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The Role of Business Intelligence in Organizational Decision-making

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LIMAC PhD School
Department of IT Management

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LIMAC PhD School is a cross disciplinary PhD School connected to research communities within the areas of Languages, Law, Informatics, Operations Management, Accounting, Communication and Cultural Studies.

To my parents

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Arisa Shollo
Copenhagen, November 2012

Abstract

This Ph.D. thesis is concerned with the role of the business intelligence (BI) output in organizational decision-making processes. The primary focus of this thesis is to investigate how this BI output is employed and deployed by decision-makers to shape collective judgement and to reach organizational decisions. Concerning the role of the BI output in decision-making the BI literature is characterized by normative ideas of how the BI output should be used in decision-making and how it can enable people to make better decisions. Most previous work has concerned methods and technologies to collect, store and analyze BI. It has also, assumed a rational approach to decision making where data from information systems are used to inform decisions either by reducing uncertainty, ambiguity or complexity.

This study attempts to establish knowledge about the role of the BI output in the IT project prioritization process of the Group IT of the Danske Bank Group. Hence, the starting point of this thesis is a 16-month long interpretive study from March 2010 till July 2011 during which I observed the prioritization process and collected various forms of data. I use a rich dataset built from this longitudinal study of the IT project prioritization process in Group IT where thematic analysis is used to analyze the data. Overall, the study operates under the interpretive paradigm, which assumes that the world and knowledge are socially constructed.

As such, the thesis contributes with an in-depth account of how the BI output is used in the process of IT project prioritization in the organization. In particular, the core contributions lie in extending the BI literature by identifying political and symbolic uses of the BI output in addition to the informational uses. Apart from using the BI output to reduce uncertainty, the study shows how decision-makers use the BI output to reduce equivocality i.e. to call or deflect attention from specific projects. The BI output is also used by the decision-makers to manage irrationality in organizational decision-making by using the BI output as a rational device to enhance the legitimacy

of their arguments or as a subjective device when the BI output did not make sense to them. Four tactics of using the BI output were identified. The decision-makers supplemented, substituted, interpreted and reframed the BI output with the help of other devices such as networks, expertise, labels and sponsors. Further, the interplay between the BI output and these other devices, the various devices used by decision makers to shape collective judgment, and the process and project characteristics that shape the use of these devices open a new window in the organizational decision-making literature. Thinking in terms of devices and their interplay provides researchers with a new way to investigate and theorize about organizational decision-making practices and the role of BI and more generally information systems in these practices.

Dansk Resume

Denne Ph.D.-afhandling beskæftiger sig med den rolle output'et af business intelligence (BI) har i organisatoriske beslutningsprocesser. Afhandlingens primære fokus er at undersøge, hvordan dette BI output bliver anvendt og udfoldet af beslutningstagere til at forme den kollektive mening og nå til organisatoriske beslutninger. Med hensyn til den rolle BI output spiller i beslutningstagning er BI litteraturen kendetegnet ved normative forestillinger om, hvad der burde ske, når BI bliver brugt i beslutningstagning, og hvordan BI kan gøre folk i stand til træffe bedre beslutninger. Det meste af den tidligere forskning beskæftiger sig med metoder og teknologier til at indsamle, lagre og analysere BI. Den tidligere forskning antager tillige en rationel tilgang til beslutningstagning, hvor data fra informationssystemer anvendes til at informere beslutninger ved at reducere enten usikkerhed, tvetydighed eller kompleksitet.

Nærværende afhandling forsøger specielt at skabe viden om den rolle, som BI output har i prioriteringen af IT-projekter i Gruppe IT i Danske Bank Gruppen. Udgangspunktet for afhandlingen er således en fortolkende undersøgelse af 16 måneders varighed udført i perioden marts 2010 til juli 2011, hvor jeg har observeret prioriteringsprocessen og indsamlet forskellige former for data. Jeg anvender et rigt datasæt, som er skabt på baggrund af dette longitudinelt studie af prioriteringen af IT-projekter i Gruppe IT, hvor tematisk analyse er brugt til at analysere data. Generelt opererer undersøgelsen indenfor det fortolkende paradigme, som antager, at verden og viden er socialt konstruerede.

Afhandlingen bidrager således med dybdegående beretninger om, hvordan BI output'et bliver brugt i IT-projekt prioriteringsprocessen i organisationen. Bidraget omhandler især i identificeringen af samspillet mellem BI output og andre instrumenter med henblik på at opnå prioriterings-beslutninger, de forskellige instrumenter

beslutningstagere anvender for at forme den kollektive mening, og processen og de projekt-kendetegn, der former beslutningstagernes brug af disse instrumenter.

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Table of Abbreviations

(AI)	Artificial Intelligence
(AIS)	Association for Information systems
(BI)	Business Intelligence
(BIJ)	Business Intelligence Journal
(CACM)	Communications of the ACM
(CI)	Competitive Intelligence
(CFO)	Chief Financial Officer
(CIO)	Chief Information Officer
(COO)	Chief Operations Officer
(CPM)	Corporate Performance Management
(CRM)	Customer Relationship Management
(DA)	Development Area
(Dep.)	Department
(DM)	Development Manager
(DSI)	Decision Sciences
(DSS)	Decision Support System
(DW)	Data Warehousing
(EIS)	Executive Information Systems
(EJIS)	European Journal of Information Systems
(ERP)	Enterprise Resource Planning
(ETL)	Extraction, Transformation and Loading
(FTE)	Full Time Employees
(GMI)	Group Management Information
(HBR)	Harvard Business Review
(ISM)	Information Systems Management
(IJBIR)	International Journal of Business Intelligence Research
(IRR)	Internal Rate of Return
(ISJ)	Information Systems Journal
(ISR)	Information Science Research
(IT)	Information Technology
(JAIS)	Journal of Association for Information Systems
(JIT)	Journal of Information Technology
(JMIS)	Journal of Management Information Systems
(JSIS)	Journal of Strategic Information Systems
(KMS)	Knowledge Management Systems
(MIS)	Management Information Systems
(MISQ)	Management Information Systems Quarterly
(MS)	Management Science
(NPV)	Net Present Value
(OLAP)	On-Line Analytical Processing
(P)	Projects
(PP&C)	Production, Planning and Control
(PPMO)	Project Portfolio Management Office
(SMA)	System Management Areas
(SSG)	System Steering Groups
(SWG)	System Working Groups

1 Introduction

This thesis is concerned with the role of business intelligence (BI) output in organizational decision making. The motivation for this study stemmed from the belief within the Group IT of the Danske Bank Group that their decisions were based too much on intuition and that more data and facts would lead to better decisions; a perspective that is strongly advocated by business intelligence supporters.

Indeed, one of the main characteristics of modern organizations is the data revolution that has been steadily taking place over the last two decades. Many practitioners and scholars even see organizational and management decision making to be in the middle of a gradual transformation from an instinct-driven “art” to a progressively data-driven approach (May 2009; Davenport 2010; Brynjolfson et al. 2011).

Many factors have contributed to this modern phenomenon. One of the main contributors is Information Technology (IT) and the emergence of organizational information systems such as enterprise resource planning (ERP), customer relationship management (CRM), transaction and accounting systems, and other similar technologies. IT is nearing ubiquity in modern workplaces. As a result, organizations today have access to almost unlimited amounts of data – sales, demographics, economic trends, competitive data, consumer behaviour, efficiency measures, financial calculations, and more. Business Intelligence (BI) has played a critical role in this transformation, through the development of methods, systems and tools that have enabled the collection, storage and analysis of this vast quantity of data recognized as BI systems and applications (Kalakota and Robinson 1999; Liautaud and Hammond 2002; Rasmussen et al. 2002).

The ability to gather, store and analyze data gave a huge boost to the scientific method in management practice. Now, organizations are able to systematically gather empirical data over time in order to analyze or test hypotheses and consequently make new observations and gain new insights into organizational phenomena. Since BI has its roots in the scientific method, its use was quickly legitimized and spread throughout organizations.

As a consequence, the concept of BI and the use of BI technologies have gained prominence. For several years now, BI spending has increased in relative to overall IT budgets: just last year, BI expenditure saw an increase of $10.5 billion worldwide while IT budgets remained static (Gartner 2011a). Luftman and Zadeh (2011) identified BI as the most influential technology in organizations, while Gartner (2011b) placed BI in the top ten strategic technologies for 2012. At the same time, Brynjolfson et al. (2011) have provided evidence that the adoption of BI technologies and data-driven decision making approaches lead firms to a productivity increase of between 5% and 6%.

Influenced by commercial and scientific interest in BI and by several studies performed by consulting companies on how the Group IT of Danske Bank Group should organize, produce, govern and use BI in the organization, the Group IT decided to run an Industrial PhD project on the subject. An Industrial PhD project is a three-year industry-focused PhD project where the student is hired by a company and enrolled at a university at the same time.

1.1 Initial research focus

In winter 2008, the Group IT of Danske Bank Group announced the Industrial PhD project titled "Cross-domain Alignment, Traceability and Precision Management". The aim of this project was to support and improve decision-making processes by developing a framework to integrate and align business intelligence from different domains and existing IT applications. In autumn 2009, the Industrial PhD project began with me, a former employee of the Group IT, as the researcher, and the Copenhagen Business School as the collaborating university.

The research project was at that time established as an action research project. According to Van de Ven (2007), action research advocates intervention to address the problems of a specific organization while at the same time contributing to academic knowledge. Figure 1 illustrates the initial research plan based on my understanding of the action research cycle (Baskerville 1999; Davison et al. 2004; Van de Ven 2007). The aim was first to diagnose the problem by investigating the decision-makers' needs in terms of data. Next, utilizing "whatever knowledge is available by basic research" (Van de Ven 2007, p. 28) different BI prototypes (dashboards and scorecards) would be developed to change the current ways of making decisions by deliberate intervention. The responses of the users and organization to the intervention would then be studied to allow for an improved understanding and approach to the decision-making processes.

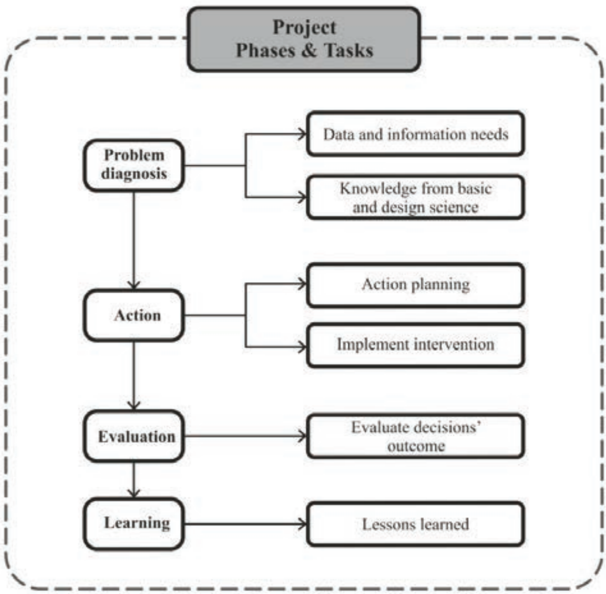


Figure 1: Initial research design based on action research (Adapted from Van de Ven 2007)

My initial role as a researcher was to play an active role in the process as an action researcher, and thus to participate in the creation of the prototypes and the analysis of outcomes. The focus was on investigating how BI tools and applications could support and improve decisions. Although the project had a focus on BI technologies, various managers in Group IT had expressed concerns that the decisions were too complex to be addressed by BI applications. Nonetheless, BI applications were seen as a support mechanism that would at least better inform decision-makers. Shortly after the start of the project, the focus of the research began to change: the role of BI technologies was deemphasized and I became more of an observer than an action researcher.

1.2 Exploring the field

Based on the initial focus of the project, my first task was to become familiar with the needs of decision makers and how BI was used in the organization. At the same time, I explored the BI literature to get a hold of previous knowledge about BI and its relation to decision making.

Very early I realized that when referring to BI decision makers would refer to the technologies, tools or applications or the process of accessing, retrieving and analysing data. However, when referring to the use of BI in their own decision making practices it was clear that BI was used in organizational decision making neither as a process nor a technology, but rather that the *output* of the BI process and technologies was used in decision-making. The output of BI processes, technologies, and tools was the outcome of an analysis based on data collected from different information systems within the organization. Further, I observed that it was easy for decision-makers to talk about how this BI output or 'analysis' was created, but when asked to elaborate on the use of this output in decision processes they found it difficult to provide details. The following quote from the regional manager illustrates this:

> "… it's a little bit difficult to discuss all this because I think it's the first time someone has asked us such questions and in a way it's a very good

> experience because now, suddenly, we're thinking a little bit more why we are looking at all the figures …" (Regional Manager)

Contrary to the view of BI as a process or a set of technologies, there were no standard templates, procedures or manuals that defined how to use the BI output in decision processes. Even more so, the interviewees were more straightforward when talking about the impact of BI analysis in structured decisions than in strategic decisions.

In parallel, the initial exploration of the BI literature and its relation to decision-making revealed that few studies have addressed how the output of BI is used in decision-making processes. Most previous work has concentrated on the methods and technologies used to collect, store and analyze data (Arnot and Pervan 2008). Thus, the literature viewed BI as a process or technology, but there was little research on how BI as an output or product of this process or technology was used in decision-making processes. Even more fundamentally problematic, there was no accepted definition of what the output of BI is.

The BI literature is characterized by normative ideas of what should happen when BI is used in decision-making and how it could enable people to make better decisions. It also assumes a rational approach to decision-making in which data from information systems are used to inform decisions either by reducing uncertainty, ambiguity or complexity (Shollo and Kautz 2010). The underlying basis for the informative nature of the BI output in decision-making is the assumption that there is a transformation process from data to information and from information to knowledge that will ultimately lead to making better decisions (Shollo and Kautz 2010).

As a result, there was no knowledge base, practical or theoretical, upon which I could build the design of an intervention in the organization. Reflecting on the difficulty that the decision-makers had in elaborating on the use of BI in their work processes and the lack of an understanding of the role of BI in such processes in the BI literature, a number of difficult questions emerged. Should I make an intervention in a situation that nobody, and certainly not me, understands? How is BI as an output used by decision-makers in decision making processes? How is BI used in highly complex and ambiguous decisions such as strategic decisions? What are the limitations of the BI output in such an environment? What other methods, approaches or devices, apart from BI, do decision-makers use in order to cope with the limitations of BI when making organizational decisions? Is there a relationship between these other methods/approaches and BI in the decision-making processes?

In summary, the combination of the practical and the theoretical observations with these emerging questions led me to realize that I should first strive to gain an understanding through an in-depth investigation of the use of BI in decision making processes. Therefore the research goal and design changed: I am not interested in designing and evaluating BI applications per se but rather in analyzing how the output of BI is mobilized by decision makers within an organization.

1.3 Research goal

On the basis of these initial experiences at Danske Bank Group and with the BI literature, I amended the focus of the research project to target unfolding the uses of the BI output in decision-making processes. With this study, I aim to contribute to the BI literature and practice by investigating how the output of BI is used in decision-making processes. Specifically, the research question that I pursue is:

1. *What is the role of the BI output in organizational decision-making processes and how is this output used by decision-makers in reaching organizational decisions?*

The first part of the research question addresses the need to investigate the role of the BI output once it is fused in organizational decision-making processes and requires documenting the different uses or purposes of the BI output in these processes. The second part of the question addresses the need to describe how the BI output is used in relation to other inputs employed by decision makers since this relationship might play a role in the actual use of the BI output in reaching organizational decisions.

To answer these questions, I embarked on a literature review on BI investigating its role in decision-making and performed an interpretive study of the role of the BI output in organizational decision-making. The purpose of the literature review is to answer the following questions:

1. What do we know about BI?
2. What do we know about BI use in decision-making?

The interpretive study is concerned with the role of the BI output in a particular instance of organizational decision-making. Specifically, the output of BI was studied in relation to the IT project prioritization process in Group IT. I use a rich dataset built from a 16 month longitudinal study of this process in Group IT.

As such, the thesis contributes with in-depth accounts of how the BI output is used in the IT project prioritization process within an organization. In particular, the contribution lies in identifying the devices (introduced and described in section 1.5) used by decision makers to shape collective judgment and reach prioritization decisions, the interplay between the BI output and the other devices, and the characteristics that shape the use of these devices by the decision makers. These contributions are discussed in Chapter 7.

1.4 Research scope and limitations

The BI field is concerned with the development and use of BI, BI systems and processes within organizations. In general, the development and use of BI depict two somewhat separate research areas that are distinguishable to a certain degree. My aim with this thesis is to contribute in general to the existing body of knowledge about BI and specifically to BI literature concerned with the use of BI in decision-making processes. Therefore, I study the topic from the perspective of the decision-makers rather than from the perspective of the developers or analysts of BI processes and systems.

This study, due to its focus on the use of BI in actual organizational decisions, and the complexity of this relationship, requires a careful research design. According to the research knowledge and activity framework proposed by Mathiassen (2002), a research study might aim at:

- Understanding the problem or topic under investigation by engaging in interpretations of practice
- Supporting practice by developing an artifact or normative propositions
- Improving practice through intervention in a particular situation

The above can be seen as three separate goals or they can be combined in several configurations, although Mathiassen promotes the combination of all three as a research strategy.

The focus of this study is on understanding how the output of BI is used in organizational decision-making processes. Therefore, as mentioned above, the research goal is to gain a thorough understanding of practice as a basic step toward achieving the other goals of supporting and improving. Although the main focus is on understanding the phenomenon, after much time in the field one would be naive to claim that there was no engagement in the other goals of supporting and improving practice. During the empirical research I experienced my involvement in the organization as described by Walsham (2006) more as a spectrum changing over time from the ‘neutral’ observer to the action researcher. Eventually, when the time came to provide feedback, my involvement became more active as I also felt “the need to offer direct advice and help as time went on … in return for the time and effort the organization put in” (Walsham 2006, p. 322). This in supporting practice by providing normative propositions and engaging in small-scale interventions into the process of IT project prioritization. In addition, in the discussion chapter, I reflect on and discuss how the findings of this study might support and improve researchers' and practitioners' activities in designing, developing and using BI in decision-making processes.

As understanding is the goal of this study, it is achieved through engaging in interpretations of practice. Specifically, it is based on interpretations of how decision makers use the BI output in the IT project prioritization process. The empirical research design is based on a pilot study and a longitudinal interpretive study of the IT project prioritization.

The IT project prioritization process is an area of research by itself, covered by the portfolio management literature and the IS evaluation literature. The IT project prioritization process is considered as the empirical setting in this case and as such, the issue of IT project prioritization is treated in the empirical setting where I briefly provide an overview of the related literature. But I do not enter into the discussions of the IT project prioritization literature nor do I aspire to contribute to this literature.

While the previous paragraphs emphasized the scope of this study, the following paragraphs highlights what was left outside of the scope. Several perspectives were considered during the lifetime of this project but eventually were excluded for different reasons.

The production of the BI output. It would have been interesting to include and investigate the process concerning which BI data are included in the data pools and who decides on and creates the associated measures and KPIs. However, I discovered that this was a complex process that could constitute a whole study of its own. Therefore, I decided to study the use of this output in decision-making and considered the production process of the output as background context.

The role of BI output in other decision-making processes in the same organization or in other organizations. Comparing the findings of the role of the BI output from the IT project prioritization with different processes unfolding in different contexts might have been very interesting. However, by focusing on one process there is the advantage of providing richly detailed accounts and findings, something that cannot be done to the same extent when investigating more processes.

An *organizational path dependence perspective* (Sydow et al. 2009; Schreyögg and Sydow 2010) could be used to explain the use of the BI output in the IT project prioritization process. However, because the study involved data mainly about the yearly process of IT project prioritization and not about the previous years, the path dependence perspective had only limited relevance. Had I had data about the previous years as well, such a perspective would have been interesting to apply.

The *discourse perspective* (Foucault 1977) is another perspective that it might have been possible to apply in this study. In particular, one could study how the discourse that takes place when using the BI output unfolds in the IT project prioritization process. However, because decision-makers were not speaking in their native language there were some linguistic constraints when they expressed their arguments and reflections. Nonetheless, this is something that might be interesting to explore in the future.

Although the above are all interesting perspectives which were excluded from this study, I find comfort in the fact that these could be pursued in future research projects on this topic, as this study is not the definitive answer to investigating the research question posed in here.

1.5 Terms and definitions

Since the aim of this study is to conduct empirical research into what people in organizations do in terms of BI once it is produced, that is, how BI as a product is used in organizational decision making processes, it is important to define some of the key concepts that are central to this investigation. Specifically, the terms *business intelligence (BI), BI output, device,* and *organizational decision* are central to this project. Because these terms are used, defined or can be understood in many different ways, it is crucial to make clear the meaning that it is assigned to them in this study.

The BI literature lacks a universally accepted definition of BI (Pirttimaki 2007; Wixom and Watson 2010). The definitions range from one-dimensional definitions, in which BI is viewed as a set of technologies or as a process, to multidimensional definitions, in which BI is viewed as a process, a set of technologies and a product (a detailed discussion about the BI definitions is provided in chapter two). In line with the multidimensional view, Davenport (2006) defines BI as a term which:

> "encompasses a wide array of processes and software to collect, analyze, and disseminate data, all in the interest of better decision-making." (pp. 106-107)

In the same way, Wixom and Watson (2010) define BI in their paper as:

> "a broad category of technologies, applications, and processes for gathering, storing, accessing, and analyzing data to help its users to make better decisions." (p. 14)

Building on the definitions of Davenport (2006) and Wixom and Watson (2010) I formulate the following definitions of BI and BI output. The later depicts how the term BI output is used in the remainder of the document:

> *Business Intelligence* is data-driven analysis - a process of gathering, storing, and analyzing data through the use of different technologies and applications - which is relevant for decision-making.

The BI output is the outcome of data-driven analysis.

This BI definition is similar to the Davenport (2006) and Wixom and Watson (2010) definitions in the sense that it accounts for the process of gathering, storing and analyzing data. Also in common is the notion that technologies and applications support this process. The definition of the BI output differs in that it highlights the output of BI both as a process and as a technology.

Further, it should be noted that views in the BI literature differ on what constitutes the output of BI amongst data, information and knowledge (discussed in detail in chapter two). I refer to the outcome of data-driven analysis as the BI output for several reasons. First, by taking an output-centric perspective on BI, the confusion between data, information and knowledge is eliminated. Second, the concept of the BI output helps to depict the fact that this output is produced by people, processed by technologies and used in organizational settings. Third, in this way, researchers studying the use of BI in organizations have a tangible, concrete conceptualization of BI output, which can serve to crystallize the object of their investigation.

In this way, the BI output can be variously a spreadsheet, a table, a graph, a report, an indicator, a measure, the results of a query, or a collection of the above such as dashboards and scorecards. Technology is considered as an important component in facilitating the process of producing the BI output, which in many instances is in a digital form. However, the BI output may also appear embedded in a hardcopy report.

The concept of the BI output is also useful because it allows us to analytically separate prescribed use from actual use. As Orlikowski (1995) remarks, “while the artifact and context of use may prescribe and proscribe particular images and forms of use, how actors make sense of the artifact and what they actually do with it is not predetermined” (p. 3). That is, simply because the BI literature prescribes the BI output as ostensibly rational it does not mean that this is also the way it is always used in decision-making.

Additionally, after the empirical data analysis I observed that the BI output was treated as a *device* used by decision-makers. Therefore, for clarity purposes I define below the term device, which is frequently used in Chapter 7.

There are numerous definitions of the term device but the most well-known is the Foucault's. Foucault defines the notion of device (in French: dispositif) as following:

> What I'm trying to pick out with this term is, firstly, a thoroughly heterogeneous ensemble consisting of discourses, institutions, architectural forms, regulatory decisions, laws, administrative measures, scientific statements, philosophical, moral and philanthropic propositions – in short, the said as much as the unsaid. Such are the elements of the apparatus. The apparatus itself is the system of relations that can be established between these elements. ... I understand by the term "apparatus" a sort of – shall we say – formation which has as its major function at a given historical moment that of responding to an *urgent need*. The apparatus thus has a dominant strategic function. (Foucault and Gordon 1980, p. 194, italics in original)

That is, according to Foucault the device serves a need. In this study it is the need of the decision-makers to reduce their cognitive burden and as such uncertainty and ambiguity. Further, the device has a strategic function meaning that it is fused, used, and deployed by decision-makers in order to achieve something, i.e. to reduce uncertainty, shape collective judgment or reach collective decisions. Agamben (2009) broadens the class of devices by including

> … literally anything that has in some way the capacity to capture, orient, determine, intercept, model, control, or secure the gestures, behaviors, opinions, or discourses of living beings. Not only, therefore, prisons, madhouses, the panopticon, schools, confession, factories, disciplines, judicial measures, … but also the pen, writing, literature, philosophy,

> agriculture, cigarettes, navigation, computers, cellular telephones and – why not – language itself, which is perhaps the most ancient of apparatuses – one in which thousands and thousands of years ago a primate inadvertently let himself be captured, probably without realizing the consequences that he was about to face. (p. 14).

In this study the term *device* is used to refer to methods used by decision makers to manage uncertainty, ambiguity and at the same time to influence collective judgment and reach collective decisions.

In the BI literature there is no discussion about what is meant by decision-making although the term is used quite often by BI scholars. Further, there is no distinction between *individual* decision-making and *organizational* decision-making.

This study investigates the use of the BI output in organizational decision-making, viewing decision-making as a collective process involving multiple actors and decision-makers that usually are not consistent in terms of their preferences and identities. At the same time, these actors might or might not be inclined to eliminate the conflict that arises from these inconsistencies. As such, the actors or decision-makers have to reach organizational decisions despite their conflicts due to inconsistent preferences or identities. Organizational decisions are decisions that have a great impact on the present and the future of the overall organization.

1.6 Outline of the thesis

This thesis is structured in eight chapters as described below.

Chapter 1 – Introduction

This chapter introduced the subject matter of the research study – the use of the BI output in organizational decision-making processes. Particularly, it outlined the initial research focus and discussed the changes that occurred very early in the research process and resulted in a new research focus. Further, it introduced the research goal by presenting the research question, the research scope and definitions of key terms used in this thesis. Finally it presents the outline of the thesis to provide a map for an easy navigation of the manuscript.

Chapter 2 – Literature Review

This chapter presents a literature review of the BI literature. The discussion of the literature is based on my understanding of previous research in the BI field to which this thesis aims to contribute. First, it presents the concept of BI and its evolution as illustrated in the literature. Second, it illustrates and discusses current perspectives on BI, which are divided in two streams of literature. Third, the chapter concludes by presenting the common ideas of these two streams in relation to BI use in decision-making and highlights the need for the current study.

Chapter 3 – Theoretical Framework

Reflecting on the BI output and its similarities with formal analysis chapter 3 presents scholarship on the use of formal analysis and how formal analysis is used in organizational decision making processes. In particular, it presents three different views on the use of formal analysis in organizational decision-making. This literature stream informed this study by providing a loose set of theoretical concepts. These are used as sensitizing concepts in studying the use of the BI output in organizational decision-making, especially when performing the analysis of the empirical data.

Chapter 4 – Research Approach

In chapter 4, the research approach is presented and reflected upon. The chapter provides a brief overview of the different philosophical perspectives which are available and describes in detail the ontological and epistemological assumptions made by the study itself and also by me as a researcher in particular. It also guides the reader through the reasoning behind the choice of interpretivism as a philosophical stance and the interpretive study as a strategy. Further, it presents the overall research design which includes a detailed description of my involvement style in the organization. This is followed by a thorough account of the data collection methods employed in the longitudinal interpretive study and the thematic analysis that guided the analysis of the empirical data.

Chapter 5 – Empirical Setting

The aim of this chapter is to provide background information for understanding the process of IT project prioritization in the broader organizational context in which it took place. The rationale behind this chapter is to provide the reader with a contextual frame in which the results of the empirical findings are embodied and embedded. Specifically, it introduces and describes the Danske Bank Group and outlines its historical development. Further, it describes the business' structure and presents the organizational chart as it was during the period of the study. Next the Group IT, its structure and the emergence of the project idea are presented. Finally, the chapter offers a detailed narrative of the process of IT project prioritization, including all the activities and the events that take place in this process.

Chapter 6 – Analysis and Results

This chapter presents the analysis of the empirical data from the IT project prioritization process. It provides rich insights into the overall IT project prioritization process and introduces the main themes and second order categories of the empirical findings for each level of the governance structure in the process in relation to the use of the BI output in the decision-making process.

Chapter 7 – Discussion

This chapter discusses the empirical findings between the two levels of the governance structure in relation to the BI literature. Moreover, it discusses the role of the BI output in this study, juxtaposed with the role of BI as discussed in the literature presented in chapter 2. Next, the contributions of this study and its implication for theory and practice are presented. Finally, the study is evaluated against a set of qualitative research criteria.

Chapter 8 – Conclusion

The final chapter of this thesis presents the conclusion. The conclusion involves a discussion of how the findings answer to the research question that steered this study. The chapter ends by summarizing the contributions of the thesis and suggesting future research streams.

2 Literature Review on Business Intelligence

This chapter presents a map of the business intelligence (BI) literature to make explicit some of the underlying assumptions that shape the positioning of this research study in the broader field. This mapping exercise also enables the identification of implicit assumptions that exist in the field, thus revealing a gap in BI research. This map is not the only possible version, but is rather the map that I developed as I read the BI literature.

Although the literature review was a continuous process, 75% of the review was conducted before the fieldwork. In this way, the literature assured that I was not re-inventing the wheel by making sure that there was not already exhaustive research on the topic. As a result, the literature helped me to assess the relevance of the study and informed the initial framing of the research. However, during the development of the interview guides and the data collection process I did not explicitly use the literature in any way as I was following an inductive approach. It was only after the analysis of the empirical findings that the literature was explicitly used again to identify a contribution by comparing and contrasting the findings from the empirical data with the literature.

The aim of this study is to contribute to the scholarly discourse on the role of BI use in organizational decision-making processes. The literature review played a critical role in enabling the positioning of the study in the broader BI field in an attempt to find a basis for such a scholarly discourse.

In few words, although the review of the literature was performed before the fieldwork I strove for an inductive study in which the empirical findings would guide the investigation of BI use in organizational decision-making. However, as I embrace a constructivist epistemological perspective I believe that researchers have to account for their own preconceptions and assumptions and not ignore them. Above, I have used the word ‘explicitly’ to emphasize the fact that this familiarization with the BI literature was partly constructed me as a researcher, thus becoming an inherent part of the research itself which cannot be discounted.

Based on the above qualifications, I embark on a review of the concept of business intelligence and its evolution from its early stages to its contemporary use and provide an overview of the literature along two different streams. Categorizing the relevant articles that resulted from the literature search into distinct categories is not without challenges. Many articles span categories and there are often overlaps between the categories themselves. Below, I note the basic ideas the two perspectives have in common and position the study relative to the BI field.

The first two streams include the technology and process views of BI. These views differ with regard to how they view and understand BI. The technology view focuses on BI technologies that allow the collection, storage, retrieval and analysis of data, while the process view focuses on the process of gathering and analyzing data to generate relevant inputs to the decision-making process. Based on this initial categorization I observed that scholars of both streams often do not refer to the BI output when defining BI and that when they do it is generally kept in the background. Even within each stream there are differences and confusions on what the raw materials and the output of BI are, either as a set of technologies or as a process. Specifically, the scholars adopting the technology view do not agree on what these BI technologies process in general and what they produce. Likewise, the process view scholars do not concur on what the inputs and the output of the BI process are.

In terms of the historical development, the BI literature seems to follow the paths of previous adjacent literatures like knowledge management, business process reengineering and total quality management that began with a focus on the technology view and later moved toward the process view in response to the perceived weaknesses of the technology view. A more detailed description of the two streams is provided later in this chapter.

As noted above, the purpose of this literature review is twofold: first, to provide an overview of the state of the art in BI research and, second, to identify critical knowledge gaps (Webster and Watson 2002) in BI research from an organizational use perspective, drawing upon previous work on the subject. Rather than starting with the different views of BI, I start by providing an overview of the BI literature and some reflections on the concept of BI as it is represented there.

2.1 Overview of the BI literature

From a first look at the literature (Davenport and Prusak 1998) one understands that BI is related to decision-making, strategic management and performance management. Wearing organizational lenses questions of how organizations use BI, for what purposes, and how it affects decision-making, performance and strategies come forward. Looking at BI from this specific angle, a literature review was performed to investigate the current state of BI in relation to decision-making, strategic management, and performance management.

The main purpose of the literature review was to capture the essence of what the literature says about BI and its role in decision-making. In particular, the aim was to find out the expectations and empirical observations of the use of the BI output in decision-making. As BI is not a mature field, I decided to perform a broad search on well-established databases and a focused searched on the 10 top journals of the IS field. As a result I found articles relevant to BI and its role in decision-making in a 20-year period from 1991-2010. At this point, I would like to note that the focus of this chapter is on presenting and discussing the results of the literature review. The literature search process, including the specific databases and journals searched, the keywords, the selection criteria and the synthesis process is thoroughly described in Chapter 4.

The literature search phase resulted in a pool of 103 articles as shown in Table 1. The first column shows the results from the search in the databases and the journals respectively. The second column shows the results after a new filtering mechanism was entered such that only articles that contained the terms ‘business intelligence’ and ‘decisions’ in the abstract or in the title were selected. Next, the abstracts of all articles were scanned in terms of relevance to the subject matter, namely BI use in decision-making. During the abstract scanning, filtering for duplicates took place since some of the articles from the top journals pool appeared in the database search as well.

Overall, the literature study shows that there is a lack of agreement among the authors of the reviewed articles on what BI is and how it is defined. These different definitions show how the concept of BI has evolved over time.

	Search results	**BI in the title or the abstract**	**Abstract Scanning**
Databases	3542	144	56
Top IS Journals	152	73	47
Total	3694	217	103[1]

Table 1: Search results

Before I delve into the concept of BI and its evolution, it is important to understand where the BI discourse takes place. The BI discourse is dependent on and influenced by the specific fields or journals that address the topic. Thus, I provide some information on which journals have addressed the topic most during the last 20 years. In Figure 1 below, one can see the number of articles per journal. Interestingly, IS journals address the topic more than any other field or discipline. While most of the

[1] The list of the 103 articles is included in Appendix D.

journals have one article, it is interesting that the journal of Decision Support Systems (DSS) while not a top 10 IS journal, accounts for 10% of all articles found. This also reflects the fact that as BI replaced DSS (Watson 2009) it is natural that most of the papers would be included in this journal. Moreover, DSS together with MISQ, HBR and JMIS have addressed the topic more frequently and make the bulk of the articles, 33% (34 out of 103) as shown in Figure 2. The abbreviations in Figure 2 refer to Information Systems Management (ISM), Business Intelligence Journal (BIJ), International Journal of Business Intelligence Research (IJBIR), Production, Planning and Control (PP&C).

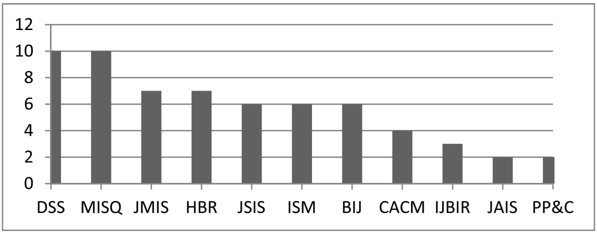


Figure 2: Number of articles per journal

In the DSS field, BI is considered to be a relatively new research sub-field in which not many studies have been performed (Arnott and Pervan 2008). During the 2000s, it was commonly held that industry was leading the BI field and that academic research was lagging behind (Arnott and Pervan 2008). Because of the increased investments in the BI field that followed, even in times of crisis, doing research on BI became fashionable (Pirttimaki 2007). This could explain the peak of published papers in 2007/08 as depicted in Figure 3. In the next section, I explore the concept of BI and how it has evolved over time.

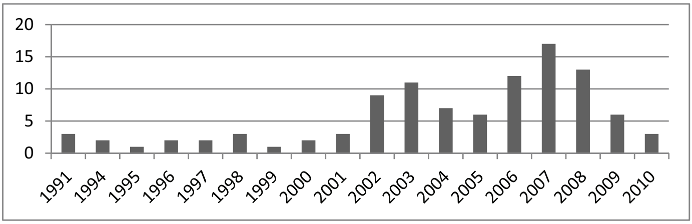


Figure 3: Number of BI articles published per year

2.2 The concept of Business Intelligence

Although the term 'business intelligence' has been in use since 1800, (Google Ngram Viewer 2011), it was used in scientific context for the first time in an article by Hans Peter Luhn, an IBM researcher, in 1958. In his article, Luhn (1958) described an "automatic method to provide current awareness services to scientists and engineers" (p. 314) who needed help to cope with the growth of scientific and technical literature. However, it was only in the 1990s that the term became widely used, after BI was used by Dresner, a Gartner analyst (Dekkers et al. 2007), to convey the idea that the data in IT systems can be exploited by the business itself.

From a historical standpoint the underlying concept of business intelligence is not new. Since ancient times, humanity has developed processes, techniques and tools for collecting and analyzing intelligence to support decision making, especially during times of war (Kinsinger 2007). Ancient military organizations developed tactics and methods to collect and develop intelligence although these were more in terms of what we today call "industrial espionage", i.e. illegal and unethical methods to collect intelligence about other organizations (Calof and Wright 2008).

One of the main issues that is obvious in the literature is the confusion between business intelligence and competitive intelligence (CI). In the literature, authors such as Calof and Wright (2008), Kinsinger (2007), Martinsons (1994) and Vedder et al. (1999) use the term BI to convey the concept of competitive intelligence. Specifically, for such authors BI has the same meaning as the definition of CI provided by Vedder et al. (1999):

> Competitive intelligence (CI), also known as business intelligence, is both a process and a product. As a process, CI is the set of legal and ethical methods an organization uses to harness information that helps it achieve success in a global environment. As a product, CI is information about competitors' activities from public and private sources, and its scope is the present and future behavior of competitors, suppliers, customers, technologies, acquisitions, markets, products and services, and the general business environment. (p. 109)

CI covers the entire competitive environment (including both current and potential competitors) by collecting internal and external information to identify business opportunities and threats (Calof and Wright 2008). However, the concept of CI attained popularity only in the marketing intelligence literature together with the concept of marketing/market intelligence (Calof and Wright 2008).

In contrast to CI and "industrial espionage" which are oriented towards information gathering and exploitation from external sources, BI started as a utilization of all the transactional data accumulated and produced *within* an organization (Yermish et al. 2010). Therefore, BI was at that point quite different from CI in scope. However, today things have changed. Transactional systems include much external data and, with the growth of the Internet, the potential of BI has expanded significantly (Negash 2004). I thus view CI as a subset of BI or a "specialized branch of BI" (Negash 2004) and concur with Choo (2002) that BI has the broadest scope among intelligence concepts. BI is as much about knowing both an organization's strengths and weaknesses as knowing its competitors' state or other external factors (such as economic and political environment) (Choo 2002; Negash 2004).

Summing up, the lack of agreement concerning BI could be explained by the fact that the concept of BI, although not new, is experiencing a renaissance which positions the concept in its infancy phase again. That is, a variety of new definitions have emerged, leading to an ambiguous and not well-defined BI concept as described below.

This literature study showed that BI is defined as a process or a set of technologies, but no definition of BI was found that focused on BI as a product. Rather, the product view was always embedded within or combined with the process or technological views. However, the research question that this study addresses focuses on how the output of BI is used in organizational decision-making, since it is not the process or technologies that are used by decision-makers but rather their output.

Also, the review shows that with time the definition of BI has evolved from a one-dimensional definition to a multidimensional definition. The most recent papers describe BI as a process, a product, and as a set of technologies, or a combination of these (see Table 2). Notably, the scholars that define BI as a process explicitly acknowledge the product of this BI process. On the contrary, the scholars that define BI as a set of technologies refer only implicitly to the product of those technologies.

The most recent papers define BI as a three-dimensional concept. Shariat and Hightower (2007) characterize it as a composition of processes, technologies and products: processes for collecting and analyzing business information; technologies used in those processes; and the product as "the information (knowledge) obtained from these processes" (ibid. p. 42). On the same track, Baars and Kemper (2008) understand BI "to encompass all components of an integrated management support infrastructure" (p. 132). According to this approach, technology is an important component of BI, because it is the integration of different technologies that enabled and continues to facilitate BI today. These definitions take a more holistic approach to BI. Yet even BI scholars who propose multidimensional definitions of BI tend to emphasize one or another dimension more. Inspired by the BI definitions discussed, two main BI perspectives were identified and are presented in the next section.

Types of definitions	**BI definitions**
BI as a process	"Business Intelligence (BI) can be defined as the process of turning *data* into *information* and then into *knowledge*." (Golfarelli et al. 2004, p.1) "…as the continuous activity of gathering, processing and analyzing *data* - supported by a BI system." (Dekkers et al. 2007, p. 626) "The term BI can be used to refer to: 1. Relevant *information* and *knowledge* describing the business environment, the organization itself, and its situation in relation to its markets, customers, competitors, and economic issues 2. An organized and systematic process by which organizations acquire, analyze, and disseminate *information* from both internal and external information sources significant for their business activities and for decision making." (Lännqvist and Pirttimäki 2006, p. 32)
BI as a set of technologies	"Business intelligence (BI) is a broad category of technologies, applications, and processes for gathering, storing, accessing, and analyzing data to help its users make better decisions." (Wixom and Watson 2010, p. 14) "Business intelligence encompasses all of the software applications and technologies that a company uses to gather, provide access to, and analyze *data* and *information* about its operations." (Pemmaraju 2007, p. 14) "Business intelligence encompasses a set of tools, techniques, and processes to help harness this wide array of data and allow decision makers to convert it to useful *information* and *knowledge*." (Clark et al. 2007, p. 589)

Table 2: Types of BI definitions

2.3 Unpacking the current perspectives on BI

Inspired by the different ways BI is defined in the literature I identified two main perspectives on BI. The first perspective views BI as a set of technologies, that is a set of tools and methods that supports the gathering, analysis and transformation of data into information (Watson and Wixom 2010). The authors who embrace this view focus on the design, development and implementation of technologies that allow or enable the transformation of data into actionable information or knowledge useful for decision-making. The second perspective sees BI as a process in which internal and external data are gathered, integrated, analyzed and transformed into information which is then turned into knowledge used in decision-making. Petrini and Pozzebon (2009) provide a similar distinction of approaches to BI in terms of what they call the managerial and the technical approaches.

Interestingly, within each of the perspectives which one would expect to be internally consistent, there is no agreement on the output of the technologies or the processes respectively. The authors who subscribe to the technological perspective do not agree on what these technologies are processing and producing. Similarly, the authors who view BI as a process differ in their opinions on what are the raw materials and the output of that process. Some authors talk about data, others about information and yet others about knowledge no matter what their specific perspective on BI is (see the words in italics in table 2 as an indicative sample). This observation emerged when asking questions such as what the users of BI are specifically using or what is being processed during the BI process and what is the final output of such processes. There are no clear answer that can be derived from the literature since the views differ among data, information and knowledge. The distinction between data, information and knowledge is an old debate (Ackoff 1989; Galliers and Newell 2003; Zins 2007). However, a thorough discussion of their differences is out the scope of this study. Briefly, data are considered context free codes that represent events in the world, information is observations made when data are placed in context and knowledge is 'justified true belief' (Nonaka and Takeuchi 1995).

In Table 3, I map all the BI articles based on these two perspectives, namely, the technology view and the process view which are thoroughly described below.

Current BI perspectives	**Articles**
The technology view - BI as a set of technologies	Jermol et al. 2003; Jukic 2006; Lawton 2006; Mykitishyn and Rouse 2007; Nelson et al. 2005; Reagan 2008; Schultz 2004; Shi et al. 2007; Thomas and Datta 2001; Wang and Wang 2008. Amaravadi 2003; Arnott and Pervan 2008; Arrieta et al. 2007; Betts 2004; Blumberg and Atre 2003; Bongsik 2003; Chenoweth et al. 2003; Dekkers et al. 2007; Geiger et al. 2008; Glassey 1998; Goodhue et al. 2002; Goodhue et al. 2009; Hackathorn 1999; Hobek et al. 2009; Lunger 2008; March and Hevner 2007; Marshall et al. 2004; Mozley 1996: Negash 2004; Pemaraju 2007; Simons 2008; Skillicorn 2007; Tseng 2006; Tseng and Chou 2006; Vandenbosch 1997; Watson 2009; Watson and Wixom 2007; Watson et al. 2008; Wixom et al. 2008. Baars and Kemper 2008; Bhatt and Zaveri 2002; Cheng et al. 2006; Chung et al. 2005; Clark et al. 2007; Cody et al. 2002; Earl 2001; Elofson and Konsynski 1991; Fowler 2000; Golfarelli et al. 2004; Heinrichs et al. 2002; Heinrichs and Lim 2003; Mark Xu et al. 2002; Moffeeet et al. 2004, Nemati et al. 2002; Olszak and Ziemba 2006; Olszak and Ziemba 2007; Ong et al. 2005; Shariat and Hightower 2007; Shim et al. 2002; Spangler et al. 2003; Steiger 2010; Yermish et al. 2010.
The process view - BI as a supporting process for decision making	Bergeron et al. 1991; Bhagwat and Sharma 2007; Bielski 2007; Bucher et al. 2009; Choudhury and Sampler 1997; Davenport 2006; Davenport 2009; Davenport 2010; Dresner et al. 2002; Fuld 2003: Hayward and Broady 1995; Hoek and Evans 2004; Jourdan et al. 2008; Kettinger et al. 1994; Kuechler and Vaishnavi 2006; Pawar and Sharma 1997; Petrini and Pozzebon 2009; Pfeffer and Sutton 2006; Roussinov and Chau 2008; Swoyer 2008; Tan et al. 2008; Viaene and Willemns 2007; Williams 2004; Wixom and Waton 2010. Hannula and Pirttimaki 2003; Jalonen and Lanqvist 2009; Lanqvist and Pirttimaki 2006; Massey et al. 2002; Olszak and Ziemba 2003; Pirttimaki 2007; Schultze 2000; Yi-Ming and Liang-Cheng 2007. **BI as CI** Calof and Whright 2008; Herring 1998; Kinsinger 2007; Martinsons 1994; Rouibah and Ould-Ali 2002; Evgeniou and Cartwright 2005; Salles 2006; Vedder et al. 1999; Sawka 1996.

Table 3: Mapping the BI literature

2.3.1 The technology view

This view sees BI as a set of technologies which comprise a system that, once in place and integrated, will allow 1) gathering and storage of data, 2) transformation of data into information through analysis, 3) transformation of information into knowledge through further analysis, and 4) utilization of information or knowledge produced in decision making. Some authors (Cheng et al. 2006; Jermol et al. 2003; Pemmaraju 2007), define BI as being nothing else but a combination of different technologies, while others refer also to processes and seldom to BI as a product, although they still place technology in the center of BI (Clark et al. 2007; Negash 2004). Because of these different purposes, BI technologies integrate a large set of various resources such as tools, packages, platforms, systems and applications (Petrini and Pozzebon 2009).

The technology stream has made great progress in knowledge and has had a significant impact on the broader BI literature (Petrini and Pozzebon 2009). To understand the proliferation of BI technologies and their wide impact both on practice and research I provide a historical background on the evolution of the development of early management information systems (MIS) to today's BI systems.

The development of the mainframe computer in the 1950s led to the development of data processing systems and, in turn, to management information systems (MIS) – systems designed to support managerial decision-making. From the mid 1960s, mini computers marked the birth of decision support systems (DSS), and subsequently executive information systems (EIS) (Somogyi and Galliers 1987; see also Table 4). MIS output was in the form of large print-outs – reports that did not provide an interactive capability to support managers in their decision-making, while DSS were designed to support semi-structured and unstructured decisions in a more interactive manner (Gorry and Scott-Morton 1971). The first DSS included optimization and simulation models that assisted managers in analyzing a situation using a small dataset and few parameters (Keen and Scott-Morton 1978). During the 1970s, DSS incorporated search functionality (Power 2007). With the development of relational databases in the late 1970s, the potential of capturing an increasing amount of data and modeling capability led to the arrival of EIS (Arnott and Pervan 2005). These systems used pre-defined information screens by providing ‘‘key information on the desktops of executives” (Rasmussen et al. 2002, p. 99) that facilitated executive enquiry through easy access to internal and external information relevant to their decision-making needs (Petrini and Pozzebon 2009).

Although both EIS and DSS (Carlsson and Turban 2002) stimulated a lot of research and became an established research area during the 1980s, in practice these systems were not widely used due to the manual work required to convert and load data from different sources and their narrow scope (Petrini and Pozzebon 2009).

However, when data warehousing (DW) (Inmon 1992), on-line analytical processing (OLAP) and ETL tools (extraction, transformation and loading) were developed, EIS and DSS began to become popular. At roughly the same time, partly as a result of business process engineering (Davenport 1996), the concept of knowledge management and knowledge management systems (KMS) (Leidner 2000) came onto prospect (Galliers and Newell 2001).

The early knowledge management movement focused on the development of document and text analysis systems along with content management and collaboration technologies.

These latest developments to aid decision-making account for the emergence of BI systems replacing the notions of EIS and DSS and including KMS under the same umbrella. Today, BI systems are defined as integrated technologies that include a data warehouse and other linked BI applications designed to facilitate the analysis of stored (real-time and historical) structured and unstructured data in support of decision-making (Negash 2004; Arnott and Pervan 2008). From a technical perspective the evolution of systems supporting decision-making shows how the term BI emerged in order to highlight the technological improvements achieved through DW, ETL and OLAP technologies. According to Watson (2009) "even the name of the field—decision support systems (DSS)—is undergoing change as the business intelligence (BI) term becomes more widely used" (p. 488).

Development Era	**Systems for management support and decision-making**	**Purpose**	**Illustrative References**
Mid 1960s	Management Information Systems	Provided structured, periodic reports and information to support structured decisions.	Amstutz 1966; Ackoff 1967; Argyris 1971
Late 1960s	Decision Support Systems	Decision related information to support semi-structured or unstructured decisions.	Scott 1967; Scott 1968; Ferguson and Jones 1969
Early 1970s	Model-based DSS	Optimization and simulation models to improve managerial decision making.	Scott-Morton 1971; Gorry and Scott-Morton 1971
Late 1970s	Document-based systems	Enabled document search to support decision-making.	Swanson and Culnan 1978
Late 1970s	Executive Information Systems	Provided predefined information screens for senior executives.	Rockart 1979;
Early 1990s	Data warehouse systems	Large collections of historical data in organizational repositories to enable analysis.	Inmon 1992; Kimball 1996
Early 1990s	Knowledge Management Systems	Managing knowledge in organizations for supporting creation, capture, storage and dissemination of information.	Akscyn et al. 1988; Leidner 2000
1990 – 2000	Business Intelligence Systems/ Business Analytics	Provided decision support linked to the analysis of large collections of historical data based on integration of different systems and data sources.	Dresner 1989; Watson and Wixom 2000

Table 4: A timeline of the evolution of systems supporting decision-making

Overall, this stream of literature consists of conceptual articles about the architecture of BI systems (Baars and Kemper 2008; Chenoweth et al. 2003; Chung et al. 2005; Cody et al. 2002; Golfarelli et al. 2004; March and Hevner 2007; Marshall et al. 2004; Nelson et al. 2005; Nemati et al. 2002; Olszak and Ziemba 2006, 2007; Shariat and Hightower 2007) and development and implementation frameworks of BI systems in organizations (Dekkers et al. 2007; Hobek et al. 2009; Jermol et al. 2003; Jukic 2006; Watson et al. 2006; Wixom et al. 2008; Watson and Wixom 2007; Yi-Ming and Liang-Cheng 2007).

Based on this view, BI combines data warehouse technology with on-line analytical processing (OLAP) and data mining, and also has an input from knowledge management systems, decision support systems and other information systems present in an organization (Negash 2004).

More specifically, data-warehousing technology is used to systematically collect and store relevant business data (internal and external) into a single repository (March and Hevner 2007). Watson and Wixom (2007) call this the “getting data in” activity. However, data warehousing only involves the collection, from transaction and administrative systems, and storage of structured data (Baars and Kemper 2008). Document and content management systems or document warehouses are used to collect and store unstructured data. Unstructured data are those that do not reside in fixed locations, (i.e., fields or tables) and do not have pre-defined content. Free text in a word document or a website is a typical example of unstructured data. These systems, however, are not widely used and their integration still poses a challenge (Baars and Kemper 2008).

Once the data are gathered and stored in a warehouse they are ready for analysis and presentation in a form that is useful for business decision-making. BI tools such as reports, OLAP, and data mining assist in the analysis of the collected data. These analytic tools have the potential to provide actionable information (March and Hevner

2007). However, according to Negash (2004) and Baars and Kemper (2008), business intelligence tools are mainly concerned with the analysis of structured data. The analysis of unstructured data continues to be an issue in BI (Chung et al. 2005; Negash 2004).

Also, technology provides support in facilitating the transfer and dissemination of knowledge by enhancing the understanding of fact-based interrelationships. Some of these technologies are: knowledge-based expert systems, neural networks, case-based reasoning and intelligent agents (Fowler 2000). According to Hackathorn (1999) and Yermish et al. (2010), the integration of BI tools with other information systems is still a problem and a focus shift is needed from a black-boxing perspective (problem centric) to a human-centric perspective.

It appears that while the common denominator of these authors is their view of BI as a set of technologies, their opinions on what these technologies collect, process and produce differ. Authors talk about data, information and knowledge that is collected, stored, processed and analyzed by the different technologies. In the next section, I present the different BI technologies categorized according to their function. Further, I also present the heterogeneity of opinions within the technology view in terms of what are the inputs and outputs of these technologies.

Gathering and storage technologies

In terms of gathering and storage technologies, the opinions converge primarily on the idea that BI systems gather and store data. Particularly, Negash (2004) distinguishes two main dimensions of data, the source of data and the type of data. There are two main sources of data: internal data about the internal environment of an organization and external data about the external environment of an organization (Negash 2004).

Internal data are produced within an organization, either by the transactional systems the organization owns (Negash 2004) or data included in documents, email, and intranet communications produced by the organization's employees. Internal data relates to data about the organization itself, its processes, products, employees and performance. External data are data about customers, competitors, markets, products in the market, environment, technologies, acquisitions, alliances, and suppliers (Negash 2004). There are also two types of data, structured data and unstructured data. Structured data are understood to be data that resides in predefined fields within a record or file, and thus can be processed by computing equipment (Baars and Kemper 2008). Relational databases and spreadsheets are examples of technologies to structure data. Traditionally, BI technologies are developed for gathering and storing structured data (Blumberg and Atre 2003; Baars and Kemper 2008).

However, for many application domains, especially strategic domains and areas outside the organization, gathering and analyzing only structured data is not satisfactory because large amounts of potentially important unstructured data are in documents, emails, presentations and web pages (Baars and Kemper 2008; Negash 2004). Negash (2004) states that only the combination of structured and unstructured data will provide decision-makers with actionable information because "unstructured data are equally important, if not more, as structured data for taking action by planners and decision makers" (p.181). Negash (2004) bases his claim on a study by Blumberg and Atre (2003). Their survey underlined the crucial role of unstructured data in BI, claiming that around 85% of all business information exists as unstructured data, while 60% of CIOs and CTOs considered unstructured data as vital for improving procedures and creating new business opportunities.

However, there are some authors who talk about information and even knowledge that is collected and stored by these technologies (Nemati et al. 2002, Jermol et al. 2003; Chung et al. 2005; Steiger 2010). Information is used many times to refer to unstructured data such as text, documents, video tapes, websites, and pictures (Jermol et al. 2003). The authors' view that BI technologies collect and store knowledge is closely linked to the view of knowledge as a commodity which can be collected, stored, analyzed, distributed and utilized by BI technologies (Nemati et al. 2002). This view is present across the different BI technologies that are described in the later sections.

Processing and analysis technologies

These technologies aimed at fulfilling different needs related to the search for and use of information, ranging from report extractors to dashboards applications and sophisticated techniques for exploration(Blumberg and Atre 2003; Baars and Kemper 2008; Chung et al. 2005; Negash 2004). The report extractor technologies are used on a more detailed informational level. Dashboard technologies are used to consolidate within a single control panel the information linked to performance factors in a largely summarized level. Exploration techniques are used to build predictive business models and include data mining, text mining, document visualization, browsing methods, web community, and knowledge maps. The views about what these BI technologies process and analyze differ in the same way as in the previous technologies of gathering and storing.

There are authors who consider that these technologies process and analyze data. Others use the term ‘information’ to refer to unstructured data that are being processed and analyzed in contrast to the term ‘data’ which is used to refer to structured data. Finally, as mentioned earlier there are authors who claim that knowledge and not data is processed and analyzed. Although it should be noted that the dominant view, concerning these technologies that enable processing and analysis, is that data are processed and analyzed and are in this way transformed into information through filtering and aggregating mechanisms (Golfarelli et al. 2004; Yi-Ming and Liang-Cheng 2007).

Presenting the output of BI technologies

The output of the above technologies is presented in different ways and in different forms, from paper to digital. Once produced, the BI output is embedded in other structures or documents such as presentations, spreadsheets, and documents. With regard to the definition of the output of these technologies, opinions vary between information and knowledge. The authors who adhere to the opinion that information and not knowledge is the outcome of BI technologies agree with the statement of Galliers and Newell (2001) that "IT processes data - not information and certainly not knowledge" (p. 5). Therefore, this stream of work views relevant information for decision-making as the final product of BI technologies. It is based on the assumption that through analysis the data are placed in a specific context and thus transformed into information.

On the other hand, there are the knowledge supporters. These authors conceive of BI systems as ultimately creating knowledge useful for decision-making (Nemati et al. 2002; Golfarelli et al. 2004; Olszack and Ziemba 2006, 2007; Steiger 2010; Yermish et al. 2010). This view of BI systems is similar to traditional views of enterprise systems and KMS, where these systems are assumed to be solutions that enable the translation of data into information and, ultimately, into knowledge (Newell et al. 2002), where knowledge is considered to be a commodity that can be captured, stored and distributed. As was the case with knowledge management (Swan et al. 1999), a literature review on the concept of BI (Shollo and Kautz 2010) showed that the topic was addressed by IT Journals and driven by IT specialists, consultancy firms and IT management gurus.

The knowledge view is based on the assumptions that techniques like data mining, predictive analytics and trend analysis enhance the understanding of fact-based interrelationships (Steiger 2010). These techniques have the ability to run analysis in huge datasets and discern complex patterns that are not visible. By making visible these patterns, decision-makers are able to generate new insights and develop causal relationships and subsequently transform these new insights into knowledge that will support their decisions (Cheng et al. 2006). March and Hevner (2007) state that “the ability to generate BI can be assisted by computational methods such as data mining, genetic algorithms, neural networks, and case-based reasoning” (p. 1041). The supporters of the knowledge view thus assume that these computational methods enhance the transformation of information into knowledge.

However, beyond the varying opinions on defining the BI output, the scholars of this view have focused mainly on how to design and develop the BI output. Characteristically, the famous case study on Continental Airlines describes how the company manages to collect, store and develop their BI output from its data warehouse but does not provide any insights into how this output is then used in decision-making (Watson et al. 2006; Wixom et al. 2008). This is to a certain extent justifiable, as the technologies have fulfilled their role in producing the BI output. Yet the authors who adhere to the technological view claim that using BI technologies improves decision-making and leads to better decisions (Wixom and Watson 2010). However, it is quite some distance from producing the BI output to claiming that these technologies lead to better decisions, since this literature review did not reveal any research performed on how the output of these technologies is used or its role in decision-making.

2.3.2 The process view

The process view regards BI as a continuous supporting process for decision-making in which internal and external data are gathered, analyzed and aggregated in order to generate relevant insights for decision-making (Petrini and Pozzebon 2009). Here the focus is on the process while technology is placed in the role of support and facilitation. The outcome of the process is relevant information or knowledge to be used in decision-making (Lanqvist and Pirttimaki 2006). For example Davenport

(2006) in the following definition gives priority to processes which are supported by tools which, in turn, facilitate analyses and their presentations in different formats.

> The term "business intelligence," which first popped up in the late 1980s, encompasses a wide array of processes used to collect, analyze, and disseminate data, all in the interests of better decision making. Business intelligence tools allow employees to extract, transform, and load (or ETL, as people in the industry would say) data for analysis and then make those analyses available in reports, alerts, and scorecards. (Davenport 2006, p. 106)

Along the same lines, Pirttimaki (2007) in her article defines BI as:

> An intelligence process that includes a series of systematic activities, being driven by the specific information needs of decision makers and the objective of achieving competitive advantage. (p. 9)

The BI process can be divided into three phases. There is a data gathering and storing phase followed by data or information processing and analysis. Finally, there is the actual application of the BI output.

The authors who address the data gathering and storing process provide insights into what kinds of data organizations gather and what their scanning activities are in terms of both the internal and the external environment (Choudhury and Sampler 1997; Hayward and Broady 1995; Pawar and Sharda 1997; Bucher et al. 2009). The literature that covers this phase is rather scarce, although it is usually supplemented by the literature on the phase of analyzing data and information which often refers to the gathering and storing activities as well.

The data processing and information analysis phase refers to the ways data are analyzed and transformed into information, which is then filtered, aggregated and provided to the users, i.e. managers and decision-makers. The literature on this phase of the BI process focuses on methods that enable the analysis, organization and presentation of information.

Goal-oriented methods and metric-driven methods dominate this literature (Massey et al. 2002; van Hoek and Evans 2004; Bhagwat and Sharma 2007; Yi-Ming and Liang-Cheng 2007; Viaene and Willemns 2007; Tan et al. 2008; Petrini and Pozzebon 2009). These methods support managers in collecting and analyzing data and information that is relevant to their strategic goals. More specifically, the authors suggest methods like the Balanced Scorecard (Petrini and Pozzebon 2009; Yi-Ming and Liang-Cheng 2007) and Corporate Performance Management (CPM) (Viaene and Willemns 2007; Tan et al. 2008) for controlling the performance of an organization by analyzing internally developed enterprise information. These methods involve the definition of goals, metrics and target values to monitor the activities and processes.

As described in the previous section, the technology stream of the BI literature assumes that once the BI technologies are in place and used to analyze data and present the BI analysis, they will improve decision making. The process perspective goes a step further by explicitly acknowledging the importance of the use of BI in the actual decision making processes. That is, they consider how the analysis and the information extracted is used and embedded in decision-making processes. Williams (2004) notes, although in a normative tone, that to capture the real value of BI, organizations should look into how to integrate BI into management processes in order that it be used in decision making. Along the same lines, Fuld (2003) states “Intelligence is an asset only if it is used” (p. 21). Nonetheless, this phase has acquired the least attention from researchers adopting the process perspective. According to Arnott and Pervan (2008) and Yi-Ming and Liang-Cheng (2007), most studies of BI have focused on the design, development and application of BI technologies, neglecting the use of information in decision-making processes.

While there is a consensus among the authors of all reviewed articles that BI supports decision making, almost no studies (apart from Davenport 2010) couple the development or the use of BI with the decision making process itself and there are no studies among the reviewed articles that explicitly address how BI as a product addresses the needs of the decision making process. Instead, the use of BI in the making of decisions is considered a given.

Among all the articles reviewed, Davenport (2010) is the first to explicitly make an attempt to describe how BI is linked to organizational decisions. He describes three approaches for how organizations link information and decisions. The most common approach is to loosely couple information with decision-making. According to this approach information is offered for supporting a range of different decisions. This, however, results in a lack of transparency as to which information is used for which decisions. The second approach is a more structured decision environment in which specific information is identified "to improve targeted decision processes" (Davenport 2010, p. 5). This environment is created by not only using specific tools and applying analysis to support specific decisions, but also by making use of organizational and behavioral techniques and additional efforts to improve the accuracy of the information provided. The third approach is the automated decision approach, whereby all necessary information is identified and rules are determined so decisions can be made by a machine.

Davenport (2010) proposes that "organizations must have a strong focus on decisions and their linkage to information. Businesses need to address how decisions are made and executed, how they can be improved, and how information is used to support them" (p. 2).

Overall, Davenport (2010) does not provide insights on how the BI output is used in organizational decisions. Rather he provides a brief description of how organizations link BI to decisions but not how it is used in practice by decision-makers to reach organizational decisions. It is obvious that Davenport identifies the output of the BI process with information. However, as the next section describes, there is no agreement on what the output of BI process actually is among the authors of the reviewed articles.

The output of the BI process and its role in decision-making

As was the case in the technology view, the terms data, information seem to be used interchangeably when the authors refer to the input of processes. In most articles data are considered as the input of the BI process. It appears, however, that information is used to refer to unstructured and external data from the environment (Swaka 1996; Vedder et al. 1999; Rouidbah and Ould-Ali 2002; Evgeniou and Cartwright 2005; Calof and Wright 2008) while the term data is used to refer to structured internal data (Martinsons 1994; Yi-Ming and Liang-Cheng 2007; Bucher 2009; Davenport 2006, 2009, 2010).

Opinions also differ in terms of the output of the BI process. There are researchers who see relevant information as the outcome and other who see knowledge as the ultimate outcome of the BI process. However, common to these authors’ conceptions is the notion that BI is a continuous process. The first group of researchers advocates that in the BI process data is initially gathered and stored, then transformed into relevant information for decision-making. The second group advocates that there is another step in which information is then transformed into knowledge to support decisions.

For example all the articles that use BI to refer to competitive intelligence (Swaka 1996; Rouidbah and Ould-Ali 2002; Evgeniou and Cartwright 2005; Salles 2006; Kinsinger 2007; Calof and Wright 2008) use the definition provided by Vedder et al. (1999) where the product of BI is information that will allow organizations to predict the behavior of the general business environment (competitors, customers, suppliers, markets, products, technologies etc.) and thus make better decisions.

The second group adheres to the idea that to use information effectively, an individual needs knowledge to interpret the information (Choudhury and Sampler 1997). Information by itself will not provide any brilliant insights, but it will point towards answers that require judgment and insight (Martinsons 1994). Knowledge thus provides the basis for effective business activities (Olszack and Ziemba 2006). Therefore, these authors view knowledge as the ultimate outcome of the BI process, to be gathered, stored, shared and distributed in the organization.

Further, in the studies of Hannula and Pirttimaki (2003), Lanqvist and Pirttimaki (2006), Yi-Ming and Liang-Cheng (2007) and Pirttimaki (2007), the authors use the terms information and knowledge interchangeably without making an explicit distinction. This makes it even more difficult to understand the output of the BI process since the reasons for using one or the other term are not clear.

Besides the differing views on the output of BI, both groups implicitly agree that either information or knowledge leads to better decisions (Martinsons 1994; Lanqvist and Pirttimaki 2006; Davenport 2006). As was the case in the technology stream, this claim is not well supported by this stream either, because of limited research into the role of the output of the BI process in decision-making.

In the next section, I describe the common ideas that these two perspectives share in understanding the role of BI in decision making.

2.3.3 Common assumptions of the current BI perspectives

Despite the differences between the view of BI as a set of technologies and the view of BI as a process, they share three underlying ideas:

1. The core of BI, no matter on the view (technology or process), is the activity of gathering, storing, analyzing and using data/information/knowledge. Although, the last activity of using BI has attracted the least attention from BI scholars.

2. The ultimate goal of BI is to support decision-making processes in organizations.
3. This transformation of data to information (and of information to knowledge) will lead to better decisions. Even in cases where transformation is not mentioned, there is an underlying assumption of a causal link between BI and better decisions (As an indication see Pirttimaki 2007; Bhagwat and Sharma 2007; Jourdan et al. 2008; Bucher et al. 2009)

These three core ideas are fundamentally anchored in a rational approach wherein more information is expected to decrease the uncertainty in decision-making and thus lead to better decisions.

Even more so, this rational approach involves the existence of a reality – an objective view – that can be perceived as it really is and the idea of causality where choices affect consequences (March 1994).

As a result, researchers studying the design or the implementation of these BI technologies in organizations wear rational lenses in their attempts to prescribe or describe BI processes. In the same way, researchers studying how the process of BI unfolds in organizations describe them through rational lenses.

BI should, under this conceptualization (adopted by both views), be useful for coping with the uncertainties pertaining to decision-making. However, research especially on strategic choice, has shown that apart from uncertainty, managers and organizations have to cope with a great deal of ambiguity since the environment never presents itself as an unambiguous signal. Indeed much of the information needed for decision making may be unclear or conflicting (Langley et al. 2005).

Apart from these core ideas both views also share the lack of agreement on the output of BI. The views differ among data, information, or knowledge. This lack of consensus among BI scholars on the conceptualization of BI as an output makes it difficult for researchers of BI use to crystallize the object of their investigation and understand which other existing research streams are relevant (i.e. knowledge and decision-making or information and decision-making or data and decision-making). It was based on this realization that I formulated and provided in the introduction a working definition of the BI output to depict my understanding of the concept and to show what the specific object of my investigation is.

The current perspectives adopt a rational approach on the use of the BI output in decision-making processes. With this study I challenge this view by positing that there might be other potential dimensions of BI use in organizational decision-making processes.

2.4 Summary

Based on the above analysis of the literature, Figure 4 presents the two streams of research on BI: BI as a set of technologies (the technological view) and its underlying technologies, and BI as a supporting process for decision-making and its underlying phases (process view). The double arrows from data, information and knowledge represent the different opinions identified in the literature.

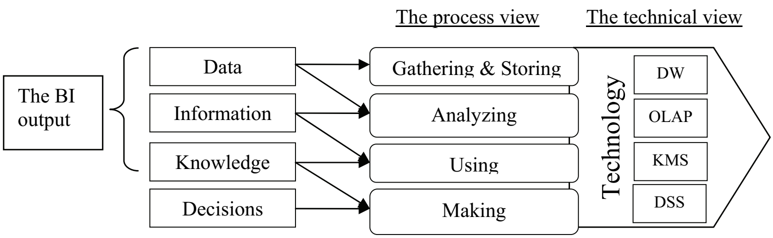


Figure 4: Summarizing the BI literature

This literature review has shown that from a technological view studies have been focused mainly on designing and developing BI technologies. One reason for this could be that BI is not a very mature field and “current research is largely focused on technology and getting the data right” (Arnott and Pervan 2008). Case studies describing BI systems implementations follow, but there are no substantial studies on the use of BI in organizational decision making although all authors imply that BI leads to better decisions.

The researchers who adopt a process view of BI seem to have followed a similar path. Most research has focused on prescriptive and descriptive studies of how organizations gather and analyze data and information. Moreover, no studies were found (with the exception of Davenport (2010)) that focus on how the intelligence provided was used in decision-making.

However, taking the perspective of Martinsons (1994) and Davenport (2010), it is not enough to analyze data, to provide information. Organizations should look into decision processes in order to deliver useful information to the decision makers. It is necessary to act upon the information obtained as intelligence is only produced through action (making decisions). For example, in many cases information that has been produced is not used, is unsuited for decision purposes, or is ambiguous and interpreted differently across different contexts (Feldman and March 1981; Davenport 2010).

However, while the Davenport (2010) study offers a significant step in the right direction by describing how organizations link data and information to decision-making processes, our knowledge on the use of the BI output in these processes remains rather limited.

Overall, in this chapter, the common ideas of these two views were discussed and challenged by shedding light on the four assumptions of these views as presented in Figure 5. First, while the literature views BI mainly as a process or a set of technologies this study focuses on the output of the BI process or technologies. Second, while it is not clear what the BI output is, I define it as the outcome of data-driven analysis (see section 1.5 in Chapter 1 for a complete definition). Third, the literature is dominated by normative writings on BI while rich descriptions of how the BI output is used in organizational decision-making processes are missing. Ultimately, the common thread to all these studies is the rational lens through which they study BI. These rational lenses take for granted that BI is used to inform decision-making and thus lead to better decisions while this study adopts an inductive approach to investigate the use of the BI output as it emerges in practice.

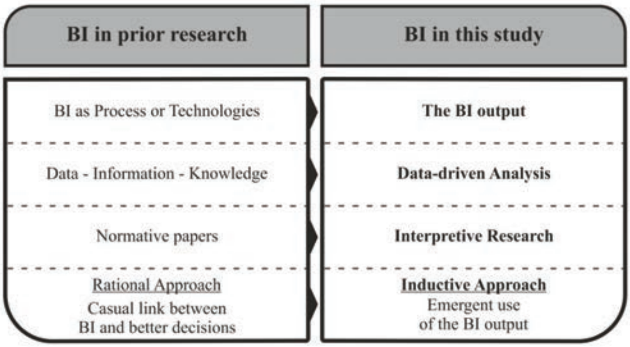


Figure 5: Key characteristics of this research study in relation to the BI literature

Identifying that the BI output is used in decision-making processes, nor the technology or the process I conceptualize the BI output as the outcome of a data-driven analysis. The BI literature that was reviewed in this chapter adopts a rational model of the decision making process and the use of BI output in these processes is seen as ostensibly rational. However, it is known that there are also other decision-making models where formal analysis is not always used as in the rational model. In the next chapter, I introduce the literature on organizational decision making and present different models that exist. Further, reflecting on the BI output and its similarities with formal analysis I present how formal analysis is used in organizational decision making processes. This literature informed the research by providing sensitizing concepts for analyzing the empirical data.

3 Research on Organizational Decision-making

The literature review on business intelligence (BI) and its role in decision-making processes revealed that BI scholars assume that there is a positive relation between BI and better decisions. Notably, BI scholars approach the use of the output of BI in decision-making processes by regarding its role as essentially rational. Therefore, BI is assumed to inform decision-makers by decreasing uncertainty and ambiguity in decision-making environments. On the other hand, the review of the BI literature also showed that there are almost no studies investigating the role of BI in organizational decision-making processes. Having no studies in the BI literature to draw on I decided to look into the decision-making literature to see how decisions are made. In the next section, I provide an introduction to organizational decision-making literature. The following section focuses on the use of formal analysis in that context.

3.1 Introduction to organizational decision-making

Decision-making is a core activity of organizational life. Poor or bad decisions have huge consequences for organizations, many times even threatening their existence. However, it was not until Simon (1947) wrote his book *Administrative Behavior* that decision making was introduced as a focal point for studying organizations. Since then, the study of decision making has become an important research topic in organizational theory and has made many contributions, contributing to some extent to the status that organizational theory enjoys today (Hodgkinson and Starbuck 2008).

In the decision-making literature, decisions have been classified according to decision types. A distinction is made between structured and unstructured decisions or, as introduced by Simon (1977), between programmed and non-programmed decisions. Simon (1977) stated that "[d]ecisions are programmed to the extent that they are repetitive and routine, to the extent that a definite procedure has been worked out for handling them so that they don't have to be treated from scratch each time they occur"

(p. 46). On the other hand, decisions are non-programmed "to the extent that they are novel, unstructured and unusually consequential" (ibid., p. 46).

Programmed or structured decisions involve well-defined, measurable and compatible criteria, while non-programmed or unstructured decisions come under the heading of "problem solving" (Simon 1977, pp. 64-65). Operational decisions tend to be structured, while strategic decisions tend to be unstructured (Simon 1977). In particular, Mintzberg et al. (1976) define as strategic those decisions that are "important in terms of actions taken, the resources committed, or the precedents set" (p.246) and which are usually made under uncertainty and do not have programmed solutions.

According to the rational choice theory, organizational choice, which is seen as an extension of individual choice, operates by selecting the alternative with the highest expected value once specific goals have been defined, all the alternatives of achieving the goals have been identified, and their consequences have been evaluated. However, critics of these rational theories have highlighted a number of limitations of this view of decision-making and the use of information. In particular, studies have shown that making strategic organizational decisions is, in reality, far from what the classical decision theory prescribes (Simon 1947; Cyert and March 1963; March 1994; Langley et al. 1995) as will be elaborated later. A further limitation to the rational approach to decision making is that people don't necessarily take a rational approach to making decisions. Organizational theorists have also documented other approaches to decision-making, such as judgement, intuition and negotiations (Klein et al. 1993; Dane and Pratt 2007; Langley et al. 1995; Bazerman and Moore 2008), which are used by decision-makers instead of the rational approach. These other models of decision-making rely on experience, beliefs, and unconscious automatic processing of a situation for making decisions. Proponents of these models have remarked that decision-makers do not use entirely rational information processes.

Simon (1947) was the first to point out that decision makers do not necessarily act rationally (according to formal theories of choice) in practice. He noted that rationality is an ideal state that cannot be reached by human beings:

> The capacity of the human mind for formulating and solving complex problems is very small compared with the size of the problems whose solution is required for objectively rational behavior in the real world - or even for a reasonable approximation to such objective rationality. (Simon 1957, p.198)

In reality what exists is "bounded rationality": humans can only be rational to a certain extent. This is because it is not always possible to define goals, and it is impossible to consider all possible alternatives and to evaluate all possible consequences. In addition, there are costs associated with collecting, analyzing and interpreting information. The complexity of reality exceeds the human capacity to process information. According to Simon (1957) the consequences of the bounded rationality are larger than one might initially think:

> It is only because individual human beings are limited in knowledge, foresight, skill, and time that organizations are useful instruments for the achievement of human purpose; and it is only because organized groups of human beings are limited in ability to agree on goals, to communicate, and to cooperate that organizing becomes for them a 'problem'. (p. 199)

The prominent work of Simon, which emphasized the role of information processing and decision making served as a driving force for further research on organizational decision making and behavioral decision theory.

Numerous researchers from different fields have proposed models of decision-making in the light of bounded rationality and limited information (Simon 1957; March and Simon 1958; Cyert and March 1963; Hilton 1981). However, March (1994) focuses entirely on organizational decision-making, looking at organizations as information processing systems. March and Simon (1958) were the first to treat organizations as multifaceted interactive systems and to describe the mutual influence between the organizational activities that take place among the systems and the bounded rationality of the decision-makers in those systems. Later, March and Cyert (1963) published the influential book, *A Behavioral Theory of the Firm*, in which they described firms as coalitions of participants and decision-makers with conflicting interests who use standard rules and procedures to avoid uncertainty and ambiguity in decision-making. Today, the above description of the firm, the notion of bounded rationality and limited information are widely acknowledged by the proponents of rational theories.

Other organizational scholars conducted research on topics related to decision-making and provided new insights from perspectives outside the traditional information processing standpoint. The conceptualization of organizations as coalitions of participants with conflicting interests spurred a series of studies looking at decision-making from a political perspective, for instance. This body of work emphasizes how different stakeholders and organizational groups influence and compete for scarce resources (Pettigrew 1973, 1985; Pfeffer and Salancik 1974, 1978; Pfeffer 1981). Since different organizational groups have different goals, conflict and disagreement arise. The competition for scarce resources and the pursuit of different goals make the organizational decision making process inherently political (Pfeffer and Salancik 1978). In relation to the concept of bounded rationality, Miller and Wilson (2006) observed that:

> In Simon's definition of the term, "bounded rationality" is largely the result of human and organizational constraints. Arguably, this view underplays the role of power and political behavior in setting those constraints. Many writers have pointed out that decision-making may be seen more accurately as a game of power in which competing interest groups vie with each other for the control of resources. (p. 471)

In 1981 Pfeffer (1981), with his book *Power in Organizations*, provided an extensive analysis of power in organizational settings and positioned his political model against other decision-making models. Another contributor to the political perspective in decision-making is Brunsson (1982, 1985, 1989) who has provided many case studies of decision-making in political contexts. Brunsson (1989) viewed decision-making in political contexts as a process of talking that participants engage in as a means of building rationales for actions, creating visions of future states, and mobilizing resources.

Another perspective on organizations is provided by Weick (1969) who views organizations as information processing systems, however not for making decisions as in March and Simon (1958) and Cyert and March (1963), but for reducing the ambiguity of information about the external environment. As such, information processing and not decision-making becomes the principle of organization and organizations can be understood not in terms of decision-processes but rather in terms of information processing and, more specifically, their means for reducing ambiguity. Weick (1969) summarizes his organizing model as follows:

> The central argument is that any organization is the way it runs through the processes of organizing... This means that we must define organization in terms of organizing. Organizing consists of the resolving of equivocality in an enacted environment by means of interlocked behaviors embedded in conditionally related processes. … organizing is directed toward information processing in general, and more specifically, toward removing equivocality from informational inputs. (pp. 90-91)

Refining the above ideas, Weick and Daft (1983) later introduced the view of organizations as interpretive systems:

> Organizations must make interpretations. Managers literally must wade into the swarm of events that constitute and surround the organization and actively

> try to impose some order on them... Interpretation is the process of translating these events, of developing models for understanding, of bringing out meaning, and of assembling conceptual schemes. (p. 74)

According to this view decision-makers process information, interpret it, and enact their environment. Central to this view are the 'assembly rules' that govern information processing and the means for reducing ambiguity, which together define the interpretation process. Assembly rules consist of the procedures or guides used by organizations to process information into a collective interpretation. A collective or common interpretation of the external environment is achieved by the efforts of decision-makers to reduce equivocality by extensively discussing ambiguous information cues (Weick and Daft 1983).

Another nascent theme in organizational decision-making is the concept of intuition and its role in managerial and organizational cognition as another mode of making decisions. Intuition is an automatic processing mode that is beyond conscious control and that enables decision-makers to process vast quantities of information rapidly without being conscious of this process happening (Dane and Prat 2007; Hodgkinson and Starbuck 2008). According to Klein (1998), intuition "depends on the use of experience to recognize key patterns that indicate the dynamics of the situation" (p. 31). As such, Klein (1998) gives special attention to expert intuition and how "it grows out of experience" (p. 33). This model of making decisions differs from the rational model in the sense that decision makers do not consider all the alternatives but rather match or recognize patterns or unconsciously collect cues that show them the right alternative almost immediately without any effort. However, as noted by Klein (1998), contrary to the rational model, decision-makers have trouble explaining and defending their intuitive judgments to others.

In parallel with the developments in organizational decision-making, significant research developments were achieved within the behavioral decision theory.

Behavioral decision theory has its roots in the psychology of choice behavior. Kahneman and Tversky made their mark in the study of judgment under uncertainty, the development of the heuristics and biases paradigm (Kahneman et al. 1984), as well as the development of prospect theory and framing in individual choice behavior (Kahneman and Tversky 1979, 1984). However, this research focused on studying the individual choice behavior usually in lab experiments and not organizational choice in real world settings.

According to Shapira (1997), there are several characteristic of organizational decision making that distinguish organizational choice from individual choice behavior. Ambiguity is one of the most important concepts in organizational decision-making (March 1994). It refers to the ambiguity of the information available, the ambiguity of preferences and consequences, and the ambiguity surrounding interpreting and evaluating past decisions. In contrast, in lab experiments such as those employed by behavioral researchers there is no information, preference or interpretive ambiguity (Hodgkinson and Starbuck 2008; Shapira 1997). Further, organizational decisions are made in ongoing processes of decision-making. In organizations, decisions are interrelated and sequential in nature and in such processes commitment rather than judgmental accuracy might be required (Shapira 1997). Other characteristics of organizations that affect decision making in organizational settings include the effects of positive and negative incentive systems that are in place or the lack of them (Shapira 1995) and rule following instead of processing available information when making repeated decisions (March 1994). Finally, conflict, always present in organizations, has a large impact on the making of organizational decisions. These characteristics of organizational decision-making pose further limitations to rationality as an appropriate model to describe how decisions are made or happen in organizations.

Rationality manifests itself in formal analysis such as information gathering, processing and use. In this sense, BI as a process of gathering and analyzing data represents a rational process and the BI output as the outcome of data-driven analysis represents the output of formal analysis. However, as described above, decision-making is not always a rational process and, as a consequence, formal analysis is not always used as intended by the rational approach, i.e. to reduce uncertainty in decision-making. In the following subsections, three complementary research streams on the role of formal analysis in organizational decision-making are presented.

3.2 Use of formal analysis in organizational decision-making

The majority of normative academic research has always advocated for more systematic and formal analysis of problems, information and environments when making decisions. However, empirical studies of decision-making in organizations continuously show that although more formal analysis is being used in organizations, their decision-making processes have not substantially changed (Abrahamson 1996; Baker et al. 2004). Simon (1978) predicted that with the increasing sophistication of formal analysis techniques and the availability of information the classic rational model would provide a progressively more accurate description of how decisions are made in organizations. Yet, as Backer et al. (2004) point out, this is not the case.

In the next subsections, studies on the use of formal analysis within organizations are presented. This research suggests that in practice the use of formal analysis for informational purposes is only one of many purposes for which it is used in organizational settings. Rather, formal analysis is also used to communicate and interact with others, influence decision-makers and justify decisions and actions.

Below, I adopt the categorization provided by Backer et al. (2004) to present the different yet complementary streams of research on the use of formal analysis in organizational decision-making.

3.2.1 The functionalist view – Managing uncertainty

The functionalist view adopts a rational and bounded rationality approach, regarding information as being used to inform decision-makers and hence to reduce uncertainty. This school of thought views decisions as rational processes composed of linear phases with specific beginnings and ends which is evident in the work of Simon (1960) and Mintzberg et al. (1976). For example Simon (1960) describes three phases of organizational decisions processes: the intelligence phase, the design phase and the choice phase. Following in the same footsteps, Mintzberg et al. (1976) also identify three phases, called identification, development and selection, which were further broken down into seven routines: recognition, diagnosis, search, design, screening, evaluation and authorization. The studies found that although information was collected and organized in the different phases it was not always used as theory prescribes – that is, to determine decisions.

Thompson's (1967) contingency model (first formulated by Thompson and Tuden 1959) proposes that decision-making based on formal analysis or "calculation" is only possible when there is no uncertainty about the goals and the means to achieve them. That is, when the preferences concerning the outcomes and the beliefs about cause-effect relations are clear, it is possible to collect unambiguous information about alternatives and to perform the analysis according to the specific criteria required. When these two contingencies are not clear, Thompson (1967) suggests the use of other approaches in decision-making rather than formal analysis. In particular, when goals are clear but the means are not then the use of majority judgment is recommended as being more appropriate. Conversely, when the goals are ambiguous but the means are clear then Thompson suggests the use of bargaining in order to achieve a compromise on the goals. When both goals and means are unclear a problematic situation is created which is called "anomie". This situation according to the authors calls for the use of the "inspiration" or intuition of a charismatic leader.

This contingency model was tested in an empirical study by Nutt (2002) in which data about 376 strategic decisions were gathered and analyzed. The study confirmed Thompson's model as a sound prescriptive guide that could predict successful decisions according to the fit of the decision context with the process followed. However, Nutt's study also revealed that decision-makers did not always follow the prescriptions of Thompson's model. Specifically, Nutt criticized the fact that decision-makers were prone to using the wrong decision approach, leading to wrong decisions such as adopting rational procedures when negotiations or judgment would have been more appropriate according to the model (Nutt 2002).

Researchers of cognitive psychology investigating decision-making and negotiation underline the importance of data in the decision process in order to avoid cognitive biases (e.g. Bazerman and Neale 1994; Bazerman and Moore 2008). These models assume that managers, who are bounded rationally but are participating in situations marked by uncertainty and complexity, use heuristics or rules of thumb when making decisions (Bazerman and Moore 2008). However, sometimes heuristics lead to systematic errors or cognitive biases and thus to sub-optimal decisions (Bazerman and Moore 2008). For example, Tetlock (1983) underlines the cognitive limitations and biases of individuals when processing information. Overall, this literature suggests that decision-makers apply heuristics (or shortcuts) that simplify decision making (Kahneman et al. 1979) in an attempt to avoid the cognitive burden of using analytical mental procedures (Tetlock 1983).

The application of heuristics in decision-making might be an explanation for the discrepancies found by Nutt (1982) between the actual behavior of decision-makers and the prescriptions of Thompson's (1967) contingency model.

In order to improve decision-making, researchers in this field have proposed methods of acquiring more information in order to reduce bias. Nutt (1998a, b) noted that in the majority of decisions some kind of information is present. This stream of research is influenced by researchers who have a normative view of the individual as being essentially rational (Bazerman and Moore, 2008). According to this view, formal analysis is a positive and useful feature of decision-making that leads to better decisions.

Above, the functional view of the use of formal analysis was presented. According to this view, formal analysis is used in decision-making to decrease uncertainty and to avoid producing biases from the use of heuristics. Several limitations of the functional view in achieving optimal decisions and avoiding systematic errors were also presented. This functional view of formal analysis is commonly adopted in the BI literature was presented in chapter 2. Nonetheless, as Royer and Langley (2008) note:

> this 'information processor' view of individuals ignores the social context in which decision-making occurs (p. 254)

The next stream focuses exactly on the social context and specifically the socio-political processes that take place around and within decision-making processes.

3.2.2 The political view – Managing equivocality

Empirical studies of organizational decision-making have reported that formal analysis is used not only to inform decisions but also for political reasons not encompassed by the rational approach. In this regard, the organizational decision making literature has documented many studies in which formal analysis is used to support already made choices (Meyer 1984; Tingling and Brydon 2010), to advocate for a specific coalition over another (Lindblom and Cohen 1979) or to call attention to or deflect attention from specific issues (Meltsner 1976). For example, Tetlock (1985) showed that when decision makers were accountable to others, the extent of their engagement in information search and analysis changes according to their views. If the views of superiors are known then people tend to search for information that will be acceptable to their superiors and to analyze it accordingly. When the superiors' views are not known, Tetlock's study showed that people tend to increase search and analysis in terms of depth but also breadth of alternatives considered, in order to be prepared for any possible disagreement that might arise with their supervisors. As such, Tetlock concluded by suggesting that formal analysis and socio-political processes are interdependent. Langley (1989) goes a step further, based on an empirical study of formal analysis in organizations, and argues that formal analysis and socio-political processes are in fact symbiotic. Specifically she remarks that:

> Formal analysis would be less necessary if everybody could execute their decisions themselves, and nobody had to convince anybody of anything. In fact, one could hypothesize that the more decision making power is shared between people who do not quite trust one another, the more formal analysis will be important (ibid., p. 609).

March (1979) argues that because of this continuous misrepresentation or political use of information in organizations much information and analysis is disregarded, overlooked or cautiously used. As a result there is an adaptation process in which decision makers learn to be skeptical of overly clever or strategic people and strategic people correspondingly learn not to be overly smart in their information manipulation activities (March 1979).

Pointing to the importance of understanding the social processes involved in decision making Balogun et al. (2008) delve

> into the socio-political nature of organizations to show that the answer to better decision-making does not necessarily lie with the provision of greater quantities of "more accurate," "objective" and timely data, but rather requires an understanding of the social processes of negotiation involved in deciding. (p. 235)

Balogun et al. (2008) point to the fact that most research on decision-making has focused on information processing and less attention has been paid to understand how decision-makers socially construct their organizational worlds and their external environment. In their article, the authors draw on sociological insights to integrate the computational and interpretive perspectives on organizational cognition in order to provide a more complete account of organizational decision-making processes. They particularly emphasize the aligning of interpretation and influencing processes that organizational members engage in through the use of symbols, rituals and language to shape cognitions and preferences.

All these studies have demonstrated that the generation, analysis and presentation of information in organizations is not at all innocent. Formal analysis can be and is used as an instrument of power and persuasion, which in turn can lead to information misrepresentation (Feldman and March 1981). Formal analysis arises from social construction because data and information are attributed to entities by people. According to Griffith et al. (2008) even if technologies are used to perform the analysis, these technologies:

> … reflect the limitations of their designers. Searches for information and uses of it depend on how designers characterize and classify information. (p. 102)

As noted by Balogun et al. (2008), managers use symbols in order to shape organizational cognition and preferences. One such symbol is formal analysis itself. The next section focuses on the use of formal analysis as a symbol of rationality.

3.2.3 The symbolic view – Managing irrationality

Contrary to the rational approach, there is also evidence that data and information are used in obscure, irrational ways. For example Feldman and March (1981) observe that organizations gather and use information that has remote relevance, that information is used to justify already made decisions, that requested information is not considered and that more information is requested while already available information is ignored. This use of information goes against the classic theory of rational choice which suggests that information and its dimensions of relevance, reliability and precision will be pursued only to the degree that the cost does not exceed the value of the information (Feldman and March 1981). Why would organizations gather information that has no relevance to decisions? That is a waste of organizational resources. A plausible explanation for such a behavior is provided by Feldman and March (1981) who draw on the symbolic value of rationality and formal analysis in western societies.

The concept of "intelligent choice" appears to have had a great impact on people's expectations of how choices should be made while at the same time it has not had the same impact on their actual behavior (Feldman and March 1981). Especially in organizational settings, the concept seems to have become institutionalized – decision-making practices have to convey rationality but do not necessarily need to have a rational outcome. Because it is so important to exhibit rationality in decision-making processes (Weber 1947) and because the systematic use of formal analysis is directly correlated to rational behavior, its symbolic value can become even more important than its informative value at times (Feldman and March 1981). This is because rationality is seen as the ideal way to make decisions. As a result, formal analysis is seen as a positive and useful characteristic of decision-making processes, while the socio-political elements are seen as counter-productive. In this way, formal analysis is viewed as an objective method for taking politics out of decisions. The attribution of a decision to formal analysis allows the decision-makers to distance themselves from politics, which are seen as negative (Power 2004, 2003). In this sense, information analysis and use is considered as a legitimate way to make decisions and a decision maker who gathers and analyzes information is considered competent and inspires confidence, even when the information might not be directly relevant or helpful.

Indeed, the very assignment of a decision to formal analysis is a political act of legitimization (Pfeffer 1981). As such, decision makers often use formal analysis because it helps them to convey an appearance of rationality to other organizational members or society at large, which by itself provides legitimacy to the chosen course of action. This use of formal analysis is not so much political as it is symbolic. Formal analysis in these circumstances provides the decision-makers with a sense of rationality which in turn creates for them the necessary trust and confidence to act.

When the dominant norm is rationality, there is increased adoption and ritualized use of managerial techniques and information (Lozeau et al. 2002). However, as Feldman and March (1981) argue that symbols and norms are not static but rather dynamic. As such while the inquiry, collection and use of information might be originally driven by its symbolic value eventually, the same information might be proved to be useful in ways that were not initially predicted.

Further research on the use of formal analysis shows that even when it is used as a symbol or to influence and direct the attention of others, it provides a basis for decision makers and creates a collective situated space in which decision-makers can discuss their interests and preferences for particular decisions (Nahapiet 1988). Blackler (1993) portrays formal analysis as an interactive process that includes at the same time symbolic, political and social elements. It is through this interactive process that decision-makers attempt to establish a common ground among them by making their assumptions explicit (Denis et al. 2005).

The above three literature streams on the use of formal analysis in organizational decision-making processes provide useful analogies for the use of the BI output and an initial set of concepts for examining its use in organizational decision-making.

3.3 Summary

In this chapter, different organizational decision-making approaches were introduced and a more complete picture of how decisions are made in organizations was provided. Further, the scholarship on the use of formal analysis was presented and it showed that information gathering, analysis and use not only inform decision makers but are also leveraged for political and symbolical purposes. This research provided me with a loose set of theoretical concepts which are used in this study as sensitizing concepts in studying the use of the BI output in organizational decision-making, especially when performing the analysis of the empirical data. Many of the concepts presented here can be traced in the results of this study presented in chapter 6. In particular, when presenting the different tactics of using the BI output in decision-making, political and symbolic uses are observed.

4 Research Approach

The aim of this study is to investigate and gain a deep understanding of the relationship between business intelligence and organizational decisions. The underlying complexity of this relationship required meticulous attention to the research design of the study. The research design and all subsequent phases of the research are highly informed and thus influenced, consciously or unconsciously, by the philosophical perspective on which this study is based. The philosophical perspective includes the basic assumptions underlying any research: its ontological (the nature of the world) and epistemological (the nature of knowledge and how it is acquired) foundations.

This chapter begins by presenting the different philosophical perspectives in social sciences and discusses the specific philosophical perspective adopted in this study. This is not an attempt to show how the chosen paradigm is superior to other paradigms but is rather an explanation of the choice based on the appropriateness of the perspective to addressing the research question. The appropriateness of a philosophical perspective is defined by the specific research objectives, as well as by the researcher's own philosophical assumptions about the nature of the world and the possible ways of acquiring knowledge about it. Therefore, after a brief presentation of the philosophical perspectives, I provide a section on my own values, assumptions and beliefs. This is followed by a discussion of the implications of the chosen perspective for the overall research approach and particularly for the treatment of the literature review, the research method, and the data collection and analysis.

Different researchers have categorized philosophical perspectives and suggested different paradigm classifications. For example, Burrell and Morgan (1979) defined four sociological paradigms: radical humanist, radical structuralist, interpretive, and functionalist. Guba and Lincoln (2000) proposed five paradigms: positivism, post positivism, critical theory, constructivism and the participatory paradigm. In the IS literature, a common presentation of the paradigms is the distinction between the positivist, interpretive and critical perspectives. This classification is used by many IS researchers such as by Orlikowski and Baroudi (1991), Walsham (1995), Myers (1997), and Oates (2006).

A comprehensive overview of the different perspectives is presented by Van de Ven (2007). In his book, Van de Ven outlines four philosophical schools: logical positivism, relativism, pragmatism and realism. I use Van de Ven's framework because it provides a dimensional map that allows me to discuss the different perspectives and show their positions in relation to ontology and epistemology.

Van de Ven (2007) describes and compares the different philosophies in terms of their characteristics, such as their ontology, epistemology, and their view on the role of the knower and language. In this way, he positions logical positivism as one of the "outer limits of philosophical thought" (p. 40) with the others being a set of alternative philosophies that emerged as a reaction to positivism and which he places under the umbrella term 'relativism'. Positivism identifies with the existence of 'one objective reality' governed by laws. These laws can be investigated independently of the observer and the mind of the observer can mirror the governing laws of reality (Van de Ven 2007).

On the opposite side, there is a set of philosophies with beliefs diametrically opposed to the beliefs of positivism. This group consists of interpretivism, constructivism, hermeneutics and postmodernism. Van de Ven (2007) uses the term 'relativism'[2] as an umbrella to include all afore-mentioned philosophies. These philosophies differ in many ways, but share their view on ontology and epistemology. They all view reality as socially constructed, and thus subjective, and

[2] As pointed by Van de Van (2007), the term 'relativism' is used in accordance with McKelvey (2002) as an 'existence concept' of the philosophical perspectives that view reality as socially constructed and not as an 'anything goes' category.

> … deny the existence of any standard or criterion higher than the individual by which claims to truth can be adjudicated. (McKelvey 2002, p. 896, in Van de Ven 2007, p. 40)

In addition, the knower or observer is considered being in the world and

> … cannot stand outside of his/her socio-linguistic constructs to view it objectively. (Van de Van 2007, p. 39)

That is, the observer, who is socially constructed, sees the world through his own basic belief system (values, culture, background, knowledge and beliefs), which impacts on the world and at the same time the world impacts on his/her system of beliefs.

Between the limits that positivism and relativism pose lies the discussion of pragmatism and realism. Pragmatism shares with relativism a subjective view on epistemology while ontologically it can adopt either subjective or objective views of reality. However, in pragmatism, this subjective view on the epistemological level emphasizes the relation between knowledge and praxis (action), that is, pragmatism claims that true knowledge resides in its capacity to guide or trigger action and its practical consequences (Van de Ven 2007).

Realism is another perspective which shares with positivism the ontological assumption that reality is objective and exists independent of human beings. However, it differs from positivism in that it does not reject the metaphysical. According to realism, reality is not the world of senses as in positivism but exists independently of human cognition. At an epistemological level, realism expands on both subjective and objective views.

Thinking in terms of these philosophical schools (See Figure 6 for an overview) enabled me to navigate the complex discipline of philosophy of science and reflect on my own ontological and epistemological assumptions and the positioning of myself in this field.

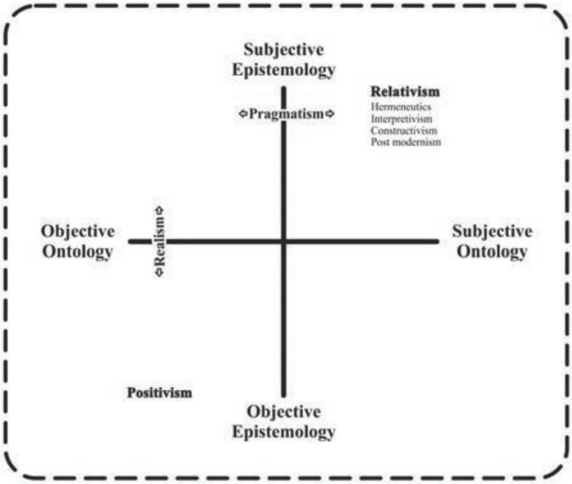


Figure 6: Positioning the philosophical perspectives based on the ontological and epistemological views presented in Van de Ven's (2007) classification.

In my opinion, the development of and changes to what constitutes reality and knowledge during human history are themselves evidence of the socially constructed nature of that reality and knowledge. These changes, from a dominant theocratic paradigm in the middle ages to a dominant positivist school of thought to the emergence of many alternative philosophies developed in reaction to positivism such as constructivism and critical theory, show that what is considered as knowledge is not objective but rather constructed by historical, social and emergent factors that gain momentum. Based on the above thought I realized that I relate most with philosophical perspectives that adhere to a subjective ontology and epistemology. The next step was to choose one specific perspective.

4.1 The interpretive perspective

After a scan of literature addressing some of the perspectives that view reality and knowledge as socially constructed I found myself confused. I could relate to each one of them but had no selection criteria to make a choice. I returned to the literature but this time I was looking on how a researcher adopts one perspective over another. Orlikowski and Baroudi (1991) recommend that

> … researchers should ensure that they adopt a perspective that is *compatible with their own research interests and predispositions* while remaining open to the possibility of other assumptions and interests. They should understand and acknowledge the extent to which the perspective they adopt will focus their attention on some things and not others, and bias their perception of the phenomena they study. (p. 24, italics added)

Reflecting more on my own predispositions, I understood that I was further from radical constructivism and closer to interpretivism. Radical constructivism denies that a true reality exists apart from human existence. While interpretivists view *truth* as relative to the eye of the beholder, the radical constructivists view *viability* as relative to the eye of the beholder (Marton 2011). I do believe that there is a physical world out there, however, this physical world does not "have an independent, objective and 'true' expression" (Kjærgaard 2004, p. 41). Rather, reality is constructed through the meaning actors assign to their experiences and observations.

Since, I already had identified my own predispositions, the above quote of Orlikowski and Baroudi (1991) directed my attention to my research interests and the phenomena under investigation and how they relate to the relativist philosophical paradigms. The next paragraphs describe how the choice of paradigm was narrowed down by thinking about, negotiating and reflecting on the nature of my research interests.

The motivation for this study stemmed from the need to organize insights into how to use BI in decision-making practices with the ultimate goal of making "better" decisions. However, after a first look into the literature and meetings between myself and experts/researchers on decision making and information systems, it became clear that there was a need to understand how business intelligence (BI) is used in organizations and what its role is in decision making. In order to be able to say anything about making "better" decisions first I needed to gain a thorough understanding of decision practices. Further, the idea of making "better" decisions is in itself almost intractable since it is very difficult to define evaluation criteria for what constitutes better decisions. These insights were also reported and discussed with the company supervisors and it was decided that the study would have a focus on understanding practice.

Therefore, very early in the process the focus shifted to how the organization uses the output of BI in the process of making organizational decisions. Organizational decision-making is a social process and the use of the output of BI in this social process is dependent on both the time and the particular decision to be made. The nature of this research, with its pursuit of understanding the connections and interactions among the output of BI, the decision makers, and the decisions, all of which constitute different parts of a social reality, pointed to an interpretive perspective. According to Orlikowski and Baroudi (1991)

> … social processes can be usefully studied with an interpretive perspective, which is explicitly designed to capture complex, dynamic, social phenomena that are both context and time dependent. (p. 18)

This study is concerned with a practical perspective on the use of the output of BI in organizational decision-making and the analysis of practices is therefore central. This focus calls for a study that is more inclined towards contextually dependent observational approaches. According to Orlikowski and Baroudi (1991), an interpretive approach is appropriate when the researcher seeks to understand how people create meanings and take action in a particular context through an emergent process. Therefore, I chose an interpretive approach in order to understand how decision makers create meanings and use the BI output in the Danske Bank Group through emergent decision making processes.

Further readings on the interpretive perspective made clear that this is a suitable choice since it meets my predisposition toward the world and is compatible with the nature of this research study. Below I present some of the key concepts of the interpretive perspective on how to obtain knowledge about reality.

The assumption concerning cognition within the school of interpretivism is that reality is 'interpreted' by the subject (Walsham 1995; Klein and Myers 1999; Weber 2004). This means that reality is constructed by the individual's subjective and intersubjective experiences and consciousness.

The interpretive perspective considers knowledge within a constructivist ontology and the use, design and study of information systems in organizations is thought of as a hermeneutic process of reading and interpreting this construction as text (Walsham 1993). The hermeneutic circle is a fundamental principle of the interpretive perspective. Although, hermeneutics is considered by many researchers to be a philosophical perspective itself, the hermeneutic circle is a common element in all perspectives that adopt a subjective epistemology.

Interpretive research is primarily concerned with human understanding and seeks to understand social members' descriptions of a situation through the meaning that the members assign to the situation (Klein and Myers 1999). The hermeneutic circle is a process theory of how human understanding is achieved (Gadamer 2003). It describes understanding as an emergent, circular process of interpretation and stresses the reciprocity between the whole and its parts (Gadamer 2003). As such, to understand the meaning of parts one has to understand the whole (context) and vice versa.

Interpretation moves from a vague understanding of the whole to an improved understanding of the parts and back to a better understanding of the whole (Klein and Myers 1999). For example in a conversation between two people, the ‘parts’ would be their preconceptions of the topic and the ‘whole’ would be the shared meanings that emerge from the interaction between them. Therefore, shared meanings “are a form of intersubjectivity rather than objectivity” (Walsham 1995, p. 320).

Meaning is constructed as people interact and engage with the world around them. In an interpretive study the researcher creates meaning by accessing the meanings that participants assign to the phenomenon under investigation (their practices and actions). Thus, the researcher should employ methods that increase awareness of how the participants perceive, act and engage with the world (Walsham 1995). Further, since the participants’ knowledge and actions are constructed within the broader historical and social context in which they act, it is of paramount importance that the researcher understands this context. Notably, at this point there is another instance of the hermeneutic circle: actions and context.

The role of the researcher in interpretive studies is described as active and engaging (Walsham 1995). In his/her attempt to understand the phenomenon, the researcher brings prior knowledge and preconceptions to their interpretation, and is at the same time is impacted by the research process itself. While in other paradigms the involvement of the researcher in the research process is avoided at any costs, in an interpretive study it is rather required. It is through involvement and interactions between the researcher and the phenomenon (participants, context, field) that meaning is constructed. Walsham (2006) views this involvement more as a spectrum changing over time from the ‘neutral’ observer to the action researcher. That said, he acknowledges that there is no such thing as a truly unbiased researcher since “we are all biased by our own background, knowledge and prejudices to see things in certain ways and not others” (Walsham 2006, p. 321).

In summary, understanding and reflecting on my own ontological and epistemological predispositions, the research topic and goal, and the use of interpretivism as a philosophical perspective, I constructed my meaning of an interpretive study as an appropriate approach to investigate the phenomenon (see Figure 7 for an illustration).

Hence, I employ an interpretive study to gain an in-depth understanding of the use of the BI output in organizational decision-making. In the following section, I describe how the above constructed meaning further inspired and shaped the research design.

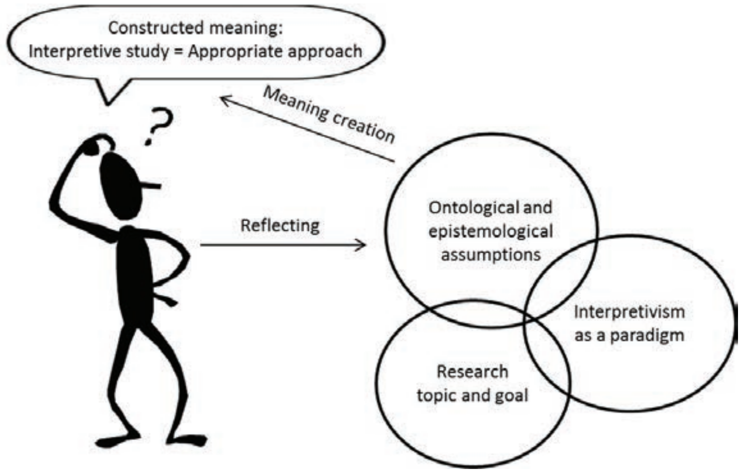


Figure 7: My constructed meaning of the interpretive study as the appropriate approach

4.2 Research design

The lack and fragmented BI literature on the subject called for an exploratory and descriptive research. To live up to the research aspirations, I employed a strategy that substantiated the exploratory and descriptive nature of this interpretive research. The remainder of this chapter discusses the overall methodology in terms of the research design, data collection and data analysis activities used to answer the study's research question.

Consistent with my interpretive research approach, I relied primarily on a qualitative interpretive study combined with a thorough literature review on BI. According to Mathiassen (2002), understanding of a phenomenon can be reached either by synthesizing documented empirical studies and broader literature on the subject or by engaging in interpretation of practice.

The literature study contributes to the process of understanding a phenomenon through the synthesis of previously documented empirical studies (Mathiassen 2002) as well as through the development and crystallization of relevant concepts (Webster and Watson 2002). In this case, however, the literature review helped in understanding how BI is conceptualized in the BI literature and as such helped to crystallize the BI concept in this study.

The primary means of developing an understanding of a problem, however, is through engaging in interpretation of practice (Mathiassen 2002). This requires that data are collected about a phenomenon in its real life settings and later interpreted using concepts that usually have emerged from the literature or that might emerge from the data itself.

A qualitative research methodology is suitable as a research strategy when the phenomenon being investigated can only be studied in the particular context in which it emerges.

At the beginning of the research process the focus was on the literature study but with the passage of time the focal point changed from the literature study to the interpretive study. Nonetheless, no matter where the focus was there was a continuous two-way feedback channel between the literature study and the interpretive study. Each of them contributed, although in different ways, to answering the research question.

The literature review enabled framing the problem under investigation and facilitated the identification and refinement of relevant concepts such as business intelligence, data, information and knowledge, and their use in decision-making. Thus, the literature study contributed to a better understanding of the conceptualizations and roles of business intelligence relative to decision-making, as documented in the literature review in chapter 3. This emerging understanding of the literature was used to discuss the findings, in which the rich descriptive account of the phenomenon is presented using references to the literature that framed the study in the first place (Merriam 2002).

The empirical basis for this research is an in-depth interpretive study (Merriam 2002) used to investigate the role of the BI output in a decision making context. I employ an interpretive study to provide insights from practice into the use of business intelligence in organizational decision-making. Qualitative interpretive studies are particularly valuable for descriptive research in which a thorough understanding and in depth descriptions of a phenomenon in its context are preferred (Merriam 2002; Creswell 2003). The rich descriptions that resulted from the data collected in the study address the call of Davenport (2010) and Arnott and Pervan (2008) for more empirical studies and research into the use of BI in decision-making processes.

In the following sections, I first explain my personal background and preconceptions and the way they shaped my initial understanding of the PhD project. Next, I describe my first experiences while exploring the field and how my research design changed. Following this, I describe how I conducted the literature review study and present a detailed description of the interpretive study, including its design, data collection and analysis processes.

4.2.1 Personal background and preconceptions

While an interpretive approach gives a voice to informants, it does not eliminate the researcher's judgment. Nor does such an intention exist. Rather, the researcher's 'bias' or 'prejudice' is the starting point of understanding. The researcher, as the primary instrument for data collection, brings her personal values, educational and cultural background, practical and work experience and assumptions into the investigation. I have already discussed my ontological and epistemological assumptions. In this section I will make an attempt to draw a rich picture of my biases by describing my educational background, my first experiences in the organization studied, and my initial thoughts on the research proposal.

I have a bachelor's degree in business administration specializing in information systems from Athens University of Economics and Business. Later, I did a master's degree on Software Engineering and Management at the IT University of Gothenburg and graduated in May 2008, just before the financial crisis hit the world. In both programs I was taught in a very linear and structured way to deal with problems.

In June 2008 I started work as an IT developer graduate at the Group IT of Danske Bank. Since I was never really interested in programming, I was assigned to undertake project management tasks for an IT project on eBanking. Things were fine in the beginning, but as I understood my tasks better and tried different ways to perform them I found many obstacles. To monitor the project's progress I had to gather data from different sources, integrate them, and then analyze them. Being very much influenced by my studies, I started to write a proposal for developing an integrated measurement system for IT projects at the bank. I discussed the proposal with many people in the bank who explained to me that there had been many proposals that had focused on the same subject but that none of them had been implemented. I found a group that was working on a similar project in another department and they were also very eager to integrate different systems so project managers would have instant access and analyze data relevant for their projects. But, as in any big organization, things evolve slowly.

In the meantime, the Group IT announced that they would like to hire a PhD student for an Industrial PhD project. In the announcement, the project aim was framed as follows: "The purpose of the project is to support and improve the decision-making process by developing a framework to integrate and align business intelligence from different domains and existing IT applications" (Quote from the announcement of the Group IT Industrial PhD project, 28-10-2008).

The announcement was very close to my ideas about improving data access at the bank, and I decided to apply. My aim at that point was to improve practice by creating a framework which I would eventually test and evaluate in the organization. I was already convinced that if BI were integrated and available to decision makers it would lead to better decisions. This diagnosis performed, I felt that all that was left was to construct the framework. I was following a rational approach as taught during my studies.

The research project was at that time established as an action research project. I had perceived my role as an action researcher who would participate actively in the process with a focus on improving decision-making in the organization. In the next section, I first briefly describe the initial project design based on the above preconceptions and assumptions. Second, I provide an account of my first experiences while exploring the field and how my research design changed.

4.2.2 Exploring the field – the pilot study

Based on the initial focus of the project – improving practice – I had created a project plan based on my understanding of the action research cycle (Baskerville 1999; Davison et al. 2004; Van de Ven 2007) as depicted in Figure 1. My first task was to familiarize myself with how BI was used in the organization and to gather data about the needs of decision makers. Therefore, I designed a pilot study in which I interviewed managers and analysts who used BI in their work.

This pilot study included 12 interviews (see Table 5) over a period of 3 months with key personnel in the organization, and two with external subject experts, to assist in triangulation (Denzin, 1978). The entry point to the organization was through Group IT and from there other relevant interviewees and units were identified. My company supervisor, together with the development manager of the business intelligence competency center (BICC) where I was located helped me in identifying participants who were relevant to my study.

The form of the interviews was semi-structured, based on an interview guide (see Appendix A). The interviews started with demographic and open-ended questions followed by questions focusing on the interviewees' daily work and use of BI in decision-making. I also asked for specific examples in order to gain a better grasp of what was being said. Towards the end of the interviews, I asked for further reflections on the examples given. Each interview was conducted in English in the interviewee's office and lasted an average of 60 minutes. Participants were informed that the interview was about the use of BI in their daily activities, but were not shown the questions ahead of time. All the interviews were recorded and transcribed (approximately 230 pages) with the consent of the interviewees. Table 5 shows the interviewees who participated in this pilot study.

Organizational role	Organizational Unit
IT Business Analyst	Group IT
Head of IT Credit Processes	Group Credits
Performance Management Specialist	Group Finance
Branch Performance Analyst	Danske Bank DK
IT Finance Business Analyst	Group Finance
Regional Manager	Danske Bank DK
Business Analyst	Danske Bank DK
Head of Forecasting Models	Group Credits
IT Finance Manager	Group IT
Follow up Branch Performance Analyst	Danske Bank DK
External expert on BI	A.P. Moller
External expert on BI and portfolio management	A.P. Moller

Table 5: Interview participants in the pilot study

Background information and organizational documents (including organization charts, reports, spreadsheets, forms, PowerPoint presentations, memos and press releases) were also collected and served as complementary material to the interviews. The participants used BI systems, tools or the BI output in their everyday work and represented different managerial levels.

During the pilot study, I realized that when referring to BI decision makers would refer to the technologies, tools or applications or the process of accessing, retrieving and analysing data. However, when referring to the use of BI in their decision making processes it was clear that BI was used in organizational decision making neither as a process nor as a technology. Rather, it was the output of the BI process and of BI technologies that was used in decision-making. As such, BI in decision making was perceived as a product. The decision makers at the bank would refer to the BI output as the outcome of an analysis as illustrated in the following quote:

> I'm not using BI tools for making decisions on what direction we should invest. In that case, we actually do get some analyses which we use in our decision-making or in what direction we should go or where we should at least focus. (IT Finance Business Analyst)

Further, I observed that it was easy for decision makers to talk how the BI output was created and the tools that were used but when asked to elaborate on the use of the BI output in decision processes they found it difficult to provide details. Further, the interviewees were more straightforward when talking about the impact of BI analysis on operational decisions than on strategic decisions. The Head of IT Credit Processes explains:

> [For strategic decisions] when you see the results or data you should use common sense. So when you make decisions you should sort of respect the story. You should investigate does it make sense? (Head of IT Credit Processes)

Contrary to the view of BI as a process or a set of technologies, there were no standard templates, procedures or manuals that defined the use of BI as an output in decision processes. Many of the interviewees would point to the selection and prioritization of IT projects as an example of strategic decisions.

At the same time, I was exploring the BI literature to get a hold of previous knowledge on BI and its relation to decision making. This initial exploration of the BI literature and its relation to decision-making revealed that there were almost no studies on how the output of BI is used in decision-making processes. Most previous work had been done on methods and technologies to collect, store and analyze data (Arnot and Pervan 2008). There was little research on how the output of BI was used in decision-making practices. In fact, there was no universally accepted definition of what BI as an output was.

As a result, there was no knowledge base, practical or theoretical, upon which I could build the design of the intervention in the organization. Reflecting on the difficulty the decision-makers had in elaborating on the use of BI in decision processes and the lack of understanding of the role of BI in such processes in the BI literature, a number of questions started to emerge. Should I make an intervention in a situation that nobody, and certainly not me, understood? How is BI as an output used by decision-makers in decision making processes? How is BI used in highly complex and ambiguous decisions such as strategic decisions?

In summary, the observations during the pilot study led me to realize that the action research approach under which the PhD project was framed was not adequate under these circumstances. After many discussions with my supervisors, colleagues at the university, two subject experts and colleagues at the company I realized that I was making too many assumptions and was taking too many things for granted.

Reflecting on the emerging questions, I realized that I should first strive to gain an understanding through an in-depth investigation of the use of BI in decision making processes. Therefore, the research goal and design changed: I was no longer interested in designing and evaluating BI applications per se, but rather in analyzing how the output of BI is mobilized and used by decision makers within organizational decision-making processes. Consequently, my focus changed from improving practice to understanding practice.

As such, a new research design was needed for understanding practice. The new design consisted of a literature study and an interpretive study. The purpose of the literature study was to investigate the concept of BI and its use in decision-making through a systematic review in order to capture and summarize all relevant research on BI. The purpose of the interpretive study was to investigate the use of the BI output in a complex and ambiguous decision-making process, specifically the IT project prioritization process in the organization. In the next section, I present how I conducted the literature study and the interpretive study respectively.

4.2.3 Designing and conducting the literature study

The literature study was conducted in an iterative manner, with a broad first iteration followed by narrower iterations. The first step of this study was to examine the literature on business intelligence and its role in decision making through a systematic literature review. The second iteration of the literature study focused on understanding and reviewing the use of formal analysis in the organizational decision-making literature. Later, the third iteration was even more focused on the specific empirical situation under investigation as part of the empirical study, that of IT project prioritization and portfolio management.

Following a combination of the strategies of Webster and Watson (2002), Mathiassen et al. (2007) and Dybå and Dingsøyr (2008), I conducted the literature review in two main phases: a search phase (data collection) and an analysis phase (literature synthesis) which are described in the next sections.

4.2.3.1 Data collection

The purpose of the search phase was to identify the literature related to BI and its role in decision-making. The search process in this first iteration comprised of the following five phases: identifying keywords, identifying journals and databases, conducting the search, scanning abstracts, and creating the final article pool. The selection of keywords was based on the observation made based on a first look at the literature in relation to the research question: in the literature it is obvious that BI is related to decision-making, strategic management and performance management. As such, the keywords used in the search phase were: business intelligence, decision-making, strategic management, and performance management. The keywords were used in the following combinations: BI AND decision making, BI AND strategic management, BI AND performance management, BI AND decision-making AND performance management, BI AND strategic management AND performance management, BI AND decision-making AND strategic management, BI AND decision making AND strategic management AND performance management. First, a search with the keyword BI was conducted, then a second search was conducted with the specific keywords in order to identify articles that were focused on the specific angle that I was interested in: the use of the BI output in organizational decision making. The searches were conducted for the period 1990 – 2009.

The next step was to define the target databases and journals for the search. Based on the MIS Journal Rankings on the AIS (Association for Information systems) website (AIS 2009) I selected the top eight IS journals: MIS Quarterly (MISQ), Information Science Research (ISR), Communications of the ACM (CACM), Management Science (MS), Journal of Management Information Systems (JMIS), Artificial Intelligence (AI), Decision Sciences (DSI) and Harvard Business Review (HBR). I additionally selected the IS Senior Scholar Basket Journals that were not already included in the top eight: European Journal of Information Systems (EJIS), Information Systems Journal (ISJ), Journal of the Association for Information Systems (JAIS), Journal of Information Technology (JIT) and Journal of Strategic Information Systems (JSIS). The choice of the leading journals was intentional, in order to create a base of mainstream journals. In addition to the journal-based search, a search was also performed in well-established databases, namely, EBSCOhost, Web of Science and IEEE, to include articles from other disciplines and to obtain a broader view of BI and decision-making.

The output of the search phase both from the top journals and the databases resulted in the creation of an article pool. When the results from the searches reached more than 100 articles, a new filtering mechanism was entered: I kept only the results that contained BI and decisions in the abstract or in the title. Next, all the abstracts of the articles were scanned in terms of relevance to the subject matter. During the abstract scanning, filtering for duplicates took place since some of the articles from the top journals pool appeared in the database searches as well. The first iteration of the literature study ended with the identification of the final pool of relevant articles.

The process followed to identify the relevant literature during the second iteration involved a database search in EBSCOhost and Google Scholar. The keywords used for the second iteration were: organizational decision making and organizational decision making AND information. The most relevant articles were filtered by reading the abstracts.

The main bulk of the literature, however, was identified through backward and forward reviewing of the citations of the most relevant articles, previously identified in the database search, as suggested by Webster and Watson (2002) in order to ensure the accumulation of a relatively complete literature.

4.2.3.2 Literature synthesis

The identification of the final article pool signaled the beginning of the synthesis phase of the first iteration. This phase involved three core activities. First all the articles were read thoroughly. Second, as the articles were examined one by one, I identified topics that were discussed across articles in relation to BI and decision-making. Finally, once the topics emerged I categorized the articles on the emergent topics as presented in chapter 2. Taking an interpretive stance to the literature review, the synthesis phase involved induction and interpretation. As such, no concepts were specified before the synthesis. It was during the synthesis that the concepts emerged from the literature. The aim was not to merely aggregate the articles but rather to synthesize them around concepts grounded in the studies included in the review.

The findings from the analysis and synthesis of the literature are based on my understanding and interpretation of the articles. However, these findings were discussed with my supervisors and other colleagues at the ITM department. Further, the literature review was presented at three conferences (Australasian Conference on Information Systems 2010, BI congress 2010, and Organizations and Society in Information Systems 2010) at which BI researchers provided valuable input.

4.2.4 Designing and conducting the interpretive study

An interpretive study is a well-accepted approach to investigating complex phenomena both in the field of information systems (Benbasat et al. 1987; Orlikowski and Baroudi 1991; Walsham 1995; Klein and Myers 1999) as well as in the field of decision-making (Allison 1971; Pettigrew 1973; Eisenhardt 1989). The choice of an interpretive study over action research was based on two considerations. First, I did not wanted to be perceived by the field subjects as attached to a specific department, party or community. In this way, the interviewees would be more open and honest with me (Walsham 2006). Neither, did I want to become overly "socialized to the views of the people in the field and loses the benefit of a fresh outlook on the situation" (Walsham 2006, p. 322). An interpretive study provided me with the opportunity to create and maintain a critical distance needed when analysing the data. More specifically, a descriptive interpretive study is employed here to gain a deep understanding of how BI is used in organizational decision-making (Walsham 1993; Myers 1997). According to Gadamer (1976) understanding is achieved through the hermeneutic circle where:

> … the movement of understanding is constantly from the whole to the part and back to the whole. (p. 117)

The pilot study provided me with a ‘helicopter’ view of the organization by collecting company documents and conducting interviews in order to find out how the decision-makers used BI in decision-making. While this pilot study provided an overview of the organization (the whole), the parts (processes, departments, culture and organizational dynamics of the organization) were missing from the picture. The pilot study also provided a panoramic indication (the whole) of how this organization used BI in decision-making but contextual details (the parts) were again missing, such as uses of BI in specific decision making processes. I could have continued to expand the pilot study and kept conducting interviews with decision-makers on how they used the BI output in their decision-making. However, I understood that I was missing many contextual details that would enable me to better understand the way BI is used in decision-making processes.

Therefore, I decided to focus on a specific organizational decision-making process. In this way, the context, the complexities of the decision, the specific BI output and how it was used through a process would be able to take center stage. That said, in an organization there are many decision-making processes and it would be impossible to study all of them. During the pilot study, many interviewees referred to the IT project prioritization process in the organization and the difficulties of using BI in this process. After many discussions with the company and my university supervisors I concluded that IT project prioritization would be an adequate process for investigating the use of the BI output in organizational decision-making.

Although individual actors and decision-makers take part in the process the focus is not on the separate individuals but on the dominant attitudes and interpretations among them, pointing toward an organizational level unit of analysis.

A longitudinal study of the IT project prioritization process allowed for a rich understanding of the phenomenon, i.e. how the organization used the BI output in the specific process (the parts). It also enriched my understanding because it allowed me to follow the phenomenon over a period of time (the whole) in contrast to the pilot study.

The next step was to identify whom I would interview and what other kinds of data I would need in order to gain a thorough understanding of the phenomenon. As Walsham (2006) remarks:

> Interviews should be supplemented by other forms of field data in an interpretive study, and these may include press, media, … internal documents [which] may include strategies, plans and evaluations. Direct observation or participant observation of action is a further data source. Web-based data from e-mails, websites or chat rooms can be very valuable (p. 323).

At that point in time, my development manager had arranged a meeting for me with the Head of IT Governance. In this meeting, we decided that he would be my mentor through the process of data collection and help me get access to data. Indeed, he was a great facilitator in this process. He introduced me to the IT project prioritization process and its different units. Initially, we made a list together of some key people in the IT project prioritization process and he brought me into contact with them. I was also allowed to follow certain groups during the IT project prioritization process and to participate in their meetings as an observer. He further gave me access to all the repositories of the different prioritization groups in which relevant documents were stored as well as to several SharePoint sites, which served as document repositories for the governance structure, the overall prioritization process and the strategy of Group IT.

Overall, the interpretive study is illustrated in Figure 8. In the next sections, I provide insights into how I conducted the study. In section 4.2.4.1, I present the style of involvement in the organization. Section 4.2.4.2, describes the data collection process and methods, while section 4.2.4.3 describes the data analysis method.

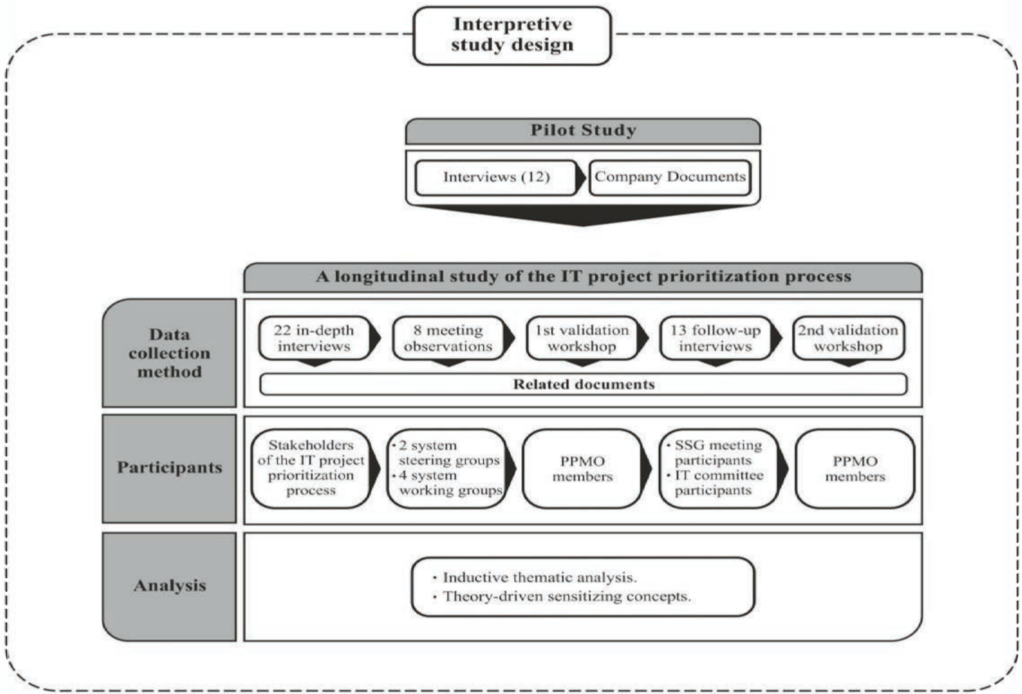


Figure 8: Interpretive study design

4.2.4.1 Style of involvement in the organization

When I was enrolled in the PhD project I was moved from the project had been allocated to in the Group IT to the BICC, a new department that had written the proposal for the PhD project (further explained in the empirical setting). Thus, I moved from one department of the Group IT to another.

Although I was a member of the new department, I did not interview any of the members of this department since they were out of the scope of my study. My aim was to investigate how the BI output was used in decision-making. The department that I was allocated to was in charge of building and developing the technologies that support a BI process and applications. I did hear, though, many stories about BI and the problems that users experienced with the BI tools and applications, as well as about the quality of the BI provided to the users. To avoid identification, as much as it was possible with this particular group, I would present myself to the interviewees as a researcher that spent most of my time at Copenhagen Business School although I was a member of BICC.

My involvement in the organization reflects the spectrum between the 'neutral' observer and the participant observer that Walsham (2006) speaks of. I did not participate in generating or altering the BI output that the decision-makers received. Rather I observed how they used the BI output that they had available during the period of the study.

During the observations I carried out my role was strictly passive and I did not participate in any way. I only observed different meetings in which decision-makers were supposed to prioritize IT projects to be implemented the following year. I observed how they made decisions and only asked questions about the meeting during the follow-up interviews.

However, during the workshops that were performed at the company, at which the results of the data analysis were presented, I was at the other end of the involvement spectrum, engaging as a participant observer. According to Walsham (2006), the participant observer role implies that the researcher is a member of the group. Once I had presented the results, I would engage in discussions with the other participants in the workshop. I would present several problems that I had observed and provide explanations or even suggestions on how we (the organization) could solve the problems. Although the other members were aware of my identity and role as a researcher, they were very open in the workshops, even discussing rumors and personality characteristics of specific decision-makers. They also expressed their satisfaction and frustrations with specific processes, groups, or departments and provided alternative explanations for the data.

I believe that being an employee of the organization, although a passive one during the PhD project, helped the participants to open up since they perceived me as one of the team, albeit contributing to the organization in a different way. For example, many would ask me at the end of an interview how this research would change the way things were done at the bank and if they could access any articles or reports that I would produce.

The fact that I was relatively new to the organization and spent half of my time (eventually more) at the university helped me not to become "socialized to the views of the people in the field" and thus not to "lose the benefit of a fresh outlook on the situation" (Walsham 2006, p. 322).

Nonetheless, I acknowledge that although I started as a rather neutral observer eventually when the time came to provide feedback my involvement became more active as I also felt "the need to offer direct advice and help as time went on … in return for the time and effort the organization put in" (Walsham 2006, p. 322). In the next sections, I provide further details on the interviews and observation studies.

4.2.4.2 *Data collection*

Data collection was performed simultaneously with the organization's IT project prioritization process for 2011 over a period of 14 months from May 2010 until July 2011. This process involved the evaluation of ongoing projects, the initiation and monitoring of new projects, as well as the prioritization of IT project for the next year. IT project prioritization is a core activity of project portfolio management.

In order to understand the prioritization process of IT projects and the use of BI in such a complex process, the researcher must be familiar with the context in which the study takes place. It also necessitates observation of the process as well as a range of interviews with the involved managers to capture changes over time. In this phase, I used a combination of semi-structured interviews, observation studies, recorded meetings, validation workshops and written material collected from different business units of the Danske Bank Group (described in chapter 5), as depicted in Figure 9, that were involved in the IT project prioritization process.

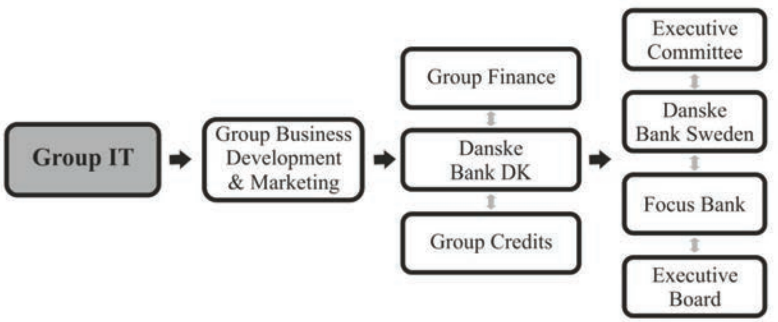


Figure 9: Data collection source units

Observation studies took place in two departments of Group IT in which I observed managers in their natural setting. The observation studies served primarily as a way to gain an understanding of the activities of the two departments and the context in which project prioritization took place. I was formally introduced as a researcher who would be present and who might ask questions about projects and their prioritization. The field notes collected from these observations also served as background information for the interviews and meetings.

The richest sources of empirical data for exploring the prioritization process originated from the 22 semi-structured interviews with the managers (approximately 580 pages of transcription) and the transcripts of the eight recorded meetings (approximately 170 pages). I adopted an open approach as I was studying a largely unexplored phenomenon. The study design was not strictly defined in advance. Instead, I followed an evolutionary, iterative approach in which the activities of data collection supported each other throughout the process. For example, the meeting observations were used as input into the follow-up interviews that were conducted at a later stage.

Semi-structured interviews with stakeholders from different levels and units of the organization were conducted in order to understand the IT project prioritization process (see Table 6). These interviews provided personal views of the current prioritization process, its context and the history of the process.

Organizational Role	**Organizational Unit**
Head of IT Governance	Group IT
Development Director 1	Group IT
Development Director 2	Group IT
Development Director 3	Group IT
Development Director 4	Group IT
CIO	Group IT
Senior Business Representative 1	Group Business Development & Marketing
Business Representative 1	Danske Bank DK
Development Director 5	Group IT
Business Representative 2	Realkredit Denmark

Senior Business Representative 2	Group Business Development & Marketing
Head of Digital Banking Program	Group IT
Development Manager 1	Group IT
Head of PPMO	Group IT
Portfolio Manager	Group IT
Business Representative 3	Group Operations
Idea Qualification Manager	Group IT
Business Analyst	Group IT
Followup Business Analyst	Group IT
Head of IT Strategy	Group IT
Business Analyst 2	Group IT
Head of Strategic Business Unit	Group Business Development & Marketing

Table 6: Participants in the first round of interviews

Two main stakeholders of the process were identified. First, Group IT, which governs the project prioritization process and implements the prioritized projects. Sixteen interviews were performed with stakeholders from Group IT at different levels of seniority. Second, the business units responsible for product-related functions and actively involved in the project prioritization process. Six representatives from different levels of the business units were interviewed.

All the interviewees were active participants in the prioritization process. The form of the interviews was semi-structured and open ended questions were asked about the prioritization process on a one-to-one basis. Each interview lasted an average of 60 minutes. An interview guide was prepared in advance (see Appendix B). Not every question was asked, however, but rather the guide served as a checklist that all the topics were touched upon, always depending on the available time. All interviewees were asked to reflect on their participation in the IT project prioritization process, their perceptions of the process, the information that was provided to them, and specifically the BI output of the projects. They were further asked how they used the BI output in this process and what their own criteria were for prioritizing a project. They were continually probed to provide examples or to describe specific events from their own experiences.

To gain insights into how prioritization decisions were made in real settings, I also observed different meetings in which the participants were required to produce a prioritized list of projects by participating in the system steering groups of the two departments that I was following. The system steering groups (SSG) are in charge of monitoring, approving and prioritizing projects (more details in chapter 5). These groups met together four times per year (See Table 11 for a timeline of these meetings). I participated in the two last meetings (see Table 7). To distinguish between the different meetings of the two SSGs I refer to the meetings of the first SSG as "SSG meeting 1.1" and "SSG meeting 1.2" and to meetings of the second SSG I as "SSG meeting 2.1" and "SSG meeting 2.2". For the previous two meetings of the SSGs I collected related materials including meeting minutes, presentations given at the meetings and any reading material that was sent to the participants before the meeting.

	Type of meeting	**Nr. of participants**	**Duration**
SSG 1	SSG Meeting 1.1	13	2 hours
	SSG Meeting 1.2	11	1.5 hours
	SWG Meeting 1.1	8	1 hour
	SWG Meeting 1.2	11	1 hour
SSG 2	SSG Meeting 2.1	11	1 hour
	SSG Meeting 2.2	10	1.5 hours
	SWG Meeting 2.1	13	1 hour
	SWG Meeting 2.2	6	1 hour

Table 7: Meetings observations

I also observed some preparation meetings that were held by lower management staff – the system working groups (SWG) – before the meeting of the prioritization groups. In all the meetings, I was only an observer and did not participate in any way. I introduced myself in the beginning of the meeting and stated my presence. In every meeting, I also asked for permission to record it. The prioritization groups and the prioritization meetings are thoroughly described in chapter 5 along with a thorough description of the IT project prioritization process.

The meeting observations led to a follow-up round of 13 interviews (see Table 8) and a collection of additional background material. From these 13 interviews, 4 interviews were follow-up interviews on the 4 SSG meetings that were observed. These interviews were conducted with the development manager who steers the meeting. No interview guide was prepared for the follow-up interviews. Rather, the PowerPoint presentation that was presented at the meeting was used as a guide (not included in the thesis due to the confidential nature of the presentations). In the interview with the development manager, we went through the presentation and discussed specific instances that I had noted as important during the meeting or based on the meeting transcript. I asked for explanations of technical terms that I was not familiar with, while at the same time I asked about specific projects and their BI output. For example, why one project was prioritized over another, or why one member mentioned the BI output for a specific project, etc.

The rest of the follow-up interviews concerned the IT committee meeting. The IT committee is the final approval body of the overall IT portfolio of projects for the Group IT. The committee meets four times per year, but only in their last meeting do they prioritize projects and finally approve the overall portfolio. This process is thoroughly described in chapter 5. The follow-up interviews focus on this final prioritization meeting and include the managers who were participating in the meeting, and both decision-makers and information providers such as the portfolio manager, the Head of PPMO and the SSG representatives. Table 8 shows the interviews conducted in this round.

Organizational Role	Organizational Unit
Follow-up on SSG Meeting 1.1	Group IT
Follow-up on SSG Meeting 2.1	Group IT
Follow-up on SSG Meeting 2.2	Group IT
Follow-up on SSG Meeting 1.2	Group IT
Follow-up on IT committee meeting with Head of PPMO	Group IT
Follow up on IT committee final prioritization meeting with Portfolio Manager	Group IT
Follow up on IT committee final prioritization meeting with Head of PPMO	Group IT
Follow up on IT committee final prioritization meeting with CFO	Group Finance
Follow up on IT committee final prioritization meeting with Senior Business Representative 1	Group Business Development & Marketing
Follow up on IT committee final prioritization meeting with Development Director 4	Group IT
Follow up on IT committee final prioritization meeting with Development Director 1	Group IT
Follow up on IT committee final prioritization meeting with COO	Group Business Development & Marketing
Follow up on IT committee final prioritization meeting with Executive Committee Member	Executive Committee

Table 8: Participants in the follow up interview round

For the follow-up interviews with IT committee participants, I created a short interview guide (Appendix C) based on the material that was send to the IT committee members before the meeting. In this material, there was detailed information about the meeting agenda. This helped to focus the questions on the different points of the agenda and thus to acquire rich accounts of what exactly happened in the meeting. The interviews were semi-structured in nature and the main focus was on asking for examples and narratives of how the meeting unfolded.

The additional background material included other prioritization documents, PowerPoint presentations, meeting minutes, forms, spreadsheets, reports, organization charts and memos. These documents enabled me to gain more insights into the organization's prioritization process and to triangulate the data sources with the interviews and the meeting observations (Lee 1999). In particular, the meeting documents and presentations helped to create the interview guides and stimulated my interpretation of the themes and concepts that emerged later during data analysis. Figure 10 presents an overview of the overall data collection process. The next section presents the data analysis process.

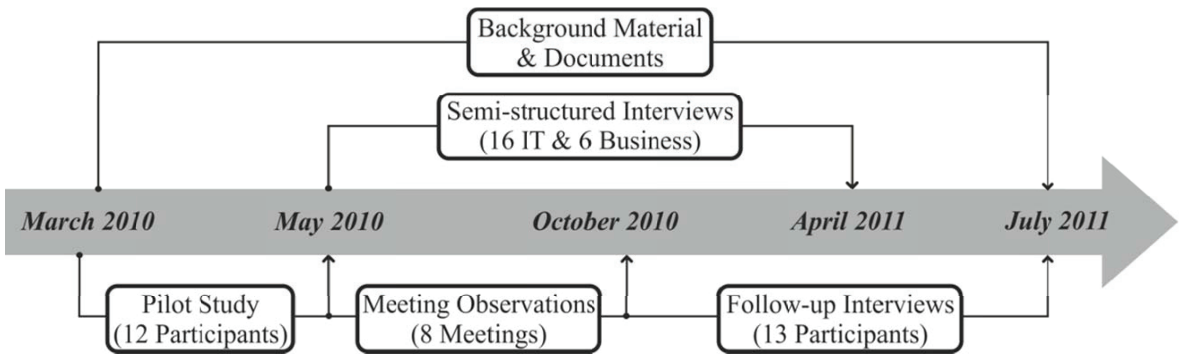


Figure 10: Data collection process

4.2.4.3 Data analysis

All the interviews and the recorded meetings were transcribed. I carefully read through the interview and the meeting transcripts as well as the official notes and the field notes to get a detailed picture and an overview of the empirical setting. In order to investigate the research question, I employed thematic analysis (Boyatzis 1998) and constant comparative techniques (Suddaby 2006; Strauss and Corbin 2008) in order to gather and analyze qualitative data in a systematic and iterative manner.

According to Boyatzis (1998), thematic analysis is a process for encoding qualitative information and developing a list of themes or a model with themes. Constant comparative techniques (Strauss and Corbin 2008) or what Boyatzis (1998) refers to as "a compare-and-contrast process to extract observable differences between or among the samples" (p. 33) were used as analytic strategies to applying coding and developing categories and themes.

Boyatzis (1998) describes two different approaches to conducting thematic analysis which form a continuum. At one end is the theory-driven approach and at the other end is the data-driven approach. Both approaches are valid for developing themes and help researchers to develop theory or theoretical concepts. However, Boyatzis (1998) points out that "they differ in the degree to which the thematic analysis starts with a theory or the raw information." (p. 29). As such, theory-driven theme development begins with a prior theory or concepts and elements of a specific theory. These concepts or the relationships between them are sought in the raw data. Here, the theory (concepts and relationships) serves as a lens or framework to look into and analyze the raw data. On the other hand, the data-driven approach to theme development involves an inductive process in which the themes are developed from the raw data based on the actual words of the interviewees or the subjects of the study. As Boyatzis (1998) notes:

> It is the task of the researcher to interpret the meaning after obtaining the findings and to construct a theory after the discovery of results. (p. 30)

In the middle of this continuum there is the prior-research-driven theme development approach in which a review of the literature typically "provides insight into the possible development of a thematic code" (Boyatzis 1998, p. 37).

The thematic analysis method was used to describe, organize and interpret aspects of the phenomenon under investigation. In this analysis, themes were generated inductively from the raw data and identified at the 'manifest level' i.e. directly observable in the data (Boyatzis 1998).

The approach that I employed to analyze the data was a hybrid approach of the data-driven approach and the prior-research approach. I was reading relevant literature during data collection and data analysis processes and in some cases concepts from the literature were used as sensitizing concepts to make sense of data. However, in other cases, they were used rather unconsciously, since the literature informed me as a researcher regarding the phenomenon under study. As such, in the continuum, my data analysis approach is situated between the data-driven approach and the prior-research approach as illustrated in Figure 11.

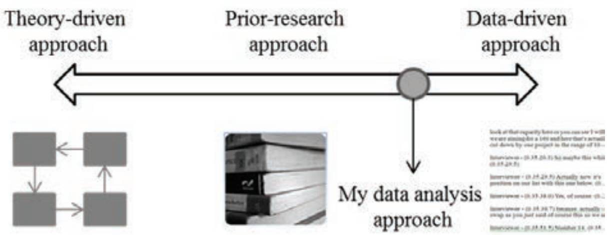


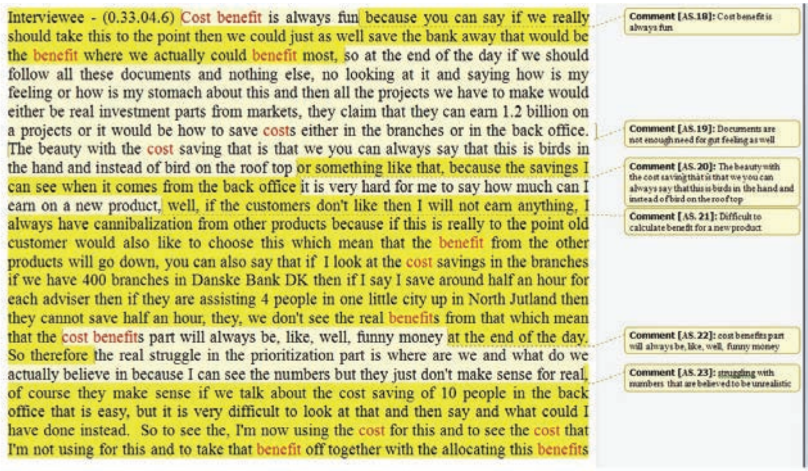
Figure 11: Theme development continuum diagram

I began by analyzing the data from the first round of 22 semi-structured interviews. When reviewing the interview transcripts and background material, together with the field notes recording my impressions at the time of each interview, I was looking, specifically, for indicators of how the BI output was used in the prioritization process as it unfolded in practice. This was an iterative process during which I considered different codes and reflected upon them until I felt confident about the code. In the following paragraphs I make an attempt to open the box of the coding and theme development process.

My first reading of the transcripts did not yield many codes or themes. As Boyatzis explains, this is a rather common phenomenon for researchers new to thematic analysis. As a result, I decided to approach the transcript in another way. I started to develop a timeline of the IT project prioritization process and its phases (described in detail in chapter 5). This timeline facilitated my understanding of the complex prioritization process.

Next, I went back to read the transcripts again. This time I performed three different activities in order to categorize the data in different ways. While reading in MS Word I applied open coding using interviewees' words or phrases by making a comment in in the margin (see Figure 12). The codes captured components of raw data across the different sources which varied from a single word to entire passages that captured ideas and themes such as "hard data", "BI fosters dialogue", "cost-benefit is free lunch", "benefits", "feelings" and prioritization criteria or irrational behaviors (i.e., outside the official guidelines).

Each interview was coded separately on the basis of in vivo terms or phrases used by the interviewees (i.e., first-order categories (Van Maanen, 1988)), based on the categorization and theme analysis techniques suggested by Miles and Huberman (1984) and Boyatzis (1998). I also highlighted passages that I found interesting but had no immediate instinct for how to code in yellow. Last, passages or information that were related to the process of IT project prioritization were entered in a separate spreadsheet.



Interviewee - (0.33.04.6) Cost benefit is always fun because you can say if we really should take this to the point then we could just as well save the bank away that would be the benefit where we actually could benefit most, so at the end of the day if we should follow all these documents and nothing else, no looking at it and saying how is my feeling or how is my stomach about this and then all the projects we have to make would either be real investment parts from markets, they claim that they can earn 1.2 billion on a projects or it would be how to save costs either in the branches or in the back office. The beauty with the cost saving that is that we you can always say that this is birds in the hand and instead of bird on the roof top or something like that, because the savings I can see when it comes from the back office it is very hard for me to say how much can I earn on a new product, well, if the customers don't like then I will not earn anything, I always have cannibalization from other products because if this is really to the point old customer would also like to choose this which mean that the benefit from the other products will go down, you can also say that if I look at the cost savings in the branches if we have 400 branches in Danske Bank DK then if I say I save around half an hour for each adviser then if they are assisting 4 people in one little city up in North Jutland then they cannot save half an hour, they, we don't see the real benefits from that which mean that the cost benefits part will always be, like, well, funny money at the end of the day. So therefore the real struggle in the prioritization part is where are we and what do we actually believe in because I can see the numbers but they just don't make sense for real, of course they make sense if we talk about the cost saving of 10 people in the back office that is easy, but it is very difficult to look at that and then say and what could I have done instead. So to see the, I'm now using the cost for this and to see the cost that I'm not using for this and to take that benefit off together with the allocating this benefits

Comment [AS.18]: Cost benefit is always fun

Comment [AS.19]: Documents are not enough need for gut feeling as well

Comment [AS.20]: The beauty with the cost saving that is that we you can always say that this is birds in the hand and instead of bird on the roof top

Comment [AS. 21]: Difficult to calculate benefit for a new product

Comment [AS. 22]: cost benefits part will always be, like, well, funny money

Comment [AS. 23]: struggling with numbers that are believed to be unrealistic

Figure 12: An example of coding during the second iteration

In the third iteration, I read the transcripts again and this time I edited different codes, giving them different or better labels. At the same time, I spend more time in the yellow passages to figure out a good code. Once I had settled on a code label, I entered all the codes into a spreadsheet. After entering all the codes that I had identified in the 22 first transcripts I started to do the same for the meeting transcripts and the follow-up interview transcripts. At the end of this process, after many months of work, I had a long spreadsheet that contained all the codes from all the transcripts of the interviews and meetings.

During the next phase of the analysis, codes that were recognized as similar were collated into the same first-order categories, using informants' language whenever possible. Many researchers agree and recommend staying as close to the data as possible" (Wolcott 1994 as cited in Boyatzis 1998, p. 35) or naming phenomena by "close examination of the data" (Strauss and Corbin 1990 as cited in Boyatzis 1998, p. 35). At this stage iterative cycles were performed between data analysis and consultation with relevant literature as guides to theme development.

As a result, the first order codes were organized into data-tables that supported a single theme or topic across data sources (Vendelø and Rerup 2011). The interview coding activity continued until it was not possible to ascertain any more distinct, shared patterns among the data. In this manner theoretical saturation was accomplished (Glaser and Strauss 1967). In parallel with the development of the first-order categories, linkages among the categories started to surface and become evident. These linkages were the seeds that initiated the development of second-order themes.

In the next step, I developed the second-order themes by using four key questions to sort through the raw data. The questions were developed based on the understanding of the IT project prioritization process that I had gained to that point. Those questions were:

1. What are the characteristics of the IT project prioritization process?
2. What are the characteristics of the BI output and how is it perceived by the decision-makers?
3. How do decision makers use the BI output in this prioritization process?
4. What kind of information is sought by decision-makers and how is it used in the process of IT project prioritization?

As IT project prioritization consists of two levels, the SSG level and the IT committee level, the questions were asked for each level respectively.

Through an iterative analysis second order themes in relation to the characteristics and use of the BI output at each level respectively emerged as "transparently observable" (Eisenhardt, 1989, p. 537) phenomena in the data, which I use to present and discuss the findings in chapter 6, inspired by Pratt (2009). Below, I present the data structure (see Table 9) that emerged at the end of the data analysis process for the SSG level as an example. A similar structure emerged for the IT committee level. It should be noted that here only one example of raw data is offered while in reality there are many examples of each second order theme. The themes consist of theoretically distinct concepts that emerged from the data when analyzed at a more abstract level.

In the final step, the second-order themes were assembled into aggregate dimensions, which led to an understanding of the role of BI in the organizational decision making process of IT project prioritization presented in chapter 6. During the analysis the focus was on capturing phenomena and processes that spanned multiple levels. The emergent dimensions thus depict the use of the BI output as performed by decision-makers in the IT project prioritization process that ultimately grant an organization-level character to the unit of analysis.

The emergent data structures from the SSG level and the IT committee level will serve as frameworks to present my findings in chapter 6.

Based on the above analysis of the IT project prioritization process at Group IT and the use of BI in this process, I performed two workshops. The first workshop included a three hour presentation of the results to the PPMO team members who were in charge of the information specifications, acquisition, standardization and distribution in the IT prioritization and portfolio management process in Danske Bank. This was the team that introduced the BI output as a mandatory input in the IT project prioritization process.

The purpose of the workshop was twofold. Apart from the obvious purpose of presenting the results to the team and increasing their awareness of the problems/issues that the process and the people involved were currently facing, the workshop was also used as a validation tool for the results. That is, the workshop was meant to discuss and validate the results of the analysis I had performed on the 22 semi-structured interviews. The main findings were summarized in a paper that was sent to participants before the workshop. In the workshop I briefly presented the findings and then most of the time was used to elaborate on the different views of the participants.

First order codes (raw data)	Second order themes	Aggregate Dimensions
"It's completely in the dark for me how that [project] could find its way to the project plan. Everything, that's before that [the plan], is an absolute black box and it depends on the manager [development manager]" (Business Analyst)	Lack of transparency of the IT prioritization process	Process and project characteristics
"There are so many interdependencies between areas and simultaneous effects, it is highly uncertain [the impact of a project in other projects]" (Development Director 2)	Lack of overview of projects' interdependences	
"We really don't know at this stage, how complex it is. With the complexity of a project of that kind, I actually risk spending double as much money." (Business Representative 3)	A projects' technical complexity	
"This number [cost calculation] could go up and down as a year expands." (Head of PPMO)	Cost calculation inaccuracy, and unreliability of benefits calculations	
"In 3 or 4 years time who takes care of the money we spent now when we are in 2014? Nobody!" (Development Director 2)	Lack of benefit follow-up process on the implemented projects	
"There is some practical issues involved in actually executing a plan and the limiting factor is really resources and competences." (Development Director 4)	Resource capacity and competency constraints	
"It's not just benefit-cost ratio, it is much more and if we combined those things then we think that we get a nice view on this [the project proposal]" (SSG Meeting 1.2)	Supplementing the BI output	Tactics of using the BI output
"I don't think it's a benefit discussion it's much more whether actually it's worthwhile doing it." (Business Representative 3)	Substituting the BI output	
"I interpret the reports and I make statements on what I see as the outcome from the analysis of the report." (IT Finance Manager)	Interpreting the BI output	
"So I will not tell them… since I am not being rewarded for being honest about the total costs of ownership, I'll simply cut down on the information." (Business Analyst)	Re-framing the BI output	

Table 9: Datastructure that emerged as a result of the data analysis process: from first order codes to final dimensions

Many questions were posed to the participants of the workshop about the findings and their opinions on the reasons for the results. They were asked to elaborate on the findings and to provide their own interpretations on the findings. In this way, the workshop led to fruitful discussions both in terms of how the organization could address the problems identified and identifying important aspects of the use of the BI output by different decision-makers. In the workshop the discussions revolved around the validity of the findings with the participants confirming most of the findings. Specifically, the Head of IT Governance stated:

> The picture that you are painting feels right. We have discussed many times that they see benefits as a free lunch and I guess it is right that we should give them incentives in order to emphasize the importance of the benefit follow-up process. (Notes from the first workshop)

Overall, the members of the workshop validated my first results and we agreed that another workshop should be held in the future to follow-up on new results. At the time, many organizational changes were taking place and some of the main points of the workshop were incorporated into these changes.

A follow-up workshop was duly held with some of the participants from the first workshop. In this workshop I reported the newest findings based on an analysis of all data collected. We focused on which problems were addressed by the organizational changes that had taken place as well as what other problems remained unaddressed and how they might be addressed. The participants discussed the final themes and aggregate dimensions that emerged during the final analysis of the empirical data. In general, they agreed with the findings although they were surprised by how common the substitution tactic (described in chapter 6) was used in the decision-making process and thus realised that they had to make more room for other kinds of inputs into the prioritization process through formal information flows. They were also impressed with the openness that interviewees had shown during the interviews. This workshop thus served as a validation of my findings and conclusions.

Apart from the validation workshops, I also presented the analysis and findings of my research at several conferences and workshops where valuable input was provided throughout this research project.

4.3 Summary

In this chapter, I presented the ontological and epistemological assumptions upon which this study was based. Next, I presented how I made the choice of the interpretive study as the appropriate research approach. Further, I presented my own background and preconceptions that shaped the study initially and discussed how I discovered biases that led me change my research goal and design. In addition, I have attempted to shed as much light as possible on how I conducted this study. In particular, I have presented in detail how I conducted the literature review, my involvement in the organization, the data collection process as well as the data analysis process. I understand that the reader might at this point have many questions about the organization, the different groups and the IT project prioritization that were only mentioned briefly. The next chapter offers a thorough description of the organization and a detailed analysis of IT project prioritization and how it unfolds in practice.

5 The Empirical Setting

The aim of this chapter is to provide background information to facilitate understanding the results of the interpretive study in its broader organizational context. The rationale behind this chapter is to provide the reader with a contextual frame in which the results of the empirical findings are embodied and embedded. For this purpose, the chapter is organized into two main sections. Descriptions of the Danske Bank Group and the inception of the PhD project idea are provided, followed by an in-depth account of the IT project prioritization process in the organization.

In the following sections, I describe the organization and outline its historical development. Next, I describe its structure and present the organizational chart as it was during the period of study. I focus on the role of Group IT and information technologies in the organization as relevant to the analysis of the use of the BI output in organizational decision-making and the inception of the PhD project idea. In the subsequent sections, I lay out the IT project prioritization process. Before I describe the specific IT project prioritization process in the organization, I offer an introduction to IT project prioritization in general in order to provide the reader with an overview of the subject as it is addressed in the literature. First, I illustrate the structure and a timeline of the prioritization process to provide an overview. Next, I present the activities undertaken by decision-makers prior to the prioritization meetings before describing how a typical prioritization meeting unfolds.

5.1 The Danske Bank Group and the PhD Project Idea

The organization serving as my empirical setting is Danske Bank, an international financial institution with the headquarters in Scandinavia. The study was primarily conducted at the Group IT of the organization, which also served as the access point to the larger Danske Bank Group as shown also in the organizational chart in Figure 2. The Group IT is in charge of standardizing and automating processes and developing IT systems to enhance efficiency in the entire organization. Before going into a detailed description of Group IT, some background information about the company and the history of the Group IT services is offered to provide a richer understanding of the organization.

5.1.1 Danske Bank's historical development

Danske Bank is the largest bank in Denmark and the second largest in the Nordic region. It provides retail banking services in many countries in northern Europe, i.e. Denmark, Sweden, Norway, Northern Ireland, Ireland, Finland and the Baltic countries. Overall it is represented in 16 countries and employs approximately 24,000 people. Consequently, Danske Bank consists of several brands. Each of the brands is a bank by itself with a specific market, with the most profitable being the Danske Bank DK brand. The Danske Bank Group has been growing steadily both organically and through strategic acquisitions. The organization is recognized as a successful financial institution with a high market share.

The group has its roots in the 1870s when the Den Danske Landmandsbank (the Danish Farmers' Bank) was established in Denmark. Den Danske Landmandsbank remained the largest bank in Scandinavia from the 1920s to the 1950s. During this period the bank expanded its branch network in Denmark. In 1958 the bank had 58 branches in the Greater Copenhagen area alone. Over the next decades the group worked to make its products and services more accessible throughout Denmark. In 1973 Den Danske Landmandsbank was the first bank to offer an online connection to its branches (see Figure 13). The growth of the organization and the change of its customer base from farmers to middle class citizens resulted in a name change to Den Danske Bank in 1976.

Figure 13: 1973 – Danske Bank offers online connection to its branches

By 1976 the bank had a national growth strategy but as further local expansion was not seen as promising, the group made a change towards an international expansion strategy. The same year, the group announced its first international branch in Luxemburg under the Danske Bank International brand. Branches in London and Hamburg followed in 1983 and 1984 respectively. The next period was characterized by mergers, acquisitions and increased international expansion that shaped the group in its current form and size.

In 1990 Den Danske Bank merged with Handelsbanken and Provinsbanken under the name of Den Danske Bank. Directly after this the organization integrated the three banks' IT systems, giving the group a technological lead (Danske Bank Website) by facilitating one of its major projects - the integration of their IT operations in the mid 1990s.

In 1995 the group acquired Danica Pension and two years later, based on a new strategy of regarding the Nordic region as the group's home market, acquired the Östgöta Enskilda Bank in Sweden and opened branches in Stockholm, Oslo and Helsinki. In 1999 the group acquired Focus Bank in Norway to reinforce this Nordic strategy. Following this expansion, the group changed its name to Danske Bank in 2000.

In 2001, another merger followed between Danske Bank and RealDenmark, which included BG Bank and Realkredit Denmark (a mortgage finance provider). In spite of the merger the new units continued to operate under separate brands. Four years later, in 2005, although still in the Nordic region, the group made its most distant acquisition: the National Irish Bank and the Northern Bank in the Republic of Ireland and Northern Ireland respectively.

The most recent acquisition of the group was the Sampo Bank in Finland, which took place in 2007 and included the bank's subsidiaries in the Baltic region and St. Petersburg. The Sampo Bank, the National Irish Bank and the Northern Bank acquisitions were followed by an integration of their IT systems under the shared platform of Danske Bank. The financial crisis in 2008 signaled a turning point in the group's strategy once more. The international expansion strategy was replaced with a strategy focused on streamlining processes, cost reduction, profitability, credit and pricing. In 2008, it appears that the group changed their focus from an externally to an internally oriented strategy.

As of 2009 the company had the following organizational structure (see Figure 14).

The group had a two-tier management structure, with the Board of Directors deciding on general principles and the Executive Board responsible for the daily management of the group. The rest of the group was organized into four business areas and five resource areas. The business areas were banking, life and pension insurance and mortgage finance, financial markets (Danske Markets), and asset management (Danske Capital).

The resource areas composed a shared platform serving all the brands. The shared platform was developed and supported by the following resource areas: Group Business Development, Shared Services Centre, Group HR and Communications, Group Finance, and Group Credits.

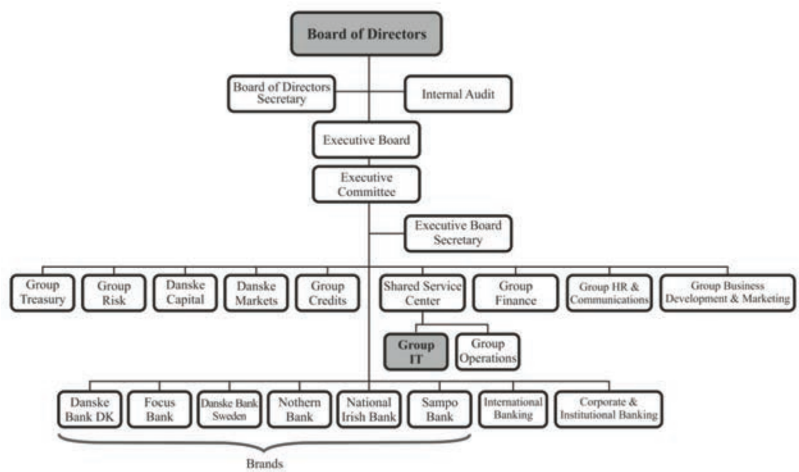


Figure 14: Organizational chart as of September 2009

(Source: The official organizational chart of the group found at its official website)

Each resource area is responsible for common concepts and shared best practices related to operating the banking brands. For example the Shared Service Centre includes the Group IT and Group Operations, which serve the whole group in terms of IT services and operational activities such as back office operations respectively. Today the group serves 5.1 million customers in both retail and corporate contexts. Its branch network consists of 804 branches, the majority of which are in Denmark (373), Finland (122) and Northern Ireland (89).

While this section presented the historical development of the Danske Bank Group the next section focuses on its technological orientation.

5.1.2 Technological orientation of the Danske Bank Group

Due to the fact that financial services is one of the most digital industries, information technology is very important for the company. Until 1997 the group did all of its centralized and decentralized IT operations and IT system and product development internally.

Over the course of the last 15 years the group gradually outsourced its IT operations. In 1997 the centralized IT operations were outsourced to a newly formed Danish IT services company, DMdata, of which Danske Bank owned a 45% stake. In 2004 the company proceeded to a larger outsourcing activity in which decentralized IT operations were outsourced to IBM. This was prompted by a major system breakdown the previous year that led the bank to realize that to ensure stability and the future development of its increasingly complex IT systems it would be better to have the maintenance of all its IT platforms in one place. The new vision of Group IT became the "One bank – One system" with the goal of maintaining one system to cover the needs of the entire group. At the same time, Danske Bank sold its share of DMdata to IBM. This outsourcing was also driven by expectations of realizing substantial savings in the years ahead. However, the company continued to carry out system and product development itself in the Group IT, serving all brands, business units and resource areas.

In 2008 the vision changed to "One Platform – Excellent Brands" differing from the previous vision by acknowledging the rigidity of the "one system" ideology and recognizing the unique characteristics of the markets that each brand was addressing. Nonetheless, the idea of a common platform was still prominent. This would be a platform that would, however, be more flexible in meeting the different needs of the brands while benefiting from common concepts and shared best practices across them. All the brands of the group used the same transaction systems, including account, deposit, loan and credit systems. The One Platform vision was a manifestation of the strategy change towards the internal environment: streamlining processes, cutting costs and standardizing activities and tasks.

In terms of information technology development, the Danske Bank Group was the market leader when compared to other banks. It was the first bank to introduce an online connection to branches (in 1973), was the first bank to introduce e-banking facilities in Denmark (in 2000) and, more recently in 2010, was first bank to offer an iPhone application to its e-banking users. The iPhone app became a huge success, 30,000 customers downloading it in the first week of September 2010. This resulted in a massive coverage of the group and the iPhone application in the media. Eventually, after offering the application on the Android platform a month later, the Bank had gained 3,000 new customers and two prizes at the Danish App Award in 2011: "Best Functionality" and "the App of the Year" (Danish App Awards 2011).

In addition, the bank possesses 61 talking ATM machines targeted at blind and partially-sighted individuals. Danske Bank has also been very active on the latest technological trend of social media. Particularly, it uses social media as a platform to engage in dialogue with their customers on Facebook, Twitter and the YouTube channel DanskeBankTV. Danske Bank was voted the best company in terms of online communication among the largest companies in Denmark for 2011 (KW Digital 2012).

All the above, combined with the fact that from 2000 the Group IT employed more and more master's degree graduates, resulted in 2009 with the company having the most IT educated workforce in Denmark. This also shows that IT was perceived as a highly valued resource in the company and that the Group IT was an important contributor to the overall organizational strategy. In the next section, I present Group IT and describe its organizational structure.

5.1.3 Presenting Group IT

Group IT is one of the resource areas of the organization (see Figure 14). It is in charge of standardizing and automating processes and developing IT systems to enhance efficiency throughout the organization. The purpose of Group IT is to support the business areas of the organization, its brands, as well as the other resource areas. To do so, a close collaboration with the business areas, the brands and the resource areas is of great importance. Figure 14 shows the organization chart of Danske Bank and the position of Group IT within it. Group IT serves all the other units and departments with IT support, IT systems and IT services. As mentioned earlier, because the banking industry is one of the most digital industries, the other units are highly dependent on the IT organization for their operational and system development activities. Almost 70% of the activities in Group IT are IT development projects that support both end product development and the development of IT tools for internal use. The rest comprises of maintenance and other operational activities.

The main products developed and produced by Group IT are applications for banking and insurance. Most of these applications run on mainframes, but steadily, where it is possible, they are being converted to newer technologies. Example applications are for internet banking, client/server environments, and PCs. The mainframe systems run 24 hours a day, 7 days a week and perform 9 million transactions per day.

Group IT is physically situated at three locations in Denmark and one in India. The main facilities are located in Ejby, Glostrup, west of Copenhagen. The second largest location is in Braband close to Århus in Jutland (in the western part of the country). The third Danish location is in Lyngby, Copenhagen north. Finally, the Group IT has a facility located in Bangalore, India to which most of the mainframe development is outsourced.

Group IT includes seven development areas (DA):

1. Retail Solutions

2. Business Controlling Systems
3. Corporate Development
4. Business Infrastructure Systems
5. IT Service Management
6. Pension and Insurance
7. IT Development Processes and Tools

In charge of these development areas is the chief information officer (CIO), with development directors in charge of managing specific development areas. Each of these development areas is further divided into different departments (Dep). The head of a given department is called its development manager (DM). In all, there are 38 IT departments employing a total of around 2,200 employees. The departments are organized in a matrix structure in which one dimension represents the projects (P) (the development element, in which new systems are developed or existing systems are extended/changed) and the other dimension represents system management areas (SMA) – the maintenance element (see Figure 15 for the organizational structure of Group IT). These areas or SMA are organizational units responsible for operating and maintaining a set of systems, with the work is divided into tasks instead of projects. Project Managers are in charge of projects and report directly to the development manager, as do the system managers responsible for a system management area. When a project is completed, it is handed over to the system manager responsible for its remaining lifecycle. In order to achieve its objectives Group IT collaborates closely with representatives of the other business areas of the organization, and thus these business representatives are heavily involved in the prioritization of IT projects.

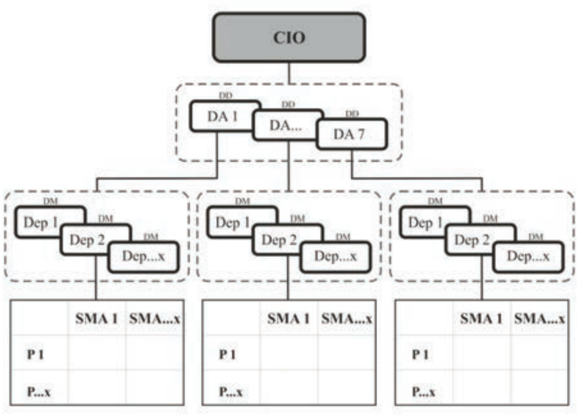


Figure 15: Group IT organizational structure

After having presented Group IT and its organizational structure, the next section, provides a narrative of the inception of this PhD project.

5.1.4 Inception of the PhD project idea

As mentioned earlier, the transaction systems alone produce 9 million transactions per day. This results in a massive amount of data available in the systems of the bank. In the 1990s the bank started to use early BI systems and practices by running analyses on historical data to observe patterns from which new insights might emerge and lead to better decisions. As one of the interviewees noted:

> I think it was trial and error or finding out yourself but also the tools we used at that time, someone told you, oh, this is the syntax here and that's how you do it. So the introduction was 30 seconds, and then trial and error I guess. But this is really many years ago, but that is how I record it, you know, that no courses, no big books, nothing. That is somewhat a mass of data made available to me as business user, in a structured way and I can access them, I can make out of those my own reporting, own analysis. (IT Finance Business Analyst)

At that point in time the BI practices were scattered amongst the different departments and areas. Many times, each of the areas would create their own databases with relevant data and analyze those using their own BI tools.

Today, in Group IT, there is a data warehouse department in charge of systematically gathering raw data from the source systems, including all the different transaction and administrative systems of the bank, and storing these data in the data warehouse so that they are accessible to organizational members who can in turn retrieve data for further analysis. The data are retrieved through different BI tools such as query analyzer or OLAP tools, which allows users to analyze multidimensional data from multiple perspectives. However, until 2008, while there was a data warehouse department, it included many different warehouses with some areas having their own, rather than a single, consolidated warehouse. Further, in these data warehouses it was often not very easy to perform 'slicing and dicing' of data according to particular user needs. In addition, there was not a standardized data model used by the source systems that input the data to the data warehouses. This created a proliferation of the duplicate entities with different names, i.e. different systems used many different names for the user ID, making the integration of data from different domains very difficult.

In 2008, Group IT decided to invest in a new BI platform that would incorporate state of the art technologies, processes and methods. The aim was to create a more resilient data warehouse, common data modelling practices, a common repository and BI tools, and to make these accessible to decision makers all over the group with the ultimate goal of making better decisions. The idea of combining, integrating and sharing data between and across different business domains was crucial to the new initiative. A new department was formed, the BICC, to carry out the development of the new platform.

At the same time, in the spring of 2008, the management of Group IT announced to the development areas and their departments that a new Industrial PhD project would be financed that year and that they should write proposals if they were interested in conducting research in their areas. The chief architect of the BICC wrote a proposal with the title: Cross–domain alignment, traceability and precision management. The purpose of the project was to support and improve the decision-making process by developing a framework to integrate and align business intelligence from different domains and existing IT applications.

The management of Group IT selected the above proposal among others. They felt that many decisions, especially in the Group IT itself, were based too much on "gut feeling" rather than data and analysis. They felt that there was room for improvement in their decision making processes. Characteristically, in one of the first meetings with the CIO he concluded by saying:

> The point is that we need more data to make our decisions! (CIO)

With the above proposal as a starting point, and before deciding on which decision-making processes I would focus on, I began a pilot study on how BI was understood by and used in the organization. During this pilot study I interviewed people from the following areas: Group IT, Group Credits, Group Finance and the Danske Bank DK brand (regions and branches). I started with Group IT, as I was an employee there, to investigate how BI was understood and how decision-makers used it. From there I identified analysts and decision-makers who used BI applications in Group Credit and Group Finance. Group IT has been already introduced, but below I provide a brief introduction of these other areas in which I conducted the interviews for the pilot study.

The Group Credit is a cross-organizational unit responsible for credit policies and reporting and monitoring the credit portfolio. Further, the unit is responsible for risk management and pricing across business units and customer segments. This group uses data analysis primarily to develop the credit systems that calculate the risk profiles of customers, to approve or decline loan applications, to enhance the valuation systems and to adopt price fees for loan applications. The credit process is one of the main users of data from the data warehouse. Several BI applications and standard reports have been created for the Group Credit.

Group Finance is another resource area that is responsible for performance management, accounting and investor relations as well as law and compliance across the whole Danske Bank Group. The performance management activities concern data gathering and analysis to track the performance of all brands and resource areas. These performance management activities are supported by a BI application called the Group Management Information (GMI) system. As one interviewee reported, this

> … is a business intelligence system primarily targeted for the branch network to enable them to make the decision locally in the market based on the best foundation. (Performance Management Specialist)

Since the GMI system was also used in Danske Bank DK (one of the brands, see Figure 7), I further explored the use of the BI output in decision-making in the regional units of Danske Bank DK and its branches. Danske Bank DK, as the brand that accounts for almost 50% of the earnings of the group, offers retail services to customers in Denmark. The headquarters of Danske Bank DK perform various analyses to track the performance of its branch network, which consists of regions and each region consists of several branches. Regional groups do the same for their own network of branches and the branches for the performance of their employees (advisors). The main BI application they use to perform analyses is the GMI system and the query analyzer to extract and run SQL queries.

During the pilot study I realized that when referring to BI decision makers would refer to the technologies, tools or applications or the process of accessing, retrieving and analysing data. However, when referring to the use of BI in their decision-making practices it was clear that BI was not used in organizational decision making as a process or a technology, rather it was the output of the BI process and of BI technologies that was used in decision-making. That is, in decision-making BI was perceived by the decision-makers as an output/product of a process. The decision-makers at the bank would refer to this output as 'the outcome of the analysis'. As already defined in the introduction, the BI output is the outcome of data-driven analysis that decision makers use in their decision practices. Further, as already mentioned in the introduction, decision makers found it easy to talk about the process and technologies used to generate BI output but difficult to elaborate on the use of that output in decision practices.

This realization, in combination with the findings of the literature review, made me change the research scope. Instead of focusing on improving the decision-making process by developing a framework to integrate and align business intelligence from different domains and existing IT applications, I decided to investigate the role of BI in decision-making and specifically how the BI output is used in organizational decision-making processes. This decision was made because there was a need both in the organization as well as in the BI literature to understand how the output of BI is used in organizational decision-making processes.

The next step was to decide which organizational process or processes would be included in the investigation. I chose to investigate a process of strategic importance to the organization: the process of IT project prioritization. This decision process is characterized by high complexity, uncertainty, ambiguity and it is inherently political. These characteristics make this decision process more interesting as a setting to investigate the role of BI, which is much more obscure in such a process.

In the next section, I provide a detailed description of the IT project prioritization process in the organization and of the BI output used in this process.

5.2 The IT project prioritization process

In the subsequent sections I lay out the IT project prioritization process. First, I illustrate the structure and timeline of the prioritization process to provide an overview. Next, I present the activities undertaken by decision-makers before the actual prioritization meetings. Thereafter, I describe how a typical prioritization meeting unfolds. However, before the description of the IT project prioritization process in the organization, I provide the reader with an overview of the subject of IT project prioritization as it is addressed in the literature.

5.2.1 An introduction to the IT project prioritization literature

Prioritization and investment decisions determine how much and in what to invest in IT and it is one of the five major decision domains of IT Governance (Weill and Ross 2005). In a non-IT context the subject of project prioritization has been extensively covered by the R&D management, operation management and management science literatures. Researchers in those disciplines have addressed the problem of project prioritization since the 1960s. Since then, many methods have been developed, but have not tended to be successfully adopted by managers (Martino 1995). The studies performed in these disciplines are prescriptive and financial models have dominated as a solution to project prioritization (Bardhan et al. 2004; Bunch et al. 1989; Cook and Green 2000; Doyle 1995; Oral et al. 1991). These studies have highlighted the importance of financial data and financial models of project prioritization, including models used for ranking or selecting projects based on traditional (expected) net present value (NPV), internal rate of return (IRR), and payback methods (Cooper et al. 2004). Apart from these models there has been a variety of scoring models and checklists in which projects are rated according to different qualitative dimensions. Researchers recommend methods that simultaneously consider some financial estimation of projects' returns (e.g. NPV) as well as evaluate the projects in relation to the business strategy (Cooper and Edgett 1997).

In the IS literature, while there are a number of practitioners' reports on prioritizing IT projects and project portfolio management based on, for example, business strategy, the phenomenon appears to be academically understudied as the literature search yielded no scholarly IS publications. However, there is an extensive body of IS evaluation literature. Ex-ante IS evaluation of project proposals is needed in order to perform IT project prioritization (Irani and Love 2001). Ex-ante evaluation is intended to answer the questions of what, why, and how organization should invest in IS (Al-Yassen and Eldabi 2004) or, in other words, to justify the investment of resources into IT projects. It is also thought of as as "predictive evaluation" because it is based on estimated calculations of costs and expected benefits (Remenyi and Sherwood-Smith 1999). This type of evaluation provides some analytical data about a project which are then used in the prioritization process.

Managers, in an attempt to justify IS investments, have borrowed methods from other disciplines such as finance, accounting and economics (Nagm and Kautz 2007). These methods, however, have been subject of extended criticism from IS scholars because of their narrow view of the nature of IS and its impacts (Powell 1992; Ballantine et al. 1999; Lubbe and Remenyi 1999; Serafimideis and Smithson 1999; Irani and Ghoneim 2002; Howcraft and McDonald 2007; Cecez-Kecmanovic and Nagm 2008). There has been an agreement between researchers that existing IS evaluation methods based on financial models are inappropriate for the evaluation of IT projects since the process of IS evaluation is both subjective and contextual (Hirschheim and Smithson 1988; Howcraft and McDonald 2007; Cecez-Kecmanovic and Nagm 2008).

Other researchers have pointed out that the nature of the costs and benefits of IT projects are very different from those of other types of projects (Irani and Love 2001). Intangible and non-financial benefits comprise a large portion of IT projects, but it is nearly impossible to identify the hidden and indirect costs prior to their development and implementation. Because of this challenge, traditional evaluation techniques are not adequate for evaluating IT projects (Maskell 1991; Farbey et al. 1992). According to Bannister and Remenyi (2000) these limitations of existing evaluation methods and processes force decision makers to decide on IT-related matters based invariably on 'gut feeling'.

The financial methods used for IS evaluation are characterized by a rational, objective, and scientific approach based on the assumption that IT projects contribute to specific ends, ends that can be articulated, and are shared and are objective (Howcraft and McDonald 2007). However, a number of researchers have argued that the process of IS evaluation is both subjective and contextual (Hirschheim and Smithson 1988; Howcraft and McDonald 2007; Nagm and Kautz 2007; Nagm and Cecez-Kecmanovic 2008).

In particular, based on a rational approach, once the evaluation is in place prioritization should be straightforward. Depending on the method employed, projects with higher scores should simply be prioritized over the projects with lower scores.

Having described the literature on IT project prioritization, in the next section, I describe the IT project prioritization process in the organization.

5.2.2 Overview of the IT project prioritization process in the organization

The prioritization process takes place at two different levels. First, at the System Steering Group (SSG) level projects from a specific department or a number of directly related departments are gathered and prioritized. Second, at the IT committee level, the prioritized lists from the SSGs are consolidated and the budget is distributed. This project prioritization process is conducted as part of IT governance. Figure 16 presents the official IT governance structure that is in control of resource allocation, budget and development planning. One of the development directors uses the government model to illustrate the size and complexity of the organization and its governance structure:

> An organization this size is like looking at a government setup. We have so many interrelations with governmental bodies that all kinds of changes have to be passed through very formalized channels... (Interview with Development Director 4)

The system working groups (SWG) are responsible for selecting, prioritizing and approving operating and maintenance tasks, but not project development, in the system management areas of a department according to their resources. The task budget is granted by the corresponding SSG after the approval of the IT committee.

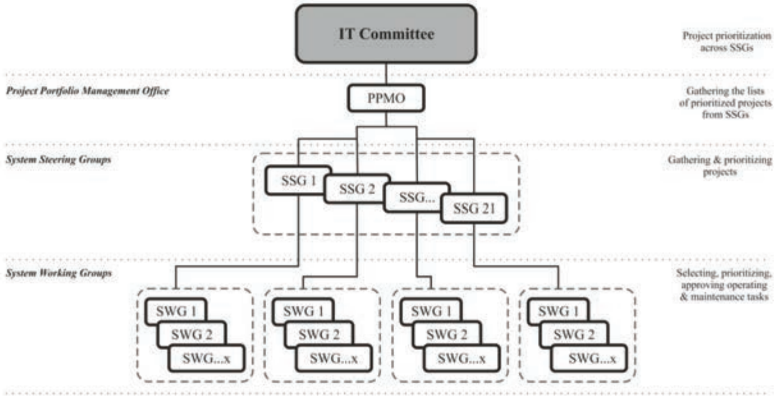


Figure 16: The Group IT governance model

The difference between a task and a project is the scale of work to be performed. Thus, tasks are smaller in size both in terms of resources and budget. A task has a budget of up to 3 million DKK and can be prioritized by the SWG or the development director/development manager jointly with a business sponsor. A project, on the other hand, has a budget over 3 million DKK and requires the approval of the SSG to which it belongs at a minimum, and the approval of the executive board if it exceeds 20 million DKK.

The SSGs draw up, prioritize and advocate for a list of projects to be implemented for the coming year. The number of projects on the list varies depending on size of the departments involved in terms of employees but also on the needs of the business units that it supports. The list serves the interest of a specific business area in terms of IT systems for the coming year. The members of a SSG are the development manager or managers, the director of the departments that are under the specific SSG, and the development directors of other interrelated areas. Additionally, business representatives sponsoring the proposed projects, IT employees specialized in the respective domains, and the CIO and the Chief Operation Officer (COO) of the Danske Bank Group are members of a SSG. In most of the SSGs a senior business representative (or the COO or the CIO) serves as chairman. There are 21 SSGs governing the 38 departments of the 7 developments areas of the organization. Table 10 shows the relationship between the organizational structure and the governance structure.

Once the SSGs have approved the list of projects for the following year, the list is forwarded to the project portfolio management office (PPMO), which consists of three portfolio managers.

The PPMO is in charge of gathering the lists of prioritized projects from the different SSGs and provides a consolidated list of projects to the IT committee. The committee is the final approval body of the IT project portfolio for Group IT, and its members conduct project prioritization across the different SSGs. The committee has six members: the CIO, the COO, the chief financial officer (CFO), the senior representative of the business units and two members of the executive board. The members of the PPMO are also present at the meeting to support the committee with information provision.

The IT committee members meet for this activity during the last quarter of the year. During the IT committee meeting all SSG chairmen together with the development directors provide a 30 minute presentation in which they explain why the organization should invest in their SSG and approve projects that they have proposed. The total budget for the coming year has been roughly decided before the meeting by the executive board. This has an impact on the prioritization process of the projects in the

SSGs. The governance structure does not prescribe at this stage how the decision makers should prioritize between SSGs or between the projects of each SSG.

Development area	**Corresponding system steering groups**	**Department**
Retail solutions	Real Estate Finance	Real Estate Finance
	Day2Day Finance	Day2Day Finance
	Channels	Card Systems
		Branch Systems
		Retail eBanking
	CRM	CRM systems
Business controlling systems	Loan Systems	Loan Systems
	Credit Systems	Credit systems
	Finance, Accounting & Management Information Systems	Risk Management Systems
		Group Finance Systems
		Business Intelligence Systems
	DW/BI Foundation	Data Warehouse
		Business Intelligence Competency Center
Corporate development	Asset Finance	Asset Finance
	Asset Management	Asset Management
	Corporate Back Office	Treasury
	Corporate e-Banking	Corporate eBanking
	Corporate Front Office	Custody
	Investment	Forex – Exchange rates
		Securities
Business infrastructure systems	Foundation	Customer & Account Systems
		Price Systems
	Document Systems	Document Systems
	HR & Organisation	HR systems
	Payment Systems	Payment Systems
IT Service Management	Technology & Demand Management	Technology Management
		Knowledge Systems
		IT Service Management
		IT Operational Excellence
		IT Infrastructure and Service Management Support
		Demand Management
Pension & Insurance	Pension & Insurance	Bank Pension
		IT Life and Pension
IT Development Processes & Tools	Development Processes	Architecture Business Development
		Development Tools and Databases
		Front End and Microsoft Tools
		Management Processes
		Step 123

Table 10: The system steering groups (SSGs) and the development areas they serve

Each year the number of projects that have to be prioritized by the IT committee varies between approximately 150 and 400 IT projects. Specifically, in 2010 the SSGs submitted a total of 318 projects for prioritization of which the IT committee approved 130 for the year 2011. Roughly 1,500 out of 2,200 employees are allocated to these projects that compose the development activities in Group IT. The rest are assigned to maintenance and operational activities.

The outcome of the project prioritization process is a list of the approved IT projects that will run in the coming calendar year in the Group IT. Within the organization, the project prioritization process and its outcome are referred to as the development plan. Each SSG has its own development plan. The SSGs and the IT committee update the development three times a year, in Q1, Q2 and Q3. In this study, I observed the prioritization process for 2011 in the organization from the beginning of 2010 through to an organizational portfolio being selected and ready to be executed in 2011.

The SSG members meet four times per year, i.e., quarterly (see Table 11 for the timeline). During the Q1, Q2 and Q3 meetings the SSG members receive an update on the progress of the current year's development plan and any changes, problems or delays so that they can act appropriately. The members of a SSG are the development manager, the development directors of the department or departments governed by the specific SSG and the development directors of any interrelated areas. Additionally, several business representatives sponsoring the proposed projects and the CIO participate in the SSG. Moreover, in these meetings, the members of the SSG revisit their strategic directions and align them with the organizational strategic focus areas. The development manager, who serves as the secretary of a SSG, is responsible for driving the prioritization process within it. In the Q3 meeting, the development manager presents a draft list with projects for the next year and invites the SSG members into the discussion. Finally, in the Q4 meeting the SSG members approve the prioritization list to be forwarded to the IT committee for the final approval.

	1st Meeting (February – March)	2nd meeting (May-June)	3rd meeting (August-September)	4th meeting (September-October)
SSG agenda	Q1 rollover of the current development plan.	Q2 rollover of the current development plan.	Q3 rollover of the current development plan. Project prioritization for development plan.	Approval of development plan for next year and delivery to PPMO.

Table 11: Timeline for the development plan at the SSG level

Once the SSG members have approved the prioritized list for the following year, the list is forwarded to the project portfolio managers at the PPMO. Several activities take place at the PPMO level. First, all projects are inserted into a spread sheet (see Appendix F for an example) along with information such as net present value, costs, number of employees, benefits, schedule, sub-deliveries, project phase, releases, business drivers and strategic focus area for each project in the list. The portfolio managers then analyse the whole portfolio and provide this information as an input to the IT committee members. The IT committee meets six times per year. Each quarter there is an update meeting on the progress of the running projects of each SSG. Budget changes are approved or denied and projects are reprioritized as necessary. Two additional meetings are conducted in which the agenda includes defining strategic focus areas for Group IT. Table 12 presents the timeline of the prioritization process at the IT committee level. In the last meeting the committee meets in order to prioritize and approve the final IT portfolio of projects for the year to come.

	1st meeting (March)	2nd meeting (May)	3rd meeting (June)	4th meeting (August)	5th meeting (September)	6th meeting (October)
IT committee agenda	Update of the project portfolio (Q1).	Half-year update of the project portfolio (Q2).	Strategy and focus areas.	Update of the project portfolio (Q3)	Business five year plans.	Prioritization of projects for next year.

Table 12: Timeline of the project prioritization process at the IT committee Level

In brief, the prioritization of projects is a bottom-up process in which project ideas are first gathered and filtered by the SWGs and by the development manager, and further analyzed and prioritized in the SSGs. Finally, the IT committee finally prioritizes within and between the SSGs portfolios, creating the final organizational portfolio of projects for the next year. This final portfolio partly establishes the final budget, an indication of which has already been given by the executive board of Danske Bank Group for the coming year that will be distributed to the SSGs which in turn will distribute to their SWGs. In 2010 the executive board declared that the IT budget for 2011 would be decreased by 4% from the previous year. However, after the final decision at the IT committee meeting the budget was decreased by only 3%, as more projects were considered important. The distribution of the budget, which follows directly after the final decision of the IT committee, is a top-down initiative. Figure 17 shows the bottom up nature of the IT project prioritization and the top-down nature of the budget distribution process.

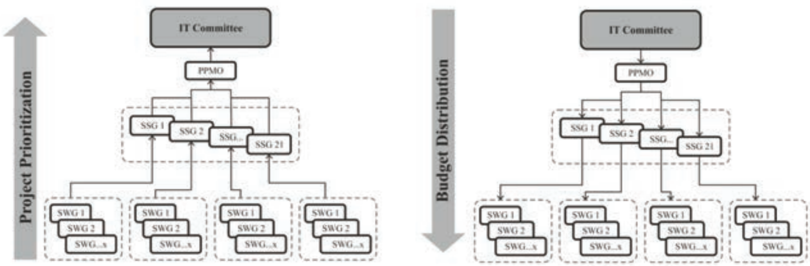


Figure 17: The bottom-up nature of IT project prioritization and top-down nature of budget distribution

Having presented an overview of the IT project prioritization process in the organization and its governance structure, in the next section I provide a detailed description of the BI output that is infused into this process and the systems and applications that are used in order to produce this output.

5.2.3 The BI output – the cost-benefit analysis

The BI output in IT project prioritization is the outcome of an analysis of the costs and benefits of each project, the ‘cost-benefit analysis’. The project manager or idea owner of the project prepares the cost calculation. For new projects, the data for the cost calculation are gathered from the HR management information system (MIS) and from the enterprise finance system before being further analyzed in spreadsheets. For ongoing projects, cost data are gathered from the project administration manager, a MIS system for monitoring the progress of projects under development.

The benefits calculation is prepared by one or more business areas or brands that depend on the project, such as Group Credit, Group Finance, or Group Business and Product Development. The data for the benefit calculation are gathered from many different systems. If the benefits are related to the branch network of the different brands then the GMI system presented above in section 5.1.4 is used. If the benefits concern sales then the data are gathered from transaction systems such as the loan, accounts and cards systems. When the benefits concern intangible benefits there are very few data available, but for example customer satisfaction data are available through the GMI system while for better customer experience there are data from the e-banking platform on which the activity of users is tracked. However, data about intangible benefits such as a better image of the bank or future sales are ultimately not available from any system, but rather are based on estimates.

Once the costs and benefits of a project are calculated they are entered into a spreadsheet and the cost-benefit ratio for the project is calculated, as well as the Net Present Value for the next two and next five years. All this information is included in the project charter of each project. In particular, the cost-benefit analysis is a section in the project charter, an example is offered in Appendix E.

In the next section, I focus on the specific activities that take place in each of the phases of the process as it unfolds in practice. I present these in a sequential order to make it easier for the reader to follow, although in reality many of these activities overlap with each other. In the following section, I describe the activities of decision-makers before the project prioritization meetings at the SSG level of the IT project prioritization process.

5.2.4 Activities before the project prioritization meetings at the SSG level

Before the SSG meetings the organization prepares proposals for new business projects to be included in the prioritization process. Typically, the preparation of a project proposal involves three sets of activities:

1) <u>Generation of project proposals</u>**.** The process of suggesting and developing project ideas is a bottom-up process. It typically begins at a lower level in the organization and unfolds in a dialogue between development managers, business representatives, project managers and IT developers. Some project ideas are initiated in the business units and others are initiated in the IT-organization. Subsequently they evolve in dialogues between development managers, business representatives, IT-project managers and IT-developers.

> It starts with the business. They have an idea and before we get involved they tend to have a couple of months to make up their own minds before we get involved together. Also, we start with very high-level business objectives then we break down those business objectives into what we call initiatives when we have broken down those initiatives or maybe I could say that under each initiative we will identify a number of project initiatives that we would like to see executed. [In addition], we work and make plans for what we see as interdependences between our projects and if one project is a predecessor of another one and so forth. So we make a rough picture of what we see coming [to the development plan]. (Development Manager 1)

When an idea begins to mature, the department manager of the department in which the project idea will be implemented assigns the 'idea owner', an IT-project manager, business developer, or business representative, to develop a memo for a potential project. Memos are one to two pages long. A typical memo includes a description of the problem or opportunity that the new project addresses, a rough cost-benefit calculation for the project, or a qualitative description of the expected benefits, and finally, a preliminary technological solution and a potential schedule for the project. The amount and quality of the information in the memo varies from memo to memo depending on the maturity of the idea: the more mature the idea, the more specific the information and the more accurate the cost-benefit calculations provided for the project.

2) Consulting About and Reviewing of New Projects. In the process of developing the memo into a full project proposal, a development manager takes over responsibility for the process. They ask their groups to produce more detailed cost-related information and calculations for each new project, and they make contact with IT-developers and IT-project managers in order to investigate the technical feasibility of the project idea:

> We call the ones that we really know can make it and ask them if I need a product in a week can you do it or not [because] it doesn't work to go into the real prioritization part because, then I will never get something, I will not get it in 100 years. (Senior Business Representative 1)

When a preliminary project proposal is available it goes through an internal review process by a business analyst from the Group IT. This quality check may lead to revisions of the project proposal. This review process takes place, internally, in each area, with each memo being revised by management and approved by the SSG.

> Then we have a formal review process … every project memo [is] reviewed by management. (Development Manager 1).

This is a case-by-case review with an acceptance or rejection decision. Once the review is conducted, the development manager brings the project proposal to the chairman of the SSG, who is the CIO, the COO or a business representative. At this point the development manager also begins to look for sponsors in his or her network, in order to secure the inclusion of the project proposal on the prioritization list.

> If you have some [projects] that you think are absolutely important then you try and get some friends to back you up in the SSG, I think that's a fairly natural process. (Head of Digital Banking Program)

In an attempt to better understand the projects and their importance (i.e., to form an opinion) the business representatives whose projects are far more diverse and come from different business units and brands, go through each business unit and ask questions about their current needs and priorities in terms of products and demand, and also ask the IT department if there are resources available on the supply side to carry out these projects.

> You don't stand a chance [of understanding the new projects] unless you are talking to a lot of people discussing all the things, also discussing from the business side is this really important? And those discussions, I have them all the time of course, so you can't do that [understanding the new projects] without [talking to a lot of people]. (Senior Business Representative 1)

3) <u>Informal Discussions of Project Proposals</u>. Once the cost calculations have been provided for each project proposal and the development manager together with the business representatives in the SSG have come to an opinion about them, the development manager and the business representatives meet informally to discuss the project proposals. In these meeting they discuss the projects and express their beliefs about them, especially their importance and priorities. They also exchange information about the resources that are available to the SSG in the coming year, as these place a limit on the number of new projects the SSG can initiate.

> Many of the things are already cleared before we come to the meetings in order to find out how many resources do we actually have for new development parts. (Interview with Senior Business Director)

When it comes to the project choice per se, a senior business representative reported:

> … at the end of the day [we] look at [the projects] and say what is my feeling … about this … project. (Interview with Senior Business Director)

Based on these informal meetings the secretaries of the SSGs compose preliminary project lists, which they bring to and present at the SSG meetings. Prior to this, the SSG secretary typically communicates with the development directors in order to briefly discuss the agenda, as well as to identify potential issues that might emerge during the meeting. Finally, before the prioritization meeting, the chairman of the SSG investigates the opinions of the different stakeholders (e.g., the Financial Director, COO, and business representatives from different units), in order to be better prepared.

The outcome of these activities prior to the meetings is twofold. Not only do participants form an opinion and make an initial attempt to understand the content of the projects but they also become aware of other's opinions, preferences and dislikes. Figure 18 presents the sequence of the activities that take place before the meetings as described above.

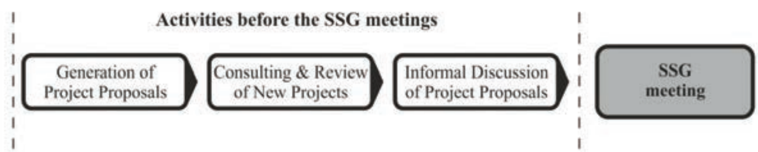


Figure 18: Activities before the SSG meetings

After having described the activities that occur in the organization before the SSG meetings and the actions the decision makers take in order to prepare for the meeting, I next present how a typical SSG prioritization meeting unfolds.

5.2.5 A prioritization meeting at the SSG level

A project prioritization meeting in a SSG lasts from one to at most two hours, with typically 8 to 13 managers participating. The development manager, who serves as the SSG's secretary, is responsible for managing the prioritization process at this level. The CIO and the COO are present along with business representatives from the different branches of the bank and IT people specializing in the relevant domains.

Before a prioritization meeting, the secretary of the SSG prepares a presentation that includes the agenda as well as a preliminary prioritization list with inputs from the activities that took place before the meeting. The prioritized list contains from 5 to 30 projects depending on the department's size and future plans. The agenda for the meeting usually consists of five main points, as follows:

1. Follow up on last meeting and action points

This is a remainder and follow-up on the points that were raised during the previous SSG meeting. The development manager presents the main topics discussed in the earlier meeting and what was done to address these issues until the day of the meeting.

2. News from the business

At this stage the development manager refers to the business representatives and asks them to share news from their areas that might concern or affect the work of the SSG. The discussions are very broad and vary from project related to employee related.

3. Budget and prioritization decisions

This is where the members of the SSG spend the most time. The development manager presents information about the department in general, such as the projects that are running, the projects that are up for prioritization and future strategic developments of the department. In one of these presentations the development manager described this agenda point as follows:

The next set of slides present facts on the department and progress, observations, and reactions and future plans. (SSG meeting 1.1)

4. Decisions

This point refers to decisions that should be made during the meeting. The decision could regard the approval/rejection of an evaluation of an idea, of a project idea, or a budget change concerning an existing project.

5. Status reporting

The last point that is presented in the meeting is the status of the currently running projects in terms of their schedule, quality, and budget. This is not discussed unless a member has specific questions, however.

In the following paragraphs I focus on the discussions that evolve during the third point of the agenda, since this is where the SSG members discuss and decide the prioritization of the IT projects.

All projects are presented by the development manager in a spreadsheet (see Figure 19), which includes standard information such as the project' name, the priority of the project, full time employees (FTE) on the project, cost calculations for the first year and for the lifecycle of the project, benefits for the next 5 years, the cost-benefit ratio, time schedule, the current status of the project and the focus area as well as the department's strategic direction. The cost-benefit analysis consists of the columns of cost and benefit calculations together with the cost-benefit ratio. The decision-makers alter this list during the meeting, after which decisions on projects' final ranking in the prioritization list are made.

Development Plan 2011 Project / Avtivity	Priority	Expected size (FTE) Vgt.2011	Cost 2011 M DKK	Cost total M DKK	Benefit 2011-2015 M DKK	Benefit/Cost Ratio	G-ITC Focus Areas	Project Status	Strategic Direction
Project a	1	7	6,3	6,3	4,8	0,8	2	Active	Run the business
Project b	2	5	7,4	9,4	10,2	1,1	2	Active	Improve the business
Project x	3	11	15,6	15,6	54,9	3,5	2	Active	Cost reduction
Project y	4	9	10,4	10,4	4,3	0,4	3	Planned	Process Efficiency
Project z	5	2	3,6	4,5	13	2,9	3	Planned	Customer Experience
Project k	6	5	4,5	8,3	0	0,0	3	Planned	Compliance
Project c	7	8	8,5	8,5	33	3,9	7	Planned	Cost reduction
Project d	8	7	9,5	9,5	22	2,3	3	Planned	Process Efficiency
Sum		54	65,8	72,5	142,2	14,9			

Figure 19: Prioritized list of IT projects in a spreadsheet

At the beginning of my field study I was intensively reading documents related to the IT project prioritization process found on the Group IT web portal. These documents contained guidelines and descriptions of the overall governance structure, PowerPoint presentations from different departments and spreadsheets with data about current projects' statuses. In these documents (see for example Figure 19) I observed that the organization has a specific categorization system to cope with the variety and large number of the projects to be prioritized. These categories have a label that designates the project nature or status and have emerged through years of practicing project prioritization to facilitate decision-makers in relating each project to a specific theme. The current project labels, some of which are included in Figure 19, are: Ongoing/Active – indicating the status of the project implementation phase; program-related or strategic – indicating the status of the project in terms of interdependences with a strategic initiative; business critical – indicating the status of the project in terms of its necessity for the organization; legal/compliance – indicating the status of the project in terms of institutional requirements.

The presentation by the development manager includes: a) the ongoing projects that will continue to run the next year, b) the compliance projects that ensure fulfilment of current legal requirements, and c) new business projects. For new business projects the cost-benefit ratio serves as the starting point of the discussion, while project specific arguments follow.

However, apart from the labels included in the official documents during the SSG meetings the decision-makers use other labels as well. In the SSG meetings and follow up interviews the managers used labels such as a *step stone project*, *burning platform*, *a link in the chain*, *foundation project*, and *low hanging fruits* to designate the nature of the projects and which at the same time would compensate for a poor cost-benefit analysis.

The list of proposed new projects includes more projects than a department can accommodate within its budget and employees, and thus a department's resources are allocated to the new projects with the highest priority. Ongoing and compliance projects are considered mandatory for the organization, and thus in prioritization meetings discussions mainly concern the new business projects and ongoing projects that require additional resources.

The main criterion used to prioritize the projects is the cost-benefit analysis calculated for each project. The other criteria used involve the organizational strategic focus areas and the strategic directions of the department itself. For the new business projects the cost-benefit ratio is used as the starting point of the discussion, while project specific arguments follow.

The resources of a department are allocated to the projects according to their priority in the list. At some point, due to limited resources, there are no more resources to be allocated. Because the list of proposed projects exceeds the numbers of the projects that a department can carry out with its current number of employees, an invisible line is created that separates the projects that can run with the existing or planned full time employees and those that need new resources. The members of the SSG usually referred to this phenomenon as projects that are under the line to emphasize the constraint that resources place on projects.

The discussions usually evolved around the last projects in the list, around the line, since at the top of the list, there are the ongoing and compliance projects that, as already described above, are considered mandatory.

The discussions in the meeting evolve around four types of events as presented in Figure 20. For new business projects the sponsor of the project idea presents the facts of the proposal included in the presented spreadsheet, i.e. the cost-benefit analysis, the status of the project, the number of FTEs required and its priority. These are challenged by other members in order to understand the business rationale behind the project, e.g., cost savings compared to other project proposals in the list. The sponsor responds by putting forward arguments in order to justify the project. This challenging and development of arguments goes on until an agreement is reached.

Figure 20: Events in the SSG prioritization meetings

After the final SSG meeting in Q4, the prioritized list is sent to the PPMO and all the lists get consolidated into a spreadsheet comprising the whole IT project portfolio for Group IT.

5.2.6 Activities in the PPMO

Once the SSGs have approved the development plan for the following year, the list is forwarded to the project portfolio managers at the PPMO. All the projects are inserted into a spreadsheet, along with information and data about their Net Present Value (NPV), cost, number of employees, benefits, schedule, sub-deliveries, project phase, releases, business drivers and strategic focus area.

In this phase of the process, the portfolio managers work closely with the SSGs and development areas to acquire specific information from them about each project in their development plan. At the same time they work closely with the IT committee members in order to understand their information needs for the final decision. The collected information is analyzed by the project portfolio managers and forwarded to the IT committee members. This analysis includes the composition of the project portfolio in terms of business drivers, the composition of the projects' costs and benefits in terms of project phase, and the composition of projects' costs and benefits per SSG. The project portfolio managers also create a report for the IT committee members that includes information about all the projects suggested by each SSG, and includes their priority, strategic focus area of the project, project name, total cost, net present value in 2 and 5 years, releases and a short project description. It is only when this information is entered from all SSGs that the development managers have an overview of their sub-deliveries to other departments. Moreover, the report given to the committee members includes NPV only for the first release of the project. The NPV calculation for the ensuing releases is not available. An overview of the activities that take place in the PPMO is presented in Figure 21.

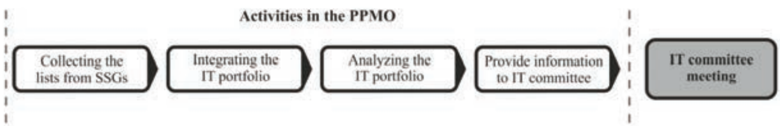


Figure 21: Activities at the PPMO level

Apart from the collection and analysis of the project data for the IT committee, the portfolio managers are also in charge of establishing and monitoring the overall IT prioritization process, including the procedures and information flow of the process as well as identifying and specifying the information needs of the decision makers in the IT committee. In 2008 the PPMO office introduced both the IT committee and the presentation phase in which the chairmen of the SSGs presented their lists of projects.

The following quotes show the rationale behind introducing a new governance body and the presentation activity.

> There has been some disappointment in the business areas of the bank about IT having too much power and taking all the decisions themselves. We put in this governance body to make it more clear how decisions were taken. (Head of IT Governance)

> All SSG chairmen will present to the council in October the ideas so that they have the chance to give some background to the numbers. [The IT committee members] feel that they [make the decision] based too much on paper and not on the real input from the SSGs. (Head of PPMO)

The next section describes the IT committee members' activities before the final prioritization meeting.

5.2.7 Activities before the final meeting on the IT committee level

Before the final meeting the members of the IT committee engage in an informal process of gathering information and forming their opinions about the projects to be prioritized, the future directions of the SSGs and the preferences/strategic goals of the whole organization. First, two weeks before the final meeting the members of the committee receive project related information for each SSG from the PPMO. The information includes a brief project name and description, the Net Present Value for two and five years, total costs and benefits, its priority number on the list, and the strategic focus area of the project. The formal established project labels of ongoing/active, program-related or strategic, business critical, and legal/compliance are also included in the documentation for the IT committee. However, as the members of the IT committee reported, this information is not enough to understand what the project is about and its importance. Hence, the members engage in a dialogue with their subordinates or closest colleagues and ask their opinions about the projects they are not familiar with. Moreover, the members also investigate the strategic directions and the overall budgets of the SSGs and their importance and alignment to organizational goals. Finally, the members investigate the opinions of the other stakeholders participating in the IT committee, in order to be better prepared for the final prioritization meeting. This quote shows why it is so important for the decision makers to engage in a dialogue before the meeting:

> The problem with what PPMO is doing is that [the decision makers] cannot see when it says legal if it's actually a legal thing that we cannot prioritize or if it can be prioritized and therefore if you are technocratic and only doing this on paper then you cannot take it out. That is the problem with [information provided by the PPMO] because you have actually to understand what's in the project, you have to know the projects... I actually use a lot of my time understanding what are the logics in the prioritization in each area ... and that is just hard work, that is just talking to people [before the meeting]. (Senior Business Representative 1)

5.2.8 A prioritization meeting at the IT committee level

The IT committee meets for the final prioritization meeting during the last quarter of the year. This final meeting of the IT committee consists of two phases. First, the chairmen of each SSG, usually senior business representatives, give a half-hour presentation for the IT committee in which they advocate for their list of projects. Second, a private meeting takes place between the IT committee members in which they determine the final prioritization across the SSGs.

During the presentations, the chairmen present the projects as decided at the SSG meeting in terms of their importance to the organization and its goals. The development director, who is an expert in the IT issues of the specific section, is present as well. After the 30-minute presentation, the committee members challenge the chairman and the director on the number and priority of the projects and the rationale behind the overall prioritization provided by the SSG. The members also ask questions in order to investigate interdependencies between projects and the consequences of cutting projects from the list. The chairman and the IT director argue and explain why the organization should invest in their SSG and approve the projects that they have proposed.

After all the SSGs have presented their project lists, the committee members gather and discuss the budget distribution among the SSGs and their projects. In this phase the members of the IT committee focus on the future directions of the organizations and in which SSGs they should increase the budget and in which they should cut the budget for the coming year. If they decide to cut the budget of a specific SSG they discuss which specific projects should be postponed and removed from the list. At this point, it is important to note that the head of the IT committee presents a scenario on how the budget could be distributed by specifically saying which SSGs will have an increase in their budget and which will have a cut and by how much based on what has been discussed over the previous two days. This scenario serves as a starting point for the discussions that take place between the members of the IT committee after the presentations.

The process of this meeting is illustrated in Figure 22. Once the IT committee members agree on the overall portfolio of projects for Group IT and the budget distribution among the SSGs, the portfolio is sent back to the PPMO who inform the SSGs and the departments about the projects that have been approved by the IT committee. The next step is for the PPMO in collaboration with the departments to redistribute the resources accordingly. If issues arise the plan is briefly revised again with the IT committee.

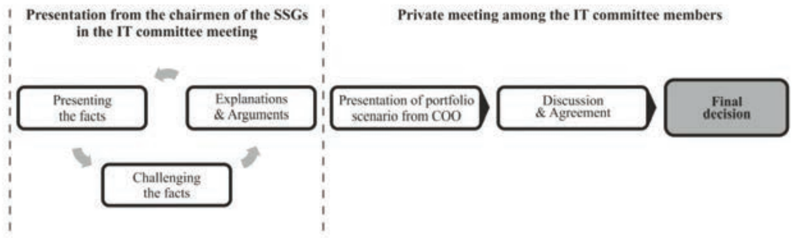


Figure 22: Events in the IT committee prioritization meeting

5.3 Summary

This chapter provided a detailed description of the empirical setting – the Danske Bank Group. A historical background along with the current organizational structure of the organization gives the necessary context at a macro level. Further, the detailed descriptions of Group IT as the access point to the empirical setting and its organizational and governance structure equips the reader with an understanding of where the prioritization process takes place. Finally, the description of the existing BI process, technologies and applications used to produce BI output contribute to an understanding how BI output is produced by analysts or decision makers.

In addition, the rich description of the IT project prioritization and its phases and activities contributes to an understanding of the complexities and multifaceted nature of events that take place at the different phases of the overall process.

Next, in chapter 6, I present the analysis of the IT project prioritization process in relation to the role of the BI output in this process and show how this output, which is the cost-benefit analysis for each project, is used by decision-makers.

6 Empirical Findings – Use of the BI output in the IT project prioritization process

The purpose of this process study is to investigate how a particular form of BI output is used in an instance of organizational decision-making, that of prioritizing IT projects. The BI output in this case was the cost-benefit analysis, a formal analysis that calculates the costs and benefits of a project. The cost-benefit analysis studied consisted of financial measures of costs and benefits based on data from previous and current projects as described in section 5.2.3. Portfolio analyses, based on the cost-benefit analysis, were also performed on all projects. Thus, this instance of organizational decision-making exhibits a special research interest as an empirical setting because it is highly characterized by ambiguity and complexity.

As this is a study of the use of BI output in the IT project prioritization process, the findings are presented based on the governance structure of this process. As described in chapter 5, the governance structure consists of two levels: the SSG level and the IT committee level. The presentation of the results is structured according to these two levels because they represent two distinct processes of decision-making. First, the findings at the SSG level are presented, followed by the findings from the IT committee level. For each level, I describe the structural characteristics that might concern the decision, the BI output or the decision process at the respective level. The purpose of these descriptions is to convey the complexities of the process and more prominently to establish a context for understanding the main tactics presented later. Next, I present and describe the tactics of using the BI output for reaching a decision.

However, before I present the themes I recount a representative example provided by the COO to describe the difficult task that organizations are faced with when prioritizing IT projects and the role of the BI output in this process.

An illustrative example

The example below demonstrates the complexity of the task of prioritizing IT projects within the organization. The organization has to select and prioritize some projects at the expense of others due to their limited resources, which could be human, budget, equipment or technology related. The example concerns an organizational decision made by the IT committee during the final IT project prioritization meeting, which was the final event of the yearly prioritization process that took place in the organization in 2010. The COO, chairman of the IT committee, provided a rich description of why prioritizing IT projects is no simple matter:

> It's a complex matter. Let me use an example. You [the organization] need to decide should you invest into a new HR system or should you invest into a faster release of the next mobile bank. The HR people tell you, this is extremely important, our talent drives the bank. We can't put a number to it but if we are not able to do this and that, we have a massive problem. The business people tell you, listen, mobile bank is the most important [because] we need to be able to forefront innovation. Now, you can sit there and challenge them, listen we don't make money with the mobile phone. We don't make a single cent more, we are not charging for it. You can tell the HR people well you know what, maybe yes, but do we need it this year. Skills develop slowly; can't we do it next year? How do you decide it? (Follow up on IT committee final prioritization meeting with the COO)

The example involves two new projects from two different areas of the bank. The HR system was proposed by the HR Group of Danske Bank and the mobile bank was proposed by the Banking Business Area in collaboration with Group Business and Product Development group. The projects were in competition and each representative was trying to show why their project was the more important one for the bank. Unfortunately for the decision-maker, they were both important; the HR system was important because it would make the work of the HR Group more efficient when selecting, promoting and developing the employees of the bank, which is recognized as the driver of the whole group. On the other hand, the mobile bank was seen as an innovative project. The COO continued by explaining what happened next:

> Then you can ask them to write a business case, they tried to put the, you know, facts, but how can you compare, how can you calculate the financial benefit of a better work force compared to the indirect financial benefits of people using mobile bank and thinking we are an innovative bank, it's impossible. The theory will tell you, you need a business case and then you prioritize in terms of the data. It doesn't help. (Follow up on IT committee final prioritization meeting with the COO)

A cost-benefit analysis is required for all projects and is considered as the official criteria based on which the projects are prioritized. The COO viewed the analysis as 'facts' and later as 'data'. He noted, however, that it was very difficult to compare these data when the projects were so different:

> At the end, it is basically a management decision, you listen to people, you try to understand the case as well as you can and that is what managers are paid for at the end, that they need to do a decision with the facts they have and it's not like in science where you actually can derive something mathematically and the process will tell you at the end what to do, you have to make a decision, that's the difficult thing. And that's why it's so important that the material is well prepared, that you understand what's in there, that you understand if you say yes or no to something, what the rough implications are. In this case, we decided to postpone the HR system and we decided to put more money into the digitalization efforts. And everybody complains about the HR system. Everybody complains about it, but we said well then they

complain another few years. We have more important things to do now. (Follow up on IT committee final prioritization meeting with the COO)

Above, the COO explains how complicated prioritization decisions can be, with no predefined formulas on how the BI output should be used in the making of such decisions. According to the COO, what is needed is a thorough understanding of the situation, the project and the interdependencies with other projects, the implications of the choice, and the preferences of other decision-makers. In the following sections, I discuss how decision-makers develop this understanding before and during the meeting, how they shape collective judgment and reach prioritization decisions, and what the role of the BI output is in this process, first at the SSG level and later at the IT committee level.

In particular, I present the themes that emerged during the analysis of the empirical data. The above discussion of prioritising between the HR and mobile banking systems will be used as a concrete example to refer to and to elaborate on the themes below when appropriate.

In this analysis, I focus on the use of the BI output on both the levels of IT governance at which prioritization decisions are made. I describe the decision-making process and the use of the BI output in this process at each level separately in the following two sections in order to highlight similarities and differences. For each level, I structure the analysis in two parts: process and project characteristics and decision-makers' tactics for using the BI output for reaching a decision. The description of the characteristics provides the context in which decision-makers operate and helps the reader to understand the difficulties decision-makers are faced when making prioritization decisions. The tactical use of the BI output shows how decision-makers cope with the limitations posed by the characteristics in order to shape collective judgment and to reach organizational decisions.

6.1 Decision process at the SSG level

The SSG level group includes middle and senior IT, and business managers who have a direct interest in the selection and implementation of specific projects for an area.

6.1.1 Process and project characteristics

Characteristics were identified in the IT prioritization process, the decision, the project and the project's BI output and more generally reflect the constraints posed by the overall organizational structure. These characteristics shaped the use of the BI output and its role in organizational decision-making. The following characteristics were identified:

- Lack of transparency of the IT prioritization process including the idea gathering process and project inclusion in the prioritization list.
- Lack of overview of projects' interdependences.
- A project's technical complexity
- Cost calculation inaccuracy, and unreliability of benefit calculations.
- Lack of benefit follow-up process on the implemented projects.
- Resource capacity and competency constraints

Below, I analyze each of these characteristics and substantiate them through the use of examples from my empirical data and field notes.

6.1.1.1 Lack of transparency of the IT prioritization process including the idea gathering process and project inclusion in the prioritization list

Very early during my fieldwork I observed that employees in the company had a positive reaction to my study because most of them found the IT project prioritization process very confusing and opaque. A typical response was:

> I would like to know how we prioritize our projects. (Field notes)

Interviewees in the first round of interviews who were participants in the project prioritization process confirmed this. For example, a business representative who participated in a SSG states:

> When we first hear of a project it is when it is approved and on the development plan [list]. The way the whole process flows from idea to being a prioritized project that is somewhat in the dark. (Business Representative 1)

While another senior business representative who participated in more than one SSG noted:

> There are so many committees and forums where you might come just cross the same topic. But sometimes it's a bit difficult to know, where are the decisions actually been taken, what is depending on what. (Senior Business Representative 2)

From another angle, a business analyst who had his own project idea/proposal and was trying to place it in the system reported:

> It’s completely in the dark for me how a [project] finds its way to the project plan. Everything, that’s before that [the prioritized list], is an absolute black box and it depends on the manager [development manager]. (Business Analyst)

While the previous quotes referred to the process of prioritizing projects, this last one indicates the lack of transparency in the process of gathering project ideas as well. Indeed, when following up on the SSG meetings it was clear that there was no official process for how the development managers gathered project ideas. Instead, it depended on each individual development manager and their personal approach. In the two SSGs that were followed, one of the development managers made a call to the department and the business areas for new project ideas and old projects not prioritized so far:

> We start by compiling data on the projects that are running and system management that is also running, of course that's something that needs to be in the plan... then what we do is to involve the whole department here... to come up with ideas, new ideas or maybe old ideas that haven't been realized yet. So we [the managers] made what you could call a call for proposals and of course also to all our stakeholders... So we got a lot of proposals, then we made a gross list of new projects that could be taken into consideration and we made an assessment if we didn't have one before, then we made a gross assessment of the involved cost and the resulting benefit for that project. (Follow-up on Meeting 1.2)

The other department followed a more centralized process. The SWGs and the development manager gave input based on the roadmap and strategic guidelines decided in the earlier SSG meeting:

> As the secretary of the SSG I make the draft, but I gathered the information mainly from the SWG members and all the history there and it is gone through with the SSG members, and of course also with the system areas here but the main, you could say, the real fact, is that at every SSG meeting we have the high level road maps that are revisited every time and these are actually the overall guideline for the development plan. (Follow-up on SSG Meeting 2.2)

As a result, the IT project prioritization process was characterized by a lack of transparency. Specifically, the project idea gathering and the project inclusion processes seemed to be the least transparent activities in the overall process.

6.1.1.2 Lack of overview of projects' interdependences

The managers underlined the lack of a clear overview of project interdependencies, which set additional challenges for the prioritization process at the SSG level:

> There are so many interdependencies between areas and simultaneous effects, it is highly uncertain [what the impact of a project will be on other projects]. (Development Director 2)

Many projects were dependent on deliveries from other areas and if those deliveries were not prioritized in the SSG then the project could not be developed. As one of the interviewees reported:

> Sometimes the different areas should be more aware of the impacts that changes have to other systems or areas. (Head of Forecasting Models)

Further, these strong interdependencies did not allow for project changes during the year, such as reprioritizing to accommodate market developments resulting from competitors' activities:

> A rise in one project would mean in another project to be postponed or even taken off the development plan but at least postponed in time. (Development Director 1)

Although managers were aware that such interdependences might exist, they were not visible in any document or in the BI output. The cost-benefit analysis does not provide any indication of interdependences among projects. As the Head of the PPMO who consolidates the information from the SSGs explained:

> It's more implicit, we cannot extract it [project interdependences] from the spreadsheet. (Head of PPMO)

The discussion of the interdependences between projects and their impact on other projects was also evident in the SSG meetings. When presenting projects, the development managers often referred to interdependencies that they knew existed or discussed how they planned to investigate possible interdependences with other systems in the future:

> When we come up with what can we do here, we will also assess if we have this very fast solution what will be the impact on the overall system. (SSG Meeting 2.2)

In summary, interdependences are project characteristics that are critical to decision-makers' prioritization decisions. This is so because when a project is downgraded or removed from the list, other prioritized or future projects that are dependent on the first one will no longer be possible as well. In the structure of the BI output, interdependences were not visible and as such decision-makers needed to use different approaches to acquiring information about the underlying interdependencies that existed.

6.1.1.3 A project's technical complexity

Another key project characteristic is its technical complexity, which is not captured by the provided BI output and might lead to huge increases in costs, as described by an interviewee:

> Complexity, that's another thing that we don't show. We just show that this costs so much, but is it easy or hard? Is the complexity in the project of the kind that we actually risk spending double as much money. We really don't know at this stage, how complex it is. With the complexity of a project of that kind, I actually risk spending double as much money. And I really don't know at this stage how complex it is. (Business Representative 3)

The Head of Forecasting Models explained that it was important to have some flexibility in the calculations of costs because of the unknown complexity of a project:

> It's very important to us that we can have some degree of flexibility in what is the target for the project and how should we achieve it. Because when we go into the details, things change a bit because we get more inside to the problem we are trying to solve. (Head of Forecasting Models)

The complexity of a project was also mentioned in the follow-up meeting interviews. For example, a development manager confirmed that the newer a project idea the less was known about its underlying complexity and vice versa:

> … the further away the rougher it gets, the nearer it is the more detailed it is. (Follow up on the SSG meeting 1.1)

6.1.1.4 Cost calculation inaccuracy and undefined benefits calculations

Early on, I observed during the interviews that decision-makers were skeptical about cost-benefit analyses of projects and often treated it with a sense of irony. A business representative revealed his skepticism towards the costs calculations as follows:

> When a developer manager makes some cost calculations for the budget [of a project] is he too positive or is he too negative? It also depends on the people doing the actual calculation, he will have some of his project leaders to do it and they will have different views on how to do it. So, it very much depends on the person doing it. (Business Representative 2)

It became evident during the analysis of further interviews that the main characteristic of the costs calculations was their inaccuracy, as illustrated by the following interview quotes:

> I need to understand if they say it will cost you this what do they really say because it will never cost me this, it will always costs more. (Senior Business Representative 1)

> This number [cost calculation] could go up and down as a year expands. (Head of PPMO)

Along the same lines, the decision-makers were reluctant to use the benefit calculations, especially when considering the way the calculation was performed. As the Head of Forecasting Models stated:

> There is some terrible gap between how are benefits calculated, how they measured, how they described in the various project proposals and what reality is. (Head of Forecasting Models)

In fact, according to the Head of the PPMO there was no defined process on how to calculate the benefits of a project:

> The issue with the benefit is that firstly we don't have a defined, structured way of calculation benefit. That's the main thing. (Head of PPMO)

This was further confirmed by the Idea Qualification Manager, in charge of reviewing project proposals and the feasibility of their business cases. He noted that:

> What typically is more unclear is where did we get the business case from, it's a number that came from somewhere but what does the number really cover on the financial estimate, it might be hundred million stated as a benefit for doing this, but is it actually a hundred million from the project or is it a hundred million potential if we conduct the project. (Idea Qualification Manager)

Similar discussions took place in the SSG meetings and many times decision-makers discussed what was actually included in the benefits calculation, as well as what should and should not be included. Overall, the cost-benefit analysis was characterized by inaccuracy and unreliability and was as such treated with skepticism by decision-makers in the prioritization process.

6.1.1.5 Lack of benefit follow-up process on the implemented projects

Another characteristic of the overall IT project prioritization process and in particular of the cost-benefit analysis was the lack of an institutionalized way to follow up on benefits and to assign accountability for their realization. Notably, the Head of the PPMO who was also in charge of the overall governance process stated:

> We have all these numbers but we should start following on benefits. (Head of PPMO)

Because of the lack of an official process to follow-up on benefits the managers had no incentives to follow-up and as such the benefit realization was not owned by anybody.

> But if we don't have to, if there is no consequence for the business we don't [follow up on benefits]. (Business Representative 2)

Thus, when projects were implemented nobody really knew what happened with the initial benefit of the project and how much it was realized:

> In 3 or 4 years time, who takes care of the money we spent now when we are in 2014? Nobody! (Development Director 2)

In summary, the lack of follow-up on benefits shaped and influenced the attitude of the decision-makers towards the benefit calculation who characterized it as a 'free lunch'.

6.1.1.6 Resource capacity and competency constraints

During the interviews with development managers it became evident that there were several constraints on the number of projects that could be developed by an area. The list of proposed projects by an SSG usually exceeded the numbers of the projects that a department could carry out with its current employees. This introduced two types of constraints: a resource capacity constraint and a competency constraint as also illustrated in the following quote:

> There are some practical issues involved in actually executing a plan and the limiting factor is really resources and competences. (Development Director 4)

The capacity of a department defines the projects that can be run with the existing or planned full-time employees, creating an invisible line in the development plan. The capacity constraint can be addressed by hiring new employees. However, hiring new employees will not ensure the required domain knowledge, as new employees need time to learn the systems and the development platform. This lack of domain knowledge is called the competency constraint and is a major constraint for a department and its ability to scale up in term of employees. The interviewees reported that sometimes it felt as though the competency constraint drove the prioritization and the solutions of the different projects:

> It'll be more what kind of developers we have [and based on their competencies will consider which project solutions] to make for the next half year, well okay, it will suit us best if it's this solution. And [we do] not [take into account so much] the demands from the business or the customers or the advisers [who will use the system]. (Business Representative 2)

The following quote shows how a project received a higher priority when a future competency constraint was taken into account in a SSG meeting:

> When you look at the people that know [domain knowledge] about [Project B], they are one or two years away from retiring both in the business side and here [at the IT organization]. So if we delay this any longer then it is not the same cost as we have projected now. Then the cost will rise because we need to educate people all over to get this conversion going. (Follow up SSG Meeting 1.2 with development manager)

Another resource capacity constraint is the platform or system constraint. A department might have employees who have the competence to run the project, but the test system may not be available.

> ... it's a limited capacity, all the loan projects go to the same platform and the same resources[employees]... it might be that we have the resources, but due to configuration management for testing we couldn't put it in, but if we had separate platforms we will be able to scale more than we would in one platform... (Development Manager 2)

Although there were several constraints limiting the number of projects a department could develop, the SSGs were required to present a development plan with all the projects without taking the constraints into account. In practice, however, many SSGs included only the projects that they could make from a capacity perspective on the list. According to them it did not make sense to include projects in the list for which the department lacked the necessary resources.

6.1.1.7 Summary of characteristics on the SSG level

Table 13 presents a summary of the concepts and categories that compose the characteristics of the IT project prioritization process overall, the BI output and the constraints posed by the organizational structure on the SSG level.

This section described the characteristics in terms of the overall process on the SSG level, the organization of the BI output, of the projects and the constraints posed by the overall organizational structure.

In summary, the purpose of using BI in the IT project prioritization process is to enable decision-makers to reach an organizational decision. Yet, as the empirical data showed, the way the overall process is structured and organized exhibits the following particular characteristics. On the SSG level it is not very transparent how the development managers come up with project ideas or how a project idea makes it to the final SSG list. Project interdependences, projects' technical complexity, ambiguity of the BI output in terms of costs and benefits analysis, and resource capacity and competency constraints characterize the process and impact the way managers use the BI output and make decisions on the SSG level.

In the following section, I present and describe the tactics of using the BI output employed by the decision-makers on the SSG level in order to cope with the barriers created by the above characteristics.

Process and projects characteristics		
First order codes	**Second order categories**	**Aggregate Dimension**
Black box Dark Not transparent Difficult to know Depends on the manager So many committees and forums	Lack of transparency	Process and projects characteristics
Implicit Impact Dependable Lack of overview Changes in the plan Difficult to see Not integrated Simultaneous effects	Lack of overview of project interdependencies	
Awareness of change' impacts on other systems Is it hard? How complex it is? Flexibility Things change Inside the problem	A projects' technical complexity	
Different views on how to do it. It always costs more Cost increases Hidden costs Lack of defined description Lack of understanding Real benefit vs. potential benefit Hard benefits vs. soft benefits Tangible vs. intangible benefits Trust issues	Cost calculation inaccuracy, and undefined benefits calculations	
No consequences No follow up on benefits Free lunch Business responsibility Nobody cares	Lack of benefit follow-up	
Resources Competences Number of full time employees Limiting factors Practical issues Supply side	Capacity, competence and system constraints	

Table 13: Summary of characteristics on the SSG level

6.1.2 Tactics of using the BI output for reaching a decision

This section focuses on how decision-makers use the BI output for reaching a decision. Specifically, it describes the tactics used to cope with the limitations discussed above. I start by describing the prescribed used of the BI output and its actual use on the SSG level.

6.1.2.1 Prescribed versus actual use of BI output

The BI output is the outcome of a formal obligatory analysis performed on all projects and used as the official criterion for prioritizing IT projects in the SSG. The PPMO uses this formal analysis of cost-benefits to ensure that only beneficial projects are prioritized. Many interviewees referred to the cost-benefit analysis as the main official prioritization criterion:

> We sort of leave it up to the cost-benefit [analysis] to decide which projects win, that's the general principle. (CIO)

A business representative specified the use of cost-benefit analysis when the projects to be prioritized were new and not ongoing projects from the previous year:

> For new projects it will be very much cost-benefit [analysis] that will decide the ranking. (Business Representative 2)

However, there is no standardized method for establishing what should be included in cost-benefit calculations. The organization had some templates and formulas (see Appendix E as an example) but they were easy to customize depending on a project's needs, since different projects have different kind of costs and benefits.

Group IT bears the costs of developing and implementing IT projects. Therefore, a relevant member of the group, such as the project's manager or business owner, generally calculates its cost. The calculation of benefits, however, is handled by the relevant business areas, because they will enjoy the benefits of the project, unless the project concerns internal development for the Group IT, then it is Group IT that calculates the benefits as well.

I observed many times in the SSG meetings that benefits and costs calculations were challenged and questioned. From my observations such discussions were focused on projects at the bottom of the list. These projects risked being cut off or excluded by the IT committee when they cross-prioritized between the different SSGs. As one of the development manager said:

> There is a saying, it's called 'if the project is above or beneath the line'… So, we might think that the line is here and we have these 10 projects, but if for some reason the line is moved up or down it is very, very important that the SSG knows which are the 2–4 projects that are just around the line that you would actually go for or cut out. (Development Manager 2)

During the prioritization process, the managers looked for comparable information when assessing a project. They used the previous year's budget as an anchor while actively seeking information on alternative solutions to the proposed project in order to facilitate a comparative assessment. This seeking of comparable information was hindered by the intangibility of project benefits.

Interviewees underlined the importance of the BI output before the meetings in enabling dialogue among SSG participants and stakeholders and as a way of exchanging information and developing a better understanding of a project's economic impact. Although decision-makers referred to the limitations of the BI output, they acknowledged its pivotal role in fostering dialogue and stimulating reflection and discussion around intangible benefits that could not be calculated, as stated by an interviewee:

> Then we go into the dialogue and say we really look, *we need actually explanation for these numbers*. (Head of PPMO)

Another interviewee explained how before the SSG meeting the decision-makers, based on the BI output, would go into discussions which allowed them to better understand not only the project but also their own preferences:

> So we need to discuss what is this, *why is this so expensive* then we look carefully through it and if we understand and agree what's in the package and we say okay this is what we want to do, now you can't manipulate anymore, so this is what we want to do. (Head of Forecasting Models)

The previous examples also show that the BI output generated discussion because of its abstracted nature from the complex reality of a project, which otherwise makes it difficult for decision-makers to understand what exactly is included and reflected in the cost-benefit analysis. The words in italics in the above quotes depict the difficulty the decision-makers had in understanding the BI output.

The portfolio manager also described how the BI output created a number of discussions among different decision-makers before the SSG meetings:

> We walk through the reports and they can take some comments back to their development director and we can have some of their comments from their areas that we can give the CIO as preparation for the meeting. (Portfolio Manager)

The use of the BI output to engage in dialogue was also prominent in the SSG meetings. Most of the discussions among the decision-makers started and evolved around the cost-benefit analysis, particularly as regarded intangible benefits and hidden costs. As also described in chapter 5, in a meeting the events unfold as following; first the development manager would present the list with the projects and data about the costs, benefits and the ratio of cost-benefit analysis. Second, the other decision-makers would challenge, doubt or ask questions about the costs and/or benefits. Third, the development manager or other decision-makers would respond by providing arguments, often using the BI output. This will be discussed in the next section, in which the tactics of using the BI output are identified and thoroughly described.

Apart from the role of BI output as a dialogue enabler, the interviewees also reported that they used the BI output to convince other decision-makers to make a certain decision or follow a certain course of action. The following interview excerpt illustrates how the BI output may be used to support an argument or claim for or against a specific project:

> No, [the BI output] is just the argument, but very often you need the data because it is the only way that you can convince people that this is a serious problem. You have to be able to tell to people, well this is affecting 100,000 customers, this is affecting all brands and you always have to tell how serious this issue is. (Head of IT Credit Processes)

Decision-makers are aware of the political uses of the BI output in the prioritization process. One decision-maker at the SSG level clearly stated this:

> It is very hard sitting on top to really understand the prioritization. I also think it's fine to have some focus on the costs and the benefits. But I think that's just too rough, specifically when you think about how much you actually use the cost-benefit calculation as means of prioritization, as who has cooked the business case most? (Head of Forecasting Models)

However, it was exactly the fact that the BI output was often used to convince people that made the decision-makers more skeptical about basing their decisions on it. Another decision-maker explained how it was necessary to be very cautious in considering the BI output in their decisions because they recognized that the BI output might be calculated in a way that favors the project and thus might sometimes offer unrealistic numbers:

> At least when we have all the numbers, you can say well this is important because actually we see we can earn a lot of money. … but people also tend to say well do we really believe in this cost benefit. And therefore to use this argument you have to do that with a smile when you do it because it is, I mean, can you for real save three minutes on each advisor in the total group if you make this system. No way. But sometimes it [the BI output] is used, and mainly I will say that I use it when it comes to the persons in back office on home loan for example because it's actually real people sitting there and if we can make a system handling what they are making in their daily work, then we could of course remove the people and then well the earnings are quite high. (Senior Business Representative 1)

Nonetheless, the same decision-maker also explained that the fact that a cost-benefit analysis has been performed grants some weight to the BI output because it symbolizes a process of thinking and investigation:

> At least they have looked into the benefits, for me you need to be able to know your shop, so you need to be able to have some hard data. (Senior Business Representative 1)

Overall, the BI output enables and stimulates dialogue among decision-makers before and during the SSG meetings. This dialogue results in a better understanding of the projects. As such the BI output is used by decision-makers to remain informed of the economic impact of projects, to convince themselves about specific projects, to support project choices and to depict rationality and influence the collective judgment of specific projects or their prioritization within an SSG.

Apart from the cost-benefit analysis the interviewees agreed that there are special circumstances and criteria that determine the prioritization of a project in the SSG list. Although during the first round of interviews many other criteria were identified, it was the SSG meeting observations that confirmed their active role in the prioritization process. In the follow-up interviews, one of the development managers confirmed that the task of prioritization was multidimensional and other criteria were used apart from the BI output:

> This is what you could call a multidimensional problem ... Pay-back ratio, G-ITC focus areas and strategic directions of the department, those three are the most important [criteria]... (Follow-up on SSG Meeting 1.1)
>
> … the ongoing projects, they will always be in the top of the list. The bargaining is on the new projects coming in, the bases of the prioritization is the discussion with the SWG members, where also the system areas are a part of and the alignment to other programs that are running in the bank, i.e. [project A] which, evaluated on its own merits, it would be much further down, but due to the fact that it is a link in a chain in a huge program, it moves up due to the prioritization and the benefit of the whole program… (Development Manager 2)

So how do managers make their project prioritization decisions in this context? They have to take into account the BI output provided for each project, which despite its unreliable nature constitutes the official criteria for the prioritization process. In the next sub-sections, I describe the tactics that were identified at the SSG level. The tactics concern the ways the decision-makers supplemented, substituted, interpreted or re-framed the BI output in their attempt to shape collective judgement and reach prioritization decisions.

6.1.2.2 Supplementing the BI output

The decision-makers advocating for a specific project sometimes supplemented the BI output with intangible elements not captured by the BI output in order to obtain a wider picture of the project under consideration or the prioritization list, as an interviewee explained:

> I think you should do the best you can within reason to get a cost-benefit analysis in numerical terms and then say this is a part of the equation, but then there are other parts of the equation which are the intangibles. (Head of Strategic Business Unit)

The decision-makers also highlighted the importance of supplementing the BI output with qualitative information about intangible benefits such as market readiness, better image, better user experience, and better advertisement as illustrated in the following interview excerpt:

> It's opening up now. So now, I do not only deliver cold data with customer benefits I also make some precise descriptions of what will this do for the advisers and for the customers. (Business Representative 2)

This approach was used to further support a specific project prioritization by enriching the BI output with contextual information. I observed that decision-makers used their networks in order to better understand the proposed projects, their impacts and interdependences, as well as the cost and benefit calculations for the projects. The Head of Forecasting Models who participates in SSG meetings reported:

> We do some informal talk, typically first hand, to find out where are the challenges, where are the time-consuming things that we need to change and if we can pin point that, then we can make a decision if we should include it formally or not. (Head of Forecasting Models)

Decision-makers would talk to other decision-makers from their own SSG and also to people they knew and trusted such as friends or colleagues with whom they had collaborated in the past. A senior business representative described how he engaged his network at Group IT before the SSG meetings:

> I call the people I actually know in the department and ask them how much it will take if I would really like to have a product now. So, the way we have done some of the latest products and many of the products that we actually made is done like that, that we call the ones that we really know can make it and ask them if I need a product in a week can you do it or not? (Senior Business Representative 1)

The above interview excerpt shows that a decision maker's personal network is often used to acquire reliable information about the projects, benefiting in this way from the personal experiences or knowledge of other persons.

In addition, decision-makers introduced other supplements such as experts' knowledge, sponsors and labels which complemented the BI output. One such instance was observed in the SSG Meeting 1.1. At the beginning of the meeting, just before presenting the prioritized list the development manager noted:

> When we get down to the business prioritization then we can use our benefit cost ratio as the starting point and then we of course can take on top of that individual arguments on how to move the prioritization. (SSG Meeting 1.2)

In the meeting one of the members asked why a project with a small benefit was prioritized and included in the list. The development manager explained:

> It's not just benefit-cost ratio, it is much more and if we combined those things then we think that we get a nice view on this [the project proposal]. (SSG Meeting 1.2)

Further, the development manager argued that the project was expected to have intangible benefits in terms of customer experience. This was not present in the cost-benefit calculations although it was expected that the project will greatly improve customer experience. The development manager supplemented the output by saying:

> We think that we need to take that [customer experience] into account, that's as good as other kinds of benefits, and we actually quantified some of the benefits seen from a customer point of view and we really think that these are also valid arguments for the project. (SSG Meeting 1.2, Development manager 1)

To further legitimate his argument the development manager called on another member who was an expert in the area to supplement the BI output with his domain knowledge. Specifically, the expert pointed out that although the project had a small financial benefit, it as a foundation project without which other projects that ere planned for the near future could not be implemented:

> I agree on the project also the scope because if you look into my business we have several different services within this area and I must say that the number of project steps we aim are large, so it's a very complex area and you can try to solve it all in one project but it will probably never end. So, I really must say that although it could seem as the benefit is small this is putting out a foundation project for future work (SSG Meeting 1.2, Business Representative 3).

The expert used a label (‘foundation project’) to designate the nature of the project, something that was not obvious from the BI output. At the same time, the fact that he was an expert in the area granted more authority to the support he provided. At the end, based on all this supplementary information around the BI output the decision makers decided to prioritize the project.

Further, the development manager after also using other arguments, ended by saying:

> I will also say that we have of course a sign off [from all the main stakeholders] on all three [planned projects]. So we have been around to everybody. (SSG Meeting 1.2)

The development manager, in an attempt to convince the other decision-makers who had challenged the project's prioritization, leveraged the fact that the main stakeholders had already signed off and were acting as sponsors of the project. In this way he provided additional support to the prioritization of the specific project.

Later, during the follow-up interview with the development manager, he explained how having sponsors makes it easier to reach an agreement in the meeting:

> It's nice to get the flow going and if it's possible to reach a solution that can be backed up by the main stakeholders and that's desirable. (Follow-up SSG meeting 1.2)

Especially in the case of projects with largely intangible benefits, sponsors are considered as credible evidence that other people believe that a project should be prioritized. The following interview excerpt illustrates this:

> We talked a lot about intangible benefits as well, typically what we asked [the idea owners] to do is maybe to pressure them a little bit is to identify sponsors at least, we need somebody else who also believes it's a good idea. (Head of IT Strategy)

As such sponsors appear to grant trust, legitimacy and a collective flavor and form to the choice of project.

Further, the follow-up interview for another SSG meeting confirmed the use of labels to designate the nature of the projects and compensate for a poor cost-benefits case:

> But due to the fact that this is just one *link in the chain* [italics added] in this huge program it moves up due to prioritization and the benefit of the whole program, because if we take that link out all the other [projects] will suffer. (Follow up on SSG meeting 2.1 with development manager 2).

In this instance the label provided situated cognitive support to the meeting participants by emphasizing the role and the importance of the project.

In brief, when a project's prioritization is challenged because of its BI output, supporters of the project used a number of other sources of information to supplement the BI output. In the previous case, the development manager first combined the BI output with personal knowledge about the intangible benefits of the project. In this way he helped the other decision-makers to better understand the intangible benefits not represented in the cost-benefit calculations. Through this discussion elements that were not captured by the BI output were brought into surface. As a result, by supplementing the BI output with other intangible elements the development manager created a stronger argument for prioritizing the project. Second, the development manager capitalized on the expert knowledge of another member at the meeting and asked for his support by involving him in the discussion. The other decision-maker employed a common label to designate the importance of the project to future projects despite its small immediate benefit. Finally, the development manager pointed out that sponsors had already signed off the project. It was the combination of these supplements to the BI output that shaped the collective judgment in the meeting and enabled the decision-makers to reach an affirmative decision about the project.

Different configurations of supplements are employed to support the BI output. As such, the supplements are active forces that complement not only the BI output but also each other. However, as it is described in the next section, the relationship is not always complementary but many times competes, fighting to substitute the BI output.

6.1.2.3 Substituting the BI output

During the first round of interviews the decision-makers referred to projects that were prioritized in the SSGs despite having a negative cost-benefit analysis. The Head of IT Governance described this practice as follows:

> There will be a negative cost-benefit but they will actually take the decision anyway, so it will be based on knowledge and description. (Head of IT Governance)

In these cases the decision-makers reported that they substitute the BI output with their own experience or personal knowledge:

> I only can write it down and tell them that this is good for the customers; this is good for the adviser. I believe that in the long run it will be good for the business but I can’t show the money. (Business Representative 2)

In such cases, the BI output is substituted by discussing and promoting non-measurable properties such as intangible benefits or losses, expertise, sponsors, knowledge from networks, and labels which are used to describe the business case instead of the BI output. As such, the decision-makers may overrule or ignore the BI output when prioritizing a project. It appears that this takes place when the BI output does not justify the prioritization of a project but information from other sources or the decision-makers’ belief suggest the opposite, or when there is no BI output available. The following interview excerpt is representative:

> The real struggle in the prioritization part is where are we and what do we actually believe in because I can see the numbers but they just don't make sense for real. (Senior Business Representative 1)

Many interviewees when asked how they prioritized projects in their SSG mentioned a belief element that played a major role:

> I don’t think it’s a benefit discussion; it’s much more whether actually it’s worthwhile doing the project. (Business Representative 3)

> Many of the projects are to a certain extent a belief [of the SSG members] that this is a good business. (Development Director 2)

However, such beliefs are created implicitly by inputs the decision-makers were exposed to before and during the SSG meetings. These inputs could be information from their network, experts, labels used to describe the project, or sponsors who supported the project. For example, a senior business representative described how he engages his network at Group IT before the SSG meetings:

> I will always call the development manager, talk to him and say well I think we should go in this direction, what do you think? (Senior Business Representative 1)

In the same spirit, in relation to finding support, the Head of Digital Banking Program noted:

> If you have some points that you think are absolutely important then you try and get some friends to back you up in the SSG. (Head of Digital Banking Program)

Especially during the meetings at the SSG level, substitutions of the BI output were frequently used to justify the inclusion of a project with a weak or negative cost-benefit analysis in the list of the SSG and thus the postponement of other projects with positive cost-benefit analyses. In such cases, the development manager directed the decision makers' attention to other information to justify the project. For example, in the SSG Meeting 1.1 the development manager presented a project with a weak cost-benefit analysis. The CIO asked if there were other projects that would be postponed because of the inclusion of this project. The development answered that there were no other projects and he highlighted to the other decision-makers at the meeting the fact that the project proposal, which was provided to all the members before the meeting, described the project as driven by strategic reasons (a change of an old system) and not by its cost-benefit analysis, which was rather weak.

In this instance, the development manager used a label to shift the attention of the decision-makers from the BI output to the label. In this way, the label was used to shape the collective judgment about the project in the meeting.

However, a business representative shifted attention back to the cost-benefit analysis by saying:

> This is not necessarily in my perspective the best business case I have ever seen. I would have liked to use more effort in [project B] in order to complete all the deliverables, which are delayed… (SSG Meeting 1.1)

At this point the development manager again substituted the cost-benefit analysis by drawing upon his domain knowledge of the competences of his employees. He described how the project, despite its weak business case, matched the existing competences of the resources of the department, which could not be used in Project B and emphasized and the timing of the project as a first step in the change process of an old system. In this case, although some of the other members of the SSG questioned the project's prioritization because of its poor cost-benefit analysis, the substitutions of the BI output by the development manager with his domain knowledge on competencies and resources and strategic outlook convinced the other members to keep the project on the list.

During the follow-up interview, the development manager pointed out that if powerful and influential people are sponsoring a project then the BI output is of little importance:

> If I have those 5 with me … we can beat the world. (Follow up on SSG meeting 1.1)

He further explained that sponsors are usually authority figures with power due to their positions and/or their expertise. He also explained that the specific labels used during the SSG meeting were to direct decision-makers' attention to specific characteristics or attributes of the project:

> We are reaching a *burning platform* for example on advising corporate systems. What I mean it's we have a very, very old system running that is not maintained very well and we are reaching a moment in time where we cannot use it anymore and then, it's actually down to do we want to be able to advice corporate customers or not? (Follow-up on SSG meeting 1.2)

In another meeting (SSG meeting 2.2), the Senior Business Representative requested a new project to be included on the list. The request was sent to all the members of the SSG some days before the meeting. The development manager presented the project and expressed his reservations about the benefits calculations of the project while he also showed what the consequences would for other projects on the list if this project was included as well.

The Senior Business Representative who promoted the project did not refer at all to the cost-benefit analysis but rather used knowledge from his network in Sweden to explain that:

> The most interesting part of this product is that we actually lack a product that is in the market right now in Sweden. All the rest of the banks in Sweden are comparing themselves against this product which means that if you look up in the newspapers you actually will see that what they compare in the market will be this product and we are the only bank that is not able to show this. (SSG meeting 2.2)

He also noted that a member of executive committee who was also a member of the IT committee wanted to sponsor the project to run on the 2011 development plan.

The development manager challenged the project's prioritization first by using the cost-benefit analysis, expressing his doubts and deconstructing the benefits to show that they were not calculated properly. Second, he used his domain knowledge on the impact that the inclusion of this project would have on ongoing projects, especially pointing to delays that would occur if this project were included in the plan. Third, he was also unconvinced by the reference to the sponsor since the last time he had met with the member of the executive committee they had agreed on a different plan.

At this point, the CIO entered the discussion, adopting the substitution of the cost-benefit analysis used by the Senior Business Representative:

> No, this is not about selling [benefit] in my mind; this is about not having the market's leading product in the market, that's the topic. (CIO – SSG Meeting 2.2)

Nonetheless the CIO acknowledged that problems would arise from the delays of the other projects. After discussing many different solutions, the decision-makers concluded that it could not be included in the plan because more investigation was needed in order to find a better solution.

In this instance, the substitution of the BI output with the network and sponsor arguments by the Senior Business Representative did not convince the decision-makers. On the other hand, the development manager relied on his expertise to show the impact of the new project on ongoing projects. At the same time, he cast doubt on the network and sponsor arguments used by the Senior Business Representative. As a result, the argumentation of the development manager based on expertise prevailed and led the decision-makers to reach a decision not to follow the recommendation of the Senior Business Representative at that stage.

6.1.2.4 Interpreting the BI output

In their interviews the decision-makers reported that they interpret the BI output and assign meaning to it based on their experience and personal knowledge. A development director described this in his interview:

> This means that we ourselves are actually interpreting 'what does this mean?' and based on our knowledge and understanding of it I make provisions for it in the planning. (Development Director 4)

Along the same lines, the IT Finance Manager reported:

> I interpret the reports and I make statements on what I see as the outcome from the analysis of the report. (IT Finance Manager)

As such, meaning is assigned to the BI output through interpretation grounded in the managers' knowledge and experience as well as the representation of knowledge by experts, colleagues, labels and sponsors. For example, a business representative reported how they perform initial filtering on projects by interpreting the BI output of the projects based on their experience:

> We are doing the initial filtering because we can then see okay by experience we judge that this is not going to fly if it's being presented like this, so we might as well take it off… (Head of Forecasting Models).

In addition, a project owner spoke of how decision-makers in the SSG interpreted the BI output as unrealistic based on their 'gut' feeling:

> They felt that some of the… expected benefits had been rated too high (Business Analyst).

The decision-makers at the SSG level referred in the interviews to how they use experts' knowledge to better understand and form an opinion about a project and its business case feasibility. The following interview excerpt describes why and how experts are used in the prioritization process to interpret the BI output of specific projects:

> They [experts, such as developers] are quite clever and they really know a lot about what to do in these systems and what to use them for. Some of the brightest persons are [sitting there] and it is very good to listen to them and

> finding out what could we actually do with this and what should be the next [project] to prioritize. (Senior Business Representative 1)

In the same way, labels such as “part of a bigger program initiative” or “legal/compliance project” were used to interpret the BI output of a project. As the Senior Business Representatives confirmed:

> I will say that yes it is used and you have far better opportunities of having your projects done if they are inside programs. (Senior Business Representative 1)

During the prioritization meetings it became obvious that the interpretation of the BI output differed from decision-maker to decision-maker. As a result, the different perspectives on which the BI output was interpreted became transparent. In the SSG Meeting 1.1, the senior business representative asked about interpretation of the BI output anchored to his perspective:

> What I really would like to know [is] if it actually means something for the customer if actually means something for the advisor, [then] I think is great. But we talk all times about the costs. I would really like to see, how this [the BI output] affects the advisers, how this affects the customers at the end of the day. (SSG Meeting 1.1)

During the follow-up interview the Senior Business Representative explained:

> There are many ways to discuss the cost-benefit, and therefore it’s quite difficult to have one individual way of doing this, so I guess that we from different business perspectives argue why are these products or why is this area important. (Senior Business Representative)

He further explained that it is not always possible to assign meaning to the BI output since sometimes the project is out of his area of expertise and he cannot understand whether the BI output is good or not. To interpret the BI output the decision maker uses his network, experts on cost-benefit analysis, labels or sponsors to provide him with information on how they see the BI output. He characterized how he uses his network as:

> That is just hard work, talking to people. (Senior Business Representative)

In few words, instead of supplementing or substituting the BI output, this tactic involves the interpretation of the BI output based on additional inputs. Here decision-makers leverage their network, experts, sponsors and labels to assign meaning to the BI output.

6.1.2.5 Presentation tactics - Reframing the BI output

Apart from the three tactics of using the BI output, some business analysts mentioned that the BI output calculations could change depending on the expectations of the decision-makers. That is, the analysts could find alternative ways of viewing and calculating the cost-benefit analysis. A business analyst whose project proposal was rejected by the SSG members explained in his interview how he would present his idea in the following year:

> So I will not tell them… since I am not being rewarded for being honest about the total costs of ownership, and that's more information than they normally get, I'll simply cut down on the information. (Business Analyst)

The analyst's project had been rejected at that point in time because the SSG members felt that it was not a good business case as the costs were very high. The analysts explained that the costs were high because he had calculated the costs for a period of 5 years, making his cost-benefit analysis look problematic compared to other projects.

These presentation tactics were observed also in the SSG meetings. The decision-makers used reframing tactics to present the BI output of their prioritization list to the IT committee members at the final meeting. The tactics were also used after a decision had been made by the members of the SSG, reframing the BI output to be presented in such a way as to convey the logic behind its prioritization to the decision-makers at the IT committee level. In this way, the cost-benefit analysis could be redefined or reframed so that it appears more convincing to the members of the IT committee. Finally, they also discussed the specific presentation strategy for the prioritization list to find ways to make it less debatable in the final prioritization meeting.

Projects that had a weak cost-benefit analysis were reframed in order to show the potential that the decision-makers believed they had. In SSG meeting 1.2 the CIO suggested the inclusion of benefits from future projects that would not be possible were the current project not prioritized:

> Maybe, the right thing would be to show the benefit of the initial project, but also perhaps indicate the full potential because the full potential is much bigger. … I have a feeling that it's right, but then you have to have the [whole] picture. (SSG meeting 1.2)

The Senior Business Representative who was to present the SSG list at the IT committee meeting pointed out why the reframing was important:

> I think that it could be nice to be sure when we have our presentation for the IT committee that we will be able, in one slide, to show them where [do we see] the benefits because it is a little tricky to come up and say well we have this project here and we don't get anything out of it. (SSG meeting 1.2)

In summary, decision makers re-select the data to adjust the BI output and to better communicate the rationale of the choice and make it more convincing.

6.1.2.6 Summary of tactics

Overall, decision-makers at the SSG level used a broad repertoire of tactics relative to the BI output to reach decisions, but also to reframe their BI output to better represent their choices. Table 14 presents a summary of the concepts and categories that comprised the tactics of using the BI output observed on the SSG level of the IT project prioritization process.

Tactics of using the BI output		
First order codes	**Second order categories**	**Aggregate Dimension**
part of the equation precise descriptions cold data the starting point individual arguments combine valid arguments foundation project	Supplementing the BI output	Tactics
can’t show the money not about selling a belief good business the numbers don't make sense for real based on knowledge it’s worthwhile	Substituting the BI output	
‘what does this mean’ I interpret the reports by experience we judge means something one way of doing this talking to people	Interpreting the BI output	
cut down on the information not rewarded for being honest indicate the full potential you have to have the picture recalculate the costs match expectations quantify intangible benefits	Presentation Tactics – Reframing the BI output	

Table 14: Summary of tactics of using the BI output for reaching a decision at the SSG level

These tactics involve a combination of uses of the BI output and a configuration of other inputs from networks, sponsors, experts and classification labels. All the aforementioned inputs together with the BI output appear to act as guideposts for collective decision-making. Since this study investigates the use of the BI output in decision-making, the above tactics show how the BI output is used for reaching a decision in relation to the other inputs – that is, how the BI output influences and is influenced by these inputs.

In this way, the BI output is supplemented and enriched with other input, such as information concerning intangible benefits, interdependences between projects, the importance of the project, sponsors etc., creating a stronger argument to influence collective judgment and reach a decision. Sometimes, the BI output is substituted with these inputs when the BI output opposes the information from the other inputs. Also, the BI output is interpreted based on other inputs. Finally, the analysis revealed that once a decision is reached, the decision-makers sometimes engage in further reframing of the BI output in order to better convey their decision rationale or support to specific projects.

6.1.3 Summary of findings on the SSG level

This section presented a thematic analysis of the empirical data concerning the use of the BI output in the decision-making process at the SSG level. The process is characterized by a complex organization of people, information, and rules. The purpose of all this organization is to enable decision-makers to arrive at an organizational decision. However, as the findings show, this organization has its own characteristics that, in turn, pose their own limitations to the decision-making process and the use of the BI output in it.

In particular, this section described the characteristics of the overall process at the SSG level, the BI output, the projects and the constraints posed by the overall organizational structure. Specifically, how the development managers come up with project ideas or how a project idea makes it to the final SSG list is not transparent. Projects' interdependences and technical complexity, the ambiguity of the BI output in terms of costs and benefits calculations, and resource and competency constraints characterize the process and impact the way decision-makers use the BI output to make decisions at the SSG level.

Further, the prescribed and the actual use of the BI output have been presented. The official purpose of the BI output is to inform decision-makers about the economic value of a project based on which the projects are prioritized. However, in practice it was observed that the BI output is also used to persuade and influence the collective judgment of decision-makers at the SSG level through a dialogical process that sometimes involves trying to understand the calculations and sometimes involves challenging the calculations due to suspicions of unrealistic numbers.

Next, this section described the tactics of using the BI output for reaching decisions. The tactics of supplementing, substituting and interpreting show how the BI output is used for reaching a decision in practice. In practice, decision-makers do not use the BI output in isolation but rather use different inputs, resulting in a strong interplay between them. In this way, the empirical findings show that sometimes the BI output is supplemented with inputs from colleagues, experts, labels and sponsors. When the relation between the BI output and the other inputs is opposing they compete and thus sometimes the BI output is substituted with arguments grounded in experts, sponsors, labels or networks. The last tactic is that of interpreting the BI output based on different inputs. Here decision-makers use the network, experts, sponsors and labels to assign meaning to the BI output. The analysis also showed that decision-makers use tactics to reframe the BI output to make it more convincing to the members of the IT committee and to better communicate their decision rationale.

6.2 Decision process at the IT committee level

The IT committee level is involved in the decision-making process from the moment that the SSGs send their prioritized project lists to the PPMO up until the final decision is made. The purpose of this process is to enable the IT committee members to make decisions concerning the overall IT project portfolio of Group IT. As described in chapter 5, the members decide on the budget and projects across SSGs. That is, they can stop running projects, reject proposed projects and approve others while also deciding on the overall budget, which also includes administrative and task budget, for each SSG. This section is structured in the same way as the previous one. First, I present the process and projects' characteristics, the BI output and the constraints posed by the overall organizational structure. Next, I present the tactics employed by the decision-makers when using the BI output in order to reach a final decision.

6.2.1 Process and project characteristics at the IT committee level

As with the SSG level, the process and project characteristics shape the use of the BI output and its role in the decision-making process at the IT committee level. The following characteristics were identified on this level:

- Lack of portfolio overview and a holistic perspective
- Lack of overview of projects' interdependences
- Lack of benefit follow-up process for implemented projects.
- Distrust towards cost and benefit calculations
- Incommensurability of projects

Below, I analyze each of these characteristics and substantiate them through the use of examples from my empirical data and field notes.

6.2.1.1 Lack of portfolio overview and a holistic perspective

In contrast to the interviewees at the SSG level, the decision-makers at IT committee level did not refer to a lack of transparency as a characteristic of the prioritization process. However, the IT committee members were concerned about the lack of a portfolio overview and a holistic perspective on the process and struggled with making portfolio decisions. As explained during the interviews the organization of the projects in SSGs did not allow them to have a group portfolio overview:

> Our role is to kind of capture those discrepancies in the plan and address them and show that I made a good decision that takes into account the pros and

cons from a group perspective and not just within the individual development area or [SSG]. (Head of IT Strategy)

During the follow-up interviews, a member of the IT committee reported the lack of portfolio overview. They suggested that they could gain a good idea of the portfolio of each SSG, but not from an overall perspective:

> [The information provided by PPMO] helped me to get insight on a detailed level again from each group but it did not help me to get this overview, process by process, segment by segment. (Follow up on IT committee final prioritization meeting with Executive committee member)

Another member pointed to the importance of the holistic perspective for the decision-makers at the IT committee level:

> I will say that I don't think we are good at really using the business arguments from a total perspective. I mean the people that can see this [project portfolio] from a more broad perspective than only their little cluster in the total they actually convince me. (Follow up on IT committee final prioritization meeting with Senior Business Representative 1)

The Head of IT Strategy explained why the holistic perspective and the lack of overview were important for the decision-makers in the IT committee:

> A good decision [is one] that takes into account pros and cons from a group perspective and not just within the individual SSG or development area. (Head of IT Strategy)

In summary, the IT project prioritization process at the IT committee level and specifically the way information is organized and provided to the decision-makers was characterized by a lack of overview of the overall portfolio since the information was provided for each SSG rather than as a holistic or Danske Bank Group perspective on the portfolio.

6.2.1.2 *Lack of overview of projects' interdependences*

The lack of overview of projects' interdependences continued to characterize the process at the IT committee level as well. Project interdependencies further complicated the IT prioritization process and budget allocation for each area, since a budget cut in one area could mean that other projects in other areas could not be implemented. As a member of the IT committee reported:

> All these complex interconnections, they are not obvious. (Follow-up on IT committee final prioritization meeting with executive committee member)

The COO remarked that many informal talks take place before and during the final meeting at which the COO has to intervene in order to make sure that interdependent projects are prioritized in all SSGs, otherwise SSGs do not commit to the development or implementation of dependent projects:

> Everyone is able to say, no, I cannot deliver if the other one doesn't deliver, and I have this bottleneck and you need to talk to the other one. (Follow-up on IT committee final prioritization meeting with COO)

Project interdependences are not detectable by the members of the IT committee using only on the BI output they are provided with. The members can only learn about such interdependences by obtaining a deeper understanding of the projects and by interacting with people who know about these projects. A recurring question asked during the IT committee meeting was how removing one project from the list would affect other projects:

> The first question was about consequences if I don't do this. How this will influence other projects, the customer experience, influence the cost savings … so there were a lot of [discussions] about consequences. (Follow-up on IT committee final prioritization meeting with executive committee member)

The importance of making the interdependences more transparent was also confirmed in the follow-up interviews with the development directors who presented the list of the projects for their SSG to the IT committee. In the following quote the development director shows how his presentation was specifically focused on emphasizing the relationships his projects had to other SSGs:

> I presented the SSG foundation because it was very important for us to paint a bigger picture than just that SSG but to point to the fact that there was a relation to the projects running in other SSGs for the new platform. (Follow-up on IT committee final prioritization meeting with Development Director 1)

Overall, the project interdependences were critical to decision-makers' prioritization decisions. In the current structure of the BI output, interdependences are not visible and as such the decision process was characterized by a continuous effort from the decision-makers to use different means to acquire information about the underlying interdependencies.

6.2.1.3 Lack of benefit follow-up process on the implemented projects

The decision-makers in the IT committee also highlighted the lack of a follow-up process on benefit calculations and the corresponding absence of accountability for those benefits. A member of the IT committee pointed out the lack of the follow-up process and explained its impact on the benefit calculations:

> As long as whoever is presenting knows that there is not going to be a follow up then it's a 'free lunch' just to argue that by having this product we can sell X million and with a margin of Y. (Follow-up on IT committee final prioritization meeting with CFO)

Further, the decision-makers mentioned the political incentives of the brands to ask for many projects, since the benefit for which they would be responsible was not traced and as such there was no accountability to make them think twice about the number of projects they proposed:

> Since our brands cannot trace back the impact on their bottom line the decisions and wishes they put forward they have an incentive to ask for as much as they can. (Head of Strategic Business Unit)

The Head of IT Strategy also confirmed the effect that the lack of a benefit follow-up process had on the prioritization process and the way the decision-makers treated benefit calculations:

> The challenge here is that because nobody is doing the follow up. It's been kind of a bidding contest sometimes when we are doing the prioritization so, one billion, I can do two billion, I can do… because there has been no kind of follow up on it. (Head of IT Strategy)

In summary, the process of IT project prioritization is characterized by a lack of follow up on benefit calculations which in turn impacts the prioritization of the projects and the way the decision-makers at the IT committee treat these calculations in decision-making.

6.2.1.4 Distrust towards cost and benefit calculations

During the SSGs' presentations to the IT committee, committee members challenged the chairmen on the number and priority of their projects. I found that during the prioritization phase the cost-benefit analysis was not directly used as an argument because the members of the committee interviewed did not believe either in the way the benefits were calculated nor in the amount of benefits they claimed to provide. As the Head of Strategic Unit explained:

> It's very easy to poke a hole in even the best [business case]. (Head of Strategic Business Unit)

On the other hand, non-financial arguments such as strategic directions were used frequently, both in term of organizational, departmental strategies, and competition. As one of the members of the IT committee reported:

> "Strategy" and "competition" were the words most used; [financial] benefits were almost not used. ... Typically [benefits] are overstated; they are not worded in a way where you can actually do a follow up. So it is lack of trust, lack of confidence [towards the benefits]. So, no time was spent on benefits, nothing, at all. (Follow up on IT committee final prioritization meeting with CFO)

The members of the IT committee also distrusted the benefits not only because of the lack of follow-up process but also because they were not always realizable in practice. The Senior Business Representative explained:

> I mean in different areas we only have four persons and what does it mean if we save three minutes, so therefore you have to be very careful using that argument of why this is important. (Follow up on IT committee final prioritization meeting with Senior Business Representative 1)

The IT committee members also showed their distrust towards the cost calculations as they had noticed that almost all projects go over budget during their development. The CFO specifically expressed his reluctance towards the cost calculations:

> I know for a fact that those figures never match, never. They are always wrong, and typically they are too small. (Follow-up on IT committee final prioritization meeting with CFO)

The Head of the Strategic Business Unit confirmed and explained that the distrust towards the cost-benefit analysis was related to the assumptions made when making the analysis which can be very easy attacked:

> It's very easy to poke a hole in even the best one [business case] because the assumptions that are made are very bold because none of them take account for the cannibalization over the products, they don't account for market share, they don't account for churn, there are just tons of flaws in them. (Head of Strategic Business Unit)

In general, the process at this level was characterized by distrust towards the cost-benefit analysis, which in turn was treated with skepticism by decision-makers in the prioritization process.

6.2.1.5 *Incommensurability of projects*

During the follow-up interviews, the IT committee members underlined the difficulty of comparing the cost-benefit analyses of different projects, especially between projects in different areas or SSGs. This was also obvious in the illustrative story presented earlier in this chapter in which the COO clearly stated that the cost-benefit analysis did not help in making the decision because the projects were not comparable.

The portfolio manager, who also participated in the IT committee meeting, pointed out the difficulty in comparing projects from different areas even though there was a cost-benefit analysis for all projects:

> It's such a broad portfolio so it doesn't make sense I think to prioritize a pension project in front of a retail banking project, because you can't compare it. (Follow up on IT committee final prioritization meeting with Portfolio Manager)

In particular, the Senior Business Representative explained why it is not always possible to compare projects based on the cost-benefit analysis:

> So even though the cost benefit on this area is quite small if you look at the individual thing in it it's actually a huge deal for the bank if you look at it from a total level, so therefore to compare this little detail with we can take

> ten men out from shared service center is the wrong perspective. (Follow up on IT committee final prioritization meeting with Senior Business Representative 1)

This difficulty of comparing projects is a manifestation of incommensurability of project proposals, which is raised because of different points of views among decision-makers. If the decision-makers shared the same point of view then the projects could be compared. A development director described how difficult it is to collectively decide what a good cost-benefit analysis is in order to be able to compare projects with it:

> That is hard to work because in another SSG the figure is a hundred and fifty, so what is then a good number? (Follow up on IT committee final prioritization meeting with Development Director 4)

6.2.1.6 Summary of characteristics at the IT committee level

Table 15 summarizes the concepts and categories that compose the characteristics of the IT project prioritization process, the BI output, and the limitations posed by these characteristics on the IT committee level.

In summary, the way that IT project prioritization is organized and structured at the IT committee level exhibits the following characteristics. The decision makers in the IT committee lacked a portfolio overview and struggled to gain a holistic perspective on the impact of projects. The information and BI output they received was organized per SSG. Therefore they were mainly informed as to how projects wold impact an individual SSG but not what their overall impact on the Danske Bank Group might be. Further, the lack of overview of interdependencies among projects characterized the process on the IT committee level just as on the SSG level. In addition, the lack of benefits follow up led decision makers at this level to show distrust towards the BI output and to question the assumption of the analysis that lies behind the numbers.

Characteristics on the IT committee level		
First order codes	**Second order categories**	**Aggregate Dimension**
group perspective their little cluster overview, process by process, segment by segment total perspective broad perspective silos stovepipe	Lack of portfolio overview Lack of a holistic perspective	Process and projects' characteristics
complex interconnections they are not obvious bottleneck consequences influence other projects relation to the projects	Lack of overview of portfolio interdependences	
free lunch cannot trace back no kind of follow up bidding contest no accountability whether we harvested what we said	Lack of benefit follow-up	
too small always wrong figures never match no time was spent on benefits lack of trust lack of confidence I don't believe our benefits poke a hole bold assumptions tons of flaws	Distrust towards costs and benefits calculations	
broad portfolio it doesn't make sense to prioritize can't compare wrong perspective what is then a good number can't put a number to it how can you compare the business case doesn't help we are special we are different	Incommensurability	

Table 15 : Summary of characteristics on the IT committee level

Further, it appears that the intangible nature of the IT projects' benefits exhibits incommensurability, a characteristic that makes the decision task of the IT committee members even more difficult. Because of all these characteristics and the limitations they impose on the decision-makers it is obvious that the decision-makers cannot rely only on the BI output alone to prioritize the projects. In the next section, I present and describe how the decision-makers reach a decision and the tactics employed by the decision-makers to overcome and cope with the limitations posed by the above characteristics.

6.2.2 Tactics of using the BI output for reaching a decision

This section describes how decision-makers used the BI output to reach a decision despite the problems posed by the projects and process characteristics described above. As was the case at the SSG level, at the IT committee level the BI output is not used in isolation but rather there is a complex interplay between the BI output and other inputs. Before presenting the tactics identified at this level, I start by describing the prescribed used of the BI output and its actual use on the IT committee level.

6.2.2.1 Prescribed versus actual use of BI output

Two weeks before the IT committee meeting, the IT committee members receive detailed documentation on the lists of projects from the PPMO, including the BI output for all SSGs. In 2010, this was a 121-page document that the decision-makers referred to as the Bible. The cost-benefit analysis is provided for each project and its main purpose is present, as on the SSG level, to inform the IT committee members of the economic value of the projects. Further it is also expected to create an opportunity for dialogue among the decision-makers and the chairmen of the SSGs during the presentations. The portfolio manager explained:

> Then, they can go into the dialogue and say I need actual explanations for these numbers. (Follow-up on IT committee final prioritization meeting with Portfolio Manager)

Nonetheless, during the follow-up interviews, the IT committee members reported that the BI output for each project is rarely used or discussed extensively, just as at the SSG level. They provided multiple reasons for not extensively using the BI output. As already mentioned in the previous section, the process at this level was characterized by distrust of the benefits. The CFO explained during the follow-up interview:

> If they had focused too much on the benefits I would have reacted because I don't believe our benefit calculations. (Follow-up on IT committee final prioritization meeting with CFO)

However, he also offered a reason for why the members did not question the BI output in the meeting:

> I think the reason why we didn't question [the cost-benefit analyses] was that we hopefully knew that it was the best effort. (Follow up on IT committee final prioritization meeting with CFO)

Further, the IT committee members were also aware of the incentives the SSGs had to show a good cost-benefit analysis for their projects:

> The SSG's know that the higher benefits they have, the more likely they will be prioritized. (CIO)

Another committee member suggested that the real focus was on gaining commitment to the cost-benefit analyses of their projects from the chairmen and development directors:

> It was about commitment because for each project they have said what would be the investment and what would be the cost benefit analysis, but it's not very clear who should deliver this, who are committed to this decision and

> how can we make sure that we will get the return we expect to get. (Follow-up on IT committee final prioritization meeting with executive committee member)

In the private meeting held among the IT committee members after the presentations the discussion focused on the total cost-benefit analysis for each SSG. The portfolio manager who participated in the meeting reported that first the members discussed specific projects and then looked at each SSG in turn:

> And often when the cross functional prioritization is finished you look into each SSG and say okay how much money do they have. Compared to last year we will end here, should we increase or decrease. So your starting point is that given the current investment level what do you want to do going forward. Do you want to invest more or do you want to invest less? (Follow-up on IT committee final prioritization meeting with Portfolio Manager)

In summary, the BI output had a less central role during the presentations of the chairmen but took a more central role in the private meeting among the members, though not on a per project basis but rather as the total BI output for each SSG. This was mainly used as an anchor for the decision-makers to decide for more or less investment in the specific SSG.

In relation to resource allocation, the managers highlighted the importance of taking a holistic perspective on the final prioritization decision, as well as the importance of experience and personal knowledge in understanding the project portfolio overview and the corresponding interdependencies that might influence the resource allocation. They underlined the role of the previous year’s budget in their present decisions, indicating the strong influence of anchoring. They also described a number of rules of thumb, such as requesting small increases compared to the previous year’s SSG budgets.

The managers did not believe the cost-benefit calculations. Despite this, they had to make their project prioritization decisions. If they did not believe the cost-benefit calculations how did they understand which project should be prioritized in this context? In the next sub-sections, I describe the tactics that were identified at the IT committee level. The tactics concern the use of the BI output in shaping collective judgement and reaching prioritization decisions.

6.2.2.2 Supplementing the BI output

The IT committee members described many practices for using the BI output in the final meeting of the IT committee. The main tactic used by the members of the IT committee was supplementing the BI output with other inputs. These inputs provided decision-makers with trusted information and at the same time provided oriented knowledge influencing their decisions. Before the IT committee meeting, the decision-makers received documentation with cost-benefit analysis for all the projects. However, they used their networks to better understand the cost-benefit analysis and the project itself. The COO confirmed this practice when he described how he approached understanding the projects before the final prioritization meeting:

> You get the material and then we ask our people, please double check what is your opinion what do you think is the right thing. I went through every single project with one of my employees who is involved with most SSGs and asked 'What does that mean?' (Follow-up on IT committee final prioritization meeting with COO)

As one of the portfolio managers observed, the IT committee members discussed the received documentation with people from their close personal network in order to better understand the BI output provided by the PPMO, but also to acquire information not included in the documentation:

> What happens is that the people behind them [the IT committee members] start working once we [PPMO] forward the material, then, the machinery

> starts to work and then they prepare them; you should be asking this or what is this or you should prioritize this. (Follow-up on IT committee final prioritization meeting with Head of PPMO)

The decision-makers also used their networks to acquire information about projects that they were not familiar with. Another member of the IT committee described how he used his network to better understand the projects before the meeting:

> I checked and I contacted some of the [people] that handled the groups, to get some more information, because I went through it [and said] oh that's a new one so I checked [with my people]. (Follow-up on IT committee final prioritization meeting with executive committee member)

In this way, personal networks were used to supplement the BI output before the IT committee meeting. Networks appeared to be critical also for the chairmen of the SSGs who presented the prioritized list of projects to the IT committee. Using their networks, the chairmen tried to understand how their own area was perceived and to attract sponsors who would participate and support their specific list at the IT committee meeting.

The presentation activity had been newly introduced and was used for the first time in 2010 during the IT project prioritization process. It was introduced precisely in order to supplement the BI output with more contextual information because as the Head of the PPMO stated:

> [The IT committee members] feel that they do it based too much on paper and not on the real input from the SSGs. (Head of PPMO)

In this phase, the committee members asked many questions, such as "If we have to cut your SSG budget, which project should we remove, should we go from the bottom of the list or are there specific projects that should be cut off?" The CFO specifically pointed how they used the presentation as a way to find out about the interdependences and the logic behind the prioritized list of projects:

> They were all asked why they had prioritized as they had, whether they had certain dependencies to other, and if we were going to cut, where they would cut themselves. (Follow-up on IT committee final prioritization meeting with CFO)

As the Head of the PPMO explained, in the meeting, during the SSG presentations the decision-makers relied on the expertise and domain knowledge of the presenters, and tried to ask questions in order to better understand the projects, their interdependences and their impact and importance for the overall Danske Bank Group and Group IT rather than just for the specific SSG:

> If they were a little bit in doubt even though they have projects descriptions you can still be in doubt no matter how good it is, what is it that this project actually does. Then it was typically the development director that would then say okay this is so and so, [he would provide] more technical information. (Follow-up on IT committee final prioritization meeting with Head of PPMO)

For example, an SSG director presenting in the meeting was trusted because of his expertise, which complemented the projects' facts by providing additional contextual information about the projects. A SSG director explained:

> Looking at the economical parameters alone is not feasible. You need to take in what are the risks associated with not doing it, what are the risks associated with doing it. (Follow-up on IT committee final prioritization meeting with Development Director 4)

The presentations also created a stronger trust towards the cost-benefit analysis since it worked as a confirmation of the analysis while. At the same time, the committee members perceived the presentations as an act of commitment from the presenters to the implementation of the projects within the cost-benefit analysis that they were presenting. For example the COO referred to the presentation activity and its role:

> It confirmed what they had written so you start trusting that the material you receive is good. (Follow-up on IT committee final prioritization meeting with COO)

The IT committee members trusted the information provided by the presenters along with the BI output about the project. The presentations from the chairmen of the SSG were very important in shaping the judgments of the members in relation to the different projects, especially those that they were not familiar with. The CFO emphasized how much the presentations and the discussion that followed immediately after influenced his judgment on the different projects:

> I would say that probably 70 percent of my notes and reactions [this project shouldn't be prioritized or could wait for next year] were made during the presentations. I would guess that 30 percent I could have made in advance just by reading the headlines and the notes and seeing that this is something that I like and this I don't like. It was definitely based on the words that came from the mouth of the people presenting. They might not know and not realize it. It was worthwhile... (Follow-up on IT committee final prioritization meeting with CFO)

At the IT committee level the interviewees referred to SSG members, particularly the chairmen and the development directors, as experts in their respective areas. An IT Committee member highlighted how the IT committee members relied on the expertise of the SSG members and trusted the BI output and the presentation of the project lists by the SSG chairmen in the meeting, especially in the case of projects that were out of their area of expertise, such as infrastructure:

> When it comes to more infrastructure… IT projects ... then we just need to trust the presenter and I would also trust that the SSG would give me a

> prioritization where they have looked into the benefits not by calculation but by their knowledge, so I would trust their prioritization. (Follow up on IT committee final prioritization meeting with CFO)

The Portfolio Manager also highlighted the expertise of the development directors and the development managers and how the IT committee members relied on this expertise:

> The input that comes from development directors and development managers, obviously, we need to rely very much on what they bring forward because they really have the knowledge to judge what comes out of it. (Follow-up on IT committee final prioritization meeting with Portfolio Manager)

Further, a development director confirmed that only the development directors and development managers had the detailed knowledge about the projects and the consequences of removing or adding specific projects on the plan:

> No one person who is the chairman [usually from the business areas] of an SSG is capable of explaining and understanding the full context of the development plan. Only the development managers and the development director have that insight because there is quite a lot of detailed knowledge behind that is necessary to understand the implications when or if a question arises, so what if we did not do this, what would be the consequence. (Follow-up on IT committee final prioritization meeting with Development Director 4)

The committee members also supplemented the BI output with their own intuitions and beliefs based on their previous experiences and domain knowledge. The Senior Business representative described the how he supplements his expert intuition with the BI output:

> If I really have to understand why is this important because all the things are important, all the things are good, all the things make sense, I can’t see a thing that does not have a cost benefit ratio of something. So therefore people really

> convincing me are [the ones that] make me also feel in my stomach that they know what will this mean if we go out and try to implement. (Follow-up on IT committee final prioritization meeting with Senior Business Representative 1)

As mentioned earlier, the SSG participants and projects owners identified sponsors in the IT committee in order to garner support for their projects in the prioritization process. One of the business representatives specified who his sponsor was at the meeting:

> He [the Senior Business Representative 1] will be my man in the [IT committee] prioritization [meeting]. (Business Representative 2)

Sponsors are considered especially important in the case of projects with largely intangible benefits and a weak cost-benefit analysis, i.e. a low or negative NPV. As such sponsoring was used as a supplementing input. The Head of IT Strategy described how they view sponsoring as granting legitimacy to projects with intangible benefits:

> It will be great if five or six people for example said: we all believe this would be a considerable benefit. (Head of IT Strategy)

After the presentations from the SSG chairmen, the committee gathered for their private meeting in which they would decide the final portfolio for the Group IT. In this private meeting, sponsoring was used to supplement the BI output. Specifically, the COO and the portfolio managers participating in the meeting created a scenario based on their understanding on how the portfolio could look. The portfolio manager described how this scenario was created:

> This [portfolio scenario] was based on our knowledge and what I heard during the presentation, and obviously the people also talked in the breaks and said 'is this important or is this not important? (Follow-up on IT committee final prioritization meeting with Head of PPMO)

The COO then presented the scenario to the other members and they discussed it until an agreement was reached about the whole portfolio. The portfolio manager explained how sponsoring works in the IT committee meeting by providing an example:

> For instance the COO presents the mobile banking project he says okay we should do this for the following reason… so he is more like the sponsor, and then the others can comment on it. (Follow-up on IT committee final prioritization meeting with Portfolio Manager)

During this discussion the members reported that the BI output of the SSGs was employed as an anchor on top of which other inputs were used. At this point, different members were sponsoring different areas and the stronger the sponsorship the questions were asked and the more likely the SSG would have its list of projects approved. It seems that the more powerful the sponsorship the fewer questions will be asked in the IT committee meeting about specific projects and thus the easier it is for the project to be prioritized, as described during the interviews:

> During the meeting I saw a couple of times that because one of the committee members was highly advocating for this or that then it was not questioned anymore by the committee members. (Follow-up on IT committee final prioritization meeting with CFO)

This section described how decision-makers used various inputs to supplement the BI output in order to better understand the projects and the organizational priorities but also to shape collective judgment and reach organizational decisions.

6.2.2.3 Substituting the BI output

When the BI output was opposed to the member's beliefs, experiences, and judgment the decision makers appeared to substitute the BI output with arguments grounded in their experiences and domain knowledge, sponsorship, intangible properties, holistic perspectives, expert authority and other inputs. For example the Head of IT Strategy reported:

> The net bank, yes we probably need to do it because it basically looks like it did in ‘96. But the business case is not going to be very good, but still the IT committee I guarantee you they will approve it because they think that that’s something we need to do from an image point of view. And it will be very hard to qualify the business case but we need to do it … We have the IT committee members as the overall prioritization-makers and they can choose to disregard all the financials, if they feel this is important they will ask us to do it no matter what. (Head of IT Strategy).

The Senior Business Representative explained how the network of informal communication was used to acquire this holistic perspective on the portfolio of projects that substituted the cost-benefit analysis:

> You can’t read it from the paper; you need to understand [the projects] and that is just hard work talking to people. … You don’t stand a chance unless you are talking to a lot of people discussing all the things, also discussing from the business side is this really important do you really mean that it is more important to make than x… At the end of the day I think that it is the stomach feeling ... well, if we … believe in it. (Follow-up on IT committee final prioritization meeting with Senior Business Representative 1)

A member of the IT committee also pointed out the dominance of what the members perceive as important over the BI output:

> I think it’s more a question of believing whether the IT solution is the right solution or not rather than just trusting a benefit calculation. (Follow-up on IT committee final prioritization meeting with CFO)

Another member of the IT committee provided an example of the substitution tactic in practice. He referred to application X, underlining the use of intuition and the limitations of hard benefits because of the subjective nature of prioritization:

> We are not making any money on [application X], but on the other hand we have had the best publicity in the last three years. Therefore, this is not looking very attractive from an IT investment point of view, but if this can turn the total look of the company around than it is probably the best investment we have ever done. (Follow up on IT committee final prioritization meeting with Senior Business Representative 1)

Another member of the IT committee described how intuition substituted the BI output in the process of prioritizing an IT project:

> [Project prioritization] was more intuition than hard facts. It is more a decision based on soft information, discussing what our appetite for this area is and not really looking at the total benefits that this area provides. For example, we don't earn any money on [application X], it was a decision based on the soft intangible benefits or intuition that [application X] would put us in front of our competitors. Now, everybody is talking about it... it is the soft information and intuition if customers would like this product or what is the appetite for products from a specific area, do we want to be strong in the area or do we just want to follow our competitors? (Follow up on IT committee final prioritization meeting with CFO)

In addition, the decision makers also used the presentation activity itself, the performance of the presenters and the impression they made to the IT committee members, to substitute the BI output. The presentations created a shared experience among the members of the IT committee and gave a common reference point to their discussions. Instead of refereeing based on the cost-benefit analysis they would refer to the performance of the presenters and the confidence they inspired in the IT committee members. The COO explicitly explained how the performance of the presenters created a collective impression of the SSGs and their prioritized lists as well as the necessary trust for the IT committee members to make decisions:

> Good presentation is if the chairmen short and clearly explains you what he does in the plan, that he explains the situation, then explains the issue we want to solve, and then explains how we solve it. You get the impression that okay that person has his shop under control and what he says is probably something I should trust as a manager because we need to trust and then make a decision. A bad presentation, answers are not clear, and then you start worrying. (Follow-up on IT committee final prioritization meeting with COO)

Specifically, the interviewees mentioned the case of one SSG presenter who did not do a good job, saying that the presentation was very defensive in nature, the explanations were not clear and that the cost-benefit analysis could not be argued from a Danske Bank Group perspective. This SSG saw a significant reduction in the number of the projects approved.

Another example of the substitution tactic on the IT committee level was the case presented at the beginning of this chapter by the COO. The members had to select between two systems: the HR system and the next Mobile Bank. Both of their cost-benefit analyses were not significant in any way because they largely offered intangible benefits. Thus, there was no basis for comparison. The projects were incommensurable and discussions about which was the most beneficial might never end because one could always make claims for or against either of them. During the follow-up interviews with the different committee members it become evident that sponsoring and the fact that the Next Mobile Bank project was a program-related project were used instead of the cost-benefit analysis. These other inputs finally shaped the collective judgment of the members and allowed them to reach a decision and prioritize the Next Mobile bank project and to postpone the HR system. The Next

Mobile bank had many sponsors in the meeting and was also a part of the Digital Banking Program, labeling it as a program-related project supported during the presentation by the SSG chairman. On the other hand, the HR SSG, in general, did not have a strong voice in the IT committee while their presentation and the argument used were not very strong either, as reported by the CFO:

> The [x] SSG didn't have that voice, maybe I should have been that voice, it probably wouldn't have mattered. I think in the next IT committee meeting I think someone should actually take some seconds discussing with the chairman of the SSG [x] what is their strategy, what is the reason for whatever they prioritize. They stood a bit naked at the meeting... and [that SSG] is probably the SSG that is the farthest away [the least familiar] from the members sitting in the prioritization group. (Follow-up on IT committee final prioritization meeting with CFO)

It was the combination of sponsors and labels used to support the Next Mobile Bank project and the lack of arguments used to support the HR project that influenced the decision-makers to prioritize the Next Mobile Bank and postpone the HR project.

6.2.2.4 Summary of tactics used on the IT committee level

In summary, on this level decision makers primarily used the tactics of supplementing and substituting the BI output with other inputs from networks, sponsors, experts and expert intuition, sponsoring and the presentation activity. These inputs equipped them with knowledge that shaped their judgment and allowed them to reach a decision.

Table 16 summarizes the concepts and the categories that comprise the tactics of using the BI output employed by the decision-makers to reach a decision at the IT committee level of the IT project prioritization process.

The 'interpreting' tactic was not used at this level. This is because the members of the IT committee appear to have delegated the interpretation of the BI output to the SSG and their chairmen during the presentation. Therefore, at the IT committee level they did not discuss the BI output per se but focused on supplementing or substituting arguments and inputs.

Tactics of using the BI output on the IT committee level		
First order codes	**Second order categories**	**Aggregate Dimension**
My employees What does that mean the real input from the SSGs technical information economical parameters risks associated feel in my stomach	Supplementing BI outputs	Tactics
choose to disregard all the financials a question of believing rather than a benefit calculation not looking very attractive not making any money	Substituting BI outputs	

Table 16: Summary of tactics of using the BI output for reaching a decision at the IT committee level

The IT committee members used their networks and expert intuition and employed sponsors, experts, and labels as inputs in the decision process. These inputs are more qualitative in their nature in contrast with the BI output which is quantitative and specific.

There was no evidence of the tactics of reframing the BI output at this level either. I believe this is the case because the members of the committee did not need to convince anyone of their choices whereas at the SSG level the decision makers needed to gain approval for their list from the IT committee.

6.2.3 Summary of decision process on the IT committee level

This section presented the thematic analysis of the empirical data concerning the use of the BI output at the IT committee level. First, I presented the characteristics of the process, projects and of the BI output. I particularly focused on the fact that the way the BI output is structured does not allow the decision makers to have an overall portfolio overview that makes interdependencies clear and the project impact on the organization transparent. The BI output is structured based on the organizational structure, focusing on information on how projects will impact an individual SSG but not on its impact from a holistic Danske Bank Group perspective. Additionally, the lack of benefits follow up characterized the process not only because the decision makers did not get feedback but also because it devalues the BI output since decision makers questioned the intentions of the calculations and analysis that lay behind the numbers. Finally, the intangible nature of the IT projects' benefits exhibits incommensurability: a characteristic that makes the decision task of the IT committee members even more difficult.

Because of the above characteristics, the decision-makers were unable to rely on the BI output or to use it as prescribed by the organization when prioritizing the projects. Therefore, in the next section, I presented the different tactics that decision makers employed to cope with the above characteristics. On this level decision makers primarily used the tactics of supplementing and substituting the BI output. Overall, at the IT committee level, decision makers used a variety of inputs to acquire information about the projects, other decision makers' preferences, and organizational goals and objectives. They engaged their personal networks through informal talks in order to better understand the projects, the BI output and the importance of the projects for the whole organization. They also employed sponsoring to garner support for a project, as was the case at the SSG level as well. To overcome the problems of cost benefit analysis the managers trusted the expertise of the SSG, assuming that they would have done the best they could in prioritizing their projects. Further, it seems that many times the decision makers resorted to their own feelings and beliefs or expert intuition to judge the importance of a project. Finally, the presentation activity that took place in the final prioritization meeting provided contextual information on the BI output, reinforcing trust in the BI output because it represented an act of commitment on behalf of the presenters to the output. Senior decision-makers underlined the importance of trusting the presenter from the SSG since the benefits calculations are not always accurate. In this context, the presenter's confidence and expertise played an important role in counterbalancing disbelief about benefits. All the above inputs used to supplement the BI output were also used to substitute it. This is the case when the BI output does not by itself offer an argument, not even a weak one. In such cases the decision-makers substituted the BI output with inputs from their networks, experts' knowledge, their own expert intuition, sponsoring and the presenters' performance during the presentation activity. In this way they shift attention to the substitutes which then become the criteria to judge the project.

The interpreting tactic was not used at this level. The tactics of reframing the BI output were not used either since the members of the committee did not need to convince anyone of their choices.

6.3 Summary

This chapter presented the results of the thematic analysis performed on the empirical data. The analysis was presented for each level of the governance structure: the SSG level and the IT committee level. An overview of the findings presented in this chapter is provided in Figure 23. For each level, I first described the characteristics of the IT prioritization processes and the impact they had on decision-makers and the way they used the BI output. Second, I presented and described the tactics of using the BI output to reach organizational decisions despite the characteristics of the BI output and the decision tasks and processes that exist at the two levels of the prioritization process. In the tactics, I also described the various inputs used by the decision-makers to better understand the projects, their BI output and interdependences in order to shape and influence collective judgment for or against a project. I discuss these findings in the following chapter.

Summary of findings

	SSG level	IT committee level
Process & project characteristics	• Lack of transparency of the IT prioritization process including the idea gathering process and project inclusion in the prioritization list. • Lack of overview of projects' interdependencies. • Technical complexity of projects. • Cost calculation inaccuracy and unreliability of benefits calculations. • Lack of benefit follow-up process on the implemented projects. • Resource capacity and competency constraints.	• Lack of portfolio overview and of a holistic perspective. • Lack of overview of projects' interdependencies. • Lack of benefits follow-up process on the implemented projects. • Distrust towards cost and benefits calculations. • Incommensurability of projects.
Tactics	• Supplementing the BI output. • Substituting the BI output. • Interpreting the BI output. • Re-framing the BI output. • Networks • Sponsors • Labels • Experts	• Supplementing the BI output. • Substituting the BI output. • Networks • Sponsors • Labels • Expertise/Expert Intuition • Chairmen Presentation

7 Discussion

The findings of this study show how complicated the task of reaching a decision is in practice, even when the decision-makers are supported by a highly organized process, relevant information and by subject-matter experts on cost-benefit analysis. The study provides clear indications that the BI output is used in multiple ways while at the same time it is not the only input used by decision-makers in organizational decision-making. Further, the BI output is not always used as prescribed by the BI literature. Rather, its use is negotiated, manipulated and re-framed continuously according to the decision-makers' needs and expectations, the characteristics of a given situation, event or decision and the other inputs used by the decision-makers to shape collective judgement and reach a decision.

Reaching a prioritization decision in organizational settings is a difficult task. The involved parameters and resources are partly determined by the way the process is organized, partly by the BI output, and partly by other obligatory inputs into the process. These other inputs include specific project selection criteria, stakeholders' interests, the specific organizational context, and the individual beliefs and preferences of the decision-makers.

This study investigated an organization which tries to formally structure the IT project prioritization process at the SSG and the IT committee levels of the governance structure. In this case, the organization engaged in a series of activities which involved identifying and constructing a set of 'objective' criteria and institutionalizing the collection and analysis of data for these criteria, i.e., cost-benefit analysis for all projects. While these elements were supposed to support and help to define the prioritization task, they did not accomplish the goal of reaching a decision in practice. Even more interestingly, the BI output was in fact used, but for other reasons than actually informing or determining the final decision. In addition, the findings of this study show how the process and projects' characteristics interacted with the actions of decision makers; one result of these interactions were the various tactics of using the BI output in the prioritization decision process.

For the purposes of discussing the use of the BI output by decision-makers in the IT project prioritization process shown in chapter 6 and in an attempt to theorize the use of the BI output by decision-makers, in the following sections I use the notion of 'device'. The concept of device, as introduced and defined in section 1.5, captures the multifaceted ways the BI output is used in the decision process. Based on the definition of Agamben (2009), a device can be anything that has the capacity to capture, orient, determine, intercept, control or secure the behavior of human beings. Further, as Foucault remarks, the main function of the device is to "respond to an *urgent need*" (Foucault and Gordon 1980, p. 194, italics in original). As such, a device is used, and deployed by decision-makers in order to achieve something, such as to reduce uncertainty or to convince others. Therefore, the BI output is discussed here as a device used by the decision-makers to shape their own judgment as well as that of others.

Apart from the BI output, other devices that were dominant in this study were networks, experts/expertise, sponsors, labels and the presentation activity. These devices are associated with private knowledge, expertise and interpersonal trust and facilitated decision-makers in shaping collective judgment and reaching prioritization decisions.

- Networks

A network consists of friends, contacts and colleagues and it is used to acquire reliable information. This device was used both to better understand the projects proposals, including their emergence, interdependences, costs and benefit calculations, complexity, and different constraints and also to become aware of the other decision-makers' preferences, needs and expectations. At the same time, it was used as a device to shape the collective judgment of the decision-makers. The use of networks functioned through informal communications. Decision-makers activated their networks at both the SSG and IT committee levels.

- Sponsors

Sponsors are usually authority figures with power due to their positions and/or expertise who act as a guarantee. The finding of sponsors took place before the SSG meetings. However, as shown above, sponsors were deployed as a device in the SSG meetings to argue for or against a specific project. The more the sponsors or the higher their authority, the more substantial their influence was on the collective judgment and the more confident and relaxed the decision-makers felt about their collective choice. This device had a strong influence on IT project prioritization at both the SSG and IT committee levels.

- Labels

Labels are names or categories associated with attributes and the nature of projects. The device of labeling helped to quickly designate the nature of a project and partially to select projects. For example, projects that were labeled "ongoing" (although in the idea phase) were usually prioritized without being debated extensively, as were projects labeled "part of a larger program initiative" or "legal/compliance project". There were official labels that were used at both levels and unofficial labels (see section 5.2.5, pp. 117-118) that emerged during discussions. The unofficial labels were mainly used in the SSG meetings.

- Expertise/Expert Intuition

Experts are people who provide specific evaluations relevant to projects. Decision-makers appeared to capitalize on the knowledge of the experts, which had been acquired through formal education and years of experience. As such, decision-makers used expertise at the SSG level as a device to inform them on technical or specialized matters, or to support their claims or choices. As a result, they influenced the judgment of others and hence the collective judgment about specific projects or their prioritization. At the IT committee level, expertise was used as a device to understand the logic of the prioritization and to find interdependences between projects. The experts were also used as a trust device, as the information they provided was seen as trustworthy because of their authority. At the same time, the IT committee members used their own expert intuition as a guide in judging projects and making prioritization decisions.

- Presentation Activity

The presentation activity is a device that brings together decision-makers with the SSG representatives (chairmen and development directors). This device shaped the collective judgment of the IT committee members through the shared experience of the presentations. In particular, the presenters used the presentation activity to influence the IT committee members. The committee members used the presentation activity to better understand the BI output, the projects and their interdependences. In addition, the members use the presentations to gain commitment from the presenters in the implementation of their plans, which created the necessary trust for the members to make a decision for the final portfolio.

In summary, decision makers used a variety of devices to better understand the projects, the BI output, other decision makers' preferences, and organizational goals and objectives. The decision-makers used these devices to influence and convince others by shaping their judgment.

The previous chapter illustrated how decision-makers used the BI output in the IT project prioritization process. A key focus was how the BI output influenced organizational decision-making processes. In the following sections, I first discuss the findings on the role of the BI output in the study, juxtaposed with the role of BI as discussed in the literature in Chapter 2 and Chapter 3. Second, I present the contribution of this study and its implications for theory and practice. Finally, the study is evaluated against a set of qualitative research criteria.

7.1 Implications for research and contributions

The findings show that decision makers use the BI output in different ways depending on the characteristics of a given situation, including the uncertainty of a project in terms of casual complexity, ambiguity in terms of preferences, interpersonal tradeoffs that take place in a specific power hierarchy, the multidimensionality of projects and the intangibility of benefits. It is exactly the existence of these characteristics that shape the use of the BI output in decision processes. At both the SSG and IT committee levels the BI output was used by decision makers for different purposes depending on the mix of the above characteristics.

In the following subsections, I discuss the findings of this study. At the same time, I present the implications for research. In particular, I demonstrate how these findings support, extend, reject and contradict the literature presented in Chapter 2 and Chapter 3.

7.1.1 Findings that support the BI literature and the rational perspective

According to Wixom and Watson (2010) "there is still much to learn about the design of BI for decision-making, where BI fits within the decision-making process, and, ultimately how and why BI makes a difference" (p. 25). Prior research on BI has adopted a rational approach concerning the role of BI in decision-making as shown in Chapter 2, including BI processes and technologies that are designed based on a rational perspective.

In this study, the decision-makers used the BI output for informational purposes when the cost-benefit analysis referred to projects with tangible benefits. These tangible benefits provided higher credibility to the calculations, which were based on measurable entities.

This use of the BI output supports the rational/informational dimension that the BI literature advocates. It is in line with the literature stream that views BI as a process that produces new insights into organizational phenomena. According to the BI literature, the BI process decreases uncertainty and ultimately leads to better decisions (Negash 2004; Lanqvist and Pittirmaki 2006; Jourdan et al. 2008). This finding also supports the technology view (Watson et al. 2006; Cheng et al. 2006; Wixom et al. 2008) of BI where BI technologies are able to gather, store and analyze data the output of which is used in decision-making leading to better decisions.

However, the BI process and the BI technologies lead to better decisions only when the decision-makers' preferences are aligned, the decision is well structured, and the BI output captures all the variables and their causal relationships. In these cases, the BI output serves as a clear signal determining the choice of decision makers – its use is ostensibly rational, as prescribed by the BI literature as well. Overall, this finding contributes to the BI literature by showing when and what prerequisites have to be fulfilled such as structured decision, known variables and causal relationships among them, in order for BI to lead to better decisions according to the rational perspective.

7.1.2 Findings that extend the BI literature and support the political and symbolic perspectives

What appears to be extremely difficult for decision makers are the choices between projects that exhibit incommensurability, uncertainty in terms of costs and benefits, ambiguity of preferences, and multidimensionality. This was clearly illustrated in the example offered by the COO at the beginning of Chapter 6.

Most of the projects could be quantified only partly, revealing an incommensurability problem (Espeland and Stevens 1998; Karpik 2010) not only between projects, but especially between portfolios of projects. This meant that the comparison of projects, or portfolios for that matter, was not based on an objective criterion but rather on a subjective classification: decision-makers were looking for "good" projects. Due to the incommensurability problem the BI output was not used as a device to compare and prioritize the projects because it did not indicate the quality of a project. Many projects had primarily intangible benefits, which are not included in the BI output, although, as observed in the SSG meetings, their inclusion was negotiated. The benefits of these projects were difficult to calculate at best, and different calculation methods provided different results.

Moreover, decision-makers had to cope with a great deal of uncertainty in terms of project complexity. The complexity of a project increased the perceived uncertainty of its outcome. Decision-makers also had to cope with ambiguous organizational goals and conflicting interests since the environment never presented itself as an unambiguous signal. Thus, they were more cautious in using the BI output in their decision practices because of political and symbolic intentions embedded in the BI output during its development.

Further, a project portfolio is a multidimensional entity consisting of a configuration of projects that are often dependent on each other. Each project is by itself multidimensional, consisting of employees, their skills and competencies, methods, ideas, technologies and functionalities. These characteristics are also interdependent, making it difficult to separate specific dimensions/characteristics of the project and compare them.

The intangible benefits that highlight incommensurability, the project complexity, and the project interdependencies impeded the prescribed use of the BI output. Consequently, these characteristics are contextual factors that regulate the ways in which the BI output can be used by decision-makers to shape individual and collective judgement.

Under these circumstances, it appears that the BI output did not help in prioritizing projects. Rather, it was primarily used as a device for dialogue among the different decision-makers. In addition, in the process of this dialogue it was used as a device to convince others. This device seemed to play a key role in leading to the articulation of the projects from different angles, interpretations and perspectives. As the interviewees of this study stated, the dialogue initiated by the BI output often brought up contextual and personal knowledge as part of the discussion. Subsequently, the BI output acquires a new role, beyond what the traditional BI literature discusses. Choo (1998) refers to this use of information as "enlightenment" in which "information is used to develop a context or to make sense of a situation" (p. 57).

Further, this problem articulation can lead to a shared understanding at the organizational level. According to Brown (1981), observed and effective communicating requires that the point of view of the other be realistically imagined. Others such as Rommetveit (1980) have affirmed this point:

> An essential component of communicative competence in a pluralistic social world ... is our capacity to adopt the perspectives of different others. (p. 126).

Thereby, the BI output can facilitate discussions about the assumptions underpinning its analysis, which might lead to adoption of other perspectives.

However, the BI output was also used to persuade other members or to direct their attention to specific decisions, alternatives or preferences. This use of the BI output was evident in the organizational practices that took place between decision-makers before and during the prioritization meetings.

These uses of the BI output do not agree with the informational dimension promoted by the BI literature, rather they extend it. They highlight the social interactive or political view in the literature concerning the use of formal analysis in organizational decision-making described in Chapter 3. Specifically, this finding supports the studies of Feldman and March (1981), Langley (1989), Griffith et al. (2008) and Royer and Langley (2008) where formal analysis is used for political purposes. In this study, the BI output is used for persuasion and communication, for promotion of a specific course of action and for directing/deflecting attention to/from specific projects and issues.

Therefore, this finding extends the BI literature by showing that the BI output is used and contributes to decision-making in a different way. The role of the BI output in this dimension is not to relieve uncertainty, but rather, to reduce equivocality by creating shared understandings of choice situations, making explicit different preferences and values, which can then be thoroughly debated.

In addition, the results of this study show that the BI output was often positioned as "facts" to be used by decision-makers as an argument to support or justify their decisions and to convince others. In this view, the BI output has a symbolic value and therefore has power to legitimize the claims of decision-makers. By symbolizing "facts" the BI output was used as a device to minimize "the constraints that others in the social community impose on the articulation" (Schultze 2000, p. 7). This supports the symbolic perspective described by the literature on the use of formal analysis in Chapter 3. In particular it supports the studies of Feldman and March (1981), Lozeau et al. (2002), and Power (2003,2004) which show how formal analysis is seen as a symbol in order to manage irrationality in organizations. This symbolic use of the BI output might, however, have adverse effects. For example, in organizations in which evidence is required to legitimize decisions, the power of facts increases, as does the likelihood that managers will 'find' facts that confirm their beliefs (Tingling and Brydon 2010).

The different uses of BI output by decision makers seem to coexist and also to depend on each other. The BI output appears to be used as a device simultaneously to inform, to persuade and to enhance legitimacy. Langley (1989) suggests that the politically oriented uses of formal analysis and informational uses are symbiotic:

> Formal analysis would be less necessary if everybody could execute their decisions themselves, and nobody had to convince anybody of anything…the more decision making power is shared between people who do not quite trust one another, the more formal analysis will be important. (p. 609)

I would go a step further and claim that because the BI output is built on a rational logic it automatically symbolizes a rational device. As a symbol of rationality it grants legitimacy to the claims, decisions and actions of decision makers. Therefore, "the more decision making power is shared between people who do not quite trust one another" (ibid., p. 609), the more the need to persuade others and thus, the more the need to use the BI output as a symbol of rationality. This creates a reinforcing cycle because the more the BI output is used, the more it symbolizes the right way to make decisions and becomes a legitimate means to convince others. This study shows that the decision-makers' search for rationality and objectivity through the use of the BI output is actually an interactive process. This is in line with Blakler's (1993) view on the use of formal analysis in organizations as a symbolic, political and socially interactive process through which various actors establish a common understanding.

In this case, decision makers adhered to the perception of the BI output as a rational device when it agrees with or supports their own requirements or perspectives. Yet when this is not the case, decision makers pointed to the subjectivity embedded in the creation and generation of the BI output. In this case, the decision makers diminished the use of the BI output by questioning its objectivity and showing distrust towards the output because of its embedded subjectivity. This means that the BI output can be considered and used by the decision-makers to justify their own perspective as a rational device conveying objective results and at the same time as a subjective device.

This finding extends the BI literature by showing that the BI output is used also to manage irrationality in organizational decision-making. In this case, the BI output is used as a rational device to enhance the legitimacy of arguments or as a subjective device when the BI output does not make sense to the decision-makers.

Overall, the political and symbolic uses of the BI output enrich our understanding of how and why BI makes a difference in organizational decision-making and extend the

BI literature by introducing new perspectives not previously considered in the BI literature.

7.1.3 Findings that extend the BI literature and the organizational decision-making literature

The findings show that when reaching a collective decision there was a strong interplay between the BI output and other devices that shaped and informed decision makers' cognition and perspectives. Ultimately, it was the emergent interaction between the characteristics and the interplay between the different devices that determined the final choice. However, it should be noted that predicting the final choice is not in the scope of this study. Rather, I focus here on the interplay between the BI output and the other devices employed by the decision makers as the process unfolded.

To theorize about the interplay of these devices I use the continuum of intellective-judgmental tasks (Laughlin 1980; Laughlin and Ellis 1986). At one end of the continuum are the intellective tasks. A task is defined as intellective if there is a clear criterion or set of criteria for evaluating the quality of performance. At the opposite end of the continuum are the judgmental tasks, those for which no clear criterion exists. Laughlin and Ellis (1986) found that most studies of decision making that they reviewed fell within a "grey area" marking the transition from pure intellective to judgmental tasks (Laughlin and Ellis 1986), hence their employment of a continuum. Building on this continuum, in this study it is observed that while the organization is trying to conceptualize the prioritization process as a collection of tasks that involve a "definite objective criterion of success within the definitions, rules, operations, and relationships of a particular conceptual system," (Laughlin 1980, p. 128) - intellective end - the process tends to move towards the judgmental end in practice, involving "political, ethical, aesthetic, or behavioral judgments for which there is no objective criterion or demonstrable solution" (ibid.).

The BI output was used as a device by the organization to make the IT project prioritization an intellective task and as such it was in principle positioned as an intellective device. The other devices, on the other hand, offered political, ethical, and aesthetic judgments, identifying them as judgment devices. Therefore, the task of reaching a decision during prioritization was somewhere between the intellective and the judgmental end. It is on this continuum that the interplay of the different devices took place.

The findings show four tactics used by decision makers when interacting with the BI output and the aforementioned devices: supplementing the BI output with other devices, substituting the BI output with other devices, interpreting the BI output based on the other devices, and reframing the BI output in order to match the message of the other devices. These tactics were used with different frequencies at the two levels of IT project prioritization.

- Supplementing the BI output

The decision makers utilized supplementary devices both to shape their own judgment about a project and to influence and persuade other decision-makers for or against a project and thus to shape collective judgment. As such, in the supplementing tactic the devices were used to legitimize and complement a weak or poor BI output. In this case, the devices act as complementary forces.

- Substituting the BI output

In the substituting tactic the devices were used to delegitimize the use of the BI output by shifting attention from it to the other devices. Here the devices acted as competing forces. This was the primary tactic used in the private IT committee meeting: the BI output was out of the picture and the discussion was dominated by the other devices, which were then used to shape the collective judgement. This practice can be understood as pragmatic restraint, a form of deliberate inattention to the problems with the BI output. If one of the decision-makers questioned or even deconstructed the BI output for a project he or she disliked, another decision-maker might retaliate by doing the same to projects they disfavored. Opening such a can of worms would make a conclusion virtually impossible. Thus, it appeared to be in everyone's interest to show trust in the experts and not to debate the provided BI output. Rather they discussed the performance of the chairmen during their presentations, the sponsors, and the information provided by their networks and experts. The BI output at the IT committee level had a primarily symbolic status, signposting that the projects had undergone a rigorous analytical process. At this level, the BI output was not used to inform the decision makers because they were aware of both the political dimension of the BI output and the limitations of the BI output in depicting the real value of a project. As a result, the decision-makers shifted their attention from the BI output to the other devices. However, the presentation activity remained anchored in the BI output provided to the decision makers, since the presenters were asked to explain and to support the BI output with more soft arguments.

- Interpreting the BI output

The interpreting tactic was used when the BI output was ambiguous or hard to understand. In this case the decision-makers employed various other devices to provide them with knowledge that would help them interpret to the BI output. Here, the other devices were used to interpret the ambiguous or de-contextualized BI output, acting as liaison forces for interpretation. This tactic, however, was not very common at the IT committee level as compared to the SSG level. This is because the members of the IT committee appeared to have delegated the interpretation of the BI output to the SSG and their chairmen during the presentation. Therefore, they focused mainly on the knowledge provided by the supplementary devices such as the experts, sponsors and the presentation activity, which provided knowledge about their confidence and commitment.

- Reframing the BI output

The decision-makers on the SSG level recalculated or reframed the BI output in order to make it appear more convincing to the IT committee members at the next level. In short, the managers at the SSG level used and interacted with the BI output in a variety of ways. Since they were close to the primary source of information both in the form of the BI output generation and domain knowledge for each project, they had a wide repertoire of tactics to support the projects they approved of while casting doubt on the projects they did not support in order to secure funding for their projects.

To summarize, the devices provided cognitive support to the decision-makers. At the same time, they were active forces that complemented, competed with and shaped each other as well as the collective judgement. The battle thus shifted from a battle of projects to a battle of devices. It is obvious that the BI output by itself as an intellective device cannot qualify projects with a cost-benefit analysis that does not promise much economical profit. The judgement devices thus became the central mechanisms in the qualification of such projects because without these devices they could not be qualified. Such projects were prioritized, therefore, because there was a shared belief in their validity and potential channeled through the judgment devices. Above I provided some understanding of the choice of a tactic over others, which leads me to the following question: How and when do decision-makers choose one tactic over the other?

The tactics depict the interplay of the devices. They provide insights into the dynamics that take place among the devices in decision-making practices. Davenport (2010) and Wixom and Watson (2010) point to a focus shift in BI research toward decisions. The tactics extend the BI literature as well as the organizational decision-making literature by particularly calling attention to the different devices used in decision-making. They provide a new perspective on organizational decision-making. Thinking in terms of devices and their interplay provides researchers with a new way to investigate and theorize about organizational decision-making practices. The findings of this study showed that the tactics exist in an organization that is considered fairly successful. This could be interpreted as if the tactics produce quality decisions, but this needs further investigation and leads to the question of the relationship between tactics and the quality of decisions and under what circumstances do tactics produce quality decisions and when they do not.

7.1.4 Summary of contributions

Prior research on BI has adopted a rational approach concerning the role of BI in decision-making, including BI processes and technologies that are designed based on a rational perspective. This study showed that the rational view of the role of BI in decision-making, adopted by prior research, limits our understanding of how BI makes a difference in organizational decision-making processes. The literature currently views BI as a device that helps decision makers make better decisions. With this study, I have provided evidence that the BI output is used by decision makers not just to make better decisions, but also as a device for social interaction, to influence others and direct attention to specific issues. Of course, the BI output is only one of the devices for prioritization and may be not the most important one in the sense of determining the final choice. However, it is central to creating room for discussions and negotiations through which shared understanding can emerge. This role is partly gained by the fact that the BI output symbolizes an objective device. In the end, it is the interplay between the BI output and the other devices that determines the final choice. As a result, this study contributes to our understanding of how and why BI makes a difference to decision-makers by introducing new perspectives not previously considered in the BI literature. By focusing on these other perspectives it becomes evident that BI helps to manage equivocality and irrationality. Specifically, helps to achieve a greater degree of shared understanding, conflict resolution and meaning creation among decision-makers through dialogue and discussions.

Moreover this study emphasizes and calls for more focus on the context, the decision-makers and the devices they use. It is widely agreed within BI research that BI is useful for organizations only if it is used by decision makers. The present study shows that the BI output is supplemented, substituted, interpreted and even reframed by the decision makers. Decision-makers, in their attempt to achieve their own goals and interests and for informational, political or symbolic purposes, use any combination of devices that helps them towards these achievements. The focus of this study is on how the context of decisions and the devices activated by the decision makers shape how the BI output is used in the decision process. Therefore, this study contributes to and extends the work of Davenport (2010) and Wixom and Watson (2010) who point to a focus shift in BI research toward decisions. In this particular direction, the study showed that it is important to focus on contextual factors such as characteristics of the processes and projects involved, the decision makers' goals and the devices they use.

Moreover, this study contributes to the BI field and the organizational decision-making literature by presenting an in-depth understanding of how decision makers use the BI output and the roles it plays in highly ambiguous and complex decisions. The different tactics employed by the decision-makers to reach organizational decisions show that depending on the context the decision-makers use those devices, or a combination of them, that enable them to make or reach a collective decision.

7.2 Implications for practice

The findings of this study have two main implications for practice, one relevant to BI system and process design and one relevant to the measurement of BI effects in an organization. The current literature on BI focuses on the design and implementation of BI technologies and data gathering and analysis processes in organizations. The findings of this study show that the focus should shift from the BI technologies and data gathering and analysis processes to decision processes and the use of the BI output in these processes. Organizations, BI designers and BI managers should focus on decision processes rather than technologies and place the decision-maker or decision-makers at the center of the BI process. This is in line with the recommendations of Davenport (2010). However, this should involve not merely focusing on how to reduce uncertainty for decision-makers, but should also consider the political and symbolic aspects of BI use.

By raising awareness about the other uses of the BI output in decision processes this study suggests that these political and symbolic aspects of BI use and the interplay between the BI output and the other devices in decision making *should be embraced as reflecting essential aspects of BI when integrated in decision processes*. In these terms, BI can be seen by the designers as *a device that facilitates interactions, cultural understandings and meaning creation* rather than simply as a device that leads to better decisions.

Having a purely functional view when designing BI applications and processes will limit the contribution of the BI output to decision-making. As such, elements from the other devices should be integrated into BI applications and processes to enhance interactions among the decision-makers. In particular, in the case of project prioritization the BI output could be enriched by capturing interdependences between projects and indicators of project complexity and project importance by experts and sponsors, as well as novel ways to account for intangible benefits.

The findings presented here also have implications for the measurements of the effects of BI in organizations. Today, managers who need to justify BI investments or manage BI processes largely value the contributions of BI to reducing uncertainty in decision-making, devaluing other contributions such as achieving a shared understanding or the symbolic value of BI. This is, again, because the traditional view of the BI output is functionalist, assuming that BI can lead to better decisions, while failure to achieve a better decision indicates a failure of the BI output or a failure of the user to correctly use it in the decision process. The findings of this study suggest that while decision makers might not always use the BI output to make better decisions, they consistently use it to influence and convince others of a specific course of action. The different uses identified in this study suggest that the outcome of using BI can be extended to consider not only whether a successful decision outcome for the organization was attained but also whether BI provided support to the decision-makers. This is in line also with Lanqvist and Pirttimaki (2006) who point out that:

> The perceived value of some intelligence product, for example, is likely to vary depending on the subjective appreciation and need of the person(s) for whom the question is addressed … value is assessed from the viewpoint of a company using BI (e.g., improved profit) or of the user of the intelligence (perceived usefulness). Second, it may even be suggested that BI has no value at all as such — that is, the value is created as a result of using the intelligence, by carrying out actions based on it (p. 34).

However, Lanqvist and Pirttimaki only include perceived usefulness as a measure. Below I offer a couple more possible measures that could shed light on the value of BI in decision-making processes. As such, BI should not only be measured by its contribution to the positive or negative outcome of a decision but also by the degree of shared understanding, contestation, resolution, and decision makers' satisfaction with the process.

In recent years many practioners' articles have remarked that BI failed to fulfill its promise to deliver better decisions. For example, in January 2011 Patrick Meehan, at that point president and research director in Gartner's CIO Research group, during an interview with Computer Weekly, stated that:

> One of the big problems with Business Intelligence is that about 70-80 percent of BI projects fail. And the reason that BI projects fail is that IT tends to think BI is a set of tools. The other irony is that business tends to think they are a pile of answers. And the real true irony of the whole thing is that neither come together and actually ever begin to formulate the burning business questions. (Computer Weekly 2011, Interview with Patrick Meehan)

However, a key question is whether BI did not fulfill its promises or whether it was mistakenly seen and positioned by the vendors as the solution to every problem an organization has without taking into consideration organizational cultures and decision-making philosophies. With this study, I wish to turn managers' attention to the BI output not as the solution or the creator of better decisions but rather as a device that will enable collaboration, dialogue and reflection among BI managers and decision-makers. Seen in this light, managers should measure the effect of BI on collaboration, dialogue and reflection and not solely on decision outcomes.

Another practical contribution of this study is the different use of the BI output by middle and top management. Middle management focuses mainly on presenting the BI output in a way that would guarantee funding for their projects, while top management tries to understand the importance of the BI output and its use. This involves the employment of different tactics and devices for each group. Overall, the study raises awareness of the political and symbolic uses of the BI output and its interplay with other devices in the decision-making processes. Therefore, the study suggests that both the varied uses of BI and their interplay should be embraced as reflecting essential aspects of BI when integrated into decision processes. Further, based on the finding that the BI output is a device that facilitates interactions, cultural understandings and meaning creation, the study suggests new measures of the effect of the BI output in decision making such as the degree of shared understanding achieved, contestation, resolution, and satisfaction of decision makers with the decision process.

7.3 Reflections on the research process

In this section, I reflect on the study to examine its relationship to the principles of conducting interpretive research.

I encountered a number of different sets of evaluation criteria for interpretive research in the literature (Janesick 1994; Guba and Lincoln 1994; Golden-Bidle and Locke 1993; Altheide and Johnson 1994; Klein and Myers 1999; Creswell 2007). While these sets of criteria differ somewhat, there is a general acknowledgement that interpretive research, due to its emotional, personal, moral and spiritual characteristics, calls for a judgement that exceeds the traditional application of positivist research criteria of validity, generalizability and reliability.

By recognizing the aesthetics of interpretive research, the focus shifts to the researchers' and the participants' involvement, the researchers' commitment and passion, and the way in which empirical data are interpreted and the findings presented (Altheide and Johnson 1994). As such, this view of research, which acknowledges logic, credibility, as well as aesthetical and spiritual quest, is in line with Shulman's (1999) view on scholarship as

> … acts of the mind or spirit that are undertaken in disciplined ways and subsequently made public so that members of one's intellectual community can judge their worth and then use them to support the more general program of the community. (p. 160)

Accordingly, different quality criteria such as trustworthiness, credibility, transferability and confirmability (Guba and Lincoln 1994) have been proposed for evaluating the quality of interpretive research. Later, Klein and Myers (1999) suggested a set of seven principles that addresses IS research evaluation specifically. Recently, Myers (2009) stressed the importance of constructing a complete, interesting and believable story. Despite the different criteria that exist in the literature, the seven principles of Klein and Myers (1999) are adopted here because they are most closely related to the BI research field.

The principles are general criteria that might apply to some situations but not to each and every study. Here, these seven criteria are used as a checklist against which I will compare the conduct of this research study. In Table 17, I present the principles as defined in Klein and Myers (1999, p. 72) along with an evaluation of how the principle was addressed in this research study.

Principle	**Reflection in this study**
1. **The Fundamental Principle of the Hermeneutic Circle** This principle suggests that all human understanding is achieved by iterating between considering the interdependent meanings of parts and the whole that they form. This principle of human understanding is fundamental to all the other principles.	In section 4.2.4. the hermeneutic circle and method were discussed. Although the hermeneutics method was used continuously in this study, a specific instance can be found in section 4.2.2 when I describe how my pre-understanding (parts) and the interviewees pre-understanding (parts) were informed by the shared understanding (the whole) that emerged during the interviews. Through these iterations I achieved an understanding that drove me into changing the research goal.
2. **The Principle of Contextualization** Requires critical reflection on the social and historical background of the research setting so that the intended audience can see how the current situation under investigation emerged.	Contextualization of the research setting has been one of the core principles used in this study. In particular, the empirical setting (chapter 5) provides the historical background of the overall organization (section 5.1) and the details on IT project prioritization (section 5.2) serve as a context to the results presented in chapter 6.
3. **The Principle of Interaction Between the Researchers and the Subjects** Requires critical reflection on how the research materials (or "data") were	This principle has been used throughout the empirical investigation. A first reflection on how the research question and the research design changed is presented in sections 1.1, 1.2, 1.3, 4.2.2 and 5.1.4.

socially constructed through the interaction between the researchers and participants.	Further, the research approach chapter is devoted to making explicit the interaction of the researcher with the participants and the impact of this interaction on further data collection and analysis.
4. **The Principle of Abstraction and Generalization** Requires relating the idiographic details revealed by the data interpretation through the application of principles 1 and 2 to theoretical, general concepts that describe the nature of human understanding and social action.	Sensitizing concepts from different organizational decision making theories have been explicitly and implicitly used, especially during the data analysis process to support abstraction and theorizing.
5. The Principle of Dialogical Reasoning Requires sensitivity to possible contradictions between the theoretical preconceptions guiding the research design and actual findings ("the story that the data tell") with subsequent cycles of revision.	I explicitly presented my assumptions and the impact they had on the research process in sections 4.2 and 4.3. However, I have not gone in-depth discussing the dialogue between the text and myself during the several iterative cycles that took place in this research process.
6. The Principle of Multiple Interpretations Requires sensitivity to possible differences in interpretations among the participants as they are typically expressed in multiple narratives or stories of the same sequence of events under study. Similar to multiple witness accounts even if all tell it as they saw it.	I have to admit that 'multiple interpretations' was not something that was intentionally sought in this study. Rather, multiple interpretations emerged during the research process, especially when collaborating with other colleagues. However, these alternative interpretations could only explain part of the data, not the whole data set, reinforcing analysis from an organizational decision making angle.
7. The Principle of Suspicion Requires sensitivity to possible biases and	Although, the write up of this thesis was an individual effort, the research process itself was not.

systematic distortions in the narratives collected from the participants.	Many conference papers were written with different co-authors who contributed with their critical thinking and experience. They challenged assumptions and offered new lenses through which to view the data, minimizing in this way possible biases. However, because the interviewees spoke in English, which is not their native language, it has been difficult in some cases to fully understand the true meaning of some responses. Sometimes, interviewees would appear cynical, for instance, but not express this very well in words.

Table 17: Reflecting on the principles of conducting interpretive research by Klein and Myers (1999)

Although, for the purposes of the evaluation of this research, I employed the principles introduced by Klein and Myers I would like to conclude, following Guba and Lincoln 1994, by stressing that I hope to have been persuasive and to have demonstrated the utility of my position for the reader and the BI field.

To conclude this section, I would like to stress that the result of this study is not the discovery of the way in which BI is used in organizational decision-making. Rather, the evident role of the BI output as a device for cognitive support, dialogue, convincing and influencing others and for symbolizing rationality, in this particular organization, shows that this is one way it may be used in practice. If such usage was present in this case, it may well be present again in the future. Thus, the study has added to the appreciation of empirical variability. The next chapter presents concluding remarks and discussion of future work.

8 Concluding Remarks

The work presented in this thesis contributed to the further understanding of the role of BI in organizational decision-making. The above discussion elaborated on the findings of this study in relation to the literature, highlighted contributions to the BI field and reflected on the validity of the overall study. In this final chapter, I present the conclusions of the study by summarizing the main findings. I also suggest some research directions that could be further explored by BI scholars in future studies.

8.1 Conclusion

BI continues to be one of the most discussed topics in industry, especially with regard to its effects on decision-making. The existing BI literature has adopted a rational approach to assessing the role of BI in decision-making, viewing BI as ultimately leading to better decisions. At the same time, several BI scholars have called for more research into the role of BI in decision-making (Davenport 2010; Wixom and Watson 2010). In the BI literature, BI is defined as a process, a technology or both. However, BI is not used in decision-making processes as a process or technology but rather as a product. As such, I introduced the concept of the BI output to indicate that it is the output of BI processes or technologies that is used in decision-making. Therefore, this study has set out to investigate how decision-makers use the BI output in organizational decision-making processes. In this respect, the study was informed by organizational decision-making theory and in particular by the various perspectives on the role of formal analysis in decision-making. Based on these different perspectives I have argued that it is important to explore how decision-makers use BI in organizational processes characterized by complexity and ambiguity. This study has thus been an occasion to look further into how decision-makers use the BI output at different organizational levels of the IT project prioritization process, an inherently political, complex and ambiguous process. This purpose relates to a research question composed of two parts. First, what is the role of the output of BI in organizational decision-making processes? Second, how is this output used by decision-makers in reaching organizational decisions?

In order to answer the above questions, apart from a systematic literature review, I conducted an empirical investigation that forms the basis of this study. The empirical investigation was conducted at Group IT of the Danske Bank Group. In particular, I examined the IT project prioritization process, in which decision-makers are expected to use the BI output to prioritize IT projects. I followed the IT project prioritization process as it unfolded in practice and observed how decision-makers used the BI output, in this case the cost-benefit analysis, in situ. I also interviewed decision-makers and other stakeholders at both the SSG and the IT committee levels of the IT project prioritization process, which generally meant 'top and middle managers'. The study was based on an interpretive perspective and the focus was on decision-makers' interpretations of how the role of BI and how they used the BI output in decision-making practices. As an interpretive study the investigation was qualitative in terms of both data collection and analysis methods. Further, to understand the broader context of the topic, I first described the history of Danske Bank Group and the Group IT and then provided a detailed description of the IT project prioritization process in which the decision-makers operated. This contextual awareness helped during the interpretation of the findings.

In addition, to address the research question, I proposed a conceptual framework based on the organizational decision making literature. I focused specifically on the use of formal analysis in organizational decision-making, using it to provide key analogies for the use of BI output and an initial set of concepts for examining its use in organizational decision-making. I have argued that this conceptual framework provides additional perspectives on the use of BI output in the current BI literature. I further claimed that these additional perspectives provide more nuance as different lenses during analysis of how decision-makers use BI output in organizational decision-making.

By addressing the research question, this study has provided a richer understanding and a more nuanced view of the use of BI output in organizational decision-making than the current BI literature provides. Based on this, it has been possible to conclude that BI output is used in multiple ways, while at the same time showing that it is not the only input used by decision-makers. Further, BI output does not always have the role of informing decision-makers as is prescribed by the BI literature. Rather, its use is supplemented, substituted, interpreted, negotiated, manipulated and reframed continuously according to contextual factors and characteristics of the situation, the decision-makers and the specific BI output itself. This is especially manifested in the political and symbolic uses of BI output in organizational decision-making processes. This has implications for the decision-makers themselves as well as for BI process and system designers. It is these process and BI output' characteristics that interact with the actions of decision makers; a result of these interactions is the use of the BI output in the decision process.

The findings have been presented for each level of the case organization's IT project prioritization process. First, I described the characteristics of the process, the projects and the specific BI output being used. This was followed by a discussion of the different tactics decision-makers' used to reach organizational decisions and to overcome the barriers that the characteristics posed.

In particular, the findings emphasize the political and symbolic uses of BI output in such processes, providing a counterpoint to the existing literature, which advocates only its informational purposes. Decision-makers used the BI output both as a device to justify, influence, orient and interact with others and as an information base. While most of the BI literature acknowledges BI's informative role in decision-making, the empirical findings of this study demonstrate some of the symbolic, political, and functional implications of BI in organizational decision-making.

Moreover, this study has shown that the BI output is not used in isolation in organizational decision-making, but rather that there is a strong interplay between BI output and other devices. The intangible properties of IT projects, for example, which are difficult to measure and compare, challenge the effectiveness of the BI output. This study found that the use of BI output as an informational device was confined to project prioritization decisions that involve highly uncertain outcomes, and in which projects were also characterized by incommensurability. At the same time, the study highlights the interplay between BI output and other devices in the decision-making process. This is visible in several tactics used by decision-makers to shape collective judgement and reach organizational decisions.

In this study it has been observed that the BI output is often supplemented or combined with judgment devices: networks, expertise and expert intuition, sponsors, labels, and the presentation activity. This is, however, generally the case when the result of BI output agrees with decision makers' judgment formed via these other devices. The decision makers in the study utilized supplementary devices both to shape their own judgement of a project and to influence and persuade other decision-makers for or against a project and thus to shape collective judgement. As such, in the supplementing tactic the devices were used to legitimize a weak or poor BI output and the devices acted as complementary forces.

There were also cases in which the BI output was substituted for with judgment either because the BI output was politically produced, was considered incorrect or was simply not sufficient, as was the case with incomparable projects. In the substituting tactic the devices were used to delegitimize the use of the BI output by shifting attention from the BI output to other devices. In such cases, the devices acted as competing forces.

It was also observed that the BI output was interpreted or translated in such way that fit the decision-makers' judgment. The interpreting tactic was used when the BI output was ambiguous and hard to understand. In this case, the decision-makers employed various other devices to provide them with knowledge that would help them interpret the BI output. As such, devices were used to interpret ambiguous and de-contextualized BI output.

By addressing the research question of this study, the findings contribute to the academic discussion of the role of BI in organizational decision-making. These findings provide new insights into the role of BI output in organizations and specifically how decision-makers use it and how and why it makes a difference. This study provides indications in line with Baker et al. (2004) and Feldman and March (1981), suggesting that BI output is more than simply innocent information or evidence applied in practice. In particular, the study shows how managers reach a decision in IT project prioritization when the BI output has both political and symbolic dimensions but is also insufficient, bringing judgment devices into play. In this context, decision-makers supplemented, substituted or interpreted the BI output with other devices in order to reach an organizational decision. The interplay among the other devices and BI output determines the final choice. During decision making BI output is not unimportant, even if it does not determine the outcome of the decision. Rather, it gains saliency because it becomes a central focus of discussion, reflection, and negotiation. In this sense, BI output does not close the dialogue, but rather starts and directs it prior to the actual decision.

8.2 Suggestions for future research

The research presented in this thesis addressed and answered the research question posed in the introduction. However, it is evident that this work has raised even more questions. The findings of this thesis point to a number of directions that could be pursued in future research projects.

As described in the analysis chapter, decision-makers were observed to use the BI output for political and symbolic purposes in the IT project prioritization process. Although this study introduced and showed different uses of the BI output in organizational decision-making, further studies could discuss the implications of BI system design choices and the generation process of BI output. It was observed that decision-makers showed distrust towards BI output because of the political incentives involved in the generation of the BI output. The generation of the BI output was only lightly touched upon in this study, leaving unanswered questions about how entities are created and decided to be captured, how it is decided which BI data are included in data pools or accessed by decision makers, who decides on the measures and their definitions, and how these are created and standardized in organizational decision-making practices. I believe that further investigations are necessary because an understanding of BI design and generation will offer new insights to managers concerned with BI or decision-making processes in their organizations. Especially important is an investigation of the whole BI lifecycle, from the creation of entities to their use in the decision-making process. Such a study would make it possible to observe how changes in entities or measures affect the way BI output is used by decision-makers and the final decision itself.

Further, the study showed that decision makers use the BI output in different ways. They supplement, substitute, interpret and reframe the BI output based on other devices. However, it is not known under which circumstances it is more effective one tactic over another. More questions are raised: what is the relationship between tactics and the quality of decisions? How and when do decision-makers choose one tactic over another? And how are these tactics embedded in or integrated with the decision process? Further studies on these aspects could lead to a framework that could provide recommendation to organizations and decision-makers on when to use each tactic in order to promote better decision making.

The notion of the BI output as a device and its relation to other devices is another area that requires further exploration and investigation. As described in chapter 6, it became clear that different decision-makers used different devices based on their role and authority. As such, the decision-makers used the BI output through which they exercised the most power. In this respect, questions arise such as how and why the BI output is encouraged and used in some instances but not in others, how and why the BI output is valued in some instances and devalued in others, and how and why certain devices or configurations of devices are accepted as legitimate while others are doubted and rejected. With regard to the above questions, it would be suitable to investigate the power relations that the BI output and other devices create and enable in decision-making.

Overall, I would like to highlight the fact that the conclusion of this study is not the discovery of some singular way in which BI is used in organizational decision-making. Rather, it contributes to the further understanding of the role of the BI output in organizational decision-making. Thus, the study has further added to the appreciation of empirical variability. Further research should be conducted in different contexts to investigate the applicability of the tactics discovered here and the use of the devices in decision-making practices. Although the findings are based on a single organization, the study contributes by providing new insights on how the BI output is used in organizational decision-making. These insights are an important starting point for future empirical studies in understanding the role of BI in organizational decision-making.

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Appendix A - Interview guide for the pilot study

1. Introduction and purpose of the interview
2. Title
3. Profession
4. Background
5. Age
6. Number of years in the current position
7. What is BI for you? Can you define BI?
8. How many years have you been using BI.
9. How was BI introduced and how has it evolved during the years?
10. What kind of products do you extract from BI systems;
11. How do you use them;
12. Who uses them; Is the same person who extracts the information also uses it;
13. If not how is the transfer made?
14. For what purposes do you use BI?
15. Describe a normal working day? Where and how do use the reports?
16. The information in the reports supports many decisions or every report has as a target a specific decision?
17. How do you categorize the reports?
18. How much do you believe BI influences your decisions? Do you base your decisions only on the numbers from the reports?
19. Do you use other channels or methods or connections or tools to support your decisions? So what exactly happens during this phase?
20. Do the decisions have an effect to other departments as well? Or only the end-customer?

Appendix B - Interview guide for the IT project prioritization process

- Introduction of the researcher.
- Brief presentation of the research project.

The purpose of this interview is to obtain an understanding of the use of the BI output in decision making processes in the organization through general open ended questions.

Background Questions:

1. Identification:
   a. Name;
   b. Title;
   c. Profession;
   d. Age;
   e. Nr of years working in the current position.
2. Description of work responsibilities.

Department Functions - Vision - Mission:

3. How your department is organized, divided, in projects, groups, teams?
4. Description of the department or development area:
   a. Purpose,
   b. Main customers,
   c. Systems under ownership,
   d. Specialization or functions of the department
5. What is your vision and mission

Questions for the decisions making process (prioritization process):

6. Can you describe in your own terms what is for you a decision making process? Can you give an example?
7. What is the process of decision making in SSC currently as you see it?
8. Who participates in the decision making process?
9. What kind of decisions are they required to make?
10. How and why were these people selected to participate in the process?
11. How do they contribute to the decisions?
12. Whose responsibility is to make the decisions?
13. How and why are these people selected as decision makers?

Information Use for Decision Support

14. **What information do you collect and what information are you provided with?**
15. How accurate does the information need to be?
16. What is the process for collecting generating and supplying the information?
17. What is efficient about this process?
18. In what timeframe does the information need to be supplied?
19. How specific does the information need to be?
20. **Can you describe an example of how do you use this information when making decisions?**
21. **How do you interact with this information, if you do?**

Identification of Problems/Opportunities (Information Needs and Information Seeking)

22. What sources are used to identify the problems/opportunities (Reports, Meetings, Informal talks with subordinates/superiors, web pages, scientific papers, internal documents)

23. Is there a formal process to identify problems/opportunities or is done randomly, whenever?
24. What information would you like to know for other departments and which departments?
    a. What information sources do you use today to get info about other departments?
    b. What kind of information do you collect?
25. What external information do you find relevant to your work?
    c. What information sources do you use today to get external info?
    d. What kind of information do you collect?
26. How do you get informed about the business areas, what channels do you use?
27. How do you anticipate your departments' issues?
28. How do you assess the performance of your department?
29. How do you measure success or failure? What metrics do you use?
30. How did you define these metrics? With what criteria?
31. What requirements are fulfilled by the information that you have and what requirements are unfulfilled?
32. How do you assure that you are achieving the organizational goals?

General questions about the strategic view of the company (Not SOS – check time):

33. How do you understand the vision of SSC (Shared Service Center; IT Development Organization)?
34. How does your departments' vision relates to the SSC' vision?
35. How does your departments' vision contribute to the vision of the SSC?
36. What operations or tasks and competences are needed or wanted to support this vision?

37. How would you describe success for your department?

Near the end ask “Is there anything else you’d like to tell me?”.
Once the tape recorder is turned off: Are there any questions that you expected me to ask and were surprised that I didn’t ask.

Appendix C - Interview guide for the IT committee follow up interviews

During the SSGs' presentations :

1. What are the managers (development directors and chairman of SSG) highlighting during their presentation:
   a. the significance of the projects regarding the strategy
   b. the significance of the projects regarding the benefits (if yes what kind of benefits)
   c. the significance of the projects regarding the competitive environment
   d. the significance of the projects regarding to other larger projects or programs
   e. other kind of focus (elaborate)
2. Do they refer to the whole list or do they acquire the attention of the G-ITC members to specific projects?
3. Which part of the list or on what kind of projects is the discussion focused.
4. During the presentation do they use or refer to hard data at all? If yes, what kind of data are these?
5. Who participates in the discussion from the G-ITC members?
6. What kind of questions are asked from the G-ITC members?
7. Who answers to the questions: is it another G-ITC member or the presentator?

During the meeting with the IT committee members after all the SSG presentations (very important):

8. How does the meeting start?
9. How does the prioritization discussion between the members evolve?
10. Who speaks first?

11. What arguments are used?
12. Do they start the discussion starting from the budget, strategy, or specific SSGs.
13. At this point, actually I would like to have a rich description of what happened step by step. The more detailed the better. It is like telling the story as it happened and unfolding the events as they occurred.
14. What is the level of the discussion, does it focus mainly on the budget and how to distribute it or does it focus on projects or does it focus on specific SSGs or does it focus on programs or on resources and competencies?

Appendix D - List of the final article pool during the literature review

List of 103 articles that were reviewed:

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Appendix E - An example of the cost-benefit analysis for a project

4.3.3 Cost / Benefit

The conditions of the calculation below are:

- Cost of production and sending envelope by C4 letter (10%) = 15,00 kr. per envelope*
- Cost of production and sending envelope by C5 letter (90%) = 5,50 kr. per envelope*
- Cost of production and sending envelope in E-boks = 0,50 kr. per envelope*
- Manual processing of output: 3 % decentral = 20,00 kr. per envelope*
  97% central = 0,00 kr. per envelope*
- RD Customers use of channels avg. over 5 years:
  e-Boks: 60%, paper 10%, Netbank/Netpost 30%
- CPU use unchanged – however decrease of CPU use in daytime
- Storage unchanged
- RD print specialist 100 hours per year: = 120.000 kr.
- Envelopes in scope of project send to customer: = 890.000 envelopes.
  18 types of envelopes containing 19 different documents.

*Cost in kr. per envelope. Information is delivered by Documents system.

In the table below a calculation for project costs, saved cost and customer value is specified.

Business Delivery	Hours	Project cost	Saved cost for 5 years	Customer value
Support to project processes	750	495.000	0	0
Make and get an approval of strategi for new RD system outputs	355	270.000	0	0
Describe flows from customer og advisor perspective	250	225.000	0	0
Make and get a approved strategi for eksisting RD system outputs	390	537.000	0	0
Make proof of concept	1.400	312.000	0	0
Make and get an approved Guidline for 'DCI Factory'	120	108.000	0	0
Develop and implement - envelope priority 1	6.970	5.463.000	15.408.750	15.280.343
Årsopgørelse og rentetilpasning				
Develop and implement - envelope priority 2+3	4.400	3.027.000	7.586.125	3.670.406
Udbetalingspakke, TL kontoudtog Årsopg, kontrolkodebrev				
Develop and implement - envelope priority 4	3.940	2.565.000	903.000	895.475
Profilskifte (5 breve)				
Develop and implement - envelope priority 5+6	3.940	2.565.000	787.500	780.937
Årsopgørelse-kautionistbrev, betinget og endelig GOV pakke (4 breve)				
Develop and implement - envelope priority 7	4.300	2.889.000	2.559.375	2.538.047
Kommunegaranti, indeksoplysningsbrev, opgørelse PF, opsigelse bekræft, indfrielsekvittering (5 breve)				
Total	**26.815**	**18.456.000**	**27.244.750**	**23.165.208**
19 RD system print in 18 envelopes				
Digitalise documents from Danske Kredit is not included int this cost estimate				
Total value = Saved cost for 5 years + Customer value - Project cost				

Customer value pr document is 24 DKK for 5 years.

The customer value are equal shared by documents send to customer due it has not been possible for the project to get the business to determine the customer value for each document.

Appendix F - Spreadsheet with all the projects from the SSGs

	Project activity name	[illegible]ket	Stratigic Focus area	[illegible]es	Resource costs 2011	Total Project Costs [DKK]	Sum Benefits [DKK]	NPV (14%) 2 years	NPV (14%) 5 years	IRR 2 years	IRR 5 years	Benefit Description	Project Description
3	Text	Formula	List	[illegible]	Formula	Formula	Formula	Formula	Formula	Formula	Formula	Text	Text
4	Management Retail Solution	11	1. Committed deliveries	3	3.639.600	3.639.600	-	(3.192.632)	(3.192.632)	#NUM!	#NUM!	-	0
5	Management D2D Finance	11	-	1	1.213.200	1.213.200	-	(1.064.211)	(1.064.211)	#VALUE!	#NUM!	-	Segments: Personal - Mass Customers
6	Management Card Systems	11	-	1	1.213.200	1.213.200	n/a	#VALUE!	#VALUE!	#VALUE!	#VALUE!	N/A	Segments: Personal - Mass Customers
7	Maintenance Card Systems	11	-	9	9.597.600	9.597.600	n/a	#VALUE!	#VALUE!	#VALUE!	#VALUE!	Maintained	Segments: Personal - Mass Customers
8	Maintenance D2D Finance	11	-	7	6.122.700	6.122.700	-	(5.370.789)	(5.370.789)	#VALUE!	#NUM!	-	Segments: Personal - Mass Customers
9	ATM decentral releases (2 yearly)	11	3. Already agreed plans	3	3.405.600	5.405.600	n/a	#VALUE!	#VALUE!	#VALUE!	#VALUE!	-	Segments: Personal - Mass Customers
10	Card Systems Legal/compliance - Cash Back Debit ca[illegible]	26	2. Legal and Regulatory	1	1.235.700	1.639.700	n/a	#VALUE!	#VALUE!	#VALUE!	#VALUE!	Online sale	Segments: Personal - Mass Customers
11	Cards Legal/compliance Task	11	2. Legal and Regulatory	10	11.101.200	11.351.200	-	(9.957.193)	(9.957.193)	#VALUE!	#NUM!	Benefits fo	Segments: Personal - Mass Customers
12	Payment Card Industry - Data Security Standard	18	1. Committed deliveries	8	7.392.300	11.692.300	n/a	#VALUE!	#VALUE!	#VALUE!	#VALUE!	Online vali	Segments: Personal - Mass Customers
13	Card Systems New/updated products - Product "A"		6. Customer products	6	5.212.800	6.212.800	57.000.000	(5.457.365)	28.484.623	#VALUE!	1	########	Segments: Personal - Mass Customers
14	BankSMS - card based - DB DK	5	4. Customer Service qu	1	606.600	706.600	27.000.000	6.616.279	17.334.802	#VALUE!	25	########	Segments: Personal - Mass Customers
15	Card Platform v3.0 (Make/buy/source- RFI+RFP)		-	5	6.811.200	6.811.200	n/a	#VALUE!	#VALUE!	#VALUE!	#VALUE!	List of poss	Segments: Personal - Mass Customers
16	Operational Excellency for Card Systems	30	1. Committed deliveries	3	4.454.100	21.954.100	38.000.000	(14.097.164)	2.873.831	(0)	0	Reduced n	Segments: Personal - Mass Customers
17	Cards platform v2.1 (Stabilisation)	10	3. Already agreed plans	10	9.749.400	15.381.000	175.500.000	32.930.792	102.601.189	#VALUE!	3	########	Segments: Personal - Mass Customers
18	Card Group Invoice (Stabilise & consolidate)	10	3. Already agreed plans	11	10.458.900	14.722.900	125.550.000	20.266.512	70.107.643	#VALUE!	2	Automation	Segments: Personal - Mass Customers
19	Online Sales Packages (FI)	7	1. Committed deliveries	3	2.749.260	9.049.260	19.200.000	(2.509.723)	4.840.361	#VALUE!	0	Online sale	Segments: Personal - Mass Customers
20	Online sales - D2D Banking products, Delivery 2 (NO)	6	3. Already agreed plans	7	6.688.200	7.688.200	-	(6.866.842)	(6.866.842)	#VALUE!	#NUM!	Benefits fo	Segments: Personal - Mass Customers
21	Digital Card Group Invoice (eInvoice SB/FB))		6. Customer products	10	10.492.200	14.311.800	46.200.000	(7.064.257)	16.516.493	(1)	1	e-invoice fo	Segments: Personal - Mass Customers
22	Cards Business Tasks 2010 & 2011	11	4. Customer Service qu	5	4.688.400	4.688.400	40.000.000	3.582.044	21.446.248	1	2	Essential b	Segments: Personal - Mass Customers
23	Online sales - D2D Banking products, Delivery 2 (FI)	3	3. Already agreed plans	2	1.868.700	2.868.700	-	(2.639.211)	(2.639.211)	#VALUE!	#NUM!	Benefits fo	Segments: Personal - Mass Customers
24	Online sales - D2D Banking products, Delivery 2 (SE)	2	3. Already agreed plans	2	1.868.700	2.868.700	-	(2.639.211)	(2.639.211)	#VALUE!	#NUM!	Benefits fo	Segments: Personal - Mass Customers
25	OSS for physical channel (DK)	11	3. Already agreed plans	12	13.540.800	13.540.800	58.400.000	(643.669)	25.438.070	0	1	########	Segments: Personal - Mass Customers
26	OSS for physical channel (SE)	7	3. Already agreed plans	1	606.600	5.606.600	-	(4.379.443)	(4.379.443)	#VALUE!	#NUM!	Included in	Segments: Personal - Mass Customers
27	OSS for physical channel (NO)	6	3. Already agreed plans		-	6.000.000	-	(4.616.805)	(4.616.805)	#DIV/0!	#NUM!	Included in	Segments: Personal - Mass Customers
28	Improved online sales process - online channels (scen[illegible]	4	7. Customer user interf	2	2.528.640	2.528.640	40.500.000	11.119.845	25.589.851	#VALUE!	#NUM!	########	Segments: Personal - Mass Customers
29	Corporate Cards in Business Online - basic		5. Enhanced customer	14	13.540.800	13.540.800	167.500.000	20.343.558	95.149.915	2	3	Corporate	Segments: Business - SME & CIB/Big c
30	Improved online sales process - online channels (scen[illegible]	3	7. Customer user interf	2	1.922.040	1.922.040	-	(1.686.000)	(1.686.000)	#VALUE!	#NUM!	Included in	Segments: Personal - Mass Customers
31	Improved online sales process - online channels (scen[illegible]	2	7. Customer user interf	2	1.922.040	1.922.040	-	(1.686.000)	(1.686.000)	#VALUE!	#NUM!	Included in	Segments: Personal - Mass Customers
32	Improved online sales process - online channels (scen[illegible]	2	7. Customer user interf	2	1.922.040	1.922.040	-	(1.686.000)	(1.686.000)	#VALUE!	#NUM!	Included in	Segments: Personal - Mass Customers
33	Improved online sales process - online channels (scen[illegible]	3	7. Customer user interf	1	1.012.140	2.012.140	-	(1.657.310)	(1.657.310)	#VALUE!	#NUM!	Included in	Segments: Personal - Mass Customers

Sheet2 | Udviklingsplan | RETU | COD[illegible] | [illegible]O | DIBA | COSE | Resou[illegible].area | Resource Overview | SSG Overview | Project descr. | Portfolio info | Brand

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