGovernment to support processes within the government for the delivery of services to its customers, but it is not satisfactory that eGovernment is used only for automation of current practices within the public sector (Goldkuhl 2009). The basic aim of eGovernment is rather to improve the ability of all people to access information and to enhance the efficiency and effectiveness of all kinds of government services (Arfeen & Khan 2009). This circumstance builds up a conducive condition for the organizations as well as employees to develop and foster innovations. Furthermore in modern eGovernment research there is a quest for ICT as a driver for innovation, which does mean to achieve innovation through ICT (Andersen 2004). Therefore someone can assume that eGovernment will influence and foster innovation in the public sector. This first initial assumption is also based by the fact that most OECD countries have eGovernment strategies, designed to set the stage for innovations derived by eGovernment service delivery (OECD 2011). While eGovernment represents a 'vehicle' for improved performance and service delivery, this can also be seen as just the most recent step in a more evolutionary process of public sector reforms and innovation (OECD 2011). Moreover, according to the OECD (2011, p. 43-44) "*eGovernment is not just about putting government services online and improving their delivery. Rather, it also constitutes a set of technology-mediated processes that could improve the overall quality of policy and decision making and change the broader interactions between constituents and government.*" This introduction or availability of new technologies may provide an opportunity for innovations in the public sector. Therefore eGovernment could be also seen as "*a prerequisite for a high performing and innovative public sector [...]*" (OECD 2011, p. 43). Also Wang (2010) assumes in his research that beside the financial and economic crisis, ICT could be also seen as enabler and driver for public sector and service innovation. Simultaneously, according to Bekkers et al. (2006) ICT, especially eGovernment, has been perceived as an important driver for innovation and modernization in the public sector. With a look on the private sector, the introduction of ICT-based systems may have large impacts on the structure of businesses and innovativeness of firms. According to Hempell et al. (2006) the implementation and introduction of ICT may lead to a whole chain of various subsequent innovations. Although the findings of Hempell et al. (2006) were observed in the private sector, it could also give an indication for the situation in the public sector that ICT may lead to several subsequent innovations.

One first approach in observing the relationship between eGovernment and innovation in the public sector was conducted by Maria et al. (2011). The researchers investigate the relationship between eGovernment and the overall innovation performance at national level, for some EU countries. They also categorized eGovernment in terms of a supply and demand-side dimension (see chapter 2.3.2), but they did not focus on process innovation but rather on innovation performance according to the SII (the Summary Innovation Index), which is a composite indicator that measures the overall innovation performance at country level and developed by European Commission. As a result of their study Maria et al. (2011) observed that the supply- and the demand-side of eGovernment are significantly correlated with innovation performance in the public sector. This result could be seen as a further starting point for my assumption that the supply-side of eGovernment correlates also with process innovation in the public sector.

Another study concerning eGovernment and public sector innovation was done by Margetts et al. (2003), who look at the impact of eGovernment on innovation in terms of policy and service delivery initiatives. With a look on their findings the researchers argue that "*moves towards e-government – the widespread use of information and communication technologies (ICTs) by governments across the EU over the last 50 years - increase the potential for these governments to innovate […].*" (Margetts et al. 2003, p. 2) Furthermore Margetts et al. (2003) also argue that "*e-government not only facilitates innovation, it can also 'force' innovation on government*" (Margetts et al. 2003, p. 4). Indeed the findings of Margetts et al. (2003) did not observe the relationship between the supply-side of eGovernment and process innovation in the public sector but they provide an indication that there is also a relationship. Therefore both articles from Maria et al. (2011) and Margetts et al. (2003) also support my assumption that eGovernment affect public sector innovation.

Another approach to describe the relation between eGovernment and public sector innovation could be found in the articles from Blind (2011), Archmann & Iglesias (2010) and Malone et al. (1987). Blind (2011, p. 20) assumes that in the public sector "*the Internet or ICT in the wider sense has the potential to promote innovation […]*". The provision of ICT infrastructure (e.g. computing systems, knowledge management systems etc.) and the internet allows a more effective and more efficient access to various sources, which are relevant for innovation (Blind 2011; Alanezi et al. 2010). This covers not only accessing databases, but also possible partners or networks for innovation (Blind 2011). In this regard according to Gretton et al. (2004), ICT could be seen as a general purpose technology (Bresnahan & Trajtenberg 1995), which provides a platform upon which further process innovations can be based, e.g. a web presence sets the groundwork from which process innovations, such as electronic or-

dering and delivery, can be easily developed (Blind 2011). For example, a governmental institution that implements new online software (e.g. registration of a new company) usually changes the routine of how incoming inquiries are processed. This is a process innovation, because according to the definition of process innovation (OECD 2011) and Blind (2011, p. 21) "[…] *the adoption of new technology [such as new computing systems or software] can be viewed as an enabler of process innovations from the perspective of the adopter, if the implementation is successful, the complementary technologies and routines are changed, and the whole new system is actually utilized in practice*". All in all, ICTs could be seen as a valuable source of process innovation because they provide substantial efficiency gains. Concerning these efficiency gains in the literature it could be found that ICT can make it easy to access information and facilitate the organization's capacity for processing and analyzing this information (Malone et al. 1987) leading to an overall more efficient organization setting. This does also mean that once government is working and communicating electronically, data could be easily collected, which can give new freedom to its users, opening up further hidden reserves like innovation potential to improve processes. Moreover lack of connectivity to the web, inferior technology, limited e-mail capacity or absence of intranets could demand a lot of capacity from the staff and impede creative thinking. Therefore ICT, respectively eGovernment, is assumed to be a measure that is a significant driver for innovation in the public sector (Blind 2011; Blind 2012b), which also supports the assumption from Archmann & Iglesias (2010). According to them "*the introduction of ICT in public administration, as in many other contexts, has brought about myriad opportunities for more efficient and dynamic work, [and] opening the door to innovation […]*" (Archmann & Iglesias 2010, p. 29). Therefore the view of the articles from Blind (2011), Malone et al. (1987) and Archmann & Iglesias (2010) on the relation between eGovernment and public sector process innovation also supports my assumption.

All in all some assumptions could be found on the relationship between eGovernment and public sector innovation in the literature. Following the different lines of reasoning (1) that eGovernment will influence public sector innovation in general (Margetts et al. 2003; Bekkers et al. 2006; Archmann & Iglesias 2010; OECD 2011) (2) that the supply and demand-side of eGovernment correlates with innovation performance (Maria et al. 2011) and (3) that eGovernment will influence public sector process innovation (Andersen 2004; Blind 2011; Malone 1987) and due to my research focus on process innovation as well as the supply-side of eGovernment my working hypothesis 1 is conclusively that the supply-side of eGovernment positively influences public sector process innovation:

> **Hypothesis 1:** *The supply-side of eGovernment positively influences public sector process innovation.*

2.4 Factors influencing the relationship between eGovernment and public sector innovation

Not only eGovernment alone plays an important role in the relationship between eGovernment and public sector innovation, but there are also other factors, which affect this relationship. In the last year's research into eGovernment and research into other factors which influence public sector innovation, such as human or organizational factors, were separate areas. Currently there is an increasing interest in combining these research areas. For example the OECD (2011) argues that innovation is about people and culture at least as much as it is about systems and processes. Support from top managers, scope for experimentation and certain risk-acceptance, and constant learning from what is being done within the organization and elsewhere are one of the important building-blocks of innovation in public sector.

Moreover despite the growing recognition to investigate the relation of eGovernment and innovation in the public sector (Xu 2010; Margetts et al. 2003; Blind 2012a), several researchers denote a lack in research on factors which influence this relationship, mainly public sector workforce skills, organizational barriers and decision-making strategies (Mulgan & Albury 2003; Blind 2012b). The human-factor and cultural aspect of eGovernment has received relatively little attention in research on eGovernment and public sector innovation in the past years (Detert et al. 2000; Bradley & Parker 2006; Pillay 2008). Furthermore, due the fact that it is assumed that public sector innovation may be motivated by political and organizational strategies as well as personal attitudes (Bugge et al. 2010; Bloch 2011), such factors should be also considered in this assignment. Therefore, in the following chapters I will elaborate on the three pre-determined factors (public sector workforce skills, organizational barriers and decision-making strategy) which are assumed to affect the relationship between eGovernment and public sector process innovation.

2.4.1 Workforce skills

In general the availability of resources influences the ability of a governmental organization to implement innovations. Resources include personnel, skills and knowledge, financial resources or ICT assets of a public sector organization such as server capacity, software etc. As public sector performance mainly relies on human capital, workforce skills are seen as key innovation drivers (Thenint 2010). Therefore the relationship between, workforce skills, eGovernment and innovation should be examined more deeply in the following. Indeed Mulgan & Albury (2003) identified some managerial factors such as poor risk management skills which could hinder public sector innovation but I would like to treat skills in terms of using and mastering ICT which better fit to the eGovernment topic. In this regard, for example Wargin & Dobiey (2001) have argued that lack of skills such as to use new technology are a

reason for resistance to change and therefore detrimental for innovation. Thus a command of ICT is an indispensable skill for all employees in the public sector. This "*area of competency, better known as eSkills, encompasses a whole range of capabilities related to the operation and application of ICT systems by individuals, from basic skills, such as using a word processor or a spreadsheet, to more advanced and specialist skills where required*". (Archmann & Iglesias 2010, p. 30) Such eSkills help organizations to reap the full potential benefits (organizational, economic, innovation benefits etc.) of ICT (Archmann & Iglesias 2010).

Moreover people differ in their personality, skills and abilities. Because of this they are likely to have different attitudes towards eGovernment and its usage, which result in different impacts on innovation. According to Goldsborough (2003), many people struggle with technology, avoid learning how to use it, or fail to take full advantage of it. When people do not know how to use technology, they may have some kind of fear or anxiety about using it. In this regard Scull (1999) conducted a study measuring computer anxiety among a group of students. The results showed that the students experienced higher levels of anxiety when they were under time or goal pressures, or when the technology failed or somehow malfunctioned. When something went wrong, this affected the emotional state of the students, leading to panic and anxiety. Conversely, the study also showed that despite deadlines and equipment failure, many students were able to figure it out. Exploring logical solutions to the problems they were experiencing included methods such as calling technical support or asking someone for help. Those with (e)skills and experience had less anxiety than those who did not know how to operate the equipment (Scull 1999). It seems as though person's inability to efficiently utilize a particular technology may increase anxiety, if they lack the necessary knowledge or skill to operate it. Therefore someone can conclude taking classes (e.g. during the study) and spending time for trainings can lead to an increased comfort level when using ICT and thereby decreasing the anxiety. With a look especially on eGovernment Abuali et al. (2010) mention the importance of trainings and proper skills for the success of eGovernment. Furthermore it can be observed that people, who had a university degree, had "*a deep ground knowledge that allows […] to enter the profession with skills for being creative and effective in the use of technologies.*" (Mazzeo 2008, p. 140) This circumstance could be beneficial for using eGovernment solutions on the one hand and for developing public sector process innovations on the other. Thus public sector workforce skills may influence the relationship between eGovernment and process innovation such that the relationship will be more strongly and positively with high workforce skills (e.g. university degree, trainings available) and weaker with low workforce skills (e.g. no university degree, trainings not available) which lead to my working hypothesis 2:

> *Hypothesis 2: Public sector workforce skills moderate the relationship between the supply-side of eGovernment and public sector process innovation such that the relationship will be more strongly and positively with high workforce skills and weaker with low workforce skills.*

2.4.2 Organizational barriers

Barriers to innovation in the public sector have attracted a lot of attention, possibly because of a belief that the obstacles faced by public sector organizations differ from those in the private sector (Arundel & Hollanders 2011; see also chapter 2.2.2). Barriers that are possibly more important in the public sector include risk-averse culture, regulatory requirements that limit change, a lack of sufficient human or financial resources, and staff resistance (Thenint 2010; Mulgan & Albury 2003; Borins 2006; Koch & Hauknes 2005; Bloch 2011; European Commission 2011). In this regard Leitner (2003) argues that the successful implementation of eGovernment is not only about technology, but also about a change of culture within the public sector. The interests, expectations and dangers which different stakeholders have, when implementing eGovernment solutions, must be addressed proactively. If not, the staff resistance, as one of the most important organizational barriers, will increase, which possibly affect the relation between eGovernment and public sector process innovation negatively. Furthermore the implementation of eGovernment is not an easy process. Providing new electronic services designed to reduce bureaucracy, increase efficiency and effectivity involves profound organizational and cultural changes. Thus, according to Maria et al. (2011, p. 126) "*the transition to eGovernment meets resistance because many times, although efforts involved are obvious, benefits they bring can be seen only over time.*"

With a look on the effect of organizational barriers on innovation Mulgan & Albury (2003) identify a number of factors which could hinder public sector innovation, like risk aversion, staff resistance, delivery pressures and administrative burdens (i.e. no time to think about innovation), poor risk management skills, short term horizons and budgets, lack of incentives and over-reliance on high performers as source of innovation. Beside these obstacles Koch & Hauknes (2005) and also Borins (2006) lists technology as a potential barrier to innovation in the public sector (see chapter 2.2.2). This statement is very interesting, because following this line of reasoning eGovernment as technology could be seen as barrier to public sector innovation. But I think the technology itself is not the barrier, rather missing skills to use it in a right and efficient way (see hypothesis 2).

In this regard I would like to highlight two important organizational barriers, (1) risk-aversion and (2) staff resistance:

(1) The willingness to take on risk is an important issue for public sector innovation (Bloch 2010). The public sector is often regarded as risk-averse and is, as mentioned in chapter 2.2, less willing to take risks than the private sector (Koch & Hauknes 2005, p. 20). Furthermore, MacPherson (2001, p. 2) suggests the main problem to public sector innovation is the "*public sector attitude which is often unsympathetic and naturally critical*" and goes on to declare that in a political environment "the costs of failure tend to be much higher than the benefits of success." This is why Hartley (2005) argues that most political leaders and managers are unlikely to support innovative ideas, which results in a risk-averse culture and non-innovating public sector. Furthermore as Borins (2001, p. 311) points out, the "*consequences for unsuccessful innovation are grave*", because a mistake is likely to be utilized by opposition parties and media. From there, the career of the person, who was responsible for the unsuccessful innovation, is doomed to failure (Borins 2001; Joyce 2007; Moore 2005). Therefore this less willing to take risk could hinder public sector innovation.

(2) As described in chapter 2 in the last couple of years, there have been many developments with regard to eGovernment (Lane 2000). According to the context of profound governmental reforms, known as the New Public Management (Lenk 2005), several change reforms and programs were initiated to increase productivity, customer orientation and especially cost efficiency in the public sector by using ICT application. However, the implementation of eGovernment, as change process, is mostly seen as difficult and lazy (Moon 2002; Hood & Peters 2004). In literature it could be found that in the change process the staff which have to make the changes work, are often overlooked by the management (Smollan 2011; Buchanan & Badham 2008), which causes some problems due to the fact that changes need to be supported from the bottom by the employees. Commitment to change will help to avoid staff resistance and better predict behavioral support for the change (Allen & Meyer 1990; Herscovitch & Meyer 2002). Conclusively, according to Welp et al. (2007) argues that staff resistance in general is even considered one of the main reasons why transformation processes and public sector innovation not succeed and emerge.

All in all organizational barriers, especially a higher risk-averse culture and staff resistance within the institution are assumed to be detrimental for public sector innovation. Thus, my assumption is that organizational barriers negatively influence the relationship between eGovernment and public sector process innovation, which leads to my third hypothesis:

> **Hypothesis 3:** *Organizational barriers of the public sector agencies (e.g. staff resistance or risk-averse culture in the organization) moderate the relationship between the supply-side of eGovernment and public sector process innovation such that the relationship will be weaker and negatively with barriers.*

2.4.3 Public sector decision-making strategy

The decision-making strategy that public sector organizations follow, whether top-down or bottom-up are central in shaping the conditions for innovation (Bloch 2011). Public sector institutions are often a part of a complex and broader organizational structure that determine how institutions operate and innovate. For example rules, regulations and predetermined strategies could influence how the institutions function. In comparison with the private sector the policy has a much larger potential to influence public sector organizations' innovation activities and enabling condition (Bloch 2011). Especially the decision-making strategies are of interest in public sector innovation research.

The public sector is mostly driven by top-down decisions, such as the introduction of new regulations, strategies or government programs/reforms (Arundel & Hollander 2011). Also the European Commission (2010) state that "*probably due to the structurally determined nature of the bulk of the innovations taking place in the public administration sector top-down policy decisions has been more prevalent (e.g. managers taking an active role in developing and implementing strategies and innovations) as opposed to bottom-up practices (e.g. ideas from staff taking an active role in developing and implementing strategies and innovations)*" (European Commission 2010, p. 38). However, this does not mean that bottom-up innovation does not occur, but in some public sector organizations top-down decision-making strategies could dominate their activities.

Now the question appears whether top-down or bottom-up strategies foster the development of innovative capabilities within public sector organizations. However, the latter one can occur through management support combined with other actions such as staff incentives to encourage innovative ideas and evaluations to support strategies and innovation activities (Borins 2001) or including users in design or planning, and evaluating new or improved services after completion (Arundel & Hollander 2011). In addition supporting these interactions electronically with eGovernment applications will probably strengthen this effect, because eGovernment provide the possibility to involve the staff from the bottom in certain decision-making processes as well as administrative processes. In the literature it can be found that in order to generate innovations, a bottom-up strategic method should be implemented instead of a top-down or a combined top-down/bottom-up processes (Hamel 2000; Michalski 2006). The advantage of the bottom-up decision-making process is that the development and implementation of innovations can be carried out in an emergent way, which means that innovations are not planned top-down (Michalski 2006). Instead, innovative ideas could be collected at the periphery of the organization through interactions with customers (citizens and businesses) and other governmental institutions (see Bitzer 1991, p. 43; Mintzberg 1990, p.

26). Indeed this theory belongs mainly to the private sector, but in the following I would like to convey and test this reasoning also on the public sector.

Moreover bottom-up decision-making strategies could help to overcome staff resistance. As described in the previous chapter commitment to change will help to avoid staff resistance and better predict behavioral support for the change (Allen & Meyer 1990; Herscovitch & Meyer 2002). Therefore, if employees from the bottom of public sector organizations are also involved in the decision-making strategy, this could lead to a lower level of staff resistance which provides opportunities for an open and innovation culture within the organization.

Thus my fourth working thesis is that the decision-making strategy of public sector organizations influence the relationship between eGovernment and public sector process innovation such that the relationship will be positively with bottom-up decision-making strategies and weaker with top-down strategies:

> ***Hypothesis 4:*** *The decision-making strategy of public sector agencies (bottom-up or top-down) moderate the relationship between the supply-side of eGovernment and public sector process innovation such that the relationship will be more strongly and positively with bottom-up strategies and weaker with top-down strategies.*

2.5 Research Model

Derived from the research goal and hypotheses development the overall research model of the master assignment could be illustrated as follows (figure 3):

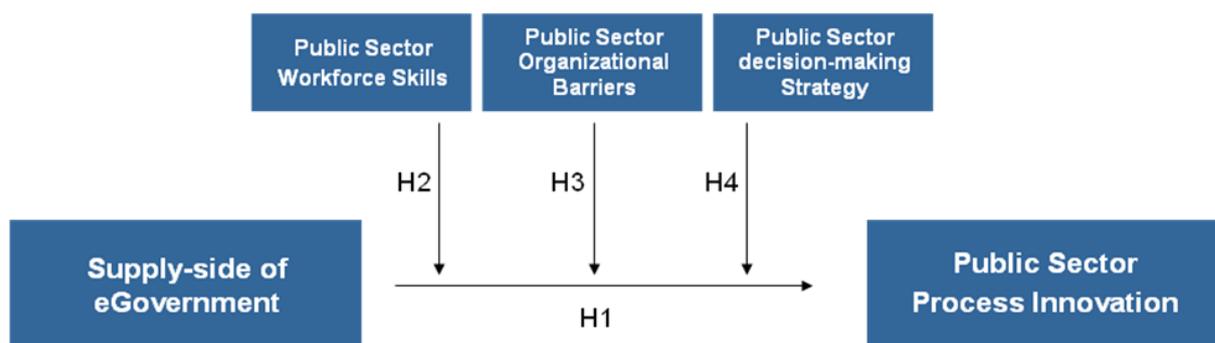
Figure 3 - The research model of the master assignment

To examine the research model a quantitative analysis via factor analysis, correlations and moderated regression analysis will be conducted. Thus, in the following, the reader will be familiarized with the general research strategy, sample, data collection as well as the deployed measures and methods to analyze the object of research.

3 Research Methodology and Research Design

3.1 The research focus in a nutshell

As you can see eGovernment and public sector innovation are broad research categories, which will be addressed in this thesis. Therefore, resulting from the hypotheses development there are two important framework conditions, which should be noted again to make clear what the research is about and is not about.

First, the empirical analyses of the thesis build on the results of the Innobarometer report of innovation in public sector organizations, developed collaboratively between the European Commission and Gallup Europe. They surveyed more than 5000 public sector organizations in the EU27 Member States to find more factual evidence on the nature of public sector innovation (European Commission 2011). The complete data set of the Innobarometer survey will be provided by the Fraunhofer Institute.

Second, this research will focus on eGovernment among European public sector agencies. eGovernment is also used by other worldwide government agencies, but the data I have available are restricted to European agencies. Furthermore I will focus on the eAdministration dimensions of eGovernment, due to the fact that eGovernment is a broad research field with various aspects and different dimension. In this regard, I also approach eGovernment, in terms of the 'supply' of electronic public services (e.g. Introduction of eGovernment services or ICT in general).

Furthermore scholars in the field have suggested to put the emphasis on eGovernance as the next step in eGovernment research (Dawes 2009). I do not aim here to consider eGovernment as a distinct to eGovernance or previous uses of technology in the public sector. Rather, I use the term eGovernment to refer to ICT which influence innovation in the public sector in a broader sense. Moreover in the context of profound governmental reforms, known as the New Public Management, eGovernment has been conceived as the most powerful agent of administrative reform (Lenk 2005). The general vision of NPM supposes that the use of ICT will enhance efficiency, policy effectiveness and democratic values (Bonina & Cordella 2008; OECD 2003). Nevertheless I deliberately decided not to define NPM and to put eGovernment in this context because this would go beyond the scope of the master assignment.

3.2   The research design, methods and procedures

3.2.1   Research strategy and data analysis approach in general

Babbie (2010) identifies three purposes of social science research. The purposes are exploratory, descriptive and explanatory. Exploratory studies are often used to familiarize the researcher with a topic. Descriptive studies are used to describe situations and events. The researcher observes and then describes what was observed. The third general purpose of social research, explanatory, is to explain things. Descriptive studies answer the questions of what, where and when, explanatory questions of how (see Babbie 2010, p. 92-94). Due to the fact that this study first explore the topic of eGovernment and public sector innovation and then describe to what extent eGovernment has influence on innovation in the public sector, the purpose will be more descriptive.

In addition there are two approaches to theory construction in scientific research, deductive and inductive (Blumberg et al. 2008; Babbie 2010; Herms 2008). Deductive moves from the general to the specific, meaning that it uses a pattern that may be logically or theoretical expected to observations that test whether the expected pattern actually occurs (Babbie 2010). Inductive, is the other way around and moves from concrete observations to a general theoretical explanation (Babbie 2010). Due to the fact that the study firstly give a general theory and some hypotheses and then explain the specific experiences from the empirical part which supports the initial theories, the research approach is deductive. This chosen research approach belongs to the positivists research philosophy, which focuses on large samples and is mostly quantitative (Saunders et al. 2009). One argument for this approach is that the results are more general, objective, value-free and less biased (Blumberg et al. 2008). Furthermore it is clearer on how to draw conclusions from the given data and it is easier to reproduce the research (Blumberg et al. 2008).

In general to test the hypotheses and to address additional conceptual and methodological concerns, the primary analytical techniques which should be used in testing my developed hypotheses in this assignment are correlation analysis and moderated hierarchical regression analysis. For scale assessment, factor analysis and Cronbach's Alpha will be used to assess construct reliability and validity for the variables considered in this research and taken from the Innobarometer report. After these analysis, standard statistical packages V.18 (SPSS) will be also available and used to examine any correlations, regressions, associations or grouping which emerges. Thus SPSS correlation should be undertaken to estimate and describe the relation between the dependent variables (process innovation) and the independent variables (supply-side of eGovernment). Moreover the moderator effects of the public sector workforce skills, organizational barriers and decision-making strategy on the

relation between the supply-side of eGovernment and public sector process innovation will be also estimated with the help of SPSS.

3.2.2   Sampling and data collection

All sources used in this master assignment are open to the public and published either on the organization's or department's website or in hard cover version in books, reports and articles. In general, the use of existing statistics and data (like the Innobarometer survey) gathered and reported by governments or agencies in a research study is widely accepted in the scientific community (Babbie 2007) and can provide the main source for a scientific inquiry (Babbie 2007). With regard to the use of existing statistics and data, I am aware of its advantages and possible threats and I am also familiar with problems regarding the validity and the reliability of the sources. Consequently, the "*researcher's first protection against the problems of reliability in the analysis of existing statistics is knowing that the problem may exist.*" (Babbie 2007, p. 334) However, in chapter 5.2 I will elaborate deeper on possible limitations of my empirical analysis and the use of existing data.

Keeping that in mind, I will use the results of the Innobarometer survey of innovation in public sector agencies. Its actual objective was to study the innovation strategies of the European public administration sector in response to changing constraints and opportunities (European Commission 2011). Despite this contradicting goal in comparison with my objective of the master thesis, I identified suitable items out of the survey in collaboration with the Fraunhofer Institute which best describe the respective variables (e.g. process innovation), to conduct my research (see next chapter 3.2.3).

With a look on the sampling and data collection, the translation of the questionnaire into all relevant national languages and its implementation was managed by Gallup Europe, which conducted the survey in 27 Member States of the EU, Norway and Switzerland in October 2010. Overall, Gallup Europe interviewed 4,063 public sector organizations (typically involved in central, regional or local government activities) across Europe, using a fixed line telephone methodology. Eligible respondents were senior managers responsible for strategic planning and decision-making. Typically, they were general managers or, where available, strategic directors of the institution or in smaller organizations where such function did not exist, the Chief Executive or a person responsible for strategic planning and reporting directly to the Chief Executive (European Commission 2011). The interviewers checked the identity of this person as well as the accuracy of the enterprise characteristics, as delivered by sample list, namely: the number of employees (European Commission, 2011). The survey sample was selected randomly within each of the participating countries, with pre-selected numbers of responses for each European country ranging from 10 responses for very small coun-

tries (Malta and Luxembourg) to 400 for the larger EU countries (Germany, the UK, France, Italy, Spain and Poland). The samples of organizations were drawn from publicly available lists.

The questionnaire prepared for this survey contained two parts: the organization information and the main questionnaire (European Commission 2011). It includes questions on the characteristics of public sector agencies (number of employees, areas of responsibility, geographic area served), a series of questions on the types of innovation introduced by the agency (e.g. process or organizational innovations), workforce skills, effects of innovation, drivers and strategies, organizational barriers, and expected developments over the next two years.

The full Innobarometer report (European Commission 2011) provides further details on the sampling, data collection and questionnaire design.[1]

3.2.3   Description of the measures and its indication of reliability and validity

Given that all of the items and questions in the Innobarometer employed were not designed specifically for this master assignment, a series of discussions and analyses were undertaken before the research questions and hypotheses could be tested. In this regard, in literature it could be found that if you are using an accepted scale and construct obtained from a published source, you do not need to worry about improving reliability. But, if you are developing own constructs by choosing the respective items, like in this assignment, you have to improve and check for reliability by using factor analysis and Cronbach's Alpha (Altermatt 2007). This analysis helps further establish the reliability and validity of the measures used in the context of this study. For example, to have confidence in a measure such as process innovation, you need to test its reliability: the degree to which it is error-free. In this regard the construct validity is also of importance. Construct validity is defined by Shadish et al. (2002, p. 38) as "*the validity of inferences about the higher order constructs that represent sampling particulars*" and can be also checked by these analysis (Anderson & Gerbing 1982). The constructs used in this master assignment, e.g. supply-side of eGovernment etc., are not constructs that have empirically been validated and developed in the previous literature and the items used in the Innobarometer survey are not empirically validated measures of the constructs. Therefore based on the hypothesis and research model researchers from the Fraunhofer Institute and I identified items during several discussions which address most of the issues about the respective construct and assigned them as a measure of the construct, proposed in table 1. Each construct consists of multiple items from the Innobarometer survey and are conceptual abstractions of phenomena that cannot be directly observed. Table 1 al-

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[1]   See pages 185-196 of the Innobarometer 2010 report. Available: http://ec.europa.eu/public_opinion/flash/fl_305_en.pdf [26.07.2012].

so shows the type of variable, how many items describe one construct and how each item has been measured (different scales have been used in the Innobarometer), which have to be considered during the empirical analysis. Although I will use factor analysis and Cronbach's Alpha to check for reliability and validity (see chapter 3.2.4), I will also take this issue into account when testing the hypotheses and discuss it in the limitation chapter 5.2.

Table 1 - Overview about the variables and items used in the master assignment

Factor/Construct	Type of Variable	Items (Reference to Innobarometer survey)
Process Innovation (5 items)	Dependent Variable	Since January 2008, did your organisation introduce any new or significantly improved processes or organisational methods, such as …? (Q6) 1) New or improved methods of providing services or interacting with your users (Q6a) 2) New or improved delivery or logistics systems for your inputs (Q6b) 3) New or improved supporting activities such as maintenance systems, purchasing, accounting, or computing systems, etc.(Q6c) 4) New or improved management systems (Q6d) 5) New or improved methods of organising work responsibilities or decision making (Q6e) Answer possibilities (Scale): 'Yes', 'No', 'No Answer
Supply-side of eGovernment (4 items)	Independent Variable	How important were the following political or legislative factors in driving the development and introduction of your innovations since January 2008? (Q16) 1) Mandated introduction of new e-government or online services (Q16e) Answer possibilities: 'Low', 'Medium', 'High', 'No Answer' Since January 2008, did your organisation put out tenders to private businesses to provide any of the following goods and services? (Q19) 2) ICT equipment or systems (Q19a) 3) R&D for new technologies and services (Q19e) Answer possibilities: 'Yes', 'No', 'No Answer' Over the next two years, do you expect any of the following factors to have a positive or negative impact on the ability of your organisation to introduce new or significantly improved services? (Q23) 4) Introduction of new technologies (such as ICT equipment or systems) (Q23f) Answer possibilities: 'Positive Impact', 'Negative Impact', 'No Impact', 'No Answer'

Workforce Skills (4 items)	Interaction Variable	Work force and skills (Q8) 1) In 2010, approximately what percent of your organisation's employees had a university degree? (Q8) Answer possibilities: '0%', 'Between 1% and 9%', 'Between 10% and 24%', 'Between 25% and 49%', 'Between 50% to 74%', '75% or more', 'No Answer' Since January 2008, did your organization provide training for your employees specifically for implementing, using or providing…? (Q10) 2) New or improved services (Q10a) 3) New or improved communication methods (Q10b) 4) New or improved processes or organisational methods (Q10c) Answer possibilities: 'Yes', 'No', 'No Answer'
Organizational Barriers (7 items)	Interaction Variable	Since January 2008, how important were the following factors in preventing or delaying your organization's efforts to develop or introduce new or significantly improved services, communication methods, processes or organisational methods? (Q18) 1) Lack of management support (Q18a) 2) Lack of incentives for your staff (Q18b) 3) Staff resistance (Q18c) 4) Uncertain acceptance by the users of your services (Q18d) 5) Regulatory requirements (Q18e) 6) Lack of sufficient human or financial resources (Q18f) 7) Risk adverse culture in your organization (Q18g) Answer possibilities: 'Not important', 'Low importance', 'Medium importance', 'High importance', 'No Answer'
Bottom-up decision-making strategy (3 items)	Interaction Variable	Since January 2008, how important were the following information sources for the development of your innovations? (Q14) 1) Ideas from staff (Q14a) Answer possibilities: 'Low', 'Medium', 'High', 'No Answer' How well do the following apply to your organisation since January 2008? (Q17) 2) Staff have incentives to think of new ideas and take part in their development (Q17c) 3) Users are involved in the design or planning of new or improved services (Q17d) Answer possibilities: 'Not at all', 'Partly', 'Fully', 'No Answer'

Top-Down decision-making strategy (4 items)	Interaction Variable	How important were the following political or legislative factors in driving the development and introduction of your innovations since January 2008? (Q16) 1) Mandated decrease in your organisation's budget (Q16a) 2) Mandated increase in your organisation's budget (Q16b) 3) New laws or regulations (Q16c) 4) New policy priorities (Q16d) <u>Answer possibilities:</u> 'Low', 'Medium', 'High', 'No Answer'

After describing the measures I would like to introduce in the following the methodological approach to indicate the reliability and validity of these measures and factors.

In general data can be investigated and understood with simple statistics, but much of it requires more complex, multivariate statistical techniques to transform these data into knowledge. Multivariate analysis techniques, such as factor analysis or regression analysis, are popular because they enable people to create knowledge and thereby improve decision making in organizations. But before starting the empirical analysis of the relations, all multi-item scales of the constructs should be checked with respect to its reliability and validity. The primary approach is to conduct a factor analysis to ensure construct validity using the assessments of *scale unidimensionality*, *scale reliability, convergent validity* and *discriminant validity* (Anderson & Gerbing 1982). Therefore in order to examine the reliability of the measures, a combination of factor analysis and reliability tests were employed. The basic procedures for the factor analyses were as follows: (1) A confirmatory factor analysis (CFA) is conducted to assess whether or not the constructs are valid and reliable and fit the overall model. CFA analyses require the researcher to hypothesize, in advance, the number of factors (in this case 6 factors), whether or not these factors are correlated, and which items/measures load onto and reflect which factors (see table 1). The most commonly used approach is principal components analysis. Therefore I will follow Hollanders & Arundel (2008) approach, by also using principal components analysis to examine each subset of items to assess the key factors in the study and to check their reliability and validity. (2) Varimax rotation was employed to enhance interpretability of the factor results. (3) The decision of how many factors to extract and rotate was based on the number of eigenvalues greater than one, the point at which the scree plot leveled dramatically, and whether or not a minimum of 3 items defined the factor (see *unidimensionality* according to Anderson & Gebing, 1982). Only factors with an eigenvalue of 1.0 or more are retained in this study. It is expected (and checked of course) that only six factors with an eigenvalue of > 1.0 emerge. In this regard the eigenvalue of a factor represents the amount of the total variance explained

by that factor (Hair et al. 2010). (4) Once a rotated factor solution was obtained, its interpretability (see *convergent* and *discriminant validity* according to Anderson & Gebing, 1982) was evaluated based on a .50/.30 criterion (i.e., primary loading of .50 or greater and no secondary loading of .30 or greater), and (5) *reliability* analyses (Cronbach's alpha) indicating whether or not the factor was viable (Cronbach 1951). This is the most common measure of scale reliability (Field 2009). It measures the internal consistency between items to decide whether the different items in a questionnaire consistently reflect the factor/construct that is measuring (Field 2009). Cronbach's Alpha ranges in value from 0 to 1. In general an Alpha equal to or greater than .60 is considered a minimum acceptable level, although some researchers argue for a stronger standard of at least .70 (Nunnally 1978). (6) In case no reasonable factor structure emerged, successive "*alpha if item deleted*" (Cronbach 1951) analyses were employed to establish the best combination of reliability and scale length.

All in all this approach tests whether only six factors emerge with an eigenvalue above 1 and also checks which items load onto and reflect which factors. The findings of this analysis could be used to draw conclusions on the reliability and validity of the six factors hypothesized in advance and on the items, which have been identified to describe the respective factors (see table 1).

3.2.4   Results of the factor analysis and Cronbach's Alpha test

This chapter provides the factor loadings from the factor analysis and the respective Cronbach's Alpha for the six factors (see table 2) to present its reliability and validity.

In general six different factors with an eigenvalue >1.0 emerged illustrated in table 2. Primary loadings of an item greater than 0.5 are highlighted in bold (and primary loadings greater than 0.35 in bold and cursive). In the brackets you can see the secondary loadings of the respective item, when it is greater than 0.2 or when the primary loading is not higher than 0.5. Furthermore table 2 provides the values of the Cronbach's Alpha reliability measurement.

The first set of items which intended to measure process innovation were factor analyzed, and a single eigenvalue greater than one emerged. Regarding the .50/.30 evaluation criterion all 5 items loaded on one factor. Moreover the alpha coefficient for the five items is $\alpha = .78$, suggesting that the items have relatively high internal consistency and are therefore reliable. Thus, the items were used to form the measure of *process innovation.*

The next set of items referred to the supply-side of eGovernment. The items from the Innobarometer which belong to eGovernment and ICT were factor analyzed, and a single eigenvalue greater than one emerged. Three of four items fulfill the .50/.30 criterion but one item (I9)

has a primary loading of .379 with a secondary loading of .155 which means that the item provide a weak contribution to this factor and actually this item should not be used in my further elaborations. But due to the fact that the secondary loading is not that high and the fact that only three items would be used in the analysis to describe the variable, I decided to include this item. Moreover Cronbach's Alpha reliability test show that all 4 items were not that reliable (α = .554) which might be partly caused by the use of only four items. Although employing successive "alpha if item deleted" (Cronbach 1951) analyses to establish the best combination of reliability, the highest reliability have been determined with all 4 items. With so few items it is virtually impossible to obtain high alphas unless the items are very similar to another. Considering the small number of items used to measure the factor even reliabilities of 0.4 are reasonable (Schwartz 2012). Nevertheless I will discuss both issues in the limitation part of this master assignment. All in all these items were summed and averaged to form the measure of *supply-side of eGovernment*.

The items assessing the role of public sector workforce skills were also factor analyzed, and a single eigenvalue greater than one emerged. Similar as above, three of four items fulfill the .50/.30 criterion but one item (I10) has a primary loading of .450 with a secondary loading of .250 which means that the item provide a weak contribution to this factor. Nevertheless I will also include this item in my empirical analysis due to the high difference between the primary and secondary loading and also due to that fact, that all 4 items were reliable (α = .66). Interestingly there is one item (I13) with factor loadings above .30 on more than one factor. The item does not only load on the workforce skill factor but also on the process innovation factor. This circumstance could be explained by the fact that the item (or rather question) belongs to the provision of trainings regarding new or improved processes methods which indicate its obvious relation to process innovation. However, due to the fact that the item fulfills the .50/.30 criterion it could be seen as a contribution to the factor workforce skills. So these items were summed and averaged to form the measure of *workforce skills*.

The items assessing the role of organizational barriers in the public sector were also factor analyzed, and a single eigenvalue greater than one emerged. Regarding the .50/.30 criterion all 7 items loaded on one factor and all items were highly reliable (α = .86). Thus, these items were summed and averaged to form a measure of *organizational barriers*.

Last but not least the items referred to the bottom-up and top-down decision-making strategies were factor analyzed and a single eigenvalue greater than one emerged in each case. With a look on the bottom-up strategy all 3 items loaded on one factor. Moreover Cronbach's Alpha reliability test show that all 3 items were barely reliable (α = .60) which might be partly caused by the use of only four items. Nevertheless these items were summed and averaged

to form the measure of *bottom-up decision-making strategy*. With a view to the top-down strategy all 4 items loaded also on one factor and were reliable (α = .67), so these items were summed and averaged to form the measure of *top-down decision-making strategy*.

All in all the goal of the factor analysis was to reveal the items to be tapping into a respective one-dimensional construct, and so, for further analysis, these items were summed to form one overall measure. As you can see the items merely loading on their own factors and fulfill the .50/.30 evaluation criterion, although there are some exceptions. With a look on the measures of reliability, the results were mostly above the recommended minimum standard of 0.6 (Nunnally 1978). Research indicates that values between 0.6/0.8 are respectable, and 0.8/0.9 very good (DeVellis 2003), so overall the scores show a satisfied picture. Regarding the rather low value of the eGovernment measure, it will be discussed in the limitation part of this assignment (chapter 5.2).

Table 2 - Principal components analysis (varimax rotation) computed with 27 items of the Innobarometer questionnaire

Item	Label	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6
I1	Introduction of new or improved methods or processes of providing services or interacting with your users	**0.500**		(0.221)			
I2	Introduction of new or improved delivery or logistics systems for your inputs	**0.640**					
I3	Introduction of new or improved supporting activities such as maintenance systems, purchasing, accounting, or computing systems, etc	**0.569**	(0.261)				
I4	Introduction of new or improved management systems	**0.723**					
I5	Introduction of new or improved methods of organising work responsibilities or decision making	**0.716**					
I6	How important was the mandated introduction of new e-government or online services			**0.547**		(0.226)	
I7	Provision of ICT equipment or systems			**0.747**			
I8	Provision of R&D for new technologies and services	(0.269)	**0.627**				
I9	Introduction of new technologies (such as ICT equipment or systems)			*0.379*		(0.155)	
I10	Percentage of employees who had a university degree	(0.250)	***0.450***				
I11	Provision of trainings for your employees specifically for implementing, using or providing new or improved services		**0.788**				
I12	Provision of trainings for your employees specifically for implementing, using or providing new or improved communication methods		**0.779**				
I13	Provision of trainings for your employees specifically for implementing, using or providing new or improved processes methods	(0.335)	**0.705**				
I14	How important was lack of management support in preventing or delaying your organization's efforts			**0.745**			
I15	How important was lack of incentives for your staff in preventing or delaying your organization's efforts			**0.783**			
I16	How important was staff resistance in preventing or delaying your organization's efforts			**0.785**			
I17	How important was uncertain acceptance by the users of your services in preventing or delaying your organization's efforts			**0.759**			
I18	How important was regulatory requirements in preventing or delaying your organization's efforts			**0.631**	(0.236)		
I19	How important was lack of sufficient human or financial resources in preventing or delaying your organization's efforts			**0.561**	(0.226)		
I20	How important was risk adverse culture in your organisation in preventing or delaying your organization's efforts			**0.742**			
I21	How important was the mandated decrease in your organisation's budget				**0.653**		
I22	How important the mandated increase in your organisation's budget				**0.624**		
I23	How important were new laws or regulations				**0.695**		
I24	How important were new policy priorities				**0.644**		

Item	Label	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6
I25	How important were ideas from staff for the development of your innovations?						**0.552**
I26	How well do staff have incentives to think of new ideas and take part in their development						**0.810**
I27	How well do users are involved in the design or planning of new or improved services						**0.723**

Bold typeface shows the component upon which each item load most highly (α = Cronbach's Alpha)

Factor 1: Public Sector Process Innovation (α=.78)   Factor 5: Top-down decision-making strategy (α=.67)
Factor 2: Supply-side of eGovernment (α=.55)   Factor 6: Bottom-up decision-making strategy (α=.60)
Factor 3: Workforce Skills (α=.66)
Factor 4: Organizational Barriers (α=.86)

3.3 Methodological approach to test the hypothesis

In addition to the factor analysis, correlation and moderated regression analysis were conducted to test the relationships among the variables in this master assignment. To investigate the relationships among the variables, the hypotheses were each tested with regard to their significance ($p < .05$ or at least $p < .10$ for the interaction effects). However, due to the fact that some items are nominal variables (only 'Yes' and 'No' answers possible) I had to create dummy variables by computing and recoding each nominal variable, to be capable to execute a regression analysis, (0 for the value that does not have the characteristic, 1 for the value that has the characteristic and 9 for no answer). Shortly, dummy variables are proxy variables or numeric stand-ins for qualitative facts in a regression model. Dummy independent variables take the value of zero or one, also called binary variables. A dummy variable can be defined as a qualitative representative variable incorporated into a regression and it assumes the value 1 whenever the characteristic it represent occurs and zero if else. This is the most common method of coding nominal and categorical variables to use them in correlation and regression analysis (Hardy 1993). Nevertheless, after recoding the items describing the respective variable, I had to create a final variable by counting how many times the value 1 occurs in each case. For example if an organization responded four times with 'Yes' and one time with 'No' regarding the process innovation items (5 items in sum), the overall score is 4. Conclusively, the scale for process innovation ranges from 0 (no process innovation) to 5 (high process innovation).

Moreover, I have to make sure that all items are coded in the same direction (i.e. reverse code negatively worded items), such that the results be not biased by such an effect. This is the case for the seven organizational barriers items. Therefore I recoded them in the same direction as the other items.

Hypothesis 1, predicted that the supply-side of eGovernment will positively influence public sector process innovation, will be tested by analyzing bivariate zero-order correlation coefficients. Correlation quantifies the strength of the linear relationship between a pair of variables, whereas regression analysis expresses the strength and direction of the relationship in the form of an equation. Moreover conducting a regression analysis is also imaginable. The regression analysis is applied as it focuses on the relationship between a dependent variable and one or more independent variables. Regression analysis helps understand how the typical value of the dependent variable changes when any one of the independent variables is varied, while the other independent variables are held fixed. But, due to the fact that I focus on the relationship between a dependent and only one independent variable, a significant correlation in the expected direction may be considered sufficient support for the relationship.

With a look on hypotheses 2, explicating an interaction effect, the appropriate way of testing this moderation effect is to create a split. The median of the full sample is calculated and serves as the cutoff value between a "low" and "high" sample. Then a regression analysis with the independent variable (supply-side of eGovernment) and the dependent variable (public sector process innovation) is executed for the split-sample. In sum hypothesis 2 will be analyzed by a regression analyses for each condition apart (split of workforce skills into two groups) to determine the effects of low and high workforce skills as moderator on the relationship between the supply side of eGovernment and public sector process innovation.

Hypothesis 3 and 4, also explicating interaction effects, will be tested with classical moderated hierarchical regression analyses (Aiken & West 1991; Cohen & Cohen 1983). The predictor variable (supply-side of eGovernment) and the respective moderator variable (organizational barrier, top-down/bottom-up decision making strategy) will be entered into the first block. Finally, the interaction term (i.e. the product of the centered values (z-standardized) of the independent variable and the moderator; Aiken & West 1991) will be entered into the second block. (Note: The interaction/product term will not be standardized after calculation, but will be based on the standardized values of the independent variable and moderator). If this product term is significant (at least $p < .10$), support for the respective moderation effect will be inferred. The effect size (R-squared change) associated with the interaction term will be reported and interpreted. However, due to the considerable problems associated with the detection of interaction effects using field samples, like the Innobarometer data, several authors have argued that even a 1-2% increase in explained variance may be considered meaningful (McClelland & Judd 1993; Evans 1985; Champoux & Peters 1987).

4   Results of the data analysis

4.1   Results of the descriptive statistics and correlation analysis

Table 3 presents the means, standard deviations and Pearson correlations between all the variables, dependent variable (no. 1) and independent variable (no. 2) as well as the interaction variables (no. 3-6). Partially the names of the columns are abbreviations of the variable names because of space limits - for clarity purposes, the variable names in the rows have been capitalized accordingly.

Table 3 - Means, standard deviations, Cronbach's Alpha and correlations of all study variables

Variable	M	SD	N	1	2	3	4	5	6
1. Public Sector Process Innovation	2.55	1.75	3963	1					
2. Supply-side of eGovernment	1.75	.60	3963	.39**	1				
3. Workforce Skills	1.11	.68	3936	.13**	.11**	1			
4. Organizational Barriers	2.63	.81	3878	-.26*	-.28**	-.16**	1		
5. Top-Down decision-making strategy	1.12	.57	3438	.24**	.35*	.14**	-.33**	1	
6. Bottom-up decision-making strategy	1.14	.55	3937	.25**	.15*	.04*	-.10**	.17**	1

M: Mean; SD: Standard deviation; N: Number of cases; * p < .05.   ** < .01.

The correlation coefficients were generally computed using the largest N (number of cases) available for each pair of variables (e.g., N = 3963 for the correlation between process innovation and the supply-side of eGovernment and N = 3878 for the correlation between process innovation and organizational barriers). The results of the correlation analysis (table 3) indicate that all variables correlate with each other at a significant level (p-value at least <.05), with the coefficients ranging from .04 to .39.

Hypothesis 1 predicted that the supply-side of eGovernment would be positively associated with public sector process innovation. As can be seen in Table 3, the supply-side of eGov-

ernment was positively and significantly correlated with process innovation (r = .39; p <.01). By the way, to test the hypothesis by conducting a regression analysis with just one independent variable does not make sense, because the result of the regression analysis will be equal to the result of the correlation analysis (r = .39; p <.01). This issue will be discussed in chapter 5.4 (e.g. including control variables in the regression analysis). Nevertheless, particularly strong empirical evidence for eGovernment as a predictor was revealed for the criterion variable process innovation, which supports hypotheses 1. Therefore it could be proved that the supply-side of eGovernment positively affect process innovation in the public sector.

In this regard I also looked for multicollinearity. Multicollinearity results from two (independent) variables that are highly correlated (Pallant 2005). When multicollinearity is present the regression coefficient (e.g. in a moderated regression analysis) might become insignificant because of the large size of standard errors (Tabachnick & Fidell 1996) and it may make it difficult to determine separate effects of the variables. Statistical problems created by multicollinearity occur at much higher correlations (0.7 and higher) (Tabacknick & Fidell 1996, p. 86). As all intercorrelations are below 0.4, all variables can be retained (see table 3). Therefore it can be concluded that there is no multicollinearity present in this analysis, which bias my empirical analysis.

4.2   Results of the moderated regression analysis

4.2.1   Hypothesis 2

As described in chapter 3.3 the appropriate way of testing the moderation effect of hypothesis 2 is to create a split by calculating the mean and cutting of the value between a low and high sample.

Hypothesis 2 predicted that public sector workforce skills would moderate the relationship between the supply-side of eGovernment and public sector process innovation such that the relationship will be more strongly and positively with high workforce skills and weaker with low workforce skills. The regression analyses were done for each condition apart (see table 4) and the difference got assessed, to determine the effects of low and high workforce skills as moderator on the relationship between eGovernment and public sector innovation. The results show that the relation between the variable supply-side of eGovernment and process innovation appears positively and significant in the low as well as in the high group (p < .01). With high workforce skills, the positive effect of the variable supply-side of eGovernment on process innovation score was slightly higher than in the low group (compare regression coefficients). In this regard table 4 also indicates the different t-values of the respective analysis, because they also give a hint on the significance. The t-test actually assesses whether the

means of two groups are statistically different from each other. However, according to the literature if the t-value is greater than 1.96 the relationship could be seen as significant. Due to the fact that both t-values in table 4 are greater than 1.96 the results could be seen as significant. Moreover the bigger R^2 (coefficient of determination) is, the bigger are sets of predictors related to the criterion. This does mean that the variable supply-side of eGovernment explain a bigger amount of variance in public sector process innovation with high workforce skills.

Table 4 - Regression analyses of the supply-side of eGovernment on public sector process innovation (Workforce skills: Split into Two Groups)

Workforce Skills	ß	t	R^2	N
Low	.25**	9,85	.063**	1476
High	.26**	10,74	.067**	1607

Note: **p < .01, *p < .05; ß: regression weight; t: t-value; R²: determination coefficient

However, the difference between low and high workforce skills in influencing the relationship between eGovernment and process innovation is not that high as assumed, which can be also seen in figure 4, which illustrates the nature of the relationships. The graph shows that the slope of the regression line is slightly lower with workforce low in skills and higher with workforce high in skills. In other words the variable supply-side of eGovernment slightly weaker influences process innovation when the workforce skills are low. In contrast to that the variable supply-side of eGovernment slightly stronger influences process innovation when workforce skills are high. Due to the fact that the influence of the moderation variable is not that high as assumed, this hypothesis has been therefore only partly confirmed.
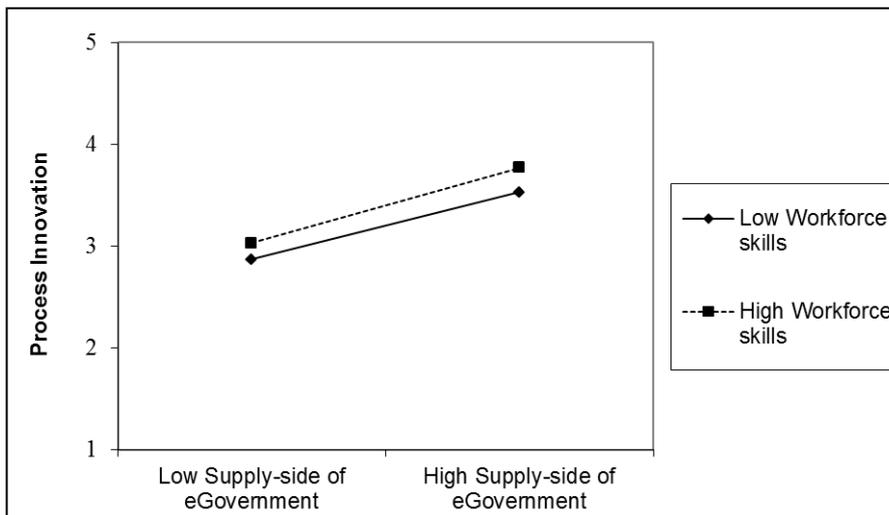
Figure 4 - Interaction effect of the supply-side of eGovernment and workforce skills (split into two groups) on public sector process innovation

Given that the results only partly support hypothesis 2 and the differences are surprisingly low, I assumed that the analysis could be influenced by another type of workforce level. Therefore I decided to split workforce skills into three groups (low, medium and high) to observe any emerging differences (see table 5). In this regard the variable workforce skills has been split into three groups with three equal parts (33.3%, SPSS default).

Table 5 - Regression analyses of the supply-side of eGovernment on public sector process innovation (Workforce skills: Split into Three Groups)

Workforce Skills	β	t	R^2	N
Low	.24**	7.19	.058**	1028
Medium	.29**	9.97	.085**	1072
High	.21**	6.78	.045**	983

Note: **p < .01, *p < .05

In general the results show that the relation between the variable supply-side of eGovernment and process innovation appears positively and significant in the low, medium as well as in the high group (p < .01 and t > 1.96). Interestingly with medium workforce skills, the positive effect of the variable supply-side of eGovernment on process innovation score was significant higher than in the low and high groups (compare regression coefficients). Also with a look on R² the variable supply-side of eGovernment explain a bigger amount of variance in

public sector process innovation with medium workforce skills ($R^2 = .085$) than with low ($R^2 = .058$) or high skills ($R^2 = .045$). The results depict an inverse u-curve relationship, illustrated in figure 5, which presents the nature of this interaction effect. Similar ways of representing such results has been already used in articles in top journals featuring interaction effects (e.g. George & Zhou 2001; Aiken & West 1991) therefore I also use this approach to explain this special moderation effect. The curve can be interpreted to describe how exactly the moderator variable (workforce skills) modifies the relationship between the predictor (supply-side of eGovernment) and the criterion (public sector process innovation). The inverse u-curve shows that the relationship between eGovernment and process innovation is more strongly with medium workforce skills and weaker with low and high workforce skills.
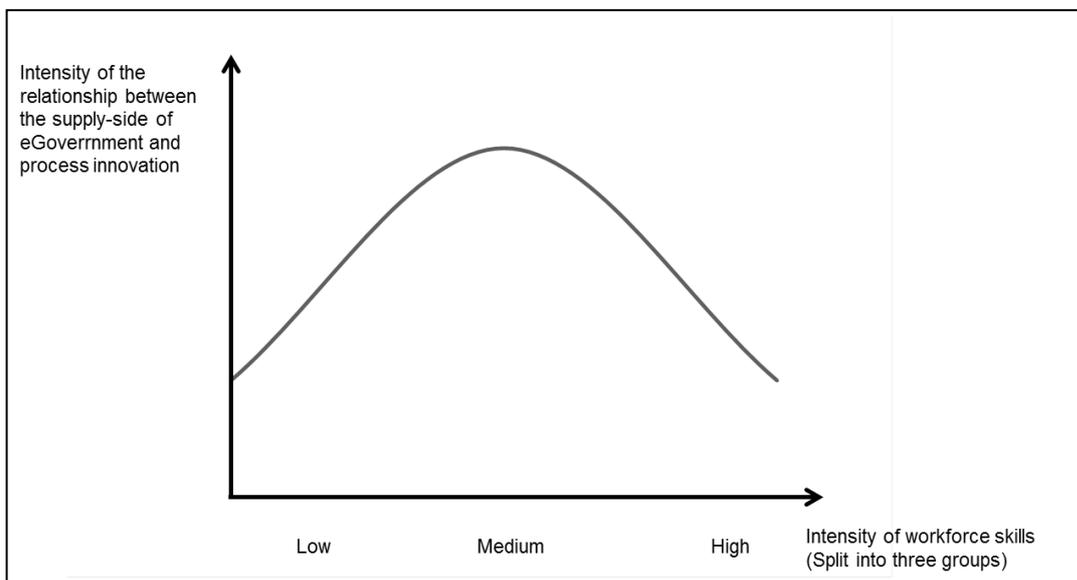
Figure 5 - Inverse u-curve relationship between eGovernment and public sector innovation with the moderator variable workforce skills (split into three groups)

All in all the results of table 4 show that workforce skills actually influence the relationship between the supply-side of eGovernment and process innovation such that the relationship will be slightly stronger with high workforce skills and weaker with low workforce skills. However, this finding only partly confirm hypothesis 2, because I assumed a much bigger effect and difference. Nevertheless the results, especially of table 5, will be discussed in chapter 5.1.

4.2.2   Hypothesis 3

The following interaction hypotheses 3 and 4 were tested with moderated hierarchical regression analyses following Aiken & West (1991). To determine the moderator effect of hypothesis 3 and 4, the cross-product of the mean centered values (z-standardized) of the re-

spective moderator and the predictor variable (supply-side of eGovernment) were entered into the second block of each analysis, after accounting for the two main effects in block one.

Hypothesis 3 predicted that organizational barriers of the public sector organizations (e.g. Risk-averse culture in the organization or staff resistance) moderate the relationship between the supply-side of eGovernment and public sector process innovation such that the relationship will be weaker and negatively with barriers. Table 6 includes the regression weight (ß) and determination coefficient (R^2) increase associated with the interaction term.

Table 6 - Moderated regression analysis of organizational barriers, public sector process innovation and the supply-side of eGovernment

Hierarchical block Variables	Public Sector Process Innovation	
	ΔR^2	β
Block 1: Predictor	.18**	
Supply-side of eGovernment		.35**
Organizational Barriers		-.17**
Block 2: Predictors	.01[†]	
Supply-side of eGovernment X Organizational Barriers		-.03[†]
Total R^2	.19	

Note. N = 3878. **$p < .01$, *$p < .05$, [†] $p < .10$.

The interaction term of supply-side of eGovernment and organizational barriers explained a negatively and significant amount of variance in public sector process innovation (ΔR^2 = .01; β = -.03; $p = .08$). However, as already described, due to the considerable problems associated with the detection of interaction effects, several authors have argued that even a 1-2% increase in explained variance may be considered meaningful (McClelland & Judd 1993; Evans 1985; Champoux & Peters 1987). Due to this fact and the fact that the product term was significant ($p < .10$), I created a graph illustrating its nature by plotting two predictor-criterion regression lines on the basis of moderator scores one standard deviation above and below the mean (following Aiken & West 1991). The process innovation scores displayed in the graph are scale sum scores (see chapter 3.3 regarding the scale of process innovation). However, the nature of this interaction is depicted in figure 6. The results show that the vari-

able supply-side of eGovernment negatively and weaker influences process innovation when organizational barriers were high (in terms of more barriers exist within the public sector organization) as opposed to when organizational barriers were low. Therefore hypotheses 3 could be accepted, that organizational barriers moderate the relationship between the supply-side of eGovernment and public sector process innovation such that the relationship will be weaker and negatively with barriers.
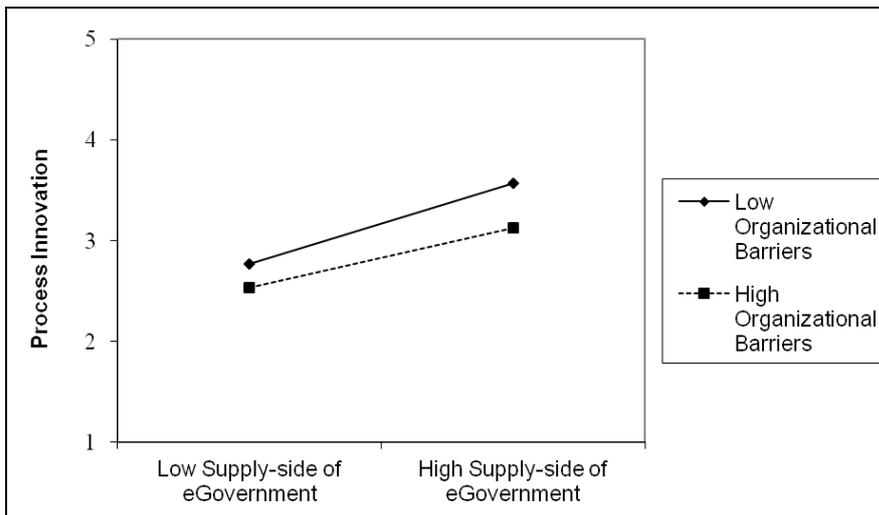

Figure 6 - Interaction effect of the supply-side of eGovernment and organizational barriers on public sector process innovation

However, it should be noted that the explained variance in public sector process innovation is not that high ($\Delta R^2 = .01$) and the regression weight of the interaction effect ($\beta = -.03$) approaches the significance criterion only at a p-value of 0.8. These issues challenge the results and the conclusions which could be drawn. Therefore the findings will be discussed in chapter 5.1 and possible explanations for this effect will be presented.

4.2.3 Hypothesis 4

Hypothesis 4 predicted that the decision-making strategy of public sector agencies (bottom-up or top-down) moderate the relationship between the supply-side of eGovernment and public sector process innovation such that the relationship will be more strongly and positively with bottom-up strategies and weaker with top-down strategies. The nature of both interaction effects (table 7 and 8) will be also depicted in a figure to draw conclusions.

Table 7 - Moderated regression analysis of top-down decision-making strategy, public sector process innovation and the supply-side of eGovernment

Hierarchical block Variables	Public Sector Process Innovation	
	ΔR^2	β
Block 1: Predictor	.127**	
Supply-side of eGovernment		.29**
Top-down decision making strategy		.13*
Block 2: Predictors	.01*	
Supply-side of eGovernment X Top-down decision-making strategy		-.012*
Total R^2	.128	

Note. N = 3438. **$p < .01$, *$p < .05$, [†] $p < .10$.

Shown in table 7, the interaction term of supply-side of eGovernment and top-down decision-making strategy explained a significant amount of variance in public sector process innovation (ΔR^2 = .01; β = -.0012; $p < .05$).
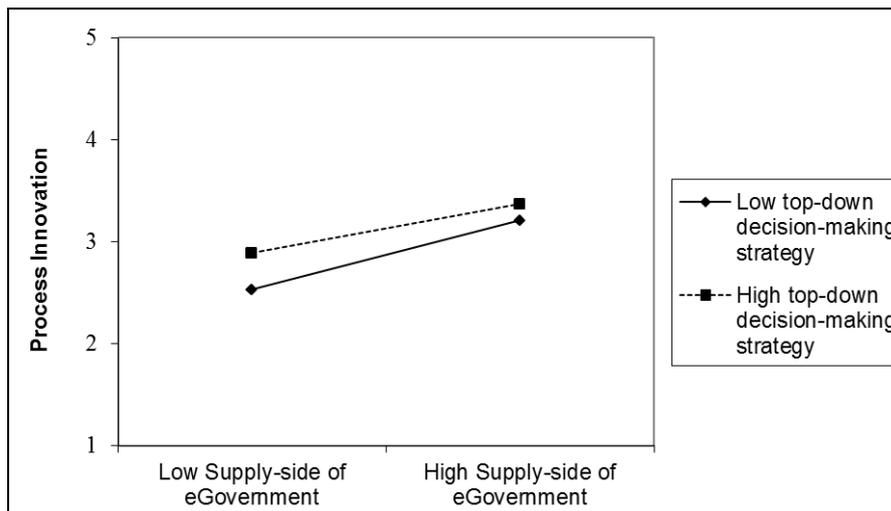

Figure 7- Interaction effect of the supply-side of eGovernment and top-down decision-making strategy on public sector process innovation

In this regard figure 7 shows that the variable supply-side of eGovernment slightly weaker influences process innovation when the top-down decision-making strategy level is high

(moderate slope) In contrast to that eGovernment slightly stronger influences process inno-
vation when the top-down decision-making strategy level is low (top-down strategy is less
used within a public sector organization). Alternatives to a top-down decision-making strate-
gy could be a combined bottom-up/top-down strategy or a pure bottom-up strategy, which
lead to the next analysis.

The interaction term of supply-side of eGovernment and bottom-up decision-making strategy
explained a significant amount of variance in public sector process innovation (ΔR^2 = .02; β =
.003; $p < .10$) over and above that accounted for by the two main effects (see table 8). Nev-
ertheless, it should be noted that the regression weight of the interaction effect (β = -.003)
approaches the significance criterion only at a p-value of 0.6. This issue could challenge the
results and the conclusions which could be drawn.

**Table 8 - Moderated regression analysis of bottom-up decision-making strategy, public sector
process innovation and the supply-side of eGovernment**

Hierarchical block Variables	Public Sector Process Innovation	
	ΔR^2	β
Block 1: Predictor	.195**	
Supply-side of eGovernment		.37**
Bottom-up decision making strategy		.20**
Block 2: Predictors	.02[†]	
Supply-side of eGovernment X Bottom-up decision-making strategy		.003[†]
Total R^2	.197	

Note. N = 3937. **$p < .01$, *$p < .05$, [†] $p < .10$.

Nonetheless figure 8 depicts that the variable supply-side of eGovernment positively and
slightly stronger influences process innovation when the bottom-up decision-making strategy
level is high. In contrast to that eGovernment slightly weaker influences process innovation
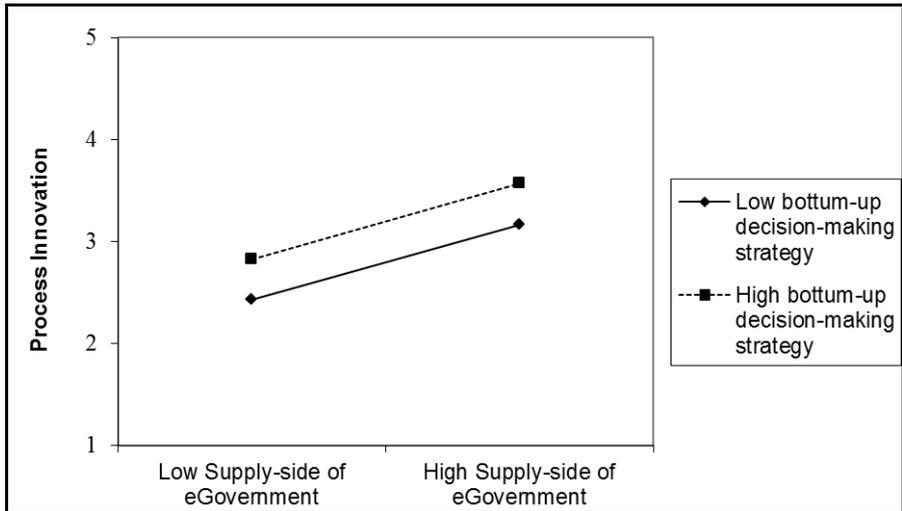when the bottom-up decision-making strategy level is low.

Figure 8 - Interaction effect of the supply-side of eGovernment and bottom-up decision-making strategy on public sector process innovation

All in all, comparing both interaction effects it could be observed that the interaction effect of top-down decision-making strategies moderates the relationship between eGovernment and process innovation negatively (table 7), while in contrast to that bottom-up driven strategies (table 8) positively influences the relation between eGovernment and public sector innovation significantly and the interaction accounted for an additional two percent of the variance in process innovation (table 8). Unfortunately the respective variances and regression weights and the difference of both moderators are not that high as assumed in hypotheses 4. In addition the interaction effect in table 8 exhibits a low significance value of at least 0.06. Therefore hypotheses 4 could be only partly accepted. This issue will be further discussed in chapter 5.1 and proper explanations will be drawn.

Conclusively the empirical analyses provide interesting findings which will be discussed in chapter 5. In this regard figure 9 summarizes the results of the data analysis whether the hypotheses 1 to 4 have been (partly) accepted or rejected:
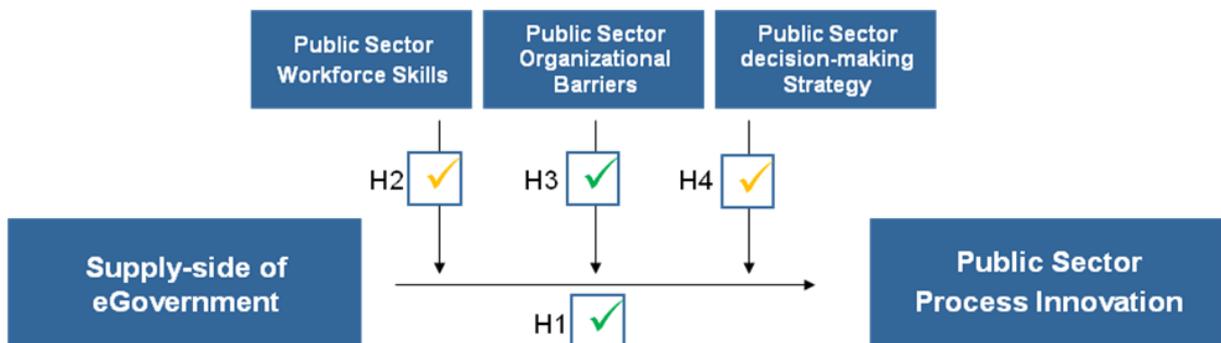

Figure 9 - Results of the empirical analysis

5 Conclusion

5.1 Discussion and Recommendations

In the literature it could be found that eGovernment has already shown its potency in increasing the productivity and effectiveness of public sector organizations. The results of the master assignment show moreover its potency in influencing and increasing public sector process innovation. The general goal of this study was to observe the influence of eGovernment on innovation in the public sector and how public sector workforce skills, organizational barriers and decision-making strategies affect this relationship. With a look on the empirical part of the master assignment the results suggest that public sector organizations that implement eGovernment from the supply point of view are more successful in terms of process innovation, which supports Hypothesis 1. This result supports not only hypothesis 1 of this master assignment but also the assumptions of several researchers about the positive influence of eGovernment on public sector innovation in general (e.g. Bekkers et al. 2003; Margetts et al. 2003; Archman & Iglesias 2010; Xu 2010; Blind 2011; Andersen 2004; Maria et al. 2011; Malone 1987). However, it should be kept in mind that eGovernment alone does not foster innovation within the public sector (see also chapter limitations 5.2) and that the relationship between the supply-side of eGovernment and process innovation is moderated by several factors.

Hypothesis 2 suggested that public sector workforce skills would moderate the relationship between the supply-side of eGovernment and public sector process innovation such that the relationship will be more strongly and positively with high workforce skills and weaker with low workforce skills. However, this hypothesis has been partly confirmed. The relationship shows rather an inverse u-curve relationship, illustrated in figure 5 (see chapter 4.2.1), which presents the nature of this interaction effect. The relationship between the supply-side of eGovernment and process innovation is more strongly with medium workforce skills and weaker with low and high workforce skills. This result is very interesting, because I initially thought the higher the workforce skills are the stronger is the interaction effect. Explanations for the effect of low workforce skills could be drawn relatively simple, as I did during the hypothesis development (see chapter 2.4.1), but to find explanations for the effect of high workforce skills are rather difficult. One explanation could be that workforce with high skills do not have positions with routine tasks, which requires a lot of flexibility in their doing. But the implementation of eGovernment is a kind of standardization which decreases the flexibility in executing their jobs and which probably leads to a weaker motivation to innovate. Therefore this circumstance could explain the low interaction effect of workforce with high skills in com-

parison with workforce with medium skills. In order to support this assumption and to diminish any doubts, further work in this direction is strongly encouraged.

All in all to skim the whole innovation potential it should be found a balance between low and high workforce skills. On the one hand to increase the knowledge and skills of the workforce with low skills Morreale et al. (2001) suggest that knowledge and skills can be gained either via formal methods such as workshops, trainings and computerized tutorials, or by more informal ways such as tinkering with a (ICT) device or system, or having someone show them how to perform a simple task. On the other hand staff with high skills should be given more flexible possibilities in doing their jobs. Furthermore they should be integrated in the eGovernment implementation process, so that they can contribute their own ideas, desires and visions about how the applications should look and work like. With a view on the workforce with medium skills the public sector organizations should take care of a technically open and flexible culture to ensure a maximum motivation to innovate.

With a look on the results of the moderating effect of organizational barriers, the relationship between the variable supply-side of eGovernment and process innovation is weaker and negatively when more organizational barriers exist. Indeed, this finding supports hypothesis 3 but the significane of the interaction effect should be treat with caution and the effect on the relationship is not that high. One explanation for this low interaction effect could be that the internal and external pressure by politics and society to be innovative in the public sector is such high, that organizational barriers have only minor influence on the relationship between eGovernment and process innovation. Another explanation illustrates the following figure 10.
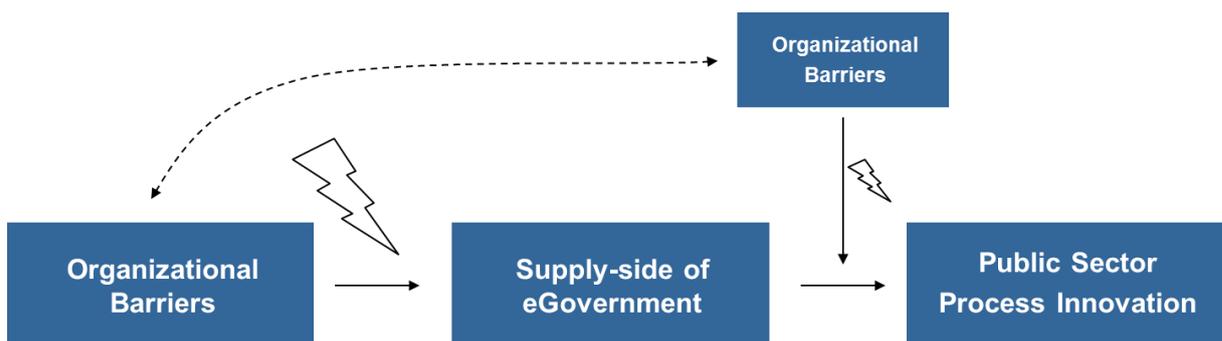
Figure 10 - Influence of Organizational Barriers on the relation between eGovernment and public sector process innovation

The negative and rather low interaction effect of organizational barriers on the relationship between the supply-side of eGovernment and process innovation could be derived by the fact that organizational barriers have to be overcome before implementing eGovernment at all. Therefore the measured moderation effect in this assignment could be probably seen as

an aftereffect. Such aftereffect could have a distorted influence on the relationship between eGovernment and process innovation, such that organizational barriers rather low affect this relationship. Moreover one further explanation could be that during the implementation and use of eGovernment systems some organizational barriers are conducive, which mitigate a stronger and negatively effect. For example staff resistance will lead to more discussions with supervisors or other parties, which increases the information exchange regarding doubts and desires of the respective stakeholders. Continuous feedback and discussions about eGovernment systems and processes will be probably conducive for the relationship between eGovernment and process innovation. Therefore the findings show a rather low interaction effect of organizational barriers. Nevertheless this explanation and the findings of this master assignment could be a starting point for future research.

Due to the fact that the results confirm my initial hypothesis, the question appears how such organizational barriers could be minimized to avoid its influence on the relationship between eGovernment and public sector innovation. The OECD (2011) recommend that one key element in the innovation process is the need for managers to accept and tolerate a certain amount of risk taking and empowering staff to take initiative and think creatively, even if this results in some cases in failures. This could be supported for example by the implementation of a risk management system which helps managers in their decision-making and maybe enable a more risk-taking culture. Furthermore I think allocating time and resources for innovative activities is also an important element in management for innovation. Creativity and 'out of the box' thinking are increasingly identified as key elements of innovation and therefore I recommend that in modern public sector it is important to allocate resources and create spaces where diverse approaches can flourish. All in all to create a sustained capacity to innovate, the public sector should abolish organizational barriers such as bureaucratic structures and build new systems that encourage fresh thinking.

But eliminating all organizational barriers (e.g. risk-aversion, staff resistance) could be also a wrong way. Derived from the literature review on organizational barriers there is an upcoming question concerning the stability of the public sector (Innovation at the expense of stability), which should be also discussed. In general the need for stability is another reason why the public sector may find it challenging to be innovative. In this regard Mulgan (2007) provides several reasons why organizational barriers and controlling innovation may be important for maintaining government stability. He suggests that some organizational barriers in the public sector are necessary (e.g. less tolerance for risk) because the services provided by the public sector are often essential for the lives and businesses of their users. He also contends that it is important that the public sector and its processes remain familiar so its users are able to navigate it with relative ease. Therefore just eliminating organizational barriers which

increase the innovation potential but as well as jeopardize stability at the same time must be well calculated and checked before it is done, given the importance of the public sector's services to its users. Nevertheless, this thoughts about stability and that few organizational barriers are conducive for innovations could be also an explanation for the low interaction effect.

Moreover the findings of the empirical analysis are partly in line with hypothesis 4, which predicted that the decision-making strategy of public sector agencies (bottom-up or top-down) moderate the relationship between the supply-side of eGovernment and public sector process innovation such that the relationship will be more strongly and positively with bottom-up strategies and weaker with top-down strategies. The low difference between the effect of top-down and bottom-up decision-making strategies could be explained by the fact that during the data collection only senior managers for strategic planning and decision-making have been asked. Most of the managers will not admit that bottom-up decision-making strategies will be better than top-down decision-making strategies because than they would lose some power to decide, which is probably not there intention. Therefore, this could be an explanation for the low difference between both moderator variables in affecting the relationship between eGovernment and process innovation.

Nevertheless as already observed by Hamel (2000) and Michalski (2006) that bottom-up strategic methods should be implemented instead of a top-down strategy in order to generate innovations in the private sector, this relation could be also transferred to the public sector. The advantage of a bottom-up decision-making strategy is that the development and implementation of innovations can be carried out in an emergent way, which means that innovations are not planned top-down (Michalski, 2006). Instead, innovative ideas could be collected at the periphery of the organization through interactions with citizens, businesses and other governmental institutions. Supporting these interactions electronically with eGovernment applications will strengthen this effect. Furthermore with a bottom-up strategy the agencies can evaluate these applications after implementation or draw on the experience of external organizations to obtain the maximum benefit. Moreover as already mentioned in chapter 2.3.1 eGovernment provide the possibility to involve the staff (and also citizens and businesses) in certain decision-making processes as well as administrative processes. This circumstance that more staff not only from the management can participate in the decision-making process could probably lead to more motivation to innovate.

But just changing the whole decision-making strategy is questionable and could be rather detrimental. As already mentioned in the context of the elimination of organizational barriers, the stability of the public sector should be not ignored. A strategic change needs on the one

hand a long transformation phase which requires a lot of resources and budget. On the other hand due to the different responsibilities within the public sector on national, regional and local level it is nearly impossible and complex to provide a same basis. However, in contrast to that Leitner (2003) claims that eGovernment and public sector innovation's further success is closely linked to fundamental change which will transform the public sector. She concludes that stable government institutions should no longer ruling from 'top-down' (Leitner 2003, p. 13). The notion of bottom-up decision-making strategies also include democratic and cooperative policy formulation, citizen involvement, transparent and participative implementation of policies as well as continuous independent evaluation of their results and accountability of public decision makers. Therefore it is imaginable to found a compromise, resulting into the necessity to balancing top-down control with bottom-up decision-making.

Nevertheless the findings could be biased by the fact that the implementation of eGovernment systems facilitates the participation on the decision-making process of as many stakeholders as possible (as already mentioned above). After the implementation of ICT-based systems employees from the 'bottom' of the public sector could have also the possibility to take part in the decision-making process. Therefore it could be concluded that there rather exist a mediator effect between eGovernment, bottom-up decision-making strategy and public sector innovation. This could be also an explanation for the fact that the bottom-up moderator variable positively influences the relationship between eGovernment and process innovation. Thus, someone can assume that eGovernment and public sector innovation are probably linked through an intervening variable (bottom-up decision-making strategy). The intervening variable could either be a full mediator if eGovernment no longer affects public sector innovation directly or a partial mediator if the effect is reduced. However, this assumption could be also a starting point for future research.

Conclusively the results of this master assignment could be used to explain the influence of eGovernment on process innovation in the public sector and how public sector workforce skills, organizational barriers and decision-making strategies affect this relationship. Such research efforts are crucial for formulating policies and strategies for effective governance as well as for monitoring and evaluating the impact of eGovernment on public sector innovation. Especially research on factors, which affect this relationship, could be used as a starting point for the introduction of measures to foster innovation in the public sector. Although the findings show promise and reliability at the first view, the master assignment in general and especially the empirical analysis exhibit some limitations, which will be discussed in the following chapter in detail.

5.2 Methodological issues and Limitations

This master assignment on public sector innovation and eGovernment has some specific lim-
itations that must be spelled out for a better understanding of the results and for possibly im-
proving future research. In the following I would like to outline the major methodological con-
straints I faced during analyzing the data. Moreover I will also mention the limitations which
derive and occur during the planning and implementation of the Innobarometer survey, which
build the basis of my data analysis.

5.2.1 Empirical Limitations

One limitation of the master assignment is, that the constructs used in this study, e.g. pro-
cess innovation, eGovernment etc. are not constructs that have been empirically validated
and developed in literature. As already described in chapter 3.2.3 the measures used in the
Innobarometer survey are actually not empirically validated measures of the constructs used
in the master assignment. During several discussions with colleagues from the Fraunhofer
Institute we identified items that addressed most of the issues about the respective construct
and assigned them as a measure of the construct. This approach could cause validity prob-
lems. Although we tried to identify suitable measures which describe the respective construct
sufficient and I tried to increase reliability and validity by conducting several analyses, the
results should be interpreted with caution. To increase the quality of future research, the va-
lidity (statistical conclusion, internal, construct and extern validity) and reliability must be in-
tensive considered (Shadish et al. 2002). In this regard validity refers "*to the approximate
truth of an inference*" (Shadish et al. 2002, p. 34). In other words, it generally refers to the
extent to which a concept, conclusion or measurement is well-founded and corresponds ac-
curately to the real world. So, future research should use empirically validated scales and
constructs found in literature to conduct their empirical research and also answers the ques-
tion "*are we actually measuring (are these means a valid form for measuring) what (the con-
struct) we think we are measuring?"* Furthermore in order to limit biases introduced by using
a single factor analysis method, as I did in this master assignment, future researcher should
also apply chi-square ($\chi2/df$) and Goodness of fit (GFI) as measures of fit. Nevertheless, time
and resource constraints have not permitted proper confirmatory factor analysis to see if all
items adequately covered the constructs.

The second limitation concerns reliability of some constructs used in this study. With a look
on the principal components analysis once a rotated factor solution was obtained, its inter-
pretability was evaluated based on a .50/.30 criterion (i.e., primary loading of .50 or greater
and no secondary loading of .30 or greater). If a factor does not meet the .50/.30 criterion
towards all respective items, it implies low reliability (such as some items of the factors sup-

ply-side of eGovernment and workforce skills, see table 2). In addition Nunnally (1978) and George & Mallery (2003) suggested that a Cronbach's alpha below '0.6' shows poor reliability, too (such as the factor supply-side of eGovernment with α = .554, see table 2). The low reliability of both constructs has two implications. First, the significant results related to the constructs with a low reliability should be interpreted with caution. Second, low reliability could have caused false conclusions in testing the hypotheses concerning the supply-side of eGovernment, workforce skills and public sector innovation. Therefore the findings of this master assignment should be used with caution, although the findings show promise and reliability at the first view.

The third limitation of the master assignment concerns the relevance of the eGovernment predictor. Although the significant correlation in the expected direction may be considered sufficient support for the relationship between the supply-side of eGovernment and public sector process innovation, particularly strong support for the relevance of the eGovernment predictor may be inferred if it succeeds in explaining additional variability in the criteria after other relevant variables (e.g. control variables) have been accounted for. For this purpose, and to provide additional construct validity evidence, future research should conduct a hierarchical multiple regression with other relevant variables (see chapter 5.4). Also, the interaction variables may not only influence the relationship between eGovernment and process innovation. Such measured effects can also be attributed to other causes – though that is always the case in social science.

The fourth limitation concerns the tautology between eGovernment and process innovation. Maybe eGovernment itself could be seen as a process innovation which could bias the proposed relationship. According to Potnis (2010) eGovernment has undoubtedly emerged as one of the greatest innovations in the public sector and could be moreover referred to as an innovation management process in the public sector. If the worst comes to the worst both constructs, eGovernment and process innovation, describe the same thing, which would challenge my whole empirical analysis. But due to the fact that the respective items loaded on the respective factor and that the correlation coefficient between eGovernment and process innovation is not that high, it could be assumed that both variables describe different things (a high correlation coefficient could be an evidence for the problem described above). Nevertheless the difference between the variables has to be elaborated precisely in future research.

Beside these limitations with regard to my empirical analysis I will also have a look on the most mentionable limitations which derive and occur during the planning and implementation of the Innobarometer survey[2]:

Limited sampling resources: The lists of public sector organizations qualified to be interviewed in the Innobarometer were developed by national institutes using local statistical data sources. These national sampling frames may not be directly comparable in terms of quality (specifically in terms of coverage, i.e. what percentage of institutions is available via these lists) and the method of compiling the lists (this was not generally available and may differ substantially from country to country).

General comparability issues across countries: The innovation performance of a public sector may be dependent on many country-specific structural factors that are very difficult to address with sampling strategies. For example, different levels of autonomy may directly influence innovation activity: in one case a smaller upgrade in a specific service may by default be implemented in a strict hierarchy, while in another similar service sector individual innovations are introduced by autonomous actors.

Generalizability of the results: The results of the report are only suitable for providing a broad assessment of Public Sector innovation and eGovernment activities in the EU. It is possible, that a richer and better weighted (generalizable) sample would have shown stronger support for some of the hypotheses. Furthermore one limitation originates from my decision to focus on the research context of the supply-side of eGovernment and public sector process innovation. Since no other contexts were discussed, this currently limits the applicability of the model to this particular context.

Last but not least this survey focuses on public sector innovation not over time rather on innovativeness at the point due to conducting a cross-sectional study. Cross-sectional analysis involves observation of all of a population, or a representative subset, at one specific point in time. But innovation could be seen as a long process (see diffusion and adoption of innovation, Chapter 5.4). Therefore the responses of the Innobarometer survey are only a snapshot of reality and can lack important information. Cross-validation and longitudinal studies are needed before definitive practical prescriptions are recommended, although the findings of the master assignment might suggest concrete measures. Therefore clearly, supplemental longitudinal studies are desirable for future research to draw more definitive conclusions.

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[2] Here, the most mentionable limitations of the Innobarometer are mentioned. Further limitations can be found in the Innobarometer report (see European Commission 2011, p. 6-7).

5.2.2 Definitional and Organizational Limitations

Beside empirical limitations the master assignment shows also other limitations. I am aware that innovation in general and particularly in the public sector, is a complex phenomenon encompassing a variety of technical and organizational aspects and an extremely large set of decision-making processes are affected inter alia by barely observable political and institutional factors. Hence innovation cannot be reduced to the mere introduction of eGovernment services. Therefore there are lot of other factors which probably bias the relationship between eGovernment and public sector innovation which have to be considered.

Moreover with a look on the theoretical framework and my literature review it completely relies on previously published research, which could be seen as a limitation. Therefore the assignment is dependent upon the availability of certain papers on the topic (file-drawer-problem) and the appropriateness of these papers (Taylor 2012). As a result, "an effective literature review requires a high level of skill[s] in identifying resources, analyzing the sources to identify relevant information, and writing [a] meaningful summary" (Marelli 2005, p. 43). Therefore I used the knowledge gained during the master class and described in chapter 2.1 to conduct an appropriate literature review by using for instance several criteria for the selection and exclusions procedure to delimitate this limitation. In this regard one further limitation in the analysis is the researcher itself, because he can color information and determine what support his thoughts and do not support his thoughts. To delimitate this research bias the approaches and findings have been discussed and shared with several supervisors from the University of Twente, TU Berlin as well as Fraunhofer Institute.

Another issue is that literature reviews in general are limited to collect information about what has happened in the past within organizations or contexts that differ from the researchers own workplace or research setting (Marelli 2005). Thus, the literature review does not deliver data about actual situations and current developments. Therefore, managers could neglect the importance of literature reviews, using the argument of limited up-to-dateness, which could be an obstacle for scholars/students conducting their research project in a company or institution. Moreover, the literature review is not an exhaustive, alphabetical list of every work published, so there is also the risk to overlook important insights that could have a strong influence on the big picture that should emerge as a result of the review (Rudestam & Newton 1992). To delimitate the up-to-dateness problem I integrated within the theoretical framework also current conference papers and working papers on the topic to show its importance. Concerning the risk to overlook important insights I conducted time intensive literature reviews by reading and elaborating papers and books from different origins to minimize the risk.

Furthermore as for almost every research, a research focus must be set to align the size of the research within the time and resources available (see chapter 3.1). Because this research is executed as a graduation assignment for a master degree there is a size limitation to finish it within a timeframe set by the assignment.

5.3   *Academic and practical relevance of the assignment*

Despite the limitations the study has both theoretical and practical implications. In general such research efforts are crucial for formulating policies and strategies for effective governance, and for monitoring and evaluating the impact of eGovernment on public sector innovation. Especially research on factors, which affect this relationship, could be used as a starting point for the introduction of measures to foster innovation in the public sector.

In order to be able to increase the knowledge and understanding of public sector innovation, as well as about its influencing factors, such as eGovernment, there is an increasing awareness of the need for more systematic data on innovation in the public sector. For instance this was one of the key recommendations of Koch & Hauknes (2005) in their research on public sector innovation. Thus, the first contribution of the assignment is that the elaborations and findings can be conducive for explaining public sector innovation and how eGovernment functions as driving force for innovation. Only few studies in the literature examine this topic although there is an increasing importance of innovation in the public sector (Xu 2010; Borins 2001; Borins 2006; Grady 1992; Thenint 2010). In this regard Bygstad et al. (2007), who investigate the relationship between broadband and service innovation in an eGovernment context, mention that further directions for research lie in studying other eGovernment foci and to investigate their impact on innovations in the public sector (Bygstad et al. 2007). With reference to Bygstad's et al. (2007) direction for the future, my research model as well as the findings shed light on the relationship between another eGovernment (supply-side of eGovernment) and public sector innovation focus (process innovation). Therefore my research follows up the thoughts of Bygstad et al. (2007) as well as other researchers and also delivers a starting point for further elaborations on the topic. In addition there are also almost no studies which investigates the influence of different factors, like workforce skills, organizational barriers and decision-making strategies, on the relationship between eGovernment and public sector innovation (Mulgan & Albury 2003; Blind 2012b). Therefore this research can enrich and extent the literature and knowledge in an under-researched context and also provide impulses for future research. Moreover this assignment contributes to the literature due to the derivation of empirical support for the model's prediction using data from an available data set (Innobarometer survey), because few studies empirically examine the function of eGov-

ernment as driving force for innovation in the public sector, especially with this particular research focus (supply-side of eGovernment and process innovation).

The second contribution belongs to the practical implications of the master assignment. In general authors such as Wexley & Baldwin (1986) name a lack of theoretical foundation as one of the fundamental concerns in management development. Therefore, it seems critical from both the scientist's and the practitioner's perspective to bridge the gap between theory and application in eGovernment and public sector innovation research. The findings suggest that implementing eGovernment systems could yield to the increase of the process innovation level in the public sector. This information could be used by European countries, which lag behind the objectives of the European Union regarding their innovation strategy and policy (see Maria et al. 2011). Furthermore an understanding of the different factors that influence the relation between eGovernment and public sector innovation can be used to develop and improve policies and management strategies to encourage process innovation in the public sector. Chapter 5.1 has already provided many examples of what can be done with the findings in practice. For example the empirical part shows that staff with medium skills, which already gained trainings or workshops for instance, influence the relationship between eGovernment and process innovation stronger, than staff without trainings. This information is an argumentation to offer more workshops (regarding the use ICT) for staff with low skills to increase process innovation. In this regard during my literature review, I found the key word 'innovation activities', which are "all activities conducted in-house or externally through acquisitions which actually, or are intended to, lead to the implementation of innovations" (OECD 2005). As part of this strategy are trainings and education of staff for innovation. Therefore my findings could support these 'innovation activities' recommended by the OECD and call for increasing investments in target-group-specific trainings. Such measures can help to build a culture of public sector improvement as well as perhaps contribute to the innovation culture more generally.

Furthermore it is necessary to consider the factors that may impede the development of an innovation culture within the public sector. By identifying these challenges and organizational barriers it may be possible to develop strategies to mitigate them, which could form the basis for several measures in an innovation performance measurement framework. However, as discussed in chapter 5.1, the whole elimination of organizational barriers could be rather detrimental. This circumstance should be investigated in future research.

Moreover the findings of the assignment can be used by policy makers as well as public sector managers and taken as necessary information to create effective public sector governance and use of eGovernment to stimulate public sector innovation under certain conditions.

In addition the findings cannot only be used by people from the public sector but also by managers from the private sector. For instance, managers of IT service provider can recognize the needs of the public sector and the importance of eGovernment. This could be a hint and motivation to develop further software products, consulting as well as training approaches in the field of eGovernment in collaboration with public sector organizations.

Last but not least, one further practical implication derived from the literature review is that the implementation of comprehensive eGovernment is a step-by-step process which encompasses several months or even years to be accomplished (Bayens 2006). In practice, there are still several gaps between the promises of eGovernment and the actual results. Therefore I suggest that the implementation of eGovernment should be planned carefully and not ad hoc.

Altogether, the master assignment provides a good starting point for investigating the role of eGovernment in public sector innovation. In doing that, it fills this gap in the literature and opens new avenues of research, which will be touched upon in the next chapter.

5.4 Future Research

The current master assignment serves as a starting point for further research on the relation between eGovernment and public sector innovation. In general governments can and do innovate and it can occur at all levels of government, i.e., national, regional or local levels (see chapter 2.2.2). Therefore it is proposed to repeat this study in future research for example with respondents from different types of governments at regional or local level and in more different departments within the governmental organizations with different job positions to explore if the current results hold, because this assignment just looks on the supranational (EU) level and on employees from the executive board or strategic planning department of the respective public sector organization.

Moreover this master assignment did not consider any control variables such as gender, organization size or level of tenure. To make sure that future findings hold irrespective of these individual attribute variables, researchers should incorporate these variables as control variables. Even though I do not expect effects for gender, researchers should examine it as a control variable to make sure this demographic variable did not affect the results. In contrast, I assume that the level of tenure, which measures the number of months the employee had been working for the organization, could affect the relationship between eGovernment and public sector innovation. My assumption is that employees, who had been working for a long time within a public sector organization with paper-based processes, negatively influence this relationship.

Furthermore it should be observed if eGovernment has influence on the other three types of public sector innovation, namely product, organizational and communication innovation (see chapter 2.2). Especially future research should use already developed and proved scales and measurements of the respective constructs (like eGovernment, process innovation etc.) to delimitate the risk of losing reliability and validity of the empirical results.

Beside these approaches future research should also consider that governmental institutions and even countries have different perspectives when it comes to the way they approach eGovernment and innovations (as already mentioned in the limitation chapter). Perhaps some governmental organizations are more open to innovations than others, because some organizations may have different perspectives on risk, less staff resistance or have different experiences with innovation. In general, "*entrepreneurial and innovation-oriented governments tend to be more receptive to new managerial and technical approaches.*" (Moon & Norris 2005, p. 47) This means that public sector organizations with a more entrepreneurial and innovation-oriented management culture are more likely to obtain the benefits of eGovernment to promote innovation processes within the public sector. Consequential it could be make sense to combine researches on eGovernment, public sector innovation and entrepreneurship in terms of entrepreneurial orientation. In this regard some studies already combined entrepreneurial orientation and public sector (e.g. Diefenbach 2011) or entrepreneurship and public sector innovation (e.g. Bartlett & Dibben 2002), but do not integrate the factor eGovernment. Therefore this could be also a starting point for further research.

In addition the public sector has been viewed as being different than the private sector in terms of innovation, with the public sector often seen as a regulatory framework for innovation in the private sector, and as a passive recipient of innovations from the private sector (Bloch 2011). But today innovation in the public sector is increasingly seen as an important factor to sustain a high level of public services for citizens and businesses, as well as addressing the so-called megatrends (see chapter 1). Moreover innovation in the public sector may have not only considerable effects on the quality and efficiency of public services itself, but also may influence the ability of the private sector to innovate (see figure 11). So it could be concluded that an innovative public sector is also important to innovation in the private sector. In this regard Bloch (2011, p. 10) confirms that public sector innovations causes private sector innovations, "*due to the close interactions between the private and the public sector in many domains and due to the role of the public sector as a facilitator of infrastructure for the private sector (e.g. knowledge development through education and research, communications such as roads, railways or ICT, and industrial policy instruments).*"
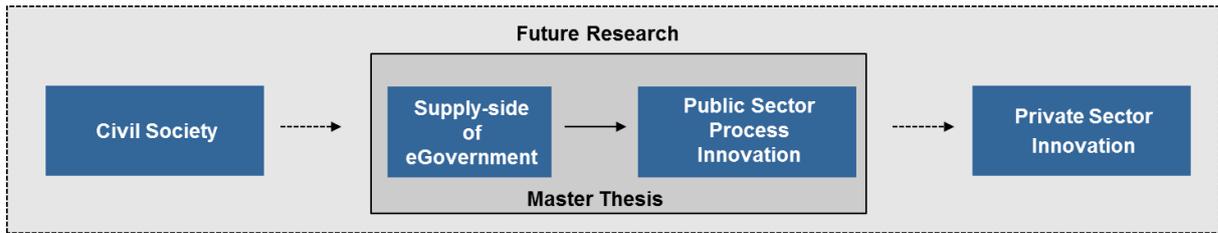
Figure 11 - Future Research – Effects of eGovernment on innovation in the public and private sector

In the dark grey box in figure 11 you can see the simplified relationship which I observed in this master assignment, which focus is just on the public sector internally. But considering the effect of eGovernment on public sector innovation which affects private sector innovation, as described above, it should be observed in future research. For example eGovernment systems, like public procurement practices, can provide essential benefits that may have major impacts on private sector innovation (Bloch 2011). Beside the impacts on private sector innovation Chochliouros & Spiliopoulou-Chochliourou (2006) state that eGovernment provide also incentives for enterprises in terms of reducing cost transactions, supporting competition in a global economic environment, and increasing speed, simplicity, and scalability. These effects of eGovernment on the private sector could be also a starting point for future research. Moreover someone can assume that public sector innovation on the one hand can be internally driven (e.g. eGovernment) or on the other hand be induced from an outside actor (e.g. civil society such as citizens or businesses). Therefore future research should also observe the influence of external factors on innovation within the public sector.

Derived from the procurement example above future research should have also a deeper look on public procurement practices as well as public sector needs and demands. According to the OECD (2011, p. 18) they argue that "*public sector needs for services play an important role in the innovation climate in all innovation systems [public as well as private sector innovation systems]*". The public procurement of services can impact innovation in two directions: first contributions to innovation in the public sector organization itself and second promoting innovation in other private sector organizations. Therefore, the needs and demands in public sector organizations form an essential market for firms in the private sector. In conclusion a positive interaction through public procurement practices (like eProcurement, which belongs to eGovernment and the G2B view, see chapter 2.3.3) "*between public sector needs and demand, and creativity and innovation in the private sector sector, can contribute strongly to renewal in the public sector and to innovation and international competitiveness in the business sector*" (Vinnova 2007, p. 18; OECD 2011). Therefore future research should investigate the function and application of procurement practices like eProcurement within the public sector and should observe the influence of such practices on private sector innovations.

Beside all positive aspects of eGovernment, one must not overlook the fact that greater use of eGovernment and ICT in the public sector also results in the appearance of new risks and challenges. One disadvantage of eGovernment is that it encroaches on privacy, especially when it involves data that reveals personal information as well as personal preferences. Especially citizens in Germany are very sensible in regard to data privacy and IT security. Maybe an increasing application and implementation of eGovernment services in everyday life will be detrimental to the trust which citizens and businesses have towards governmental organizations. This circumstance will not foster an innovation culture and put the implementation of eGovernment into question. Therefore, issues related to ICT security and the development of secure standards are gaining importance in the implementation of eGovernment solutions (Archmann & Iglesias 2010). Future research should consider the disadvantages of eGovernment and for example observe the acceptance and trust of citizens and businesses regarding eGovernment and which influence it has on public sector innovation.

Moreover in the master assignment I examine two dimensions of eGovernment: eAdministration and eDemocracy. Due to several reasons (see chapter 2.3.2) I treat my study as part of the eAdministration dimension. However, research with focus on the eDemocracy dimension as well as its sub-dimensions eVoting and eParticipation should be also extended. Although still in its infancy and at elementary levels (with some pioneer experiences especially in northern Europe), eDemocracy formulates a very promising expectation for the future (Chochliouros & Spiliopoulou-Chochliourou 2006). Therefore it would be interesting and necessary for managers and policy makers to investigate the influence of eGovernment applications which belong to the eDemocracy dimension on public sector innovation.

Future studies and research should also consider or integrate concepts such as (concepts were briefly mentioned in the master assignment):

- *Differentiation between radical and incremental public sector innovations:* Future research should differentiate between radical and incremental innovation in the public sector and investigate if the implementation of eGovernment services is more conducive for incremental innovations than radical ones.

- *Diffusion and Adoption of innovation in the public sector:* Future research should also elaborate on Rogers's (1995) theory about the diffusion and adoption of innovation and on Damanpour & Gopalakrishnan's (2001) work on the dynamics of the adoption of product and process innovation in organizations. For instance, a new innovation can impact the adoption rate of an existing innovation and path dependence may lock potentially inferior technologies in place. Maybe too many eGovernment initiatives will

neutralize the respectively innovation diffusion and adoption. Furthermore if eGovernment applications are too complex and hard to understand to use, the degree of resistance level will increase and the rate of diffusion will be low. All in all it seems possible to test these propositions empirically in further studies, for example by conducting longitudinal studies to describe the diffusion and adaption of innovation over time.

- *Effects of innovation (positive and negative) in the public sector:* In this master assignment I just observed if eGovernment has influence on public sector innovation but I did not investigate the effects of such innovations. Indeed I assumed that innovative actions are generally taken to achieve positive outcomes but maybe innovations driven by eGovernment backfire and the net gain of the innovation might be negative due to additional administrative costs. Therefore the effect of such innovations should be investigated in future research.

All in all I believe that this research is one step towards a better understanding of eGovernment and its influence on public sector innovation. Even though, some limitations should be kept in mind and generalizations are difficult to make, I believe that future research can build on this master assignment. Conclusively I hope that future research on eGovernment and public sector innovation gets the same significance and relevance in literature that eCommerce and innovation in the private sector have got in the past.

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Appendices

1.   Appendix - Declaration of Academic Integrity

I hereby confirm that I have written this thesis paper entitled "eGovernment: a driving force for innovation in the public sector?" independently, without help of third parties and only with declared literature.

Directly or indirectly adopted thoughts from other sources are indicated at the corresponding places within the document.

The master thesis has not been submitted to any other university or authority, nor has it been published, yet.

Berlin, August 08th, 2012

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