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Business Model Innovation for Data Driven Services

An investigation of how a large, established
firm conducts business model innovation for
data driven services

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THESIS DESCRIPTION

The purpose of this thesis is to understand how a firm can conduct business model innovation for data driven services. To fulfil this purpose, the master thesis investigates how a large, established firm have developed three data driven services by examining performed activities that define and shape their business models. Moreover, the thesis studies how leadership, customer involvement and network relations impact the process of developing a business model for a data driven service.

PREFACE

This master's thesis is written by two students at the Norwegian University of Science and Technology. The thesis constitutes the final work of the authors as part of their Master of Science degree at the NTNU School of Entrepreneurship, in the the subject TIØ4945 - Innovation and Entrepreneurship, Master's Thesis.

The thesis has investigated the development of three data driven services at DNV GL, a Norwegian-German classification society. However, one of the data driven services belonged to a unit, which was sold from DNV-GL after the service was launched. The authors have not interviewed employees at the spin-off company VPS, which now owns one of the services that was studied in the thesis. This is because the thesis employs an internal perspective when investigating the development of these services, and thus, the authors have only interviewed subjects from DNV-GL. However, findings in this thesis are supplemented with data from a previous master thesis that includes interviews with subjects from both DNV GL and its spin-off VPS.

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ABSTRACT

Business model innovation has been identified as vital for sustaining company performance (Zott et al., 2011). Established firms need to renew their business models in the face of changes that potentially threaten company profits (Sosna et al., 2010), as well as business model innovation is necessary to obtain the potential business value from technological innovations (Chesbrough, 2010; Teece, 2010). Despite this emphasis on the importance of innovating business models, there are few studies that focus on understanding the development of business models (Palo & Tähtinen, 2013). Moreover, due to the development towards service-based economies enabled by technology (Chesbrough, 2010), there is a need for studies focusing on how to create and capture value from data (Wamba et al., 2015).

In light of these issues highlighted by scholars, the purpose of this thesis is to investigate how large, established firms conduct business model innovation for data driven services. To fulfill the purpose, the authors investigate business model innovation through activities that define and shape business model components, which is examined through research question 1. Moreover, the thesis studies how the dimensions *leadership*, *network relations* and *customer involvement* impact the process of developing a business model for a data driven service, which is examined through research question 2. Studying these dimensions are motivated by scholars within business model innovation (e.g. Teece, 2010), Big Data (e.g. McAfee & Brynjolfsson, 2012) and the service literature (e.g. Spohrer & Maglio, 2008).

The theoretical background of this thesis builds upon the authors' pre-diploma thesis (Andersen & Barkost, 2015) which, based on a literature review, created a theoretical framework for business model innovation in the context of data driven services. This theoretical framework was extended by investigating theory on leadership, network relations and customer involvement in the context of business model innovation, in this thesis. A single-embedded case study design investigating three data driven initiatives at a Norwegian-German classification society, DNV-GL, forms the basis for the analysis and discussion. The empirical findings for the thesis consists of 23 semi-structured interviews with employees from the case company, 13 of which were conducted by the authors, in addition to secondary data consisting of 10 interviews from a previous master thesis investigating one of the initiatives in this thesis (Stabursvik, 2014).

Guided by the theoretical framework, the authors selected and compiled the distilled material from the empirical findings into events in time for each project. These events are analyzed separately for identification of activities and dimensions impacting the development of each service's business model. Also, the project's events are analyzed in terms of how these dimensions interrelated with one another. Finally, a cross case analysis is conducted across the three projects, addressing the research questions. It is found that business model innovation may be viewed as an activity system within events that occur in the development of an initiative. These events shape one or more business model components. Further, the analysis shows how the activity system may be affected by leadership, network relations and customer involvement, either directly in the event, or indirectly through the organizational context, as well as how these dimensions may impact one another.

The discussion combines the findings on research question 1 and 2 into a process perspective consisting of phases, in addition to the considerations of business model innovation in the context

of a data driven service and in a large, established firm, in order to answer the purpose. A model of the identified business model innovation process is presented in the discussion. It shows that the process of business model innovation can be viewed as a stream of relatively unrelated events consisting of one or more activities, wherein one event shapes one or more business model components. These events are scattered along the development, or change process of a data driven service, which proceeds through four phases in developing its business model. One event may impact one or more subsequent events in the BMI process, or the definition of a component can influence the definition of other business model components. The dimensions were found to primarily impact an event directly by performing or guiding business model innovation activities in that event, or the dimensions could influence an event indirectly through the organizational context.

This thesis contributes to the business model innovation literature by detailing which activities can be performed during the events of developing or altering a service, that shapes its business model. It further details how this can be done, and potentially is affected by the dimensions, leadership, network relations and customer involvement, with the associated organizational context. Consequently, the thesis extends theory by proposing a model where all of this is incorporated, illustrating the coherence between elements of the overall business model innovation process through an activity-based perspective. This has not been found to be done in existing theory on business model innovation. Furthermore, this thesis describes how a business model innovation process can be analyzed. This provides insights to the gap identified by amongst others Palo & Tähtinen (2013), that there are few studies that focus on the development of business models (Sosna et al., 2010; Seidenstricker et al., 2014).

The practical implications of this research is mainly relevant for management in large, established firms, but could also be interesting for other types of roles and companies, and those looking to leverage data in offerings. The proposed model can be used to generate lessons by analyzing the development of previous initiatives, eliciting the consequences on the business model of choices and actions that have been made. Management's role in initiation of the process and institutionalization of the business model has been crystallized from the analysis as crucial for the initiative's access to resources, ability to explore business model options and for overcoming barriers in the process. For digitizing companies looking to create value through brokering information, four lessons are that the value proposition may be based on creating transparency and/or incorporating multiple data sources, choice of technology may pose significant consequences for the value chain and/or value proposition, and that data access may be an issue when relying on partnerships.

SAMMENDRAG

Innovasjon av forretningsmodeller er ansett som essensielt for langsiktig konkurransedyktighet (Zott et al., 2011). Etablerte selskaper må fornye forretningsmodellene sine ettersom de støter på endringer som kan potensielt være destruktive for inntektsstrømmer (Sosna et al., 2010), i tillegg til at innovasjon av forretningsmodeller er nødvendig for å virkelig kunne utnytte forretningspotensialet fra teknologiske innovasjoner (Chesbrough, 2010; Teece, 2010). Til tross for den understrekede viktigheten av å innovere forretningsmodeller, er det få studier som fokuserer på å forstå utviklingen av dem (Palo & Tähtinen, 2013). Videre, på grunn av utviklingen mot en tjenestebasert økonomi basert på teknologiske innovasjoner (Chesbrough, 2010), er det et behov for studier som fokuserer på hvordan man kan skape og høste forretningsverdi fra data (Wamba et al., 2015).

Sett i lys av disse utfordringene skissert av akademikere, er formålet med denne masteroppgaven å undersøke hvordan store, etablerte selskaper utfører forretningsmodellinnovasjon for datadrevne tjenester. For å oppnå dette formålet vil oppgaven utforske hvordan innovasjon av forretningsmodeller gjennom aktiviteter, som definerer og former komponentene av forretningsmodellen, bli studert gjennom forskningsspørsmål 1. Videre vil oppgaven studere hvordan dimensjonene *ledelse*, *nettverksrelasjoner* og *kundeinvolvering* påvirker prosessen av å utvikle en forretningsmodell for en datadreven tjeneste, gjennom forskningsspørsmål 2. Undersøkelsen av disse dimensjonene er motivert av akademikere innen forretningsmodellinnovasjon (f.eks. Teece, 2010), Big Data (f.eks. McAfee & Brynjolfsson, 2012) og tjenestelitteraturen (f.eks. Spohrer & Maglio, 2008).

Teorikapittelet i denne oppgaven bygger på forfatternes prosjektoppgave (Andersen & Barkost, 2015) som, basert på et litteraturstudie, skapte et teoretisk rammeverk for innovasjon av forretningsmodeller i konteksten av datadrevne tjenester. Dette teoretiske rammeverket har blitt utvidet gjennom utforskning av teori innen ledelse, nettverksrelasjon og kundeinvolvering i konteksten av forretningsmodellinnovasjon i denne studien. Masteroppgaven er et casestudie som inneholder flere analyseenheter hvor utviklingen av tre datadrevne tjenester ved et norsk-tysk klassifikasjonsselskap, DNV-GL, danner grunnlaget for analysen og diskusjonen. De empiriske funnene er basert på 23 semi-strukturerte intervjuer med ansatte fra caseselskapet, hvorav 13 ble utført av forfatterne, i tillegg til sekundærdata bestående av 10 intervjuer fra en tidligere masteroppgave som studerte en av de samme tjenestene som denne oppgaven (Stabursvik, 2014).

På bakgrunn av det teoretiske rammeverket har forfatterne selektert og samlet kondensert materiale fra den empiriske dataen til hendelser i tid for hvert prosjekt. Disse hendelsene er analysert separat for identifiseringen av aktiviteter og dimensjoner som har påvirket utviklingen av hver tjeneste sin forretningsmodell. I tillegg blir prosjektenes hendelser analysert med tanke på hvordan dimensjonene relateres til hverandre. Til slutt utføres en kryssanalyse av de tre prosjektene for å besvare forskningsspørsmålene. Det utledes at forretningsmodellinnovasjon kan sees på som et aktivitetssystem innenfor hendelser som skjer i utviklingen av et forretningsinitiativ. Disse hendelsene former en eller flere komponenter av forretningsmodellen. Videre viser analysen hvordan aktivitetssystemet kan påvirkes av ledelse, nettverksrelasjoner og kundeinvolvering, enten direkte i hendelsen eller indirekte gjennom organisasjonskonteksten, i tillegg til hvordan dimensjonene påvirker hverandre.

Diskusjonen kombinerer funn fra forskningsspørsmål 1 og 2 i et prosessperspektiv bestående av faser, i tillegg til betraktninger for forretningsmodellinnovasjon i konteksten av datadrevne tjenester og et stort, etablert selskap, for å besvare formålet med masteroppgaven. En modell av den identifiserte prosessen for forretningsmodellinnovasjon presenteres i diskusjonen. Den viser at prosessen for forretningsmodellinnovasjon kan sees på som en strøm av relativt urelaterte hendelser som består av en eller flere aktiviteter, hvor en hendelse former en eller flere komponenter av forretningsmodellen. Disse hendelsene er spredt utover utviklingen eller forandringsprosessen til en datadreven tjeneste som går gjennom fire faser i utviklingen av sin forretningsmodell. En hendelse kan påvirke en eller flere følgende hendelser i prosessen av forretningsmodellinnovasjon, eller formingen av en komponent kan påvirke definisjonen av andre komponenter i forretningsmodellen. Dimensjonene ble ansett til å hovedsakelig påvirke en hendelse direkte ved å enten utføre eller guide utførelsen av aktiviteter i den hendelsen, eller så ble det identifisert at dimensjonene også kunne påvirke en hendelse indirekte gjennom organisasjonskonteksten.

Denne oppgaven bidrar til litteraturen på forretningsmodellinnovasjon ved å vise hvilke aktiviteter som kan utføres under hendelser i utviklingen eller endringsprosessen av en tjeneste, som former forretningsmodellen. Videre utleder oppgaven hvordan disse aktiviteter kan gjøres, og hvordan de potensielt blir påvirket av dimensjonene ledelse, nettverksrelasjoner og kundeinvolvering, og den assosierte organisasjonskonteksten. Dermed utvider denne studien eksisterende teori ved å foreslå en modell hvor alle disse elementene blir inkorporert, som illustrerer sammenhengene mellom dem i den overordnede prosessen av forretningsmodellinnovasjon gjennom et aktivitetsbasert perspektiv. Dette har ikke blitt identifisert til å ha blitt gjort i eksisterende teori om forretningsmodellinnovasjon. Dermed beskriver denne oppgaven også hvordan prosessen for forretningsmodellinnovasjon kan bli analysert. Dette bidrar med detaljer og ny innsikt til litteraturen som etterlyst av Palo & Tähtinen (2013), angående det at det er få studier som fokuserer på utviklingen av forretningsmodeller (Sosna et al., 2010; Seidenstricker et al., 2014).

De praktiske implikasjonene av denne studien er hovedsakelig relevant for ledelse i store, etablerte selskaper, men kan også være interessant for andre typer roller og selskap, og de som ønsker å skape forretningsverdi med data gjennom tjenester. Den foreslåtte modellen kan brukes til å generere læring ved å analysere utviklingen av tidligere initiativer, som dermed avdekker konsekvensene for forretningsmodellen på bakgrunn av valgene og handlingene som har blitt gjort. Ledelsens rolle i initiering av prosessen og institusjonalisering av forretningsmodellen har utmerket seg fra analysen som avgjørende for et initiativ sin tilgang på ressurser, evne til å utforske alternative forretningsmodeller og for å overvinne barrierer i prosessen. For digitaliserende selskap som ønsker å skape verdi gjennom formidling av informasjon, er det fire læringer som kan være verdt å ta med seg; verdiskapning kan baseres på å skape transparens og/eller inkorporering av flere datakilder, valg av teknologi kan skape signifikante konsekvenser for verdikjeden og/eller verdiskapningen, og datatilgang kan være en utfordring når man avhenger av partnerskap.

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1. INTRODUCTION

This thesis aims to investigate how large, established firms conduct business model innovation for data driven services. Business model innovation, hereafter BMI, will be the main focus of the thesis, which builds on a pre-diploma thesis, which serves as the foundation for the literature review (Andersen & Barkost, 2015) presented in the theoretical background of the thesis. Furthermore, when referring to "the authors" throughout the text, it is the authors of the thesis.

This chapter will cover the importance of investigating BMI in the context of data driven services, the purpose of the study, relevant concepts and context for the thesis, the research questions, and finally, its contribution.

1.1 BUSINESS MODEL INNOVATION FOR DATA DRIVEN SERVICES IN ESTABLISHED FIRMS

Established firms may need to renew or innovate their business models to counteract threats and market changes that put them at risk of becoming obsolete or less profitable (Sosna et al., 2010). In order to be able to continue delivering value to its stakeholders and to capture value for itself, BMI is an important capability for every firm (ibid.). In fact, BMI represents the highest return on investment relative to other innovation methods (Girotra & Netessine, 2014). However, an established firm may find it more difficult to introduce new business models as they have to deal with the organizational inertia and effects of their existing business models, as well as the fact that they may need to cannibalize existing business models for long term survival (Sosna et al., 2010). According to Sinfield et al. (2011) few organizations have managed to "successfully conceive and execute a business model different from their current one" and few have collated a methodological approach to BMI.

In the literature on BMI there is an increasing consensus that innovation of business models, BMI, is key to company performance (Zott et al., 2011), representing one of the most sustainable forms of innovation (Sosna et al., 2010). Chesbrough (2010), Osterwalder et al. (2005), Teece (2010) and Amit & Zott (2010) emphasize the importance of innovating business models in order to exploit the full business value potential of innovations. Chesbrough (2010) argue that BMI can attract as much value as a technical innovation can. In order to obtain value from technological innovations, Teece (2010) further underline that it must be matched with BMI. Additionally, Cavalcante et al. (2011) also emphasize that the importance of business model dynamics associated with technology and market discontinuities, drives the need for BMI. Teece (2010) contend that new business models or refinement of existing ones, may result in lower cost or increased customer value that provides the pioneer with an opportunity of higher returns if not

copied by competitors. Therefore, "it makes good business sense for companies to develop the capability to innovate their business models" (Chesbrough, 2010).

However, despite this emphasis on the importance of innovating business models, there are few studies that focus on understanding the development of business models (Palo and Tähtinen, 2013). Sosna et al. (2010) claim that there is a need for further research on BMI to better understand its underlying mechanisms and move the conceptual frameworks of BMI to more solid theoretical ground. This is supported by Seidenstricker (2014) who state that the majority of the models that try to offer a systematic BMI process, with the aim to control the full life cycle of the business model, provide little detail and support for practical application.

At the same time, there is a development towards service-based economies enabled by technology (e.g. Chesbrough, 2010), paralleled by a drastic increase in data being collected, which can be exploited to create business value (e.g. Brown et al., 2011). Such massive amounts of data, or Big Data, presents great opportunities for businesses to create value through services offering. Thus, the potential to generate great business value has placed Big Data in the spotlight of academic and corporate research (Wamba et al., 2015). Wang et al. (2015) posit that the importance of digital services and digitization of traditional services has gained relevance, and thus will be matched by the need for BMI. Thus, in order to exploit the full value potential of Big Data, it is necessary to innovate the business models, as stated by Brown et al. (2011), Ferrando-Llopis et al. (2013) and Porter & Heppelmann (2015).

Despite the growing interest in the subject, Wamba et al. (2015) claim that little is known about what encompasses the concept of Big Data and therefore, there are difficulties in understanding how to capture value from it (ibid.). Ferrando-Llopis et al. (2013) support this view by stating that it is still unclear how to extract value from Big Data for firms, and contend that there is not yet sufficient data from companies to identify successful patterns and business models. Shane & Venkataraman (2000) and Palo & Tähtinen (2013) also identify the development of business models that forge markets for new technology-based services as a key challenge. Thus, the literature on Big Data suggest that BMI is necessary to create and capture potential business value. This motivates a deepened understanding of the BMI process for data based services and its contents.

1.2 PURPOSE

The purpose of this thesis is to investigate how large, established firms conduct business model innovation for data driven services.

This purpose was motivated by the limited detail in the literature on how to perform BMI, especially in a data driven context. To fulfill the purpose, the authors must address the processes by which BMI is initiated and how the business model changes over time in the context of a firm.

Thus, the authors will study the BMI processes taking place within a large, established firm that develops business models for three data based services. To give the reader a foundation that is aligned with the definitions and perspectives employed by the authors the section below provides a definition of the business model, BMI, Big Data, and Big Data Analytics. Further, the reader is provided with appropriate background information on the "data based" context, which further motivates the research questions listed towards the end of this section.

1.2.1 DEFINITIONS & BACKGROUND INFORMATION

This section aims to familiarize the reader with definitions and central concepts in this thesis; the business model and BMI, as well as data based services.

1.2.1.1 THE BUSINESS MODEL & BUSINESS MODEL INNOVATION

A definition of the business model and BMI is crucial as the two concepts are fundamental to the thesis. Furthermore, it prepares the reader for the elaboration of the BMI process in the theoretical background (ch. 2).

The Business Model
Chesbrough & Rosenbloom (2002) and Teece (2010) state that there has been a neglect in defining the concept of business models academically since it is an interdisciplinary topic, which lacks prominence within a single research area. Several scholars have attempted to define a business model (Chesbrough & Rosenbloom, 2002; Osterwalder& Pigneur, 2010; Palo & Tähtinen, 2013; Gummesson et al., 2010; Baden-Fuller & Morgan, 2010; Doz & Kosonen, 2010) by describing its components, and characterizing its role in the firm. However, the literature converges towards a general consensus that a business model is a system of several individual business model elements (Zott et al., 2011). Recent studies also take a dynamic perspective on business models to focus on change and innovation (Cavalcante et al., 2011, Demil & Lecocq, 2010).

This paper will utilize a combination of the definitions created by Amit and Zott (2010), Chesbrough (2010) and Wirtz et al. (2015). Hence, a business model is defined as *"a system of interdependent activities configured to create value through the exploitation of business opportunities"* (Amit and Zott, 2010), fulfilled by the following functions (Chesbrough, 2010) *"articulating the value proposition, identifying the market segment, defining the value chain and required assets to support position in the chain, detailing the revenue mechanism and cost structure, describing the position in the value network, and formulating competitive strategy"*, that can be sustained by having a dynamic perspective on the business model (Wirtz et al., 2015). The reader should note that this thesis views *identifying the market segment* to also involve customer segmentation and identifying target customer. This definition is chosen because Amit & Zott's (2010) perspective of a business model as performing activities to create and capture value is aligned with the activity based perspective employed by the authors. The dynamic perspective

of Wirtz et al. (2015) is included as the authors aim to study BMI. From hereon the authors will refer to these functions of the business model as components throughout the thesis, as this is the most widely used term to describe the parts of a business model.

Business Model Innovation
Several scholars have defined BMI, which signifies many different perspectives where some differentiate based on impact of the innovation (Wirtz et al., 2015), how many components of the business model are changed (Mitchell and Coles, 2003), or as different types of changes in a dynamic perspective of the business model (Cavalcante et al., 2011; Chesbrough, 2010). Furthermore, a distinction in regards to the process of BMI is made by certain scholars where some contend that the continued configuration and implementation of business model components represents the BMI process (Mitchell & Coles, 2003), whereas others see the configuration of business model components as only one part of the entire process from initiating BMI all the way until a suitable business model is implemented in the organization (Sosna et al., 2010). The thesis will therefore take a process oriented perspective on BMI viewing the configuration of business model components as only a part of the overall process of BMI, from initiation to implementation of the changes (Sosna et al., 2010). Furthermore, this thesis takes the perspective that BMI is never finished as firms must continuously adapt their business models, through a cyclic process, for long term success due to changes in the market (ibid.).

The authors of this thesis take the perspective of Cavalcante et al. (2011) and Chesbrough (2010) viewing BMI as a term that entails developing a new business model or making changes to an existing business model. This entails making minor or major changes to the functions in the chosen definition of a business model, or building an entirely new business model. The authors have chosen this definition since the aim is to study and identify all activities that may impact the BMI process.

1.2.1.2 DATA BASED SERVICES

Since the thesis will investigate BMI in the context of data driven services, first, the concept of *services*, *Big Data* and *Big Data Analytics* must be defined. Next, this section provides the reader with an elaboration on the one half of the context that deals with data based services. The thesis will use implications of Big Data on developing a business model, to investigate how a firm can conduct BMI, as the distinction between data and Big Data is not clear cut.

Definition of a Service
There are several suggested definitions of a *service* (Spohrer & Maglio, 2008; Zeithaml et al., 1996; Maglio & Spohrer, 2013; Vargo and Lusch, 2004). The employed definition in this thesis comes from Spohrer & Maglio (2008) who identified fundamental aspects of a service by integrating the definitions of central scholars within service science. They describe the co-creation of value and the customer's role in co-production activities as essential facets of a

service in a business context (ibid). This is based on a combination of the definition proposed by Fitzsimmons & Fitzsimmons (2005) claiming that a service is *"a time-perishable, intangible experience performed for a customer acting in the role of a co-producer"*, and the definition of Hill (1977), saying that it is *"a change in condition or state of an economic entity caused by another"*. The combination of these definitions signify that if the customer does not undertake its role as co-producer of value, the benefit of the service will be lost (Spohrer & Maglio, 2008). This integrated definition is chosen because it highlights the economic value aspect of a service, as well as the customer's role, which are important implications for a business model and its development in respect to a data driven service.

Definition of Big Data and Big Data Analytics

There are currently several definitions of *Big Data* highlighting different aspects of the concept (Johnson, 2012; Davenport et al., 2012; Brown et al., 2011; McAfee & Brynjolfsson, 2012; Hagerty & Groves, 2013; Boyd & Crawford, 2012). These definitions are frequently characterized by a set of "Vs"; Volume, velocity, variety, veracity and value (Wamba et al., 2015). The definition provided by Gartner (2015) is frequently used by academics to summarize what Big Data encompasses (Wamba et al., 2015, Gandomi and Haider, 2015): "Big data is high-volume, high-velocity and high-variety information assets that demand cost-effective, innovative forms of information processing for enhanced insight and decision making" (Gartner, 2015).

For this thesis, the authors will use the integrated definition of Big Data proposed by Wamba et al. (2015): *"a holistic approach to manage, process and analyze five Vs (i.e., volume, variety, velocity, veracity and value) in order to create actionable insights for sustained value delivery, measuring performance and establishing competitive advantages"*. This definition is chosen since it underlines veracity, i.e. the quality of the data, and value, i.e. capturing the economic benefits (Gandomi and Haider, 2015; Wamba et al., 2015), which is in line with the aim of this thesis to investigate BMI in a data driven context.

Gandomi & Haider (2015) focus on Big Data's role in business analytics due to the value it can provide. Thus, to create value with Big Data, it must be leveraged to create actionable insights, which is in line with the chosen definition above. This introduces the concept of *Big Data Analytics*, which is *"the collection of data and technology that accesses, integrates and reports all available data by filtering, correlating and reporting insights not attainable with past data technologies"* (APICS, 2012).

Implications for a Data Based Business Model

This section elaborates on the opportunities, potential issues and capabilities related to value creation and value capture for Big Data. These findings are included because there are specific considerations to be made when developing a business model for a data driven service, that the reader should be aware of, and that will be will be applied throughout the text.

Based on the work of Brown et al. (2011), Wamba et al. (2015) present five dimensions for business value creation with Big Data being 1) Creating transparency by making data more accessible to stakeholders close to real-time, 2) enabling experimentation to discover needs, expose variability and improve performance, 3) segmenting populations to customize actions, 4) replacing/supporting human decision making with automated algorithms for data driven decision making, and 5) innovating business models, products and services.

There are different views on whether creating and capturing business value with Big Data will require entirely new business models or if traditional models can be extended for this purpose. Ferrando-Llopis et al. (2013) claim that a business model for Big Data can be innovated through two modes. The first one focuses on extending the evolution of current platform business models of leaders such as Google and Amazon (Gawer and Henderson, 2007, Gawer et al., 2012, Eisenmann et al., 2006). The other mode entails developing entirely new business models that integrates the "Vs" of Big Data. In contrast, Huberty (2015) claims that to truly exploit Big Data, will require fundamentally different business models. He states that current Big Data business models use data to scale old modes of value creation, rather than adopting new ones. These business models have separated data generation from the point of value creation. Thus, Huberty (2015) argues for business models that link the data generation directly to the value of the final product (ibid.). Brown et al. (2011) support this view and claim that a business model can be built fundamentally on Big Data, not only based on analyses supporting existing business.

Following on this, Wang (2012) recognizes three business models to emerge with Big Data, in which the first focus on utilizing data to create differentiated offerings, providing increased customer satisfaction and contextual relevance. The second business model revolves around brokering information, i.e. selling raw data, benchmarking, analysis and insights, by addressing and mixing unstructured data to create new specialized streams of insights repackaged to provide relevancy and context. The third business model focuses on delivering data when and where it is needed through building trade and delivery networks for content creators, information providers and brokers (ibid.). Wang (2012) claims that in order to become a part of the new data era, firms must understand which business models match their organization in order to enable smart decisions on how to build, partner or acquire new business.

With regards to Big Data, Hui (2014) recognizes a shift in the mindset of value capture. First, a transition from pricing based on cost structure, maximizing profits and discrete product sales to a value based pricing facilitated through recurring revenue streams (Porter and Heppelmann, 2015). Second, due to new and differentiated offerings, there is a shift in control points from creating lock-in through intellectual property and brand, to customization and network effects offered by the provider (Hui, 2014). Lastly, to capture value, firms must redirect their focus from building

internal capabilities to emphasizing growing partnerships and understanding how to generate value collectively in ecosystems (ibid.).

Issues and Capabilities in Creating Value with Data

Due to the complex nature of Big Data, a number of challenges must be considered when translating Big Data into business value (Brown et al., 2011). Based on Brown et al. (2011), Wamba et al. (2015) present issues related to business value creation from Big Data; 1) Data policies need to be clarified concerning data privacy, security, intellectual properties and liability matters. 2) Organizations must deploy new technology and techniques to capture and extract meaning from the data, such as storage, computing, analytical software and types of analyses. Thus, the firm will have to handle different standards and formats for data storage, which may be incompatible. 3) Organizational change and talent will be critical in unlocking value from Big Data. Moreover, several organizational leaders lack the necessary understanding and relevant talent in their organizations to derive insights from Big Data (Russom, 2011). 4) Access to data is critical, and to enable transformative opportunities, firms must collect data from multiple sources and third parties by offering compelling value propositions. 5) Industry structure will impact the value potential of Big Data as sectors with low competitiveness, performance transparency, and consolidated profit pools, will be slower to adapt and leverage Big Data (ibid.). For instance, there may be low competitiveness in the public sector, limiting efficiency and productivity; hence the incentives for adopting Big Data may be reduced. Thus, organizational leaders should consider industry structure and its future prospects in their approach towards Big Data, both at a firm level, sector level and the economy as a whole (Brown et al., 2011).

The majority of the current literature converges to these five dimensions, in which most covers issues related to technology and techniques (Wamba et al., 2015). Ferrando-Llopis et al. (2013) expresses that several stakeholders will be involved in the development of technology and commercialization of Big Data. Moreover, McAfee and Brynjolfsson (2012) claim that the managerial challenges are even greater than the technological ones. Novel organizational arrangements as ecosystems and strategic partnerships will be required to access and collect value from Big Data. McAfee and Brynjolfsson (2012) and Hagerty and Groves (2013) focus on culture and the leader's responsibility as a role model, as key to becoming data driven. Brown et al. (2011), Porter and Heppelmann (2015) and McAfee and Brynjolfsson (2012) focus on building internal capabilities for a data driven organization. They recommend highly coordinated internal communities, especially IT and R&D, that span functions and top managers, in order for all employees to leverage insights, and for cross functional cooperation (ibid.). Finally, Porter & Heppelmann (2015) claim that several organizational changes will occur during a Big Data transition.

1.2.2 RESEARCH QUESTIONS

The previous section established necessary definitions and background information, which further motivates the research questions. The authors have chosen to take an activity based perspective on BMI since the aim of this thesis is to investigate how this process can be performed. Thus, RQ1 will help to dissect the process into concrete, manageable steps and activities to be identified through a literature review and an empirical study:

RQ1: How do business model innovation activities contribute to establishing a business model for a data driven service?

The process of BMI for data driven services occurs within the context of a company and its network (Chesbrough, 2010). Hence, the authors theorize that the activities which constitute the BMI process also are influenced by other factors than the organizational context of the company. Thus, based on the literature review, the authors identified three dimensions that were deemed important for BMI, especially in the context of data based services. These will be motivated below.

Sosna et al. (2010) state that managers have a difficult task developing business models as they face uncertainty in dynamic markets when conceiving a business model in a time of exploration. Moreover, they have developed mental models and a rationality based on the existing models in the firm, limiting the ability to identify new ways for value creation and capture. Furthermore, implementing new models require organizational realignment, prompting the leaders to allocate resources, develop competencies and to restructure to acquire knowledge for the promotion of constant learning (ibid.). Teece (2010) supports this as he highlights the issue that executives often fail to pair technical success with a winning business model, that is crucial to create commercial success. Thus, Chesbrough & Rosenbloom (2002) claim that it is an entrepreneurial act to identify and execute a new or disparate business model. This, combined with the fact that McAfee and Brynjolfsson (2012) stress the demanding managerial challenges for Big Data, motivates the investigation of *leadership's* role in the BMI process in the context of offering data based services.

Through their study on 69 service innovation projects in a mobile telecom company, Wang et al. (2015) contend that BMI is more complex than other forms of innovation, and therefore requires an involvement of external collaborations. Drawing on this, Hamel (2000) argues that in order to succeed in the "age of revolution", value creation and value capture must occur in a network where cooperation extend the company's resources. This is supported by Hui (2014), McAfee & Brynjolfsson (2012) and Ferrando-Llopis et al. (2013) who argue that there is a shift towards capturing value for data based services through novel partnerships, and understanding how to generate value collectively in ecosystems. Johnson et al., (2008) and Palo & Tähtinen (2013) futher state that the research examining the impact of business models on networks when offering

services is limited. Thus, it makes sense to look at how *network relations* may affect the BMI process.

According to the definition of a service, employed in this thesis, the role of the customer as a co-producer of value is emphasized (Spohrer & Maglio, 2008). Thus, if a company is unable to ensure co-production of value with the customer, the benefit of the service is lost (ibid.). In regards to Big Data, Russom (2011) underlines the importance of assessing the ability of customers to use the services, and also consider their incentives for adopting them, since industries with less competitiveness may be slower to adopt and leverage Big Data. Thus, when innovating a business model the firm must acquire knowledge both from and about customers. This motivates the third dimension to be studied in regards to BMI, namely *customer involvement.*

The previous sections motivated RQ2, and the investigation of the following dimensions; *leadership, network relations* and *user involvement*:

RQ2: How do leadership, network relations and customer involvement affect the business model innovation activities that contribute to establishing a business model for a data driven service?

The research questions will be addressed through a theoretical framework and through evidence acquired through a qualitative case study. To answer RQ1, the authors must identify relevant activities for BMI, before establishing how the performed activities led to outcomes on the business model and what they were. In order to answer RQ2, the authors must establish how each dimension impacts the identified activities, if it promotes or obstructs these activities, and whether it impacts it directly or indirectly via the organizational context. Additionally, the authors must establish how the dimensions interact to impact the BMI activities.

1.3 CONTRIBUTION

This thesis highlights the importance of BMI to introduce new services or innovate existing business, in the context of an established firm offering data based services. The thesis will extend the literature on how firms can conduct BMI, providing more detail with regards to specific activities, as called for by Sosna et al. (2010). Furthermore, this thesis will establish how BMI is impacted by the three dimensions leadership, network relations and customer involvement to better understand the underlying mechanisms of BMI (ibid.). Thus, this thesis provides a more holistic model of the process, incorporating the interactions between identified BMI activities, the influences of the organizational context and the dimensions of BMI and their coherence. The final model presented in this thesis may enable both researchers and practitioners to decompose and analyze the BMI process for increased insight. This contributes to fill to the gap identified; that there are few studies that focus on the development of business models (Palo & Tähtinen, 2013; Sosna et al., 2010; Seidenstricker et al., 2014).

As the research in this study is based on a large, established firm, the thesis contributes to identify processes specific to this context, providing a number of implications, especially with regards to overcoming organizational barriers. The majority of the implications may offer both large, established firms and more nascent firms with qualitative information for managing BMI, as well as how one should consider leveraging leadership, network relations and customer involvement in this process. The findings on BMI for data based services will fill a gap in the under-researched topic of of creating value for Big Data through BMI (Wamba et al., 2015). Thus, this thesis will present practical lessons based on three data driven projects. In addition to contributing theoretical and practical implications, based on the findings, this thesis also suggests a number of future research agendas.

To fulfill the purpose of the thesis, the authors have constructed two research questions that guides a literature review, serving as the Theoretical Background in chapter 2. The theoretical background covers the topics of BMI and its process, the organizational context in BMI, and the three dimensions of leadership, network relations and customer involvement. The theoretical background further guides the data collection, which forms the basis for the three project outlines in chapter 4, Findings, which are presented as events. The project findings will further be analyzed with regards to BMI activities, the outcome on the business model components and according to the dimensions, in light of the theoretical background in chapter 5, Analysis. Next, the authors will perform a cross case analysis of the studied projects in order to answer RQ1 and RQ2. Finally, in the Discussion, chapter 6, the research questions will be combined with background information from the theoretical background regarding phases and the context of an established firm delivering data based services. Thus, the thesis aims to fulfill the purpose and contribute to fill the gap in the literature on how large established firms may conduct BMI for a data based service.

2. THEORETICAL BACKGROUND

This chapter presents the theoretical framework of the thesis. It will provide the reader with relevant background information for understanding the topics of this thesis. Further, this framework will be applied in the analysis for answering the research questions, and in the discussion for answering the purpose. The chapter is structured into two main parts according to the two research questions presented in chapter 1 - the first part presenting literature on the process of BMI and contextual factors affecting it, thereafter an investigation of literature on the three dimensions in relation to BMI. Furthermore, it should be noted that this thesis investigates BMI in the context of a large, established firm, but most BMI literature does not distinguish between BMI for a small or large company. However, there are studies included in this chapter that have investigated large, established firms, and therefore implications of this context are included throughout this chapter.

2.1 BUSINESS MODEL INNOVATION

This section elaborates the findings on how companies can innovate their business models based on a literature review (Andersen & Barkost, 2015). First, the process of BMI will be presented by examining its initiation, phases and activities that can be performed in the process. Next, there is a presentation of contextual factors affecting the BMI process.

2.1.1 THE PROCESS OF BUSINESS MODEL INNOVATION

As stated in the introduction of this thesis (ch. 1), the BMI process is viewed to entail the proceedings from initiating BMI and configuring the components into a business model design, to the full implementation of the chosen model. Employing an activity-based perspective, the findings from the literature review are decomposed into BMI activities that comprise the BMI process.

Based on a literature review (Andersen & Barkost, 2015), four approaches to BMI were identified and are summarized in table 1. These approaches are leadership, experimentation, building capabilities, and collecting and analyzing intelligence. The table shows which scholars from the literature review emphasize the four prominent approaches, and shows how some scholars highlight more than one approach. It should be noted that the authors deem two of the approaches, experimentation and collecting and analyzing intelligence, as activities that will be part of the process of performing BMI and will be elaborated on in this section. Building capabilities, on the other hand, is a part of creating the context to perform BMI, and will therefore be examined in section 2.1.2 on contextual factors for BMI. Lastly, leadership has been identified as a dimension affecting BMI, and will therefore be examined separately in section 2.2.1. The fact that leadership is one of the most prominent approaches in BMI literature further underlines the authors' decision of examining this dimension more closely.

Table 1: Distribution of identified BMI approaches in literature

Articles regarding approaches to BMI	Leadership	Experimentation	Building capabilities	Collecting and analyzing intelligence
Baden-Fuller & Stopford (1992)		x		
Bhide (2003)	x			
Cavalcante et al. (2011)	x			
Chesbrough (2010)	x	x	x	
de Jong & van Dijk (2015)				x
Demil & Lecocq (2010)	x			
Doz & Kosonen (2010)			x	
Euchner & Ganguly (2014)		x		
Jones & Macpherson (2006)	x			
McGrath (2010)		x	x	
Mitchell & Coles (2003)		x		
Morris et al. (2005)		x		
Palo & Tähtinen (2013)		x		
Sosna et al. (2010)	x	x		
Svejenova et al. (2010)	x			
Teece (2010)		x	x	x
Zott et al. (2011)	x		x	
Number of references	**8**	**9**	**5**	**2**

2.1.1.1 INITIATION OF BUSINESS MODEL INNOVATION

This section elaborates on triggers for initiating BMI and provides an understanding of how the literature recommends this process as one that can be initiated. Initiation of BMI can be considered as the first step towards an entirely new business model paired with a new product or

service, or as the effort of continuing to innovate an existing business model in response to triggers (Sosna et al., 2010).

The introduction of this thesis (ch. 1) presented technological development as a type of trigger for BMI, in order to create and capture as much as possible of the latent potential business value (e.g. Chesbrough, 2010). Sosna et al. (2010) and Sinfield et al. (2011) state that such triggers may be external or internal to a company. Thus, BMI is initiated through recognizing and acting upon internal or external triggers. Sosna et al. (2010) particularly highlight crises caused by external triggers, such as regulatory changes to a market, as a driver of initiating BMI. Teece (2010) argues that business model inventions may stem from many potential sources. In almost every case a new successful business model is pioneered, it is due to a deep understanding of the fundamental needs of customers, how competitors do not satisfy the latent needs, and the possibilities for improvement that lie in technology and the organization (ibid.). However, Seidenstricker et al. (2014) underline that the existing business models and research work have to show substantial shortcomings for direct application, in order to embark on BMI. Furthermore, the literature highlights the role of leadership in initiating the process of BMI, which will be discussed in section 2.2.1.

2.1.1.2 PHASES AND ACTIVITIES OF BUSINESS MODEL INNOVATION

Table 1 presented the four approaches which the authors found most prominent in the BMI literature. Of the mentioned approaches, more than one appears to be necessary for performing the BMI process. Chesbrough (2010) stresses both leadership and experimentation as necessary approaches to BMI, whereas Teece (2010) underlines experimentation, collection of intelligence, and building capabilities. A majority of the literature identified by the authors discusses one or more of these approaches in a static or abstract manner, which the authors interpret as the literature not connecting the approaches to a specific sequence or event in BMI. However, there are a few scholars that have identified specific phases and activities in BMI that will be presented in this section. The presented phases and activities in this section will be combined into a table summarizing the BMI process in section 2.1.1.4.

Morris et al. (2005) envision the life cycle of the business model to involve phases of specification, refinement, adaptation, revision and reformulation. The initial period will have a fairly informal or implicit model, which will be followed by a process of trial-and-error, and a number of decisions delimiting the directions for evolvement. At some point, a more formal and fairly definite model is in place, however, adjustments and experiments will constantly be conducted (ibid.).

In a similar vein, the practitioners Euchner and Ganguly (2014) have proposed six activities of business model innovation: (1) demonstrate value creation, (2) generate business model options, (3) identify the risks for each option generated, (4) prioritize the risks, (5) reduce risk through

business experiments, (6) organize for incubation. Euchner & Ganguly (2014, p. 34) suggest that "uncovering customer needs and developing concepts for new value propositions" should be the first activity, which means having a clear understanding of the value before embarking on the BMI process. Next activity in the process is to generate several business options with the aim of capturing the most value from the identified value creation in activity 1. Identifying and prioritizing the risks associated with the generated options is the ensuing activities, which is followed by experimentation. According to Euchner & Ganguly (2014), experimentation is the heart of BMI, which allows firms to create insights that enables one to validate or invalidate crucial assumptions about the business model options. Finally, a suitable business model is identified, which must then be deployed through small-scale incubation in the company. During the incubation phase, a firm needs to consider whether the new business should be organized within an existing business unit or as an independent entity. The goals of the phase is to "demonstrate profitability and scalability in the market, and to identify a business-building strategy" (ibid., p. 38).

Although Morris et al.'s (2005) process has less distinct phases, both processes include experimentation, decisions, and institutionalization. They also differ with regards to the detail and sequence. Euchner & Ganguly (2014) describe a more extensive process for selecting a business model to experiment, whereas Morris et al. (2005) highlight experimentation in the beginning as a means to limit the pool of decisions. Furthermore, Euchner and Ganguly (2014) emphasize identifying and prioritizing risk and they do not include revision as a last activity in their process, which differs from most other BMI literature identified by the authors.

In their longitudinal study, Sosna et al. (2010) observed a pattern for successful business model change, which they have divided into two main phases - exploration and exploitation. First, a company recognizes the need for BMI as a reaction to externalities, where leadership plays a central role in creating urgency and initiating change. The change process starts through small-scale experimentation of business model designs affecting the ongoing business as little as possible. The initial business model designs are based on prior knowledge and assumptions about future market conditions made by leadership. The trial-and-error learning from experimentation yields new insights for choosing an appropriate model. When a successful model is identified, the BMI process enters the exploitation phase. The identified business model is gradually implemented throughout the company and enters a phase of sustained growth through organizational learning which requires constant adaptation. The implementation process consists of transferring and integrating the learnings from the business model experimentation into "the organizational routines, processes, systems, decision making as well as its culture" (ibid., p.390), which means that the business model is institutionalized in the company. During the sustained growth phase, business models are established in the organization, but new triggers may appear that "challenge its status quo". Hence, the company needs to ensure continuous knowledge acquisition and create processes for organization-wide learning that integrates and utilizes new

knowledge (ibid.). Demil & Lecocq (2010) underline the importance of maintaining a dynamic perspective on the business model by referring to the notion of 'permanent evolution' stemming from Casadesus-Masanell & Ricart (2010). They recommend that strategic management should aim to develop a business model with feedback loops between variables and their consequences (ibid.). The process of Sosna et al. (2010) resembles the ones of Morris et al. (2005) and Euchner & Ganguly (2014), especially the latter, but Sosna et al. (2010) emphasize the importance of experimentation with attention to existing business.

Palo and Tähtinen (2013) have identified three distinct phases in context of developing a networked business model for emerging technology-based services, which is based on the work of Teece (2010). They view the process of BMI on a network level, but the authors deem this as applicable for BMI on a business level as well since the business models on a business level shape the network level business model (ibid.). The first phase is the service development phase, in which the technologies for the service is chosen, and identification of the possible business models begin as the roles of the actors in the network establishes. The pilot phase follows, where end users test the service and the business opportunities with potential are identified (through experimentation). Here, Palo and Tähtinen (2013) highlight the need for an entrepreneurial actor to guide the development of the service in a network context. Finally, there is the market phase where the service is used commercially. In this phase, the actors and roles in production and delivery of the service have been established, and there exists a collective understanding of the business opportunity. The scholars further emphasize that the business model will always have to be adapted and revised (ibid.). Although established for a networked business model, Palo and Tähtinen's (2013) process model coincides with the suggestions of other scholars, especially with regards to identifying possibilities for business models, experimentation, institutionalization and revision. However, as this model looks at business models from a network perspective, the commercialization phase is more complex as each actor must find its place with regards to the other actors while simultaneously implementing the business model within their own organization.

Based on these findings, the authors have identified some suggested phases and activities to perform in the process of BMI, which will be summarized in table 2. However, the findings of the literature review show that there exists limited literature describing these phases or activities in the process of BMI and there is little consensus amongst scholars on how the process should be conducted in terms of approaches and sequence of activities. Although, the BMI literature does elaborates more thoroughly on three identified activities that can be a part of the phases in the BMI process, which will be elaborated on in the next section.

2.1.1.3 BUSINESS MODEL INNOVATION ACTIVITIES

The following section will take a closer look at three specific activities in the BMI process. Two of these were identified in table 1, which were experimenting and collecting and analyzing

intelligence. The first one, however, is configuring the components of the business model. As mentioned in the introduction (ch. 1), the authors view the actual configuration of business model components as a subordinate element of the entire BMI process, in line with Sosna et al. (2010), and therefore how to perform this activity will be described in this section.

Configuring the Components of the Business Model
Several scholars discuss how to configure components (Osterwalder & Pigneur, 2010), functions (Chesbrough, 2010), elements (Teece, 2010) or activities (Amit & Zott, 2010) of a business model. In this section, findings on this activity, i.e. the suggested approaches as to how companies can configure the business model components, will be presented.

In terms of configuring components of the business model, one of the most recognized methods is the Business Model Canvas by Osterwalder and Pigneur (2010). A tool like this is suggested to be used during BMI by Chesbrough (2010) as a mapping approach for designing one's business model following a specific set of sequences. Sinfield et al. (2011), on the other hand, propose that the firm should create the business model template (canvas) with the relevant components themselves as a first step in BMI. By identifying elements in the business model and then look at different combinations, one can rapidly explore BMI. Furthermore, to prioritize, a firm can "lock down" one or more components and design around that, or set up a list of priorities to be met (ibid.). Amit & Zott (2010) agree that the individual company should create tailored business model templates for this configuration activity. However, they add that choosing relevant components (or activities as they call it) for one's business model is challenging due to the many options and ways of defining components (ibid.). Thus, there is a disagreement in literature regarding whether or not a firm should use an existing business model template for the BMI process, or if the firm should develop its own template.

Teece (2010) propose an approach by which management systematically deconstructs existing business models to evaluate each individual element towards refinement or replacement. The business model elements must be designed with reference to each other and the to the external developments in the business environment, i.e. customers and technological developments in the industry (ibid.). On the same note, Sinfield et al. (2011) state that changing one variable of the template has consequences for some or all of the other variables. E.g. a manufacturing firm deciding upon offering after sale services has implications for both cost structure and revenue mechanisms (Teece, 2010). In designing a business model, Teece (2010) specifically recommends that in addition to specifying a realistic revenue architecture, deciding on a set of lateral and vertical activities that needs to be performed, i.e. evaluate if and how they can be performed sufficiently cost-efficient to create profit, and who is to perform them. Moreover, Seidenstricker et al. (2014) highlight the importance of creating prototypes, or visual representations for the option of business models to aid communication within the firm and with external contacts.

Collecting and analyzing intelligence

An approach mentioned in the literature on BMI is collecting, analyzing and evaluating intelligence (Teece, 2010; de Jong & van Dijk, 2015). Developing a new business model "requires insight, and a good deal of customer, competitor and supplier information and intelligence" (Teece, 2010, p. 187). De Jong and van Dijk (2015) and Teece (2010) recommend analyzing the current state of the industry, the current business models and their components, and then evaluating this against the direction the industry is headed. If a company has a clear and in-depth grasp of the user needs, examines several alternatives, analyzes the value chain carefully in order to create an understanding of how to create what the customer needs in a cost-effective and timely manner, the chances of a good business model design is greater (Teece, 2010). However, not all information and foresight can be extracted through market analysis, hence other approaches are necessary in order to develop and to confirm or disconfirm a business model (ibid.).

Experimentation

Experimentation is frequently mentioned in the BMI literature, and several authors state that experimentation is a key activity in developing new business models (e.g. McGrath, 2010; Chesbrough, 2010; Morris et al., 2005). Teece (2010) argues that there might be a significant tacit component to the process of business model innovation, and therefore experimentation is needed to elicit this knowledge. Further, due to insufficient availability of information to analyze one's way towards a business model (Chesbrough, 2010) and due to an uncertainty regarding the viability of new business models in dynamic markets (Sosna et al., 2010), experiential trial-and-error learning is important to articulate the business model fully and for implementation purposes (Teece, 2010; Chesbrough, 2010; Sosna et al., 2010). Experimentation may challenge established core business assumptions, and help defining them (Doz & Kosonen, 2010). Furthermore, Sosna et al. (2010) argue that most of the organizational learning that takes place in an entrepreneurial context is experiential in nature, hence experiments are necessary to generate this learning.

Mitchell & Coles (2003) and Baden-Fuller & Stopford (1992) recommend inexpensive experimentation and constant adaptation. This is supported by Sosna et al. (2010) who emphasize that small-scale experimentation should be conducted that affects the ongoing business of the firm as little as possible. Also, they underline that when the "final" business model is implemented, it needs to constantly be revised and adapted (ibid.). Similarly, Mitchell & Coles (2003) highlight the benefits of having business processes designed to identify and foster experiments that may lead to new business models.

A process of trial-and-error experimentation usually follows after an initial period during which the business model is informal and implicit. This experimentation helps core decisions about delimiting the directions for the firm (Morris et al., 2005). Sosna et al. (2010) further underlines

the importance of having a nuanced reaction to failure as an individual and organizational capability, meaning the ability to extract learning from failed experiments, and retain the experimentation efforts. Consequently, experimentation capabilities may become a source of competitive differentiation resulting in continuously building better models, that are more quickly implemented (McGrath, 2010).

2.1.1.4 SUMMARY: THE PROCESS OF BUSINESS MODEL INNOVATION

The previous sections presented what triggers the process of BMI and how it is conducted. Further, the section examined scholars' suggested phases and activities to perform in BMI, before elaborating on three activities that were particularly prominent in literature, configuring of the business model components, collecting and analyzing intelligence and experimentation. Table 2 below integrates the suggested activities of BMI into four phases based on the presented findings from literature. The table shows which authors underline which activities in each phase. From hereon, all identified BMI activities in the table below will be highlighted in cursive throughout the thesis.

Additionally, it should be noted that since this thesis employs a dynamic perspective on the BMI process, continuous revisions of the business model is emphasized (e.g. Sosna et al., 2010; Teece, 2010). According to Teece (2010), selecting, adjusting, or improving a business model is complex, and the design process has an iterative nature. Therefore, an activity in the initiation phase is *recognize and act upon external or internal trigger*, and in the final phase of revise and adapt, there is the activity of *recognizing and acting upon a new trigger*. The authors have chosen to separate these two activities in order to identify events that mark the initiation of the BMI process, and potentially events that signify starting the process over due to a new trigger impacting an existing business model

Table 2: Phases of Business Model Innovation with Associated Activities

Phase	Activity
Initiate BMI	Collect and analyze intelligence (Teece, 2010; de Jong & van Dijk, 2015) Recognize and act upon external or internal trigger (Sosna et al., 2010; Sinfield et al., 2011) Demonstrate value creation (Euchner & Ganguly, 2014)
Generate Business Model Options	Configuration of business model components (Sinfield et al., 2011; Teece, 2010) Identify and prioritize risks (Euchner & Ganguly, 2014) Collect and analyze intelligence (Teece, 2010; de Jong & van Dijk, 2015) Experimentation (e.g. Morris et al., 2005; Sosna et al., 2010; Chesbrough, 2010; Teece, 2010) Choice of technology (Teece, 2010; Palo & Tähtinen, 2013)
Implement and Scale	Knowledge transfer (Sosna et al., 2010; Euchner & Ganguly, 2014) Institutionalize or incubation within company (Sosna et al., 2010; Euchner & Ganguly, 2014; Morris et al., 2005)

	Sustained growth and organizational learning (Sosna et al., 2010)
Revise and Adapt	Ensure continuous knowledge acquisition (Sosna et al., 2010; Demil & Lecocq, 2010; Casadesus-Masanell & Ricart, 2010) Organizational learning (Sosna et al., 2010) Recognize and act upon new triggers (Sosna et al., 2010; Demil & Lecocq, 2010; Casadesus-Masanell & Ricart, 2010; Palo & Tähtinen, 2013)

2.1.2 CONTEXTUAL FACTORS FOR BUSINESS MODEL INNOVATION IN THE ORGANIZATION

In the prior section, phases and activities encompassing the BMI process were elaborated. These activities do not happen in isolation, but in the context of a firm. The context of a large, established firm will be emphasized in this thesis. Thus, there are capabilities a firm can enhance and develop to better promote BMI activities (Doz & Kosonen, 2010). On the other hand, there are barriers inherent to the firm that may prevent BMI (Chesbrough, 2010). This section will describe capabilities and barriers that may come into play and how this occurs.

2.1.2.1 CAPABILITIES FOR BUSINESS MODEL INNOVATION

Several scholars have recommended that companies should build capabilities necessary for performing BMI (e.g. Zott et al., 2011; Doz & Kosonen, 2010; Teece, 2010). Zott et al. (2011) and Doz & Kosonen (2010) further highlight three meta-capabilities - strategic sensitivity, leadership unity and resource flexibility - which make companies better disposed for strategic agility, and thus successful BMI. Strategic sensitivity refers to "the sharpness of perception of, and the intensity of awareness and attention to, strategic developments" (ibid., p. 371) and enables the firm to identify opportunities for new business models and the need for renewal of existing business models. McGrath (2010) underline this by stating that companies must create business models that take into account irresistible forces in a flexible manner. Second, leadership unity is "the ability of the top team to make bold, fast decisions, without being bogged down in top level 'win-lose' politics", and are thus essential to allow for shifts in business models (Doz & Kosonen, 2010, p. 371). Finally, resource flexibility refers to "the internal capability to reconfigure capabilities and redeploy resources rapidly" and are critical to allow for reallocation of resources, for instance people, to new opportunities (ibid., p. 371). In similarity, Bock et al. (2012) highlight strategic flexibility, or "the ability to identify innovation opportunities, commit resources to new courses of actions, or reverse unproductive resource deployment" (ibid., p.279), as important for BMI (Sanchez, 1995; Shimizu and Hitt, 2004; Uhlenbruck, 2003; Worren et al., 2002). The three meta-capabilities within strategic agility, seems to overlap with strategic flexibility on two accounts; first on identifying opportunities, and secondly the flexibility of resources coincide. Furthermore, Bock et al. (2012) highlight the role of agile leaders and effective knowledge management as prerequisites of strategic flexibility (Lakshman, 2007; Uhlenbruck, 2003).

On the other hand, Teece (2010) explains that the design and selection of the business model constitutes the microfoundation of dynamic capabilities - "the sensing, seizing, and reconfiguring skills that the business enterprise needs if it is to stay in sync with changing markets, and which enable it not just to stay alive, but to adapt to and itself shape the (changing) business environment". Hence, there is a mutually affecting relationship between a company's capabilities and the business model. However, the aspect of the business model influencing the capabilities in return will not be further discussed in this thesis, as it is beyond the scope of this thesis to investigate this mutually affecting relationship. Finally, Teece (2010) also adds creativity as a necessary capability for business model innovation. Culture influences innovativeness and is an informal part of the firm's structure. This is especially important as BMI may realign activities, leading to resource configuration and structural change, that is increasingly embraced by cultures encouraging creativity (Bock et al., 2011). This means that an innovative culture may dampen employee resistance to changes in the organization's identity that may occur during an transformation (Dutton et al., 1994).

2.1.2.2 BARRIERS TO BUSINESS MODEL INNOVATION

The literature presents several barriers to the innovation of new or existing business models, especially in the context of a large, established firm. The business model must accommodate several contexts; first, it should be adopted fast and by as many customers as possible. Second, it should create a sustainable advantageous position towards competition, and thirdly, it must be considered with regards to compatibility with the existing business model(s) of the firm with potential synergy effects (Seidenstricker et al., 2014*)*.

A business faces challenges in managing strategic paradoxes simultaneously, meaning following multiple strategies that may be contradictory in order to achieve long-term organizational success (Smith et al., 2010). In the context of BMI, the paradox of *exploring* and *exploiting* prevails, as successful exploration may directly threaten established business, i.e. exploitation, and the business areas must constantly compete for scarce organizational resources and market shares (ibid.). An exploratory strategy seeks to define new marketplaces through introduction of new products or services, whereas the exploitative strategy aims to refine and improve products or services in the existing marketplace (ibid.). Research finds that both exploitation and exploration must be performed simultaneously, which may be a barrier to BMI if not managed efficiently (ibid.).

Chesbrough (2010) identified that conflicts with the prevailing business model or its underlying configuration of assets and processes, hinders BMI. Such organizational change is complicated by the inertia of existing structures, processes and beliefs in the organization and the consequent evolving complexity and rigidity of the business model (Doz & Kosonen, 2010; Chesbrough, 2010; Mitchell & Coles, 2003). Raynor & Christensen (2003) and Amit et al. (2001) state that

managers may readily recognize the correct business model, but there are conflicts in developing it. Whereas Chesbrough & Rosenbloom (2002) claim there is a cognitive barrier which makes the identification of a new business model difficult. This is due to the prevailing business model influencing the information being routed into corporate decision processes (Chesbrough, 2010). This can be related to Sosna et al. (2010) who draw upon the work of Nelson and Winter (1982) regarding barriers to BMI, stating that organizations remember by doing, which causes their established routines and beliefs to support continuity of the same patterns and create inertial pressures. The existing business model represent a *dominant logic* (Bettis & Prahalad, 1995) that works to maintain focus and consistency among the activities of the firm. Hence, this logic implicitly filters out ideas and behaviours that are not aligned. The manager's perception of environmental threats and opportunities will be directed by the organizational beliefs and routines in creating responses and further strategic change will be obstructed (ibid.).

Sosna et al. (2010) calls for more research within the trade-offs between having stable and profitable business models to creating new business models, and the impediments an existing business model establishing a status quo exert on the development of new business models. To investigate the effects a current business have on potential new business, Chesbrough & Rosenbloom (2002) looked at several spin-offs from Xerox. They found that for the successful spin-offs, which had an implicit business model affected by the existing business from the advent, the models were changed one or more times after they had demonstrated their viability and was separated from the core business. This meant that the filtering process within the incumbent firm precluded some models, indicating the inhibiting effect of the current business model. The initial business models of the unsuccessful cases, were little adapted or modified later on (ibid.). This shows the importance of the revision and adaptation phase.

Both Sosna et al. (2010) and Cavalcante et al. (2011) highlight the aspect of power structures in a company and the resistance of managers who want to protect their own business area within the firm if they feel threatened by new business, which is therefore a potential barrier. Santos et al. (2009) builds upon this stating that the dependencies amongst business units (BUs) in a company renders BMI difficult to perform. The relationships of a BU with the corporate center and other BUs, constrain its autonomy to innovate business models (ibid.). However, Santos et al. (2009) also highlight that a BU's membership in a corporation may also create better opportunity for BMI. Insightful market knowledge and a greater understanding of BMI can be shared across BUs (ibid.). Furthermore, "the internal network" is larger, which may provide opportunities for more exploration of BMI, such as the knowledge of one BU may yield insights into new activity configurations for another, unrelated BU (ibid.).

To overcome the barriers, Chesbrough (2010) states that a promising approach is to construct maps of the business models, in order to understand underlying processes. However, mapping is not enough, organizational processes must change (ibid.). Therefore, scholars (Zott et al., 2011;

Chesbrough, 2010) recommend a commitment to *experimentation* to overcome barriers, which was highlighted as an important activity in BMI in the previous section. Elaborating on this, Chesbrough (2010) recommends an effectual (Sarasvathy, 2008) attitude towards *experimentation* with BMI, employing internal leaders to guide the change process. Again, leadership plays an important role in overcoming barriers for BMI (Chesbrough, 2010), which motivates the next subchapter of the theoretical background regarding leadership's effect on BMI.

2.1.2.3 SUMMARY: CONTEXTUAL FACTORS FOR BUSINESS MODEL INNOVATION

This section presented the the contextual capabilities and barriers that may promote or impede BMI. The capabilities may enable a firm to recognize opportunities, the abilities to perform BMI, and it may enhance leadership and resource allocation to facilitate the process. These capabilities are identified to be strategic agility (Doz and Kosonen, 2010) and strategic flexibility (Bock et al., 2011). Teece (2010) further highlights the mutual influence between the the design of the business model and the dynamic capabilities needed for BMI. Finally, Teece (2010) adds creativity as a necessary capability for BMI. Next, barriers were discussed, emphasizing the balance between exploring and exploiting existing and new business, the role and impact of the current business model as a cognitive barrier and structural challenge, and finally the power structures in the firm. To overcome these barriers, scholars recommend mapping of the current business models and commitment to *experimentation*. Moreover, leadership is highlighted as essential to overcome barriers.

Table 3: Capabilities and barriers that comprise the organizational context for BMI

Context	
Capabilities	Strategic agility (Doz & Kosonen, 2010) - Strategic sensitivity - Resource flexibility - Leadership unity Strategic flexibility (Bock et al., 2012) Creativity (Teece, 2010)
Barriers	Managing strategic paradoxes (exploration and exploitation) (Smith et al., 2010; Mitchell & Coles, 2003) Prevailing business model and underlying configuration of assets (Chesbrough, 2010; Raynor & Christensen, 2003; Doz & Kosonen, 2010; Mitchell & Coles, 2003) Cognitive barrier and dominant logic (Chesbrough & Rosenbloom, 2002; Chesbrough, 2010; Sosna et al., 2010; Bettis & Prahalad, 1995 Power structures within company and dependencies amongst BUs (Sosna et al., 2010; Cavalcante et al., 2011, Chesbrough, 2010)

2.2 DIMENSIONS

In relation to RQ1, the previous section presented findings from the BMI literature on the process of BMI in terms of phases, activities, capabilities and barriers. This section will investigate theoretical findings on how leadership, network relations and customer involvement may influence the BMI process, in relation to RQ2 presented in ch. 1.

2.2.1 LEADERSHIP AND BUSINESS MODEL INNOVATION

The BMI literature emphasizes the role of leadership throughout the process, and leadership is highlighted as a critical factor for successful BMI (e.g. Morris et al., 2005; Sosna et al., 2010). According to Teece (2010), a business model reflects the management's hypothesis for value creation and capture, which is a statement that underlines leadership's role in BMI. Thus, this section explains how leadership influence BMI through leadership actions and skills, to understand how it impacts the business model outcome. It should be noted that within the identified leadership literature, scholars focus on various levels of leaders, such as CEOs, management and project managers. However, the authors deem the literature applicable to interpret the findings, although interpreting different hierarchical levels.

2.2.1.1 LEADERSHIP ACTIONS

This section highlights proposed actions and responsibilities that should be performed by managers and leaders to enforce BMI. The scholars vary in their emphasis; McGrath (2010) highlights the role of leadership in experimenting and initiating BMI, whilst Doz and Kosonen (2010) identify leadership unity as a way for the firm to become strategically agile, which facilitates BMI.

Initiating Business Model Innovation
Leadership has been especially emphasised in initiating the process of BMI (Sosna et al., 2010). Sosna et al. (2010) state that change processes of business models have been the result of managers' responses to critical incidents or crises threatening the company's long term survival. The innovation process can also be initiated by leadership recognizing a valuable opportunity (Bhide, 2003, Sosna et al., 2010, Jones and Macpherson, 2006). The leaders play a vital role in creating a sense of urgency that is crucial to initiate the change process (Bhide, 2003; Jones & Macpherson, 2006; Sosna et al., 2010).

Fostering Organizational Commitment to Business Model Innovation
Chesbrough and Rosenbloom (2002) state that the development of business models must become part of the firm's dominant logic for management of technology commercialization. Mitchell & Coles (2003) further state the responsibility of the CEO is to "establish an unchanging core vision for serving customers and other stakeholders that includes an expectation of regular business model changes". Thus, although initiated at the top of the organization, change must become a

collectively shared view that pervade all organizational levels (ibid.). Leadership has a major role in involving the organization in BMI (e.g. Chesbrough & Rosenbloom, 2002; Sosna et al., 2010). Chesbrough and Rosenbloom (2002) state that managers have a responsibility to focus on the architecture of revenue in capturing value from novel technology, and they should be conversant in such issues, which means not relying on other employees in the organization to address these questions on their behalf. McGrath (2010) further underline the increasing importance of leadership's responsibility to engage in conversations with employees that might challenge the viability of a business model, and further encourage questioning it.

Santos et al. (2009) assert that an alteration in the business model of an incumbent firm requires transformational behavioral change. They highlight two important behavioural aspects that leadership must foster as prerequisites for BMI; *mutual engagement* and *organizational justice*. Mutual engagement between corporate executives and business unit managers is important to encourage development, proposing and sharing of inventive business models. Mutual engagement can be achieved through five components; an open and engaged dialogue among relevant stakeholders, and exploration of available options with their associated implications. Further, clear decisions from those with responsibilities where the execution of them is performed transparently. Finally, an extensive evaluation of results and of the execution culminating in validated lessons is recommended. Organizational justice refers to the perception that decisions are fair amongst the organizational members. In a large firm, status, power differences and a context where limited resources across business units is a reality, organizational justice is required to maintain openness, trust, sharing and a context for BMI (ibid.).

Santos et al. (2009) elaborate on the responsibilities of the corporate and business unit managers. They state that corporate executives aiming for BMI, must make an effort to develop creative space among the associated business units and their managers. However, creativity is not the most important element to foster BMI, rather managers at both the corporate level and business unit level must jointly create a context where BMI is promoted. This organizational context must allow for and reward risk-taking behaviours as that is required by the initiator to commence innovation (Byrd & Brown, 2002). The managers must experience a safe environment, where they do not have to fear rejection or punishment. This is critical as it is mainly the business unit managers who are at the source of ideas for BMI. Hence, corporate management must convince business unit managers of their engagement and openness with regards to BMI. On the other hand, the business unit managers, with the ideas for BMI, must promote their innovative ideas while simultaneously considering the potential impact on the firm and its associated business units. Managers should also focus on the relational dynamics at the informal level in the organization (Santos et al., 2009).

On a similar note, Foss et al. (2011) and Sosna et al. (2010) suggest the vital role of delegation by leadership in relation to BMI. Decentralized decision making can be linked to strategic flexibility,

which is also a suggested capability for BMI (Bock et al., 2012). Foss et al. (2011) emphasize the mental limitation of managers (Galbraith 1974), and the costly and slow progress of communicating the knowledge about the decision to be made to hierarchical superiors. Thus, delegation has a benefit as it may co-locate decision making rights with those who possess the appropriate knowledge to make an optimal decision (Jensen and Meckling, 1992). Especially, in dynamic and fast moving external environments that requires fast decision making, extensive delegation becomes increasingly important (Foss et al., 2011). Sosna et al. (2010) emphasize the influence the leader has on the "sense making" of the business, and thus, its ability to learn. Hence, by delegating and distributing authority to make decisions, Sosna et al. (2010) assert that organizational learning can be secured, which is vital step for strategic organizational renewal.

Leading Experimentation
Leadership's role in *experimentation* is highlighted within BMI theory (Baden-Fuller & Stopford, 1992; Chesbrough & Rosenbloom, 2002; Sosna et al., 2010). Chesbrough & Rosenbloom (2002) state that leaders must foster experiments that include *experimentation* with alternative business models. Baden-Fuller & Stopford (1992) assert that successful BMI requires leaders to engage in *experimentation* to extract, then communicate and institutionalize lessons and learning mechanisms into processes across all firm levels. Sosna et al. (2010) underline that a team's experience may come from failures, not only success. Chesbrough (2010) further assert that leading change in the business model of the organization requires interactions between various functions such as operations, engineering, marketing, sales and finance. A possible consequence of such testing and experimentation is conflicts between some or all of the functions (ibid.). Then, the organizational commitment to change and the BMI context may be utilized to dampen such conflict (Mitchell & Coles, 2003).

Enabling Organizational Capabilities for BMI
Managers and leaders must cope with the strategic paradox of exploration and exploitation, as explained in section 2.1.2.2 (Smith et al., 2010). Benson Rea et al. (2013) name two critical factors for managing co-existing business models, namely similarity or conflict between them, and if the firm should integrate or separate the business models (Casadesus-Masanell & Tarzijan, 2012). By investigating how different leader teams handled this paradox, Smith et al. (2010) identified several efficient functions, which were dynamic decision making focusing on two businesses simultaneously, building commitment to an overarching vision with agenda specific goals, and actively learning about each agenda and the relationship between them at multiple levels. The most successful leadership groups showed a "dynamic decision making pattern", that resulted in subsequent trade-offs between the specific agendas (ibid.).

Sosna et al. (2010) state that new business models seldomly work at the first try, as decision makers may face struggles at both exploratory and implementation stages. At the stage of exploration, i.e conceptualizing a business model, managers must cope with the uncertainty and

unpredictability of dynamic markets, and must struggle to overcome their perceptions routed by the organization's past experiences, as explained in the section on barriers to BMI (section 2.1.2.2). At the stage of implementation, the challenges the leader faces are organizational alignment of new business, mobilization of scarce resources, developing unique competencies and alteration of organizational structures. Sosna et al. (2010) also emphasise the responsibilities of the CEO and managers to maintain a dynamic perspective on business models, with attention to continued revision and adaptation.

Doz & Kosonen (2010) highlight concrete priorities and actions for leaders to enable the meta-capabilities: strategic sensitivity, leadership unity and resource fluidity. These are necessary to accelerate successful renewal and transformation of business models through strategic agility, as previously explained in section 2.1.2.1. To increase strategic sensitivity the manager may engage in anticipating, experimentation, distancing, abstracting and reframing, also making the manager more alert towards externalities. Second, leadership unity can be enhanced through dialoguing, revealing motives, integrating roles, aligning aspirations and interests, and caring. These activities may also foster the engagement needed to include the organizational levels. Lastly, in order to obtain resource flexibility, Doz & Kosonen (2010) suggest decoupling activities, modularising business processes, dissociating resources as well as switching between parallel modes and affixing capabilities.

2.2.1.2 LEADERSHIP SKILLS

Morris et al. (2005) assert that a "well conceptualized business model affects and is affected by such organizational variables as culture and leadership quality". The literature review has revealed a number of leadership actions, however, this section places a focus on the skills and abilities the leader should exhibit or acquire to enhance such efforts.

In Sosna et al.'s (2010) case study of Naturhouse, they found that the "who" was as important as the "how", as resilience and commitment to change of the CEO and top management team were vital to the success of the business model experiments. Smith et al. (2010) found that successful leaders in the context of BMI demonstrated both cognitive complexity - the ability to manage and integrate opposing tensions, and behavioural complexity - the ability to execute manifold seemingly contradictory leadership behaviours. Benson-Rea et al. (2013) further argue that the tensions and contradictions demand substantial managerial capabilities. They state that in an embedded industry context, it is crucial that the manager is able to manage complex network contexts, independently of firm size (ibid.). This requires managerial attention; a responsiveness to the industry, market forces, resource and relationship flexibility, similarly to Doz and Kosonen's (2010) concept of strategic agility.

Guo et al. (2013) found several linkages between different skills of managers and BMI promotion based on their studies of 146 Chinese firms. They concluded that the interaction between

entrepreneurial skills, capabilities for sensing and recognizing opportunities, and managerial ties, the ability to establish and maintain social connection, facilitated BMI. Whereas the interaction of managerial skills, the ability to effectively organize, allocate and configure resources, and managerial ties, obstruct BMI. This is in line with Chesbrough & Rosenbloom (2002) who state that "identifying and executing a new or different business model is an entrepreneurial act". The combination of entrepreneurial skills and managerial ties affects BMI positively as strong entrepreneurial skills can guide managers in establishing managerial ties with focus on experimentation and learning, to realize entrepreneurial opportunities via BMI (Guo et al., 2013). On the other hand, the combination of strong managerial skills and ties may inhibit BMI, due to strong managerial skills impacting the configuration of managerial ties resulting in making the firm over-embedded in cohesive networks (ibid.). Further, this combination is likely to foster exploitative learning, i.e. capitalizing and improving on existing opportunities, rather than exploration of new businesses (ibid.). Thus, to promote BMI, entrepreneurial skills and managerial ties should be emphasized for leaders.

2.2.1.3 ORGANIZING LEADERSHIP FOR BUSINESS MODEL INNOVATION

Leading change through interactions and *experimentation* is essential, but which leader is most suitable to lead such change? Chesbrough (2010) proposes that in smaller firms, the CEO may be ideally suited for leading change. However, he warns that the CEO rose to his position via the current business model, which means that he/she is familiar and comfortable with the current model. This might impair the *experimentation* process as the CEO may find alternative business models as unfamiliar or threatening. On the other hand, managers of specific businesses in larger firms may be more suited to lead change, however, they are frequently re-located from one position to another. Two to three years is too little time to perform a comprehensive *experimentation* process (ibid.). Furthermore, Sosna et al. (2010) assert that power structures in a company may impact BMI success. If the decision power is centralized, its commitment to *experimentation* is decisive for the BMI process' outcome. It the decision power is distributed within the firm, new initiatives can be impeded by other power centers (ibid.).

2.2.1.4 SUMMARY: LEADERSHIP AND BUSINESS MODEL INNOVATION

This subchapter has presented literature on leadership in the context of BMI by investigating leadership actions, skills, abilities and how leadership may be organized for BMI. Highlighted leadership actions are initiating the BMI process, fostering organizational commitment to BMI, leading *experimentation* and enabling organizational capabilities for BMI. In terms of leadership skills, theoretical findings underlined mastering the cognitive complexity of managing strategic paradoxes, entrepreneurial skills, especially in combination with managerial ties, and that an overemphasis on managerial skills may be obstructive to BMI. Lastly, there was a reflection regarding who should lead change processes such as BMI, and how centralized or decentralized decision power may affect this.

The influence of leadership can therefore be summarized to influence the BMI process directly, for instance through initiation or *experimentation* (e.g. Chesbrough, 2010; Sosna et al., 2010), or indirectly by influencing BMI activities through for example fostering organizational commitment (Mitchell & Coles, 2003; Santos et al., 2009) or through enabling organizational commitment (Doz & Kosonen, 2010; Sosna et al., 2010; Smith et al. 2010). The relationships between leadership, the organizational context and the BMI process, as noted by the authors based on the theoretical findings, will be summarized with the other two dimensions' relationships in figure 1 at the end of this chapter. It should be noted, however, that Teece (2010) underlines that the business model may in turn also impact the organizational context, and leadership may also be impacted by the organizational context. These relationships are not included in the figure, or the subsequent ones for network relations and customer involvement, since the authors have not been able to investigate these relations in their research.

2.2.2 NETWORK RELATIONS AND BUSINESS MODEL INNOVATION

"One important mechanism for innovating one's business model is through establishing co-development partnerships" (Chesbrough & Schwartz, 2007). Exploiting one's value network and pursuing partnerships has been identified as an important factor affecting business model innovation, especially in the case of business model innovation for technology-based services (Chesbrough & Schwartz, 2007; Wang et al., 2015; Palo & Tähtinen, 2013; Maglio & Spohrer, 2013). Thus, this section will elaborate on the relations between networks relations and BMI as identified through the literature review. First, the authors will clarify what is meant by networks and partnerships, before discussing the value of networks for BMI and how to create the potential value through BMI with partnerships and networks.

2.2.2.1 DEFINING NETWORKS AND PARTNERSHIPS

All firms are embedded in a network of relationships, which include everything from its customers to its distribution system and supply chain (Chesbrough & Schwartz, 2007). According to Chesbrough & Rosenbloom (2002), "a value network created around a given business shapes the role that suppliers, customers and third parties play on influencing the value captured from commercialization of an innovation" (p. 8). Networks are also identified as key elements of business models (Palo & Tähtinen, 2013; Shafer, Smith & Linder, 2005), where literature emphasize the actors and their roles. Chesbrough & Schwartz (2007) define co-development partnerships as embodying mutually working relationships between two or more actors who aim to create and deliver a new product, technology or service.

2.2.2.2 THE VALUE OF NETWORKS IN BUSINESS MODEL INNOVATION

As described above, Chesbrough & Schwartz (2007) argue that partnerships is an effective means of innovating one's business model. This is supported by several other researchers.
One of the key findings from the research of Wang et al. (2015) on service innovation was that all business model innovation involved external collaboration. Further, they identify modern

information and communication technologies as a trigger of service innovation, and state that this often requires the cooperation of several organizations (ibid.). Gummesson (2010) and Maglio & Spohrer (2013) argue that value emerges when organizations co-operate for mutual benefit, where effective value co-creation is key. Moreover, Kijl et al. (2005) and Palo & Tähtinen (2013) emphasize the necessity of networks in terms of business model development for technology-based services. Here they highlight infrastructure, content and access rights as important issues, which are rarely all dealt with by a single actor (ibid.). Hence, there appears to be a converging consensus in BMI literature that networks and partnerships are potential means of innovating one's business model.

Despite this tendency in literature on agreeing that utilizing networks and partnerships is a potent means of BMI, Bock et al. (2012) warns that partner reliance may reduce strategic flexibility for innovating business models. As previously mentioned, strategic agility is identified as an important capability for performing BMI (Teece, 2010; Doz & Kosonen, 2010), which is closely related to strategic flexibility. Structural mechanisms such as alliances offer information and resource access, but may affect strategic flexibility (Bock et al., 2012). Furthermore, Bock et al. (2012) acknowledge that partnerships and external collaboration tends to increase when firms are faced with exogenous uncertainty, and that "network and collaboration effects generally improve innovation and performance" (Gulati & Sytch, 2007; Bock et al., 2012, p. 283). They argue that partnerships may lead to reduced flexibility since they may increase coordination costs and decision-making across firm boundaries (Bock et al., 2012). Furthermore, exploration in turbulent settings and partner dependence exposes a firm to uncertainties and unpredictable costs (ibid.). Thus, there is a nuanced picture within BMI literature on the potential pros and cons of utilizing external collaboration for innovating business models.

Still, most literature on BMI view external collaboration as a potent means of creating new and better business models. This is in line with the literature on open innovation, which was defined by Chesbrough et al. (2006) as "the use of purposive inflows and outflows of knowledge to accelerate internal innovation, and expand the markets for external use of innovation, respectively" (Chesbrough & Schwartz, 2007, p. 55) BMI has been identified as essential to sustaining open innovation, wherein partnerships and networks are vital components (Chesbrough & Schwartz, 2007). In research and development of new products or services, the use of partners, i.e. open innovation, can increase innovation output, reduce R&D expense, and open up previously inaccessible markets (ibid.). On the same note, Lakemond et al. (2015) argue that utilizing open innovation to combine inflows of external knowledge with internally held knowledge is often an attractive alternative to the sole reliance on internal R&D. However, they argue that this literature has primarily focused on how and why open innovation is important for companies' innovation processes, whereas their study presents how external knowledge can be integrated into a firm's internal knowledge (ibid.). Therefore, how firms are advised by literature to utilize networks and partnerships in business model innovation will be examined in the next subsection.

2.2.2.3 CREATING VALUE WITH NETWORKS

It is established in literature that exploiting one's value network, especially through partnerships, is a recommended method for value creation, i.e. a manner of business model innovation. Through the literature review, the authors have also identified how to create this potential value with external collaboration.

Maglio & Spohrer (2013) underline that co-creation of value depends on an orchestration of activities amongst individuals, organizations and companies. These are often intimate relationships that require sharing rewards, resources and risks (ibid.). Thus, a company has to carefully evaluate its assets and consider what to own and share, how to share it, capabilities to build themselves, what capabilities and resources to access through borrowing or buying, and which entities to potentially avoid in external collaborations. Others underscore that their research indicates the need for an "entrepreneurial actor" (Palo & Tähtinen, 2013) or "leading actor" (Kijl et al., 2005) in the network of delivering a service with an innovated business model. Hence, a company engaging in a network of actors in providing a service needs to carefully what to share with that network, and there has to be an "entrepreneurial actor" guiding the efforts of the network.

When engaging in external collaborations, Palo & Tähtinen (2013) also underline the necessity of aligning the business models of companies co-operating in delivering a service. This is supported by Chesbrough & Schwartz (2007) who states that the business objectives of a partnership needs to be carefully defined and the business models of each firm aligned, in order to sustain co-development collaborations. Further, they elaborate that "aligned business models are complementary; if you execute your model well, your partner will benefit, and vice versa" (ibid.). According to Chesbrough & Schwartz (2007), few companies take the time to fully articulate their own business model, and even fewer have a clear understanding of the business models of their partners, suppliers, customers, etc. Thus, they recommend that in order to create more valuable partnerships, firms need to clearly understand one's own business model, assess potential partners' business models and evaluate the degree of alignment between them (ibid.).

2.2.2.4 SUMMARY: NETWORK RELATIONS AND BUSINESS MODEL INNOVATION

This subchapter has presented literature on networks in the context of BMI. First, a brief clarification on the concepts of networks and partnerships was made. The BMI literature has underlined the value of networks as an effective means of innovating one's business model, especially for data driven services. However, the literature also contrasts this view by stating that partnerships may limit strategic flexibility, which is important for performing BMI. Still, the literature mostly converges towards an agreement on the positive effect of utilizing network relationships for BMI. In order for companies to utilize external collaboration in BMI, they need to evaluate their own business model and the business models of partners. This is in order to assess what to share in the collaborations and how they together can create value that benefits

both parties. In a network setting, there has to be a leading actor guiding the collaborations, and the business models needs to be aligned.

By integrating theory on the BMI process and the contextual factors affecting it, the influence of network relationships on BMI can be summarized in the following manner; a company's capabilities steers the degree to which it is able to recognize the opportunities in its network and engaging in relationships within it. Thus, the context of a firm guides its use of network relations, which again may affect the BMI process. For instance, a firm's strategic sensitivity influence its ability to recognize and obtain value from partnerships, which again can be leveraged during experimentation in the BMI process. However, the context can also be affected by a company's use of network relationships. By engaging in open collaborations in networks, a company may enhance its capability of strategic sensitivity and use partnerships to overcome barriers, which are contextual factors that also may directly influence the BMI process. These relations between the network dimension, the context and the BMI process are outlined in figure 1 with the other dimension at the end of this chapter.

2.2.3 CUSTOMER INVOLVEMENT AND BUSINESS MODEL INNOVATION

In terms of BMI, and especially in the context of service offerings, the role of the customer has been emphasized in literature (e.g. Kindström, 2010; Maglio & Spohrer, 2013; Palo & Tähtinen, 2013). Building upon the previous section on networks and BMI, this section will elaborate on the relationship between customer involvement and BMI, as denoted by the authors based on a literature review. It should be noted that by customer involvement, the authors refer to both customer and user involvement. This is because the literature refer to these roles interchangeably even though the user is not always the same individual as the customer. First, the role of the customer will be investigated, before discussing which customers to involve in the innovation process and how to leverage that information in the organization.

2.2.3.1 THE ROLE OF THE CUSTOMER

Based on their study of BMI at Xerox, Chesbrough & Rosenbloom (2002) noted that a market focus is essential to begin the process of BMI. This is to learn how the offering should be defined and configured, what technological attributes to pursue and how to resolve potential tradeoffs that one might encounter during development, meaning that interaction with the market should be conducted at the beginning of BMI. This is supported by Kindström (2010), who conducted seven case studies on the transition to service-based business models, where it was identified that it required more integration and coordination with customers. He further builds upon this saying that the aspect of customer maturity must be considered when identifying a target market for a service offering (ibid.). Thus, an assessment of the customers' competencies and readiness to adopt new and potentially advanced services should be included in the evaluation of target markets. Service offerings typically have a deeper reach into the operations of a customer, due to their greater effects on the customer's processes, hence requiring a greater need for coordination

(ibid.). Through segmentation, the firm should consider the customer's processes, functional needs and overall potential profitability of the relationship (Johnson & Selnes, 2004). Palo & Tähtinen (2013) report from their study that the managers viewed the role of the customers as essential to the development of a service. Maglio & Spohrer (2008) support this by stating that one of the fundamental aspects of a service is the role of the customer as a co-producer of value. De Vries (2006) elaborates on this by arguing that in order to obtain the value from a service, the customer must act in alignment with its provider(s) and have the right competencies to co-produce the value of the service.

Several studies have shown that user involvement is a critical success factor for both new product or new service development (e.g. Alam, 2002; de Brentani, 1995; Brown & Eisenhardt, 1995). A comparative study has also shown that the critical success factors for new product development compared to new service development is not necessarily the same ones (Atuahene-Gima, 1996). For physical products, the quality or advantage of the innovation seems to matter the most for its success, whereas for services, human resources, teamwork and user collaboration, appear to be the critical success factors (Alam, 2002). Hence, user involvement may be even more important when developing services than tangible products (Sundbo, 1997; Alam, 2002).

2.2.3.2 LEAD USERS

Customers have been identified by literature as the most important type of collaboration partner (Drejer, 2004), but it is also stated that too extensive user involvement does not necessarily lead to user satisfaction (Tidd & Bessant, 2013) and identifying the "right" users to involve is vital (von Hippel, 1986). Still, the risk of failure is best avoided through experiments and pilot trials (Stuart & Tax, 1996).

Von Hippel (1986) coined the term "lead users" for identifying which customers to involve in new product or service development. It was based on the fact that it had been shown to be near-essential to have a proper understanding of user needs for development of commercially successful products (Rothwell et al., 1974; Achilladelis et al., 1971). However, in the case of very novel products or rapidly changing product categories, the selection of who to involve is important to consider (von Hippel, 1986). For instance, in high technology industries where the ordinary user's insights and feedback might be outdated by the time a company is able to build a new product or service based on it, von Hippel (1986) recommends identifying lead users to involve in the development.

"Lead users of a novel product, process or service are those displaying two characteristics with respect to it: Lead users face needs that will be general in a marketplace, but face them months or years before the bulk of that marketplace encounters them, and lead users are positioned to benefit significantly by obtaining a solution to those needs" (von Hippel, 1986, p. 796). This entails that one must identify the underlying market trend in which these specific users have a

leading position before the actual users can be identified (ibid.). Several authors have noted that lead users may be able to "provide insights to forecasting the diffusion of innovations" (de Brentani, 1995; Flowers & Henwood, 2010; Tidd & Bessant, 2013). However, there are three complexities in identifying these lead users. First, the lead users may be outside of the standard customer base. Second, there may be different groups of lead users to consider for the entire product or service, based on different groups being leading in different aspects of the complete offering. Third, lead users may already have solved their problem, as they are the ones characterized by having the highest benefit from solving their issue (ibid.).

2.2.3.3 ORGANIZING FOR CUSTOMER INVOLVEMENT

Alam (2002) conducted an empirical study on how twelve firms conducted user involvement in new service development. He found that the intensity of the user involvement varied across the stages of development, where there was highest intensity of user involvement in the early stages of idea generation and screening, and the later stages of test marketing and commercialization (ibid.). Thus, Alam (2002) identified that customers or users should be involved early on in development of new services, which is supported by Chesbrough & Rosenbloom (2002). Furthermore, he found that face-to-face interaction with the customer is preferred. However, he did not elaborate on how this information from user involvement should be leveraged into the organization of a company, which the two next sections presents.

The user innovation and open innovation literature contend that firms' innovation performance can be enhanced by working closely with users and customers (Foss et al., 2011). Foss et al. (2011) builds upon this literature by elaborating on organizational practices for leveraging user and customer knowledge in the context of innovation, as this appears to be a gap in the innovation literatures. They argue that when customer contact is through e.g. key account managers, there arises an organizational issue of communicating relevant knowledge from this interaction to the correct employees and encouraging the desired behaviours of employees to do so. "Intensive vertical and lateral communication, rewarding employees for sharing and acquiring knowledge, and high levels of delegation of decision rights" are new organizational practices recommended by Foss et al. (2011, p. 980) to resolve this issue and thereby leveraging user and customer knowledge in a company. Hence, their results supports that customer involvement has an effect on innovation performance, but that this link may be indirect where it needs to be disseminated through organizational practices.

In order to exploit customer insights, a company needs to build the ability to transfer knowledge in the organisation, which may be a source of competitive advantage, according to Argote & Ingram (2000). *Knowledge transfer* in organisations is defined as "the process through which one unit (e.g. group, department, or division) is affected by the experience of another" (ibid., p. 151). Argote & Ingram (2000) argue that the effectiveness of knowledge transfer varies between organisations, and that a competence in doing so efficiently will enhance organisational

performance. McGrath & Argote (1993) contend that organizational knowledge is ingrained in the three basic elements of organizations, which are members, tools and tasks. Due to the fact that individuals are able to restructure knowledge to new contexts, as well as transferring tacit and explicit knowledge (Allen, 1977), moving members is deemed a potent mechanism for knowledge transfer in organizations (Galbraith, 1990; Rothwell, 1978). Transferring tools, however, has been widely studied and has shown varying results of success for knowledge transfer (Argote & Ingram, 2000). Transferring tasks is less studied, but there are some studies showing that it may be effective, although this depends on the nature of tasks being transferred (ibid.). Thus, moving individuals is considered the powerful manner of transferring knowledge in an organization, whereas transferring tools or tasks may also be effective, but this is dependent on the complexity of the tool or task being transferred.

2.2.3.4 SUMMARY: CUSTOMER INVOLVEMENT AND BUSINESS MODEL INNOVATION

This subchapter has presented literature on customer involvement in the context of BMI. It is emphasized that companies should aim to involve customers in their innovation and development processes, and particularly in the early phases. This involvement becomes especially important for the development of service offerings and their business models. Although, identifying the correct users to involve is also underlined as essential to the development process. Moreover, the review indicates that firms need to arrange its practices to leverage customer knowledge into the organisation through vertical and lateral communication, proper incentivisation for employees to acquire and share knowledge, and delegate decision rights. Furthermore, knowledge is most efficiently transferred within an organisation by moving individuals since they can adapt the knowledge to new contexts and transfer both tacit and explicit knowledge.

The relationship between customer involvement, the BMI process and the organizational context appears to be similar to that of network relations, which is most likely due to the fact that customers are a part of the company's network. The capabilities and barriers of the organization will be decisive for their practises of engaging in and leveraging user and customer knowledge. Thus, customer involvement may have a direct impact on BMI through for instance being a source of information in *recognizing triggers* or through *experimentation*. Moreover, the dimension may have an indirect effect on BMI through the context. For example, by exploiting user involvement to overcome organizational inertia or barriers, a firm may have its context altered towards open innovation. Based on the theoretical findings figure 1 in the next section outlines the relationships between the three dimensions, the BMI process and the organizational context.

2.2.4 SUMMARY OF DIMENSIONS AND BUSINESS MODEL INNOVATION

The authors have found the following relationships between the three dimensions, the BMI process and the organizational context based on their literature review, which are illustrated in figure 1 below:

- Leadership can affect the BMI process directly, however, it may also influence the organizational context, the network dimension or the customer dimension, which in turn may impact the BMI process.
- Network relations can impact the BMI process directly, but it may also influence the organizational context, which in turn affect the BMI process. Furthermore, the involvement of network relations may be shaped by the organizational context.
- Customer involvement show the same relationships as network relations.

As mentioned in section 2.1.2.1 on capabilities for BMI, there is a mutually affecting relationship between the business model and the company's capabilities, i.e. the organizational context. This is not included in figure 1 below as it is beyond the scope of this thesis to investigate how the business model in turn affects the capabilities.
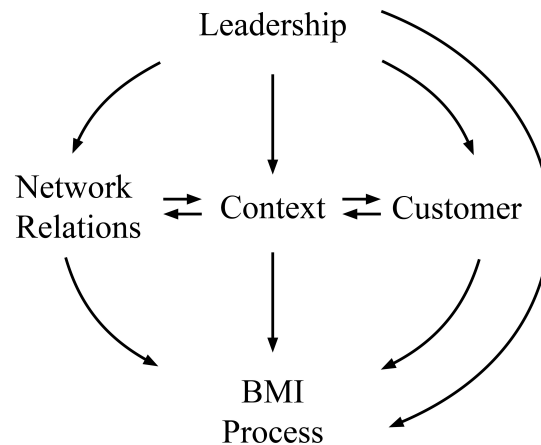
Figure 1: Theoretical framework of relationships between the dimensions of leadership, network relations and customer involvement, and how these relate to the organizational context and the business model innovation process.

3. METHODOLOGY

This chapter will outline the methodology used to obtain the results of this paper. First, the use of the qualitative research and case study method will be discussed. Next, the chapter will cover how the authors have acquired the data, how the analysis was conducted and how the the findings from the research will be presented. Finally, the chapter will provide a reflection of the preferred methods, its strengths and limitations.

3.1 RESEARCH STRATEGY

This thesis will employ the qualitative research methodology as the aim is to discover new aspects of a situation, i.e. BMI, which often entails posing "how" and "why" questions (Flick, 2015). The aim of qualitative research is further to generate theory based on empirical research, positioning it within the interpretive paradigm, as the aim is to analyze and understand phenomena through subjective interpretations of participants (Bryman, 2008, Flick, 2015). The qualitative research method will help the authors gain insights and detailed descriptions of how firms conduct BMI for data based services, from analyzing a limited number of cases (Dalland, 2007). As the aim is to explore novel areas and achieve deepened understanding of an issue or topic, the study does not require any propositions (Yin, 2014). Furthermore, due to the fact that there is limited detail to the BMI process, an explorative study is deemed appropriate.

3.2 LITERATURE ACQUISITION

A literature review performed by the authors, which is presented in the theoretical background, served as a foundation to understand the empirical data. The literature in this thesis builds upon a literature review performed by the authors in the autumn 2015 (Andersen & Barkost, 2015). This literature review was iterated during the spring of 2016, in the process of writing the paper. In this paper, however, only a limited number of the articles from Andersen & Barkost (2015) is compiled into the theoretical background.

The literature review (Andersen & Barkost, 2015) aimed to establish an understanding of the phenomenon BMI in the context of offering a service based on Big Data. Furthermore, because the subject boundaries of the main topic, BMI, are relatively fluid and open to change, a narrative review was found to be more appropriate as it becomes more wide-ranging in scope, in contrast to its counterpart, a systematic review (Bryman, 2008). Moreover, the exclusion or inclusion criteria of chosen literature are often less explicit (ibid.). The narrative approach gives an account of the literature in the sense of a general overview, including different types of literature (Flick, 2015). These implications are why the authors chose a semi-structured search for the literature acquisition, allowing the authors to aim wider in terms of acquiring literature and get a general overview from different types of literature

The searches were primarily conducted in two databases, Oria (NTNU library's database) and SCOPUS. The search process continued by identifying a starting set of articles for each research question. These articles, especially, the review articles, proved useful to identify additional relevant literature through snowballing, i.e. identifying literature from the listed references (Flick, 2015, Bryman, 2008). This enabled the authors to remain flexible and dynamic in their search process in order to discover as much relevant literature for the research questions as possible within the limited time scope.

The literature review, Andersen & Barkost (2015), ended with a recommendation to take a closer look into literature on the dimensions "leadership", "network relations" and "customer involvement" in relation to BMI. Thus, the literature review was revised, and another the round of literature acquisition was performed. Again, the authors conducted semi-structured searches in two databases, Oria and ISI Web of Science. The search terms were combinations of variations of the above dimensions and "business model innovation". This search led to the identification of a number of articles on BMI, that were combined with a set of articles from the previous literature review (Andersen & Barkost, 2015), constituting the theoretical background.

3.3 RESEARCH DESIGN

A research design is described as a framework to collect and analyze data (Bryman, 2008) in order to answer the questions posed by the author (Flick, 2015). This section discusses the choice of a multiple case study as a research design, the collection of data, and finally, the strategy for data analysis.

3.3.1 QUALITATIVE CASE STUDY

Due to the nature of the research questions asking "how", and the fact that the the questions require an extensive and in-depth description of a social phenomenon in a specific context, a qualitative case study is appropriate (Yin, 2014). The authors have decided to study the BMI process as a phenomenon that is influenced by the context of a firm and data based offerings. The usage of a qualitative case study will allow for wider insight into relevant factors and variables, and help the researchers understand the present dynamics within single settings (Eisenhardt, 1989a). Further, the intensive study of one unit may serve to aid the understanding of a larger class of units (Gerring, 2004). The use of a case study is also suitable as the authors aim to describe and explain a contemporary and present phenomenon, that is, BMI in the context of data based services (ibid.).

Yin (2014) states that a case study research can be both single- and multiple-cased, with holistic or embedded units of analysis. Yin (2014) claims that a two-case study improves the level of analytical benefit. By covering more firms the authors could contrast how BMI proceeds across firms, which could render the study more robust (Yin, 2014). Nevertheless, this thesis will

employ a "single embedded case study design", allowing the authors to look at a firm through individual embedded units of analysis, thus being impacted by the same context (ibid.). This will enable the authors to generate richer insights and operational detail on how the case firm performs BMI for data based services (Klein and Cannella, 1999), which is the purpose of the thesis. The authors have selected one case firm, DNV-GL, and a set of its associated projects, as units of analysis, presented in the next section. Moreover, the case study will be retrospective (Flick, 2015), thus looking back at historical events, in order to establish how BMI was conducted.

3.3.1.1 SELECTION OF CASE FIRM & PROJECTS

To acquire the data to answer how firms conduct BMI, the authors have to choose relevant sites and subjects (Bryman, 2008). Furthermore, the case must be significant to the purpose and the research questions.

For this thesis one case firm is chosen, namely DNV-GL, a Norwegian-German classification society and advisory firm that has existed for more that 150 years. The case firm is chosen because it fits the context of being a large established firm, and because it offers data based services. However, the firm has traditionally not created and supported digital services to external customers. DNV-GL has observed a number of startups and other companies offering data based services and data analytics to the maritime sector, which has caused them to evaluate their strategies in terms of utilizing data and digitizing their services. Thus, DNV-GL aim to become a data smart company, using digital solutions to innovate and offer better services to their customers.

Since the business areas (BAs) of DNV-GL are quite different and serve different markets, the authors chose units of analysis from one single BA in order to minimize differences caused by industry characteristics that is considered relevant for Big Data (Wamba et al., 2015). DNV-GL run a number of businesses across several industries, but its most traditional business is within the Maritime BA, where the business models have remained relatively unaltered for a long time. Recently, the firm has initiated a number of digital initiatives to support, extend and add new value to existing business in the Maritime BA. The firm has an extensive database for seagoing vessels, and is one of the largest service suppliers for classification. Thus, the authors believe that this BA serves as a relevant context to help fulfill the purpose. A collaboration between DNV-GL and the university that the authors attend, The Norwegian University of Science and Technology, allowed the authors to use an established contact, and thus received access to units or projects through a representative in the Strategy, Research & Innovation unit. He assisted the authors in identifying potential projects within the BA Maritime..

Eisenhardt (1989) recommend four to ten cases to be sufficient to generate theory. However, the authors chose three projects, in order to get an increased amount of detail and depth in each

project, instead of covering more projects only "scratching the surface". Also, the authors deemed the choice of fewer case projects as appropriate due to the limited time frame, and as it was in line with the aim to extend the detail and practical insight of BMI.

To choose the three units of analysis, the authors set up the following inclusion criteria:
- Must be within the BA Maritime.
- The service offering must have data, or preferably Big Data at the core of the offering.
- The project must have existed for a month or more. This, in order for the authors to be able to trace the development of a potential developing business model.
- The service can be offered to external or internal customers. Internal customers can for instance be managers of stations or ports, offering certification services to incoming ships.

In order to provide a more nuanced perspective of the BMI process, the authors chose one project, currently an operative service, that had so far been successful, and one service that had been terminated. Both offerings would provide retrospective perspectives, that would be helpful in outlining the overall process, but may be less rich in detail as the project participants had to recall past events. Therefore, the authors specifically selected a project that was more recent, in order to provide more detail. However, it should be noted that in this last case project, the authors would not be able to collect and analyze the long term outcome of the activities performed. Thus, the proposed case design includes one service that is operative, one service that was terminated and one project that was a pre-project when it was studied by the authors.

Although RQ2 involves the study of customer involvement and network relations as external inputs, this study only focuses on projects and associated participants within DNV-GL Maritime, and does not include the perspectives of customers or partners. This is because the purpose was mainly to get an understanding of how the case firm conducted BMI through their internal perspective, in order to understand why and how they did what they did. The last dimension that was scrutinized was leadership, which aligned with the internal perspective.

3.3.2 DATA COLLECTION

This subchapter first presents how data was acquired through interviews, before elaborating on the use of secondary data.

3.3.2.1 INTERVIEWS

Yin (2014) states that interviews are one of the most crucial tools to obtain case study evidence. For this thesis semi-structured interviews were used as the main means to collect data due to their increased flexibility and focus in understanding the interviewee's perspectives of events, patterns and behaviours (Bryman, 2008). The semi-structured interview allowed the interviewee to pursue topics of particular interest (ibid.), and enabled the authors to capture activities, behaviours,

reflections and processes employed by employees, that may not have been covered by the theoretical framework.

Prior to conducting the interviews, the authors compiled an interview guide (appendix A) to aid the interviews. This guide was based on the theoretical framework and was guided by the research questions. The topics covered were BMI, Big Data, leadership, customer involvement and network relations. Specifically, the authors compiled the questions to reveal important events and turning points of the projects. The interview guide had many open ended and wide questions that allowed for flexibility with regards to how the interviewee chose to answer a question. Especially, a question in which the interviewees were asked to elaborate on the project's development from initiation to current status, whereby some interviewees drew timelines, allowed for deepened insight and a variety of detail. The interviews were performed in five rounds, and in between, the authors revised and removed some of the questions based on saturation and on the insight the question would provide.

Data was collected from subjects involved in the three service projects. These were leaders, managers, product developers and researchers that took part in developing the services. The authors strived to maintain a balance between "business oriented people" and "technology oriented people" for each project, in order to enhance *construct validity*, or the use of appropriate and correct operational measures for the concepts of study (Yin, 2014). The managers may provide narratives of the overall plan for the project and which activities were performed to configure the elements of the business model. The more technically oriented interviewees may serve to provide insights into issues regarding data, and specifics of the development of the product. Finally, several of the interviewees had participated in more than one of the projects, and were thus able to provide more insight and a comparison across the projects. Thus, the distribution of interviews performed by the authors were almost equated for the three projects.

The empirical findings for the thesis consisted of 23 interviews which are provided in Appendix B and D, whereby a total of 13 interviews were conducted by the authors. The interviews were conducted during February 2015, and lasted for approximately one hour each. Most interviews were conducted at DNV-GL's Headquarters in Oslo, except for three interviews which were conducted at the Hamburg Offices in Germany. All the interviews contributed to the findings, although the interviews with the more senior executives served more to increase the author's understanding of the context of the BA, than as an input to the projects. As several interviews were conducted, the authors were able to triangulate the data, as the different interviews constituted different perspectives, thus enhancing the confidence in the study (Eisenhardt, 1989).

All of the interviews were audio recorded and then transcribed, and then stored in a case study database on Google Drive until the end of the writing process. By transcribing and compiling the interviews, the reliability of the study may be augmented, i.e. it renders the the empirical

foundation transparent to the public (Bryman and Bell, 2011, Yin, 2014). During the interviews both authors ensured that all topics were covered, and one author would lead the interview while the other took notes and asked follow up questions. These notes, as well as the timelines compiled by the interviewees, helped the authors debrief after each interview, and served to support the recording if something was unclear. The transcribed interviews were compiled and stored in the case study database, and were also sent to the person being interviewed for approval and possible added detail or corrections, again, increasing the construct validity.

3.3.2.2 SECONDARY DATA

This section elaborates on the use of secondary data in the thesis, thus data collected by others, not specifically for the research question at hand (Stewart, 1984; Frankfort et al, 1992). The secondary data was especially useful to provide a second opinion, and the use of multiple sources may improve construct validity. All the secondary data was stored together with the authors' own transcripts in the case study database.

Interview Transcripts
The authors were given access to the transcripts of ten interviews that were compiled in a master's thesis conducted on one of the projects studied in this thesis, "Fuel Insight". The master's thesis written by Stabursvik (2014) aimed to explain the reason behind the failure of the service "Fuel Insight", and thus provided the authors both with the transcripts and a point of departure with regards to understanding of the project, also rendering "Fuel Insight" as the project with the largest base of empirical data. Despite having a different focus than this thesis, it covered several topics similar to the research questions of this paper, amongst other "user involvement", "management" and "knowledge transfer" on service innovation. Thus, it was considered a valuable contribution to this thesis, covering similar topics, but contrasting in the aim of the study, as this study seeks to investigate BMI in the context of data driven services. Due to the coincidence of some topics, Stabursvik's (2014) interview guide covered central aspects of this study (appendix D). Furthermore, the interviews were conducted closer to the termination of the project, and can thus be argued to provide more detail. To ensure the quality of the transcripts, and to extend on the findings of Stabursvik (2014), the authors specifically asked questions about the project to four of the interviewees, whereby one of the four was conducted solely with the intention to cross check current findings with the secondary transcripts. In the findings, Stabursvik's (2014) transcripts were used in the same line as the authors' own interviews, complementing their findings.

Documentation
Relying only on interviews may decrease the validity of the research, thus Yin (2014) recommend to rely on other sources of possible contrary evidence. Further, he contends that documents play a valuable and explicit role in all case study research (ibid.). The documentation that was used consisted of three reports on the project "Push Based Class", a case presentation of

a prior initiative to the project "ECO Insight" and a marketing brochure for "Fuel Insight", which all were collected and stored in the authors' database. Furthermore, prior to the interviews on "ECO Insight", the authors prepared by looking at websites describing the service, and at the status report of "Push Based Class".

3.3.3 DATA ANALYSIS

Analyzing qualitative data is deemed to be challenging as there are few established rules as to how such analysis should be conducted, and due to the fact that the data material may be vast and unstructured textual data (Bryman and Bell, 2011). For this paper the authors' transcribed interviews resulted in a total of 104 471 words, which combined with the transcripts of Stabursvik (2014) constituted a vast empirical foundation. Thus, a structured approach to the large and unstructured data material was required. This section elaborates the analytical techniques used, and how it was conducted through four steps.

3.3.3.1 ANALYTICAL TECHNIQUES

Yin (2014) state that "data analysis consists of examining, categorizing, tabulating, testing, or otherwise recombining evidence to produce empirically based findings", thus the purpose of an analytic strategy is to link data to the concepts of interest. Thereafter, one utilizes the concepts to provide a direction for analyzing the data. This indicates the importance of conducting a literature review and having a theoretical framework to help guide the analysis (ibid.).
.
Dalland (2007) describes a structure that was employed by the authors, by which interviews are transcribed word by word before reading the transcripts to establish an overall sense of its contents and highlights. Next, he recommends to divide the interview into natural parts (ibid.). According to Tjora (2011), this activity should be done in two steps; coding, i.e. key words and expressions that represents the content of each section in the interviews. Next, he recommends categorizing, i.e. a clustering the codes that are deemed relevant to answer the research questions, thus reducing and condensing the coded material (ibid.). Finally, the remaining data must be elucidated by the research questions, distilling the most significant elements to fulfill the purpose (Dalland, 2007.). As the research design consists of multiple units, a technique called cross case synthesis, as described by Yin (2014), should be employed for elucidating the remaining data. This technique comprises of collecting information on each separate case, for instance in tables, and then cross-comparing the findings (ibid.). The analysis conducted by the authors followed the main directions of the above approaches and is explained in the next section.

3.3.3.2 ANALYSIS STRATEGY

The analysis of the empirical data consisted of four steps conducted in a sequential manner, whereby the first three steps were conducted separately for each case, before cross-analyzing the projects in step four. However, it should be noted that the authors performed several iterations between the steps and to the analytical strategy.

Prior to the first step of the analysis the interviews were transcribed word by word. This was the authors' first round of exploring the data. Next, each interview was examined more closely by adding codes to the text, highlighting sentences and sections in the written interviews in line with the technique suggested by Tjora (2011). Moreover, the authors took notes in a separate document, highlighting interesting findings. When coding, the authors were especially looking for actions that resulted in a change in the business model, actions or impacts made by leadership, establishment or use of networks, as well as customer contact and testing. To provide an example, the authors would tag sections with phrases such as "same development team from the beginning", "choice of technology/value chain/assets", or "data driven service, data quality". Furthermore, to get a more visual overview of the content and concepts of the data, the authors registered all the codes from each interview in one excel sheet per project. Further, this coding inductively confirmed the prominence of the dimensions leadership, network relations, and customer involvement across the projects. The whole coding process was conducted by splitting the 23 interviews between the authors, then comparing results between themselves after a couple of interviews to see if the process was conducted in a similar manner. The coding process and the codes were both based on the prior knowledge of the authors and the understanding established through the theoretical framework. The authors strived stay as neutral as possible in order to add codes in a way where they were not being limited by previous understanding, but due to the subjective nature of coding, some findings may have been left out.

The next step was to divide the interviews and codes into natural parts in line with Dalland (2007). To be able to study BMI activities and the dimensions, the authors clustered the coded sections into events in time, that were further distributed according to stages appropriate for the specific project, e.g. "Project Initiation" and "Handover to Development". The events comprised of the reduced and condensed material, consisting of findings that dealt with the business model, alterations in the organization or in the product, for instance one event being "deciding on a revenue model".

Next, through the third step, each project's events were analyzed with the help of the theoretical framework, decomposing the events into BMI activities, identifying business model outcomes and how the dimensions impacted the events, and the interrelatedness of the dimensions. Thus, this step categorized and further distilled the coded material, as recommended by Tjora (2011), in order to provide a foundation for the cross-analysis. Thereafter, the projects were cross-compared, first with regards to BMI activities and their outcome, and second with regards to the impact of the dimensions on the BMI activities and their interrelatedness. Thus, answering the research questions.

The final and fourth step was the cross case analysis as proposed by Yin (2014). The previous steps were performed for each separate case, to be able to compare the findings. The authors

commenced the cross case analysis step by step, making a table of significant tendencies and trends for each project, to serve as a foundation for comparison. Based on this, the projects and their associated events were compared more deeply with regards to which activities had been apparent and how they impacted the business model, in order to answer RQ1. Lastly, in order to answer RQ2, the authors cross compared how the dimensions had impacted the BMI activities, how they interacted and how this related to the answer in RQ1.

3.4 REPORTING

This section will describe how the authors present the findings from the research, preparing the reader for the consecutive chapters. Thus the structure for presenting the findings is explained in addition to the elaboration on why some aspects of the study has received more consideration than others.

In chapter 4, Findings, each case is presented separately in order to paint a clear picture of the chronological development of each project, representing the condensed and coded material from the interviews from step two. The authors divided the events by stages specifically configured to each project, e.g. "Fuel Insight" is presented through the stages "Project Initiation", "Handover to Development" and "After Launch". The reason why the findings were presented in this way was to enable the reader to follow and become familiarized with the events (Eisenhardt, 1989). Moreover, presenting the full empirical foundation, in a systematic manner, enhances the reliability of the study.

The first part of chapter 6, Analysis, contains a thorough analysis of each event in light of theory for the separate cases. The second part of the chapter presents the cross case analysis that was used to answer the research questions (Dalland, 2007.). Yin (2014) suggest that it is sufficient to only present the cross case synthesis for multiple case studies. Applying this to a single embedded case study, the the authors contend that it was necessary to include the individual case analyses. First, this was to enable the reader to follow the argument, as the analysis was comprehensive, and due to the fact that that each project was quite different to the other. Secondly, it was considered valuable to present the full analysis to provide the detail and depth to the BMI process that the literature called for in the purpose.

Finally, the discussion in chapter 7, presents a discussion of the findings and analyses, using the latter sections as a foundation to fulfill the purpose of the master thesis.

3.5 QUALITY OF THE RESEARCH

This section assesses the quality of the study design; its strengths and weaknesses, and potential ways the design could be improved. To ensure the quality case study research, Yin (2014) presents four concepts to consider; *Construct validity, external validity, reliability* and *internal*

validity. The last concept, *internal validity,* which deals with establishing causal relationships, is inapplicable to to descriptive or exploratory case studies, and will thus not be covered. The other three concepts will be discussed in the following sections, before commenting on ethical considerations

3.5.1 RELIABILITY

As stated earlier in the section, the objective of reliability is to enable somebody else to repeat the procedures and arrive at the same findings and conclusions (Yin, 2014). Throughout the study, the authors strived to document the procedures and make all the steps involved in data collection and the analysis operationable. Moreover, as stated earlier, a case study database was constructed, as recommended by Yin (2014), comprising of all the documents; data collection procedures, documentation and the empirical findings. Additionally, an interview guide was made in order to conduct the interviews consistently, complying with the replication logic (ibid.). To ensure the operability of the procedures, the authors tested the interview guide on co-students and had the mentor review the interview guides (Runeson and Höst, 2009). Interviews may be difficult to replicate due to the unique connection between interviewer and interviewee in extracting insights and opinions (Dunn, 2010). Furthermore, the semi structured nature of the interviews made each interview different, despite following a guide. Additionally, the interview guide was subtly revised throughout the interview process, which may have rendered the process more difficult to replicate.

Throughout the analysis the authors made sure to go step by step, enabling potential investigators to follow the reasoning of the authors, thus, establishing a chain of evidence to enable a reader to follow the derivation of evidence, from the initial research questions until the case study conclusions were reached (Yin, 2014). This process was explicated in section 3.3.3.3. Although this process was documented, the analysis and coding of the authors was based on subjective interpretation constituting the authors' prior knowledge and background within entrepreneurial studies, and on the theoretical framework, which may make it difficult for somebody else to arrive at the exact same results.

3.5.2 VALIDITY

This section discusses internal and external validity which are important criteria when assessing case study research.

3.5.2.1 CONSTRUCT VALIDITY

Sceptists of case study research has questioned the subjectivity of the researcher and the lack of developing sufficient operational measures (Yin, 2014). Two steps must be covered to ensure the criteria of construct validity, which deals with the use of appropriate and correct operational measures for the concepts of study. First, defining change in terms of specific concepts and

relating them to the original objectives to the study, and second, identify operational measures that match the concepts (ibid.). For the purpose of this study, the concepts are BMI activities and the three dimensions (leadership, network relations and customer involvement), and the measure is the outcome on the business model and its components.

A way to enhance construct validity is through using multiple sources of evidence (Yin, 2014). Moreover, due to the time span between the events in the projects and the time of the interview, it could be difficult for participants to reconstruct why decisions were made and provide historical detail. Thus, the authors strived to obtain construct validity by collecting empirical evidence from several people across the projects. All participants were asked to elaborate on the projects' process from initiation to the current status, allowing the authors to extract several nuances of the same story. The distribution of input was equated for two of the projects, however "Fuel Insight" was based on substantially more data due to the evidence provided by another master's thesis. This weighted difference could ideally be balanced, but was not considered critical to the outcome. In order to get a nuanced perspective for each project, the authors aimed for a balanced distribution of orientations with regards to business and technology people. Based on the roles of the interviewees in the projects, the authors achieved a fairly equal distribution (appendix B). It should be noted, however, that the authors maintained an internal perspective, and did only interview people internal to DNV-GL. By interviewing customers and partners, more sources of evidence and additional perspectives could have rendered the study more valid. However, due to the limited time and the focus on how the firm worked to establish the model, the authors chose to omit this source of evidence.

To ensure that the data was treated consistently by the authors when splitting work to compile findings, distilling evidence from the rest of the data material, and when analyzing the projects, they cross checked each other's work. The authors may misinterpret narratives and contexts of the interviewees, however, this was attempted counteracted by having interviewees review the obtained results (Runeson and Höst, 2009). Also, project representatives from all the projects verified the chronological story of events (Bryman, 2008; Yin, 2014). Finally, the interview transcripts were cross checked with the documentation. This triangulation of the data strengthens the validity (Bradshaw & Stratford, 2010; Simons 2009).

3.5.2.2 EXTERNAL VALIDITY

External validity deals with the question if the conclusions are generalizable beyond the case study, and strives to minimize error and biases (Yin, 2014). The one-case study has been criticised to offer a poor foundation for generalization, however in contrast to statistical generalization, the goal is analytic generalization, wherein the purpose is to generalize a set of results to some broader theory (ibid.). Moreover, Baxter (2010) contend that well performed case studies may contribute to credible, robust and trustworthy theoretical explanations, and thus render them generalizable to theoretical propositions.

The current study targeted analytical generalizability in order to develop a theoretical understanding of a phenomenon at higher level than the specific case (Yin, 2014). As the research design employed a single case, the use of theory was recommended (Yin, 2014). Such research often starts with theory, then selects a case where a phenomenon can be studied, and then generalizes the findings back to the theory (ibid.). Thus, the study was based on a literature review constituting the theoretical framework, that the authors aimed to extend. In order to generalize based on external validity, the authors ensured that "how" questions permeated the research questions to extract more detail to build theory.

To be able to generalize the generated theory, it must be tested or replicated to see if the same theory occurs, which is referred to as the replication logic (Yin, 2014). As this study only has generated theory based on a single case firm, based on three units of analysis, the study should be replicated to see if the same patterns occur at other firms. Still, for the purpose of this thesis it was deemed necessary using one case firm and its associated projects, as it enabled the authors to achieve deep insight of a smaller scope, with more "richness" (Yin, 2014). Moreover, its practical implications were better suited the time scope and resources of the thesis (ibid.).

In order to improve the study, the authors would extend the study, revisiting the projects at two or more different points in time (Yin, 2014). This represents a longitudinal study, an alternative to the retrospective case study, allowing the investigators to identify how certain conditions change over time. Thus, the authors would be able to specify the long-term outcomes of certain events or activities on the business model and subsequent events.

Finally, when aiming for analytical generalizability based on findings from a case, the context may be lost, and the findings may not be as valid independently of their original context (Flick, 2015). To enable others to infer from the results, the authors strived to provide the reader with contextual factors throughout the text for comparison. In the conducted research, the three projects were subject to the same context (the Maritime BA), which can be argued to decrease the chance of other factors not accounted for in the research. However, the projects were not conducted simultaneously, thus, the context may have changed over time.

3.5.3 ETHICAL CONSIDERATIONS

The authors made an explicit and ethical choice of anonymizing all the interviewees, due to the fact that it it was more important to emphasize the particular impact of a role on the BMI process. Additionally, the authors made sure to ask for permission to audio record each interview, and each participant received the transcript of their interview prior to conducting the analysis, for them to correct or comment on the statements made.

3.6 SUMMARY

This chapter has summarized the research strategy and design of the thesis. The purpose afforded a qualitative case study, by which the authors studied three units or projects, within a single case firm. The data was collected based on interviews performed by the authors, combined with documentation and transcripts from a previous master thesis conducted on one of the projects. The analysis was presented through four steps, addressing both the separate projects and the cross case analysis, as the objective was to provide extensive detail or the BMI process. The chapter further described how the findings will be presented throughout the consecutive chapters, before reflecting on the quality of the study performed.

4. FINDINGS

This section presents the empirical findings from the three case projects at DNV-GL, Fuel Insight, ECO Insight, and Push Based Class, hereafter referred to as FI, EI, and PBC. Each project section starts with a project timeline and background, before the findings from each project is presented in a chronological manner, describing the development of the projects from their origin, initiation and to their current status. As stated in the method, each project description has been assigned stages appropriate per case to describe the development of the specific project, wherein events are distributed. These findings, and events, are compiled based on the authors' coding process, identifying data from each project relevant for each initiative's BMI process. Thus, the findings will serve as the foundation for the analysis in the next chapter, wherein the number assigned to each event in this section, will represent the same events in the Findings chapter.

4.1 FUEL INSIGHT

The findings on FI will be presented in this section and is structured according to three stages: project initiation, handover to development and after launch. As mentioned in The Methodology of this thesis (ch. 4), it has investigated three projects where one of them is discontinued, which is FI. The findings on FI is concluded with a section detailing the discontinuation of the service.

4.1.1 FUEL INSIGHT CASE BACKGROUND

Project Timeline
- *2010 - Project initiation of Fuel Insight with R&I and DNVPS*
- *2010 - Implementation with the Metric Centre at DNV*
- *2011 - Partnership with BIMCO*[1]
- *May 2011 - Launch of FI at Norshipping Conference* [1]
- *June 2011 - Change of managing director at DNVPS*
- *2013 - Fuel Insight is discontinued*
- *2013 - DNVPS sold to IK Investments Partners, becoming VPS (Ship And Bunker, 2014)*[2]

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[1] Safety4Sea article, 2011
http://www.safety4sea.com/dnvps-introduced-a-new-data-analytics-tool-for-best-bunker-fuel/

[2] Ship and Bunker article, 2014
http://shipandbunker.com/news/world/106185-bunker-testing-agency-dnvps-unveils-new-name-new-branding

FI was a data analytics tool offered via a web application to the bunker fuel market. It was designed to provide real-time information on bunker fuel deliveries around the world, and thus provide companies with insights on procurement and benchmarking. The service utilized the database of DNV Petroleum Services (hereafter DNVPS), an independent unit at DNV, on bunker fuel quality based on their comprehensive fuel testing over many years.

Previously, a fuel buyer would have to look through an extensive report, locate the port and suppliers, then calculate the mean score, which would take time and require domain knowledge. The value proposition of FI was to help shipping companies get the best value from bunker purchases, and support ship charterers, operators and owners in achieving cost savings and reducing risks. The value was delivered through faster and easier access to information on the best bunker fuel suppliers and their previously delivered fuel in the form of benchmarks based on analytics (Stabursvik, 2014). This would also aid buyers to watch out for fuel suppliers that showed a higher probability of not fulfilling mandatory regulations. Further, the customers would receive information on fuel quality and quality of fuel suppliers in the different ports worldwide. FI offered five key features; a financial, a technical quality, a reporting behaviour, a price correction, and a statutory benchmark. These benchmarks would help the customer characterize to what extent a supplier could be considered within best practice.

The primary target group for FI was those who would buy bunker fuel, such as charters and brokers, constituting 2/3 of the market. The secondary target group was ship owners interested in the history of the technical quality of purchased fuel (Stabursvik, 2014). When launched, FI was offered as a subscription-based service with a yearly fee.

DNVPS was an independent unit at DNV, which provided fuel testing services to the maritime sector. This unit was the product owner of FI, and thus the decision maker for the product development and business model. This means that the managing director of the unit had the overall responsibility. DNVPS headquarter was located in Singapore in the project period, with a number of other offices, such as in Høvik, Norway. The research department of DNV, which at the time was called Research & Innovation (hereafter R&I), and the IT department, which was called Metric Center at the time (hereafter Metric), cooperated with DNVPS in developing FI. R&I was responsible for developing the methodology, whereas Metric was an internal service provider for the implementation of FI. DNVPS was responsible for assisting R&I and Metric in their tasks, the database, and sales and management of the service.

4.1.2 PROJECT INITIATION

1. Initiation of the Project
In 2009, business intelligence and data analytics was a significant market trend that influenced the research department at DNV. The company looked into how they could leverage their

business intelligence in external service offerings, where FI was one of the results of this effort. This type of service represented a new way of thinking for DNV and was a new way of delivering their services.

Aiming to start new activity around data analytics and data driven services, representatives from R&I were sent around DNV in the end of 2009 to identify the type of data sources the company possessed. One of the data sources they came across was the fuel testing database of DNVPS, an independent unit at DNV, who had performed fuel testing since the 1981, who gave R&I access to their data. DNVPS had wanted to do something with their unique data for a long time, to differentiate themselves from other sample testing suppliers, by adding value through analytics. However, they had not had sufficient resources. The former leader of DNVPS wanted to address the lack of transparency in the lucrative, but fickle market of $100 million. Also, DNVPS had received input from one of their biggest clients, Maersk, and others that there was a customer need in the market for statistics and benchmarking on bunker fuels against the industry. For example, the customer wanted documentation and statistics for fuel purchasing that was quick to access.

2. Developing the Methodology
The leader of DNVPS met with R&I in the beginning of 2010 and gave them the freedom to explore their data. There were weekly workshops from January to April (2010), as requested by the leader of DNVPS, where two representatives from them would meet with R&I. In these meetings, the DNVPS representatives explained the data and talked about the problems in the market and how the industry worked, and R&I could ask questions. There was amongst other things, an issue of "shortlifting" in the fuel bunker market, which DNVPS was concerned with. "Shortlifting" is when a supplier overstates the delivered fuel density, and is therefore able to charge more for the fuel than what was actually physically delivered.

After R&I had explored DNVPS' data without specific instructions on what to do with them for a while, R&I met with the managing director of DNVPS again who asked them to develop a benchmark for quality of the fuel, but also for the suppliers of fuel. This solution would solve the problem that the customer struggles to understand the parameters, and hence, make an intuitive graded benchmark that not only showed which suppliers are within the approved limits, but also how good or bad they are performing. Thus, DNVPS put in an order for R&I to create the methodology for such a benchmarking service, which took around three to six months of development. R&I began by creating some quick prototypes where one could browse the database and compare ports. After this, the decision to develop a new service based on this methodology was taken, and the implementation into the data warehouse began.

4.1.3 HANDOVER TO DEVELOPMENT

3. Choice of In-House Implementation

R&I did not develop or operate services, so the solution had to be implemented somewhere else. There were two options; either to use internal or external resources. The managing director of DNVPS chose the internal unit Metric as they already delivered performance benchmarking and knew the data warehouse well. Furthermore, the intent was strategic as DNVPS wanted to become closer to DNV, and it would also be wise to develop automatization capabilities in house.

Metric began cooperating with DNVPS and R&I on FI after the decision for implementation of the service was made by management of DNVPS in May 2010. Hence, R&I owned the methodology of FI, DNVPS owned the data and Metric had to integrate this and cooperate with both units. It was the first data driven service that was to be delivered externally which Metric had implemented. Both R&I and DNVPS had many ideas and suggestions to implement in FI, and according to some informants, this led to a considerable increase in complexity of the solution. Furthermore, the people working on the development of FI were also engaged in other projects and tasks at the same time. Thus, the development of FI was done ad hoc, which meant that it became an expensive project that took a long time.

The project participants from R&I and DNVPS were mostly internally financed. The hours put in by Metric, on the other hand, were financed by DNVPS. Informants from DNVPS recall difficulties in cooperating with Metric due to the fact that they needed to cover large, unanticipated expenses themselves. It turned out to cost a lot to develop a solution like FI, and as it was a dynamic development, and Metric would get additional payment for each alteration. Ultimately, this led to a greater expense level than anticipated by DNVPS. Also, it was stated that DNVPS had been given the impression that the development costs would be shared amongst departments at DNV. However, it did not turn out that way in the end. DNVPS got the entire bill and this led to difficult discussions about who were to pay for the hours charged in the project.

4. Choice of Technology

There was a discussion on which tool to use for developing the service platform. Initially, R&I met with Metric and presented their solution, and wanted to hand over their scripts and algorithms. However, Metric did not reuse the presented solution by R&I and decided to implement everything from scratch. For implementation, Metric decided to use a tool called Cognos since this was a tool they were familiar with, which they could operate and support. Some of the project participants warned about the choice of technology, and the opinion of some was that it was a less suited tool for developing this service. Cognos was a reporting tool, not a web application tool, limiting the flexibility for the graphical user interface. One of the issues with Cognos was that DNVPS and R&I had developed the methodology and functionalities with a more flexible business intelligence program in mind which were difficult to accommodate with the Cognos tool. There were several occasions where DNVPS and R&I felt that the ideas they

had developed did not turn out as expected, due to the limitations of the Cognos system. Also, as some of the further development of benchmarks happened in parallel to the implementation, this further complicated the product development.

Due to the method employed by Metric, everything had to be calculated in advance, in contrast to the method used by R&I's algorithm that performed the calculations automatically when requested. However, it was decided to use IBM's Cognos tool since it is more difficult to develop and operate, as it is made from scratch. Although, in some cases, they had to hack their way around it and then the whole reason for choosing a standard tool became invalid, according to some informants. Further, R&I argued that Metric's approach did not accommodate data volumes, as it would enlarge the amounts due their chosen method of calculating everything in advance. A few employees from R&I sent a letter of concern with regards to the chosen technology used for FI since the interface was outdated, and the response times insufficient. This concern was, according to the interviewee, not received positively. R&I later made an effort to make a web version, based on Google maps and more visuals, as an alternative to the current FI solution. This was presented to DNVPS, with the offer to integrate it into their web page. However, this was not pursued further.

Informants from Metric have expressed that they should have been involved in FI at an earlier stage. R&I and DNVPS had worked together on FI for about five months and developed a significant ownership to the solution. This made the handover process to Metric complex, who were included into the project after about five months. Metric experienced that the ambitions for FI were high, and there were many specifications for the solution that they were about to take over. This made it demanding and expensive for Metric to implement the solution.

5. Use of Internal Experts for Initial Service Development
The interviewees have clearly stated customer involvement as insufficient during the development of FI. Partly, due to DNVPS being afraid to show the product to external customers. It was the project manager from DNVPS who decided who, when and how in terms of customer involvement. The project members from R&I were not allowed to speak with customers. In the beginning of the project, R&I worked with internal experts from DNVPS who had worked 20 - 30 years with fuel quality. These internal experts acted in the role of the customer or end user, and made suggestions on their behalf, which, according to some informants, led to a considerable increase in complexity of the solution which did not properly target specific customer segments. Furthermore, DNVPS showed some external customers what they were thinking in terms of FI through customer meetings to obtain indications if they were headed in the right direction, but the customers did not get to experiment with the service in the early stages. It has been stated by some interview subjects that DNVPS seemed anxious to create expectations in the market by involving customers too extensively, and potentially not fulfilling the expectations.

6. Partnership with BIMCO

To get increased customer access, DNVPS aimed to establish a partnership with the Baltic and International Maritime Council (BIMCO), an international shipping association, in 2011[1].This was a partnership initiated by the managing director and project manager from DNVPS, which they worked on concurrently with the development of FI. The intent was to leverage BIMCO's network of shipping companies as a sales channel, by promoting FI on their web page. In return, BIMCO and its members would receive a minor free service from DNVPS. The development of FI also used members of BIMCO for testing the service before launch in May 2011.

The partnership with BIMCO was a new way of thinking in terms of partnerships for DNV, and it was appreciated as a good effort from the leadership's side. In terms of customer acquisition, FI relied on this partnership, and thus did not focus as much on DNVPS' existing customer base as they normally would have. However, the partnership did not turn out as planned. The managing director of DNVPS was involved in the beginning, but withdrew his involvement after some time, and the one in charge of the partnership with BIMCO at DNVPS had a lot of responsibilities in a time of great change. He resigned after some time, and thus the ownership of this partnership was lost within the organization. The one who took over the responsibility of the partnership also had a lot of other responsibilities, was promoted to a new position, and eventually quit the organization. There were many factors that led to the non-fulfilment of the partnership. However, when attempting to establish the partnership, FI was able to conduct pilot trials with some of the members of BIMCO in the later stages of development.

7. Product Testing with Customers

At a later stage, when the product was more or less finished, it was tested by a few shipping companies prior to the launch in 2011. According to the managing director of DNVPS at that time, they offered all customers a trial of FI, but experienced that no one used it. However, they were able to use some of the members from BIMCO for product testing. The feedback was then processed by DNVPS and the data warehouse, and there was a sense of having customer meetings just to do so, but not necessarily change according to the feedback. The plan for FI was set by the time customers were involved in the development, and they had already spent too much developing it. Hence, it became difficult to make too many adjustments based on feedback.

Over time, the service had become more complex, starting with a financial benchmark, but ending up with four different categories of benchmarks. Some benchmarks accommodated ship owners and others were aimed at charterers. A few interview subjects expressed that FI was so complex that you did not only need to be an expert in fuel, but also in using the solution to get insights. The situation has been described as a case where DNVPS were convinced internally that FI was a good idea, and kept building upon it without asking the customers about what they needed. The managing director of DNVPS, however, claims to have worked with the customer perspective and with people close to the customers, and have further said that functionality was

based on what customers valued highest. The last period before launch, the managing director of DNVPS was in Singapore and demonstrated FI to customers. Metric, on the other hand, indicated their perspective to be that R&I seemed to have designed the complex solution as much as DNVPS had from the beginning.

Maersk, one of the companies that initially triggered DNVPS in pursuing FI, turned out to be a disappointing lead for the project developing FI. After a long development, they discovered that Maersk had an issue in terms of timing for fuel purchasing, which meant that they were not interested in the FI solution. Also, Maersk had developed a system of their own in the meantime of FI's development, and they seemed disappointed over the graphic user interface, complexity and little flexibility of FI.

8. Deciding on a Revenue Model

During the development of FI, alternative business models were discussed at DNVPS, and by R&I and Metric. Hence, discussions on how to deliver the FI service to the market was a subject discussed on several occasions throughout the development of the service. An option favored by R&I, was to give the service away for free, making companies dependent on the value it provides, and then find out how to profit from it. The reasoning behind this opinion was that FI was an entirely self-automated service, which was a byproduct of another service, with its own well-functioning and stable business model. Therefore, it would be possible to give the service away for free in order to generate profit from it through other means, such as increased customer acquisition to fuel sampling. Yet another opportunity presented was that customers that reported the price paid for fuel, could receive benchmarks to see how efficient their fuel purchase was. Furthermore, a number of fuel suppliers showed interest in FI as a means to document their superiority. Albeit, no fuel suppliers were involved in the development of FI. However, these views were not shared by all parties involved in FI, and it was the managing director of DNVPS who had final say when choosing a business model for FI. It has been stated that DNVPS wanted to generate profit from FI. Thus, the decision to offer the service as a subscription was made before launch in May 2011.

Several interviewees have pointed out that the pricing of FI was also a discussion, where many have pointed out that it was priced too high. The pricing model was constructed using a benchmark for another product. FI was priced around $50 000, which was a high subscription fee. DNVPS defended the high price, based on the belief that they had a strong value proposition. It was later argued that the pricing was not anchored with how the customers perceived the value of FI, but was set to cover the expenses of developing and operating it. The costly development with Metric was partially the reason as to why DNVPS did not want to give FI away for free.

4.1.4 AFTER LAUNCH

9. Selling Fuel Insight

The initial plan was to launch FI at Singapore International Bunkering Conference (SIBCON) in October 2010. However, the managing director of DNVPS was not happy about the product and wrote an email to Metric complaining about the solution, arguing that one could not allow several minutes to update a webpage. Furthermore, not all the benchmarks were finished either. FI was instead launched in May 2011 at the Norshipping conference.

After the launch, DNVPS kept on improving FI based on customer needs. However, FI did not sell as anticipated, and the data-centric solution was costly. FI experienced a slow market penetration since they had struggled to convince people internally at DNVPS that it was worth working for and selling. There were few people internally who truly understood the service offering, and the sales force of DNVPS already had a large portfolio they were trying to sell. Selling this type of service was new to DNVPS, and the sales team did not receive sufficient training about FI and they were not properly incentivized to sell it. It turned out to only be one who was responsible for selling FI. Furthermore, the service required a lot of customer education. It was never the intent that a customer should be able to sit down and immediately understand FI. The intent was that DNVPS would create a closer relationship with their customers and show them how it worked.

Another reason for the slow market penetration was that the customers of DNVPS often had their own systems that they worked with, and they were used to that new systems could be implemented into their existing systems. However, the development of FI had not taken this into consideration, and FI was more difficult to integrate.

10. Change of Leadership

There was a change of managing director of DNVPS in June 2011[1]. The first one, who was a part of initiating the FI project, has been described as entrepreneurial and was invested in the initiative, and believed in it. The new director, that came in shortly after the launch of FI, has been described as more structured and systematic. Furthermore, the new director lacked the same ownership to FI as the previous one, as he had not been involved in this initiative from before and had other priorities. His priorities were more focused on improving the economy of DNVPS and its core services, and less on creating new services. The previous managing director had told the new one to terminate FI if he did not like it, but due to the engagement in DNVPS, he felt he could not discontinue FI.

The new managing director of DNVPS delegated the responsibility of FI to another person in the organization. However, it was stated that the one who got the responsibility lacked the mandate to launch FI properly. It was further expressed that the new leader gave up making a business of FI due to cutting staff and costs to make the upcoming sale of DNVPS from DNV efficient. Hence,

FI was not prioritized in the process. It seemed that the interest to get FI into the market was low, which can be illustrated by the fact that by the time of launch, DNVPS had not made any marketing material.

11. New Perspective on Target Customer
At some point DNVPS became aware that the shipowners were commonly not the ones buying fuel. The issue was that FI highlighted the problem of the fuel purchaser, which was irrelevant for the one in charge of daily operations on a vessel, who did not want to pay for the service. Furthermore, the fuel purchasers were "wined and dined" by the fuel suppliers, and so they did not want to see whether they were being deceived. These customers were not the ones DNVPS had established relations to. Hence, there was a lack in understanding who the customer was and the value FI could provide for them.

Furthermore, the new managing director of DNVPS noted that as he understood more of the fuel analytics market, he came to realize that the traditional customers of DNVPS who bought their core services of fuel testing were not the same ones who would buy FI. The traditional customer base of DNVPS worked in the technical departments of the shipping companies, but they were not the ones in charge of buying fuel, which was the target customers of FI. The ones who were in charge of deciding who and where to buy fuel from were not the typical customers of DNVPS, and thus, DNVPS did not have established relations to this customer group. This turned out to be a mismatch between their existing customer base, to whom they offered a very technical service, and FI, which was considered a very commercial type of service, that served a different customer group.

12. Change in Pricing
After FI was launched on the market and there had been an effort selling it as a subscription with a yearly fee of $50 000, it was decided to reduce the fee. This decision was made because DNVPS struggled to sell FI at this price, and they received customer feedback that it was too expensive. It has been stated by interviewees that "customers were laughing at DNVPS" due to the high price. Furthermore, the customers of DNVPS already paid a premium price for their testing service compared to other fuel testing providers, and some of them did not accept having to pay even more for their statistics. It also turned out that the product they had benchmarked against in terms of pricing was an unrealistic comparison. Thus, the yearly fee of FI was reduced to $3 000 - $12 000, depending on the customer.

13. Continuous Implementation of Customer Feedback
After its launch in the market, DNVPS worked to continuously improve FI based on customer feedback. Hence, DNVPS collected customer feedback and conveyed the ones they wished to implement to the Metric Center, who then integrated the improvements DNVPS wanted. The aim was to counter and improve the dismal sales figures of FI they were experiencing. Unfortunately,

the improvements did not seem to meet the customers' needs since it did not change the sales situation. DNVPS had planned for 250 sales of FI, but after two years they had only reached 20. This led to DNVPS paying the Metric Centre for improvements that turned out not to satisfy customer needs, and FI becoming a costly product offering without sales results.

4.1.5 DISCONTINUATION OF FUEL INSIGHT

This section will detail the discontinuation of FI and information on the selling of the unit DNVPS from DNV. This will not be utilized in the analysis of FI, but will provide the reader with background information on the project, and this will turn out to be relevant for the other project, EI, at a later stage in its development.

The new managing director of DNVPS never considered to discontinue FI when he entered his new position in 2011. This was due to the sense of enthusiasm regarding FI at DNVPS. However, for the next two years, FI did not sell as anticipated and the improvements made in an effort to improve sales, became a considerable budget drain for DNVPS. Thus, the decision to discontinue the offering of FI was made in 2013. It should be noted that even though FI was terminated, the platform was still 'active', which meant that Metric still provided support to the service, but there were no resources put into further development. The managing director of DNVPS, at that time, has stated the following about the discontinuation of FI: "Some way down the road you have to be able to earn money from the service offering, and I believe the realization was that it was not going to happen with the way the cost structure was set up" (Stabursvik, 2014).

Around the same time as the termination of FI, DNVPS became Veritas Petroleum Services (VPS) as it was sold to IK Investments Partners in 2013, and thus was no longer a part of DNV. This happened around the same time as DNV's merger with GL in 2013, and some interviewees believe this is due to cutting costs to ease the merger. Prior to the sale of DNVPS, R&I was asked to move the algorithm for computing the benchmarks of FI into their systems. Even though FI was discontinued, VPS was still interested in using the analytics from the benchmarking made by R&I. R&I took the benchmarking implementation they had developed and enabled VPS to generate benchmarks themselves. Thus, the FI platform was no longer a part of DNV.

4.2 ECO INSIGHT

This section will outline the development of the project EI, the operative service of the three projects studied. Before the merger of DNV and GL in 2013, there had been initiatives at both former companies which can be viewed as predecessors of what we know as ECO Insight today. These are included as their events shaped the subsequent development of EI's business model. Thus, the findings on the development of EI and its business model will be presented through three stages; the predecessor of ECO Insight at DNV before the merger, predecessor of ECO Insight at GL before the merger, ECO Insight at DNV-GL after the merger.

4.2.1 ECO INSIGHT CASE BACKGROUND

Project Timeline
- *September 2013 - Merger of DNV and GL*
- *2013 - Agreement to pursue project EI together*
- *July 2014 - Version 1.0 of Eco Insight*
- *September 2014 - Launch of ECO Insight*
- *September 2014 - Department for Fleet Performance Management established*
- *Jan/Feb 2015 - Bundled with Navigator Insight*
- *June 2015 - Partnership with Jotun*
- *December 2015 - Partnership with Hempel*
- *January 2016 - Digital Solutions and Innovation*
- *February 2016 - Partnership with VPS and implementation of fuel module*
- *February 2016 - Version 1.4 of ECO Insight with*

4.2.1.1 PRODUCT & MARKET

ECO Insight is a fleet performance management solution offered by DNV-GL Maritime. It is a portal that provides customers with a comprehensive overview of their fleet's performance. The solution aims "to assist ship owners and operators in making informed decisions in order to cut emissions, lower operational costs and save fuel"(ECO Insight flyer). The value propositions presented for EI are "identify best saving measures, increasing operational efficiency across the entire fleet, transparency for your customers, environmental performance reporting, and low effort, low CAPEX"[3].

More than a total of 800 ships are connected to EI, constituting about 35 customers. ECO Insight is offered to customers at a yearly subscription fee. However, they engage in contracts with a varying time frame with different customers.

ECO Insight utilizes the existing processes onboard ships for data collection, such as noon reports, voyage reports, bunker reports and automatically reported real-time data. All relevant data from customers is collected into the portal on a daily basis and is combined with other data sources such as Automatic Identification System (AIS) data and weather data. The portal compiles and displays the relevant ship performance data for data analytics and fleet performance management. The users are able to access the performance data for their entire fleet, where they can sort and compare vessels, also against benchmarks based on the world fleet average[1]. The user is presented with a dashboard with a number of features, which he/she can customize according to what they find relevant.

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[3] ECO Insight Flyer https://www.dnvgl.com/services/eco-insight-easy-fleet-performance-management-1175

There are around 30 people working on the development and delivery of EI. It is the offices of DNV-GL in Hamburg, Germany, who holds the overall responsibility of EI within the newly established unit called Fleet Performance Management, organized under the Department for Digital innovation, Maritime BA. The EVP of Digital Solutions and Innovations has the responsibility of EI, however, the director of Fleet Performance Management is the person who holds the daily responsibility, in terms of delivering and developing EI. Additionally, EI has teams in Norway, China and Singapore that report to Hamburg. These teams are mainly concerned with the technical development of the portal and with feeding the received customer data into the portal. Hence, the department of Fleet Performance Management has the main responsibility of EI, and cooperates with DNV-GL's Business Intelligence Competency Center (BICC) for technical development and support.

4.2.2 PREDECESSOR OF ECO INSIGHT AT DNV

1. Initiation of the FRAM Project
In 2012, DNV began a cooperation with World Wildlife Fund (WWF) and the Norwegian Shipowners' Association (NSA) through a project called FRAM. DNV helped these two organizations to create a portal for voluntary and free reporting of CO_2 emissions from the Norwegian shipping fleet. The goal was to create a framework for measuring and monitoring CO_2 emissions, and to use the framework to improve energy efficiency for project participants. In return, ship owners would receive reports on their performance. The project obtained funding to have a developer team from GSSIT (now named BICC) develop a technology. This technology was reliant on a reporting tool called Cognos, to create a portal that could receive and process reports on CO_2, emissions from shipping companies. This portal was finalized in the end of 2013.

2. Initiation of the Project Fleet Insight
The project manager of FRAM had previously worked at a shipping company where they had developed a performance management system. When he started at DNV GL in 2011, he started lobbying for DNV to create such a service offering due to the apparent market need and the neutral role of DNV. With the help a program manager, he managed to convince management to initiate a project for a fleet performance management system called Fleet Insight. Thus, the project manager of FRAM became the new project leader of this initiative, that was intended to be a premium version of Fram. The project team presented a business case and business model for Fleet Insight in January 2013. This was in part based on intel from two projects where DNV helped customers create their own performance management solutions. Shortly after this, Fleet Insight came to a halt since the anticipated merger of DNV with GL was about to commence.

4.2.3 PREDECESSOR OF ECO INSIGHT AT GL BEFORE THE MERGER

3. Opportunity Recognition in the Market

GL had also worked on an initiative before the merger that can be viewed as a predecessor of ECO Insight. In 2012, GL Maritime Solutions had been looking at various firms offering advisory services in the industry, and concluded that they were better prepared to deliver such a service. GL saw that they could be better positioned, as a bigger company, to deliver such a service compared to the 10 - 15 smaller competitors offering fleet performance management

4. Planning a Subscription Based Service

In the middle of 2012, GL had a management workshop where they put together a one-page document about a ship performance management concept. This document meant that the management wanted to develop a service within this sphere. The document described that they were seeking to create services to be sold on a recurring basis for more stability revenue-wise, in contrast to the traditional one-off fee for projects at Advisory at GL. It was given from the beginning that the service should be developed in a manner that it could be sold with a recurring revenue model.This was the start of what GL called Eco Performance Manager, that later contributed to the business logic to EI from the GL side.

5. Small Scale Experimentation

After the management workshop in GL Maritime Solutions, they started up a project to investigate how they could leverage the data collection onboard ships in order to create something better than the current solutions. This project was headed by a project manager for corporate development. Their first solution was an Excel table that they designed and gave to some clients. In this period they collected several Excel tables with reported data from clients, which they used as input to design their own template. Then the merger with DNV came, and the project came to a halt.

4.2.4 ECO INSIGHT AT DNV-GL POST MERGER

6. Hamburg Offices to Pursue the Development of EI

The merger of DNV and GL happened in September of 2013. As a consequence of this merger, DNV and GL compared initiatives, amongst them fleet management performance. They realized that they could combine the intelligence and insights from GL, with the portal technology DNV had explored through FRAM, and that this could represent a strong value proposition. The newly formed firm decided to integrate the initiatives and call it ECO Insight. Moreover, employees at DNV-GL has stated that EI became a joint initiative for DNV-GL because the right kind of people, with the right positions and resources pushed it through.

With project initiation in 2014, EI became one of the first combined projects between DNV and GL, with people from Advisory from both sides. Two sides shared of their knowledge and experiences based on prior initiatives, and there were many discussions on choice of technology

and business model. There were disagreements regarding the business model for EI in terms of pricing and product strategy. The GL side of DNV-GL took the lead in continuing the initiative,especially headed by the EVP of Maritime Advisory, and it was decided that the project manager of previously Eco Performance Manager would become the project leader for the joined initiative at DNV-GL. Since the ownership of EI then resided with the offices in Hamburg, they became the decisionmakers with regards to the technology and business model. As the initiative for performance management at GL prior to the merger was based on a subscription-based revenue model this was continued into EI. Thus, the development of EI revolved around finding the right model and technology to support a subscription-based business.

7. Establishment of Dedicated Team

A difference with EI compared to other initiatives in the past at DNV, that has been noted by some of the interviewees, is that the leadership behind EI funded the entire organization of it from day one. Previous initiatives were said to have suffered from the fact that a lot of the work had been done ad hoc and that project participants have had to focus on several initiatives simultaneously. The leadership of EI had focused on dedicated team members being able to devote their full attention to the project as well as appointing an entrepreneurial project leader. Hence, the organization of EI has been defined as different compared to similar initiatives that have been conducted earlier at DNV or DNV-GL, as the focus was to make the initiative rather independent from the rest of the organization.

8. Choice of Technology

Of the allocated team members to EI, was a fully dedicated IT team from BICC, delivering internal services to DNV-GL. This IT team had already developed the technical solution for the FRAM project prior to the merger, relying of a technology supplier to deliver a reporting tool named Cognos. After a rather short evaluation of options, it was decided that EI would reuse this technology in EI since they already had competence within this technology, and due to management who wanted a short time-to-market. The technology is revisited in the event "Discontinuation of technology component".

9. Integration of External Data Sources

During the summer of 2014, version 1.0 of EI was built. Soon the project team realized that they had access to more data than previously contemplated, that could enrich the insights. Hence, the project managers decided to integrate the data collected from customers with AIS data and weather data, which DNV GL already paid for access to.

10. Piloting the Service

The first pilot customers of EI were chosen at random and were based on established connections. The initial focus was on energy efficiency, being the container shipping segment. This segment was also an initial focus because DNV-GL had close ties to them in Hamburg.

However, the management of EI wanted a pilot to be conducted in Singapore to enforce a global scope from the beginning. The management team in Singapore chose a bulk carrier operator as the first pilot customer.

Currently, EI is sold to all segments from cruiseliners, to container ship liners to bulk. DNV-GL's sales approach is based on using DNV-GL's established network of customers. Feedback and requirements from the various segments are further translated into features that are built into EI. EI is also used internally by the Maritime Advisory services at DNV-GL, that also provide feedback to the IT development team and promote EI to DNV-GL's network.

11. Establishment of the Business Unit Fleet Performance Management
In September of 2014, the EVP of Maritime Advisory created a new business unit for Fleet Performance Management. This way, EI became institutionalized within a global business unit that develops its own content all the way down to sales and execution. From then on, there was an official line of management for EI where the product owner reported to the Director of Fleet Performance Management, who reported to the Head of Maritime Advisory. This line of management became the decisionmakers of EI in terms of its overall strategy, business model, and day-to-day management, except for the decisions within the general IT landscape, which was decided by the appointed IT team. At the same time, EI was officially launched at a trade fair in Hamburg.

12. Realization About Target Customer Value
By launch, in September 2014, DNV-GL hosted a committee, where key account managers came together. A participant commented on his role as a third party ship manager, i.e. performing services contracted through the shipowner, suggesting that he had no benefits from a product such as EI. The EVP of Maritime Advisory then realized that half of the customer base for EI were third party ship managers who did not benefit from the solution. Hence, he approached the customer and asked what they had valued in EI upon the purchase. The response was "because it's not energy efficiency, the focus is transparency and control", in order for this market segment to win the trust of their stakeholders and therefore, their vessels and customers.

Consequently, the newly discovered value proposition was added to include transparency and control for the third party manager, as well as the benefits of performance management. Thus, the message to the sales was to sell transparency and control, and not make any claim with regards to saved fuel.

13. Bundling EI with Navigator Insight
A change was made to EI in the beginning of 2015 when the service was connected to another service developed at GL prior to the merger, Navigator Insight. Navigator Insight is a software running onboard ships, serving as a reporting tool that can receive, send and store all types of

data automatically, and then returns a report. When EI has a connection to Navigator Insight, it can get the data directly from Navigator Insight's server. Without Navigator Insight, customers upload excel sheets in a specific format, which is not very user friendly and often results in dissimilar data. A goal is therefore to sell EI and Navigator Insight together as a joint offering. However, some customers will only buy EI as they already have developed an equivalent to Navigator Insight. Whereas other customers have bought Navigator Insight, but not EI yet.

14. Implementation of SCRUM Methodology
The team developing EI changed their work method in the beginning of 2015, to a more agile product development process through attending a SCRUM course. Previously, there was not much structure to the development process, and going from version 1.0 to 1.1, the development team got a list of things to be done, which they worked on for three to five months. With the new SCRUM methodology, the team would work in three week long sprints, ending with a demo. The priority lists for each sprint were mainly based on testing and bug identification, performed by the product manager and DNV-GL employees.

Some of the interviewees, especially the IT development team expressed a lack of user involvement in the development of EI. There are disagreements in terms of how to adapt the development of EI to how the customers use the service, and verifying what the customer maturity is for different types of widgets in the service.

15. Yearly User Conference
In 2015, the Department of Fleet Insight arranged a user conference for the first time, inviting clients to spend a day at their offices in Hamburg. This conference was intended as a yearly event where they could receive feedback on the service offering and provide training. This was regarded as important as the sales process is slower than the development of the solution. Most potential customers already have some kind of system, and it is a big project changing it. Thus, customers' understanding and interaction with the product is quickly outdated.

EI is a product that requires close relationships to the customer as well as post-sale activities. When a customer has agreed to purchase EI, DNV-GL run an implementation project with them to help them set EI up and to ensure that they understand how to use it, and this is EI's main source of customer feedback. Upon implementing EI with a client, they make sure to have a representant from the client who needs to learn why using EI is important, and that makes sure the crew reports the data correctly. However, one of the current key issue challenges is that the focus is more on putting customers in a position to get value, but no effort is currently made to ensure that value is obtained, thus setting up activities for guiding user behaviour.

16. Entering Partnerships

As part of EI's strategy they explore new business opportunities through partnerships. EI was assigned as a dedicated partner manager from DNV-GL Norway, in January 2015. After this, DNV-GL and EI has entered partnerships with two paint suppliers for the shipping industry, and Environmental Ship Index (ESI) a voluntary system designed to improve the environmental performance of sea going vessels.

The high quality paint suppliers needed a credible third-party to verify that their high quality paints would yield reduced costs over time. Thus, DNV-GL entered a partnership with Jotun in June 2015 and with Hempel in December 2015. EI can perform the digital analyses that can help Jotun and Hempel show their customers the long term value of their high quality paints. For EI, these partnership imply increased exposure, through Jotun and Hempel's customer bases.

As of March 2016, EI entered a partnership with ESI. This is a partnership based on the two organizations being related to one another and referencing each other. EI can generate the necessary data input for the shipping companies to report to the ESI. The shipping companies' incentive for doing this is to show transparency in terms of environmental performance, while they in return may receive discounted stays in ports. DNV-GL offers a 50 percent discount on the subscription of its EI Environmental module, and gains publicity, and a footprint in the market in return.

17. Establishment of the Department for Digital Solutions and Innovation

Organizational changes at DNV-GL in January 2016 made Albrecht Grell, the previous EVP of Maritime Advisory, leader of the new department Digital Solutions and Innovation (DSI) within the Maritime BA. The the aim is to transform DNV GL Maritime, leveraging digital technologies, and DSI included the Department for Fleet Performance Management. After this event, the former EVP of Maritime Advisory, now the head of DSI, do not control the same resources as before. This means that if EI needs consultants or other resources they must be rented at a cost from another department.

18. New Fuel Module in ECO Insight

One of the most recent developments within EI is the implementation of a fuel module in EI. This is delivered through a partnership with VPS, which was previously part of DNV under the department DNVPS .This partnership was announced in February 2016, and the fuel module was released with version 1.4. Thus, VPS supplies EI with proprietary and valuable data, while VPS can give their current customers free access to this module in EI, which may increase their customer acquisition. No customers had specifically requested the feature, but the fuel module could be a mean of differentiation from other similar solutions. The contract state that EI receives data, and in return customers of VPS may receive free access to the Fuel Module of EI. The fuel

module is said to not differ considerably from the way it was in the previous project Fuel Insight (section 4.1).

19. New Business Developer to Innovate ECO Insight
In April 2016, a new business developer was appointed, located at the headquarters at Høvik, Norway. He is hired to function as a counterpart to the product owner, with the aim to develop new services to be offered in connection to, or within EI.

20. Discontinuation of Technology Component
The development of EI was based on the same technology as was used in the FRAM project, since this is what DNV-GL had licenses to and competence within. Now, the technology supplier has decided to discontinue the support of a component within Cognos, which is a vital part of the EI infrastructure and its performance, and therefore, this forces DNV-GL to find a different technology and technology supplier for EI. This is, however, a change they would have performed independently of the described event, as the current technology does not perform as required. This constitutes a challenge as large amounts of data will have to be transferred. The transition to a new system will be costly, but still interview subjects indicate that the previous technology decision was beneficial as it helped EI to be launched quickly. Now, that the value of EI is better verified, the business case to make an investment in new technology is strengthened.

4.3 PUSH BASED CLASS

This section will present the findings on PBC, and is structured according to the same three stages as in findings; project initiation, project phase and handover of PBC pre-project. Regarding PBC, the reader should note that in contrast to FI and EI, PBC was a pre-project at the time of the authors' research conducted at the research department at DNV-GL, and not a commercialized project. PBC being a pre-project means that its purpose was not to commercialize the technology, but to investigate that the concept was technically feasible and how it could be further developed after a handover from the research department. Thus, the business model remains undecided and will depend on which unit who chooses to further develop and implement the concept.

4.3.1 PUSH BASED CLASS CASE BACKGROUND

Project Timeline
- *2014 - Origin of idea*
- *2015 - Proof of concept*
- *2015/2016 - Pre-project Push Based Class*

The PBC pre-project investigated how a methodology developed for estimated time of arrival (ETA) of vessels based on Automatic Identification System (AIS) data, could be used to create a survey planning tool for vessels' classification services. AIS data is an automatic tracking system with the purpose of locating and identifying vessels at sea. Hence, the algorithm which used historic AIS data for the routes of vessels could be used to predict their future routes.

The way ship classification services function today is that it is the shipowner's responsibility to schedule any upcoming surveys. However, this is currently causing risks for the shipowners and bottlenecks for DNV-GL as a classification society. First of all, overdue surveys may put the shipowner at higher risk for port controls. Second, late bookings may cause last minute planning, re-scheduling and expensive fly-ins of surveyors. This, combined with the fact that some stations are frequently overburdened while others are underused, constituted the foundation for the PBC concept (DNV-GL R&I, technical report nr: 2016 - 0075).

The idea of PBC is to enable DNV-GL to take control of the survey planning of vessels. In order to do so, they need to be able to know the future schedule of their vessels. The ETA algorithm they have developed can be used to estimate vessel's time of arrival in ports based on the shipping companies schedules, if they provide them to DNV-GL, or they can use historic AIS data to predict the future route of vessels. This way, DNV-GL could take the first initiative for scheduling surveys of vessels based on the future route of the vessels and where it is most optimal to conduct the survey for both parties.

The first project that developed a methodology for calculating ETA based on AIS data was conducted by a researcher at SR&I. The team conducting the pre-project of PBC was performed within a four-week period with five people from the SR&I IT program, one of them being the developer of the ETA methodology, and one from the IT unit BICC. All of them performed a technical task in the project. The project team also included a business developer who had experience from working with class processes who was actively involved in selecting use cases for PBC.

4.3.2 PROJECT INITIATION

1. Origin of Idea at the GL side
A part of the background of PBC is DNV-GL's work on an AIS suite where they amongst other things looked into how they could improve internal operations based on AIS technology. It immediately popped up that they could perform survey planning based on AIS data to predict the arrival of ships to ports and stations. At the Hamburg offices of DNV-GL, they have relations to the port of Hamburg where they were told that there is a problem of congestion in the port. This is because they are not able to move the vessels to the right place quickly enough, hence, queues

develop since the ships have to wait, usually outside the port, causing efficiency decreases. With this issue in mind, DNV-GL began investigating the possibility of making predictions for the arrival of ships to the port of Hamburg. This is called making an estimated time of arrival (ETA). The Hamburg offices of DNV-GL ran a small pilot with an external Big Data consultancy on this idea of making predictions for vessels using AIS data, investigating whether it should be internally or outsourced. They choose to pursue it internally at SR&I because the concept required exploration and research.

2. Origin of Idea at the DNV side
From the perspective of the developers at SR&I, the idea originated in the autumn of 2014 when a business developer at DNV-GL presented them with an online portal from the EU (http://www.equasis.org) that shows the technical conditions of all vessels, i.e. classification. First, the idea was thought to be used for active sales and customer acquisitions for DNV-GL's classification services by offering surveys to both DNV-GL's existing customers as well as to non-DNV-GL ships that approach a port. To achieve this they needed a manner in which they could predict the route of ships, which could be achieved using historic AIS data that is publicly available for all vessels. Thus, two employees at SR&I got the idea of this estimated time of arrival (ETA) algorithm based on publicly available AIS data, after the meeting with the business developer. However, since ships rarely change classification societies, they altered the primary use of this idea as intended to enable DNV-GL take more initiative in offering surveys to their customers rather than active customer acquisition.

Also, SR&I had talked about investigating new ideas towards ports where this idea of predicting vessels' routes to ports was one of the things that came up. They conducted a project in 2015 called "Port Visitor" where they discussed the idea of an ETA algorithm and refined it. Through this project, the members got the chance to speak with relevant customers, stakeholders and isolated a few business cases. Hence, PBC is the result of ideas and efforts from several parties at DNV-GL.

3. Initiation of Project
The program director of SR&I's IT program presented this idea of an ETA algorithm for ships entering ports to a manager of the CSM process, who was intrigued by the idea. They developed the idea further into the concept of PBC where DNV-GL can take more responsibility of the class process in terms of availability and optimization, and thus, minimizing the customer's cost.

An employee from SR&I developed the ETA algorithm in the middle of 2015 where he made a simple proof of concept in a web interface. This was an algorithm that used AIS data and historical tracking data for the ship to predict where the vessel is going next.

In the beginning when they began to process the concept of PBC and that it could be interesting for everyone who runs a port-based service to see when a ship will be arriving, they experienced little enthusiasm about it. However, when they mentioned PBC to Jotun and Wilhelmsen who sell ship paints and chemicals in harbours, more people became interested in this concept. These companies said that a solution like PBC could help optimizing the delivery of their products, the pricing and storage requirements. Hence, those working on PBC at DNV-GL saw an opportunity to not only optimize their own processes using this ETA algorithm, but also to serve other companies operating out of ports. In light of this, they had a dialogue with Jotun from quite early on as a potential customer or partner of PBC. Based on the ETA algorithm developed at SR&I, and the mentioned processing of the concept of push based classification services, it was decided by management to run a pre-project on PBC.

4.3.3 PROJECT PHASE

Project Objective
The PBC project was conducted within the SR&I department of DNV-GL with the aim to identify and specify user requirements and desired functionality, identify, collect and make required data sources available, and finally, to develop a proper visualization prototype[4]. The project team was set up by the program director of information, technology and analytics at SR&I together with a senior researcher.

4. First Round of Prototyping and Demonstrations
All project participants were relieved of their other tasks, and were co-located for the purpose of developing PBC on a full-time basis. All participants have underlined the benefits of having a cross unit collaboration, and the fact that they could work full time. This work style was chosen as a consequence of previously positive experiences with such a work method. Furthermore, this is aligned with the overall efforts at DNV-GL, where they strive to work in a more modern manner - intensively and in cooperation with participants from IT, research and the relevant BAs. During the project, the team integrated the data and made a web application. Overall, with all resources available, the project participants report few problems with the development. All the data was internal and they had people familiar with the data warehouse in the project team. Furthermore, the team member from BICC unit had experience with class processes and their data, hence this eased the process of understanding results in the development.

The project team created a mockup powerpoint that they demonstrated to a few key account managers and a station manager. This demo became a means to collect new ideas, and project participants emphasised visualization and interactivity as important for accomplishing buy-in from others, a lesson from the previous project FI.

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[4] DNV-GL R&I, technical report nr: 2016 - 0075

5. Choosing a Customer Segment

Two possible customer segments was considered for PBC, which they referred to as two perspectives on how to develop PBC. It was either a vessel view targeting superintendents and customer service managers (CSMs), or a station/port manager view meant for DNV-GL station managers. The vessel-centric view was intended for planning upcoming surveys for a vessel or a small fleet of vessels, whereas the port-centric view was intended for managing the degree of utilisation of stations or ports.

During the project period, the project team had no contact with external customers of DNV-GL. However, they talked to internal station managers and CSMs. The station managers seemed enthusiastic about the solution and recognized the problem it solved. The CSMs recommended the project team to pursue the station manager view. There were some uncertainty about the value they would receive from PBC, and some CSMs meant that the customer did not mind calling DNV-GL for surveys, and would therefore be reluctant to use a tool. Hence, the decided to follow the CSMs' recommendations to pursue the station manager view.

Furthermore, this decision was made since data quality was mentioned as a critical issue, and it would be safer to first test PBC with internal customers than external ones. It is further underlined that it was decisive to receive internal feedback about the value the service brought about. The intent was therefore to first use PBC as an internal tool for station managers to monitor ships for survey status, enabling them to contact customers about surveys that are due or if the station has available slots. The next step would be to let the customer be in charge.

Project participants have stated that the discussion on business model during the project was more focused on how to get the customer to use PBC. They discussed ways to engage the customer such as reduced costs in return for planning surveys. Furthermore, there was some disagreement amongst team members as to how early business competence should be involved in the project, since its objective was to develop a proof of concept.

6. Second Round of Prototyping and Demonstrations

Despite choosing the station manager view, the project team decided to implement the vessel view for the web application first, as this was technically easier to do. A project participant stated that by choosing vessel view "they did not need to take the product that far". It would also considerably reduce the problem complexity as a single ETA had to be estimated instead of ETAs for a large number of vessels, which would have to be done with the station manager view. Therefore, this could be a starting point to build upon for calculating ETAs for a larger number of vessels later on.

During the development of the web application, the process came to a halt when it took time to get updated AIS data from their supplier, Vessel Tracker. This, despite the fact that DNV-GL had contractual rights to get the data. Since an ETA algorithm is based on publicly available data, anybody could make a similar product, and Vessel Tracker has also developed their own ETA service.

In the end of the project period the web application product was demonstrated to stakeholders in DNV-GL. These were business developers at SR&I, station managers with responsibility for the international ports, some managers from Høvik and for the offices in Rotterdam, Singapore, Bergen and Stavanger. It was also demonstrated to a project called Station Cockpit. The response was very positive since they could show how PBC could help DNV-GL better utilize their surveyors, while also giving the customer a better service at a lower price. Furthermore, station managers currently use much resources in planning and management which might be reduced with the use of PBC.

4.3.4 HANDOVER OF PUSH BASED CLASS PRE-PROJECT

7. Deciding on Handover of Push Based Class
PBC was meant to be handed over to another project that was supposed to start early in 2016. However, the entire development portfolio had been reorganized at DNV-GL Maritime, and the person who was promised funding to continue PBC was no longer ensured this. SR&I have indicated that they intend to run a pilot with Jotun regardless of the other alternatives for PBC. This collaboration may provide additional input about potential external ETA users, and because such a pilot would create useful learning for SR&I and DNV-GL.

On the other hand, Station Cockpit, a project that has created a tool used by station managers and surveyors to collect key information for managing a station, had shown interest in PBC. They may want to incorporate the outcome from the project into their solution. The Station Cockpit project has been offered a functional solution which can be used to test the usefulness and requirements for required accuracy. However, the solution is not yet a user-friendly web solution, but a hack where they could submit a list of vessels having booked a survey for selected ports, and in turn would receive a file containing ETAs based on the DNV-GL-made algorithm, the ETA from Vessel Tracker and an ETA based on the shortest route to destination port. The station managers would then get the ETAs for their port(s) twice a day in an Excel file. As far as the authors of thesis are aware, this remains undecided.

At a later stage, it was decided that the Digital Solutions & Innovations (DSI) unit of DNV-GL was to continue developing PBC after a handover from SR&I. They have decided to create a 'manual' solution of PBC. In this case, shipowners are supposed to provide port schedules of their DNV-GL classified vessels to DNV-GL, alleviating the need for a longer term ETA prediction based on historic AIS data. These shorter term ETA predictions are still needed in

order to prepare for any delays and so on. This decision was made since management were convinced that PBC is a good idea, but due to the uncertainty of a dynamic calculation such as ETAs, they decided to reduce this uncertainty by going straight to the source of information for vessels routes, i.e. the shipowners. These are the ones who most likely have the most accurate information as where the ship is heading and when it will get there. Thus, the decision has been made to develop short-term ETA calculations for a few hours or days, in order to estimate when a vessel reaches its destination.

5. ANALYSIS

This chapter presents an analysis of the findings from chapter 4 in light of the theoretical background. This chapter consists of two steps: First, each project is analyzed separately, event by event, with regards to the theory on BMI activities, leadership, network relations, customer involvement and the organizational context. Secondly, the findings from each project analysis are cross compared regarding BMI activities and their outcome, and with regards to the influence of the dimensions and their interrelatedness. This will enable the authors to answer the research questions.

It should be noted that the analysis is conducted on an activity level, whereby each event is decomposed into activities, which are used to identify outcomes on the business model as illustrated in figure 2. This is done to be able to identify specific BMI activities and their associated outcomes on the business model or on subsequent events, and to investigate how the dimensions impact the BMI activities.

Event

Activity   Activity   Activity
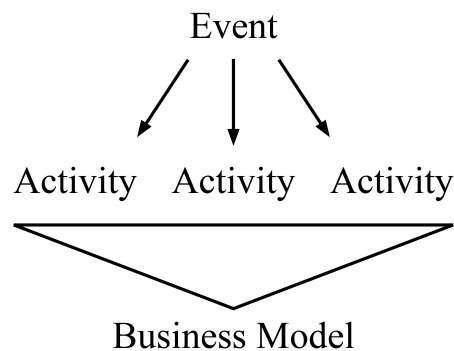
Business Model

Figure 2: Structure of analysis where one event can be decomposed into one or more BMI activities, that again has an effect on the business model.

5.1 ANALYSIS OF FUEL INSIGHT

In this subchapter, the events identified for FI in chapter 4 are analyzed with regards to BMI activities, their outcome on the business model, the dimensions of leadership, network relations and customer involvement, and the contextual factors. Table 4 presents the analyzed events and explain how they impacted the business model of FI and if they were affected by the dimensions. After table 4, this section is structured into the same three stages as previously in the findings on FI (ch. 4), i.e. project initiation, handover to development and after launch, wherein the associated events will be analyzed.

Table 4: Events in the development of Fuel Insight's business model with associated BMI activities, dimensions, contextual factors and impact on business model.

Event	BMI activities performed	Dimension(s)	Contextual factor(s)	Impact on business model
1. Initiation of the project	Recognize and act upon external trigger Collect and analyze intelligence Configuration of business model components Demonstrate value creation	Leadership	Capabilities: Strategic sensitivity Resource flexibility	Value proposition Market segment
2. Developing the methodology	Collect and analyze intelligence Knowledge transfer Experimentation Configuration of business model components	Leadership		Value proposition
3. Choice of in-house implementation	Configuration of business model components Institutionalization	Leadership	Barrier: Dependencies amongst BUs	Value chain Revenue model Cost structure
4. Choice of technology	Configuration of business model components Choice of technology	Network relations	Capability: Strategic flexibility	Value chain Revenue model Cost structure Value proposition
5. Use of internal experts for initial service development	Experimentation Configuration of business model components	Customer involvement		Value proposition Market segment
6. Partnership with BIMCO	Configuration of business model components	Network relations Leadership	Capabilities: Strategic sensitivity Resource flexibility Strategic flexibility	Value network Value chain
7. Product testing with customers	Experimentation Configuration of business model components Collect and analyze intelligence	Customer involvement		Value proposition Market segment
8. Deciding on a revenue model	Collect and analyze intelligence Configuration of business model components	Leadership		Revenue model Cost structure
9. Selling Fuel Insight	Institutionalization Knowledge transfer Configuration of business	Leadership	Barriers: Managing strategic paradoxes	Value chain (and required assets to support

	model components		Prevailing business model and underlying configuration of assets	position in value chain)
10. Change of leadership	Institutionalization Configuration of business model components	Leadership	Barrier: Managing strategic paradoxes	Value chain (and required assets to support position in value chain)
11. New perspective on target customer	Collect and analyze intelligence Organizational learning Configuration of business model components	Leadership	Capability: Strategic sensitivity Barriers: Managing strategic paradoxes Prevailing business model and underlying configuration of assets Dependencies amongst BUs	Market segment
12. Change in pricing	Knowledge transfer Organizational learning Configuration of business model components	Customer involvement	Capability: Strategic sensitivity	Revenue model
13. Continuous implementation of customer feedback	Ensure continuous knowledge acquisition Knowledge transfer Configuration of business model components	Customer involvement		Cost structure

5.1.1 PROJECT INITIATION

1. Initiation of Project

Based on the data analytics trend that influenced the research department at DNV and the lack of transparency in the bunker fuel market combined with DNVPS' comprehensive fuel testing database, led DNVPS' managing director to initiate the development of a fuel analytics tool that addressed this lack of transparency. This event coincides with findings in the theoretical background on triggers of BMI. There was an external trigger influencing DNV, where leadership chose to act upon a valuable opportunity (Bhide, 2003; Sosna et al., 2010; Jones & Macpherson, 2006), and thus, played a crucial role (Sosna et al., 2010). Hence, leadership played a direct role in promoting FI by *recognizing and acting upon this external trigger*.

Furthermore, DNVPS had received signals from clients that there was a time issue in ordering fuel, and a need for statistics on fuel purchasing that was quick to access. Thus, there was an antecedent customer involvement that contributed to this decision of initiating FI, i.e. *intelligence was collected and analyzed*. The customer involvement providing knowledge about this unmet problem in the market (Teece, 2010) represented an inflow of knowledge into DNVPS, which

contributed to their decision on making a new, innovative service. This can be related to Chesbrough et al.'s (2006) concept of open innovation where inflows of external knowledge into a company can increase innovation output.

Recognizing and acting upon this external trigger is also connected to the contextual factors of a company that may affect BMI. The fact that DNV recognized this market trend and delegated resources to act upon it relates to Doz & Kosonen's (2010) capabilities of strategic sensitivity and resource flexibility, whereby DNV 'sensed' strategic developments in the marketplace and allocated resources to pursue this potential opportunity. This indicates that DNV demonstrated some of the necessary capabilities identified by literature to initiate the BMI process. Furthermore, the managing director of DNVPS demonstrated entrepreneurial skills by seeing and initiate to realize an entrepreneurial opportunity (Guo et al., 2013).

The trigger of utilizing data analytics to create transparency, which is one of the value creation dimensions with data identified by Wamba et al. (2015), in the bunker fuel market influenced the *configuration of the components* value proposition and target market (Chesbrough, 2010). The view of FI's value proposition and target market did not appear to change throughout the project development and commercialization, although the perspective on target customer within the market segment was reviewed at a later time. Thus, the chosen value proposition and target market at the very initiation of the project was influential for the final business model. This can be related to findings on leadership in the context of BMI from the literature review. The value proposition for FI was based on the management of DNVPS' hypothesis of value creation (Teece, 2010) in this market. Hence, the management's presumptions about the market need was decisive for the resulting business model of FI. This can also be related to the proposed steps of BMI by Euchner & Ganguly (2014) who suggest to begin the process by defining the value proposition of the innovation, i.e. *demonstrate value creation*.

2. Developing the Methodology
After some time exploring different possibilities with DNVPS' data sets, the managing director of DNVPS asked R&I specifically to develop benchmarks for the quality of fuel and the suppliers of it, which means that leadership directly impacted the choice of value proposition. R&I created the methodology for such a benchmarking service, and made some quick prototypes, i.e. *experimented* (e.g. Sosna et al., 2010) as to how the service could be made. Based on this, the managing director of DNVPS made the decision that they were to pursue further development of FI and implement the service. Thus, the choice of what the service was to entail was chosen by management of DNVPS, and their assumptions of what the market needed (Teece, 2010). Although these assumptions were grounded in previously *collected customer intel* on an unmet market need, which shows an initial market focus (Chesbrough & Rosenbloom, 2002) mediating the initiation of FI. The knowledge of this customer need was obtained via a KAM, and successfully leveraged into the organization (Foss et al., 2011), i.e. *knowledge transfer*, to the

managing director of DNVPS.

The decision of creating a specific benchmarking service for the quality of fuel and fuel suppliers early on limited the potential business model options for FI (Morris et al., 2005), and was a *configuration of the business model's* value proposition. The findings from the development does not indicate an evaluation of any other options than creating this benchmarking service, which is noted in the theoretical background as an important step in the BMI process (Euchner & Ganguly, 2014; Palo & Tähtinen, 2013).

5.1.2 HANDOVER TO DEVELOPMENT

3. Choice of In-House Implementation
DNVPS chose in-house implementation with the IT unit of DNV, Metric, which was decided by the managing director who therefore exerted a direct impact on the business model. This meant that Metric would be the ones who operated and supported the service platform. Hence, this decision further *configured the business model* of FI (Amit & Zott, 2010) since it entailed that the value chain of FI was structured on the basis of this choice, and the cost structure of paying Metric for implementation and support was determined (Chesbrough, 2010). However, in this instance, they had considered the option of outsourcing (Euchner & Ganguly, 2014; Palo & Tähtinen, 2013), but chose in-house implementation since DNVPS wanted a closer connection to the rest of DNV, and thus, FI was *institutionalized*. This choice therefore affected the business model of FI in the manner that it needed to be aligned (Santos et al., 2009) with the one of Metric, which is a contextual factor of the organization affecting BMI since there arises dependencies amongst BUs.

This decision of in-house implementation also relates to Teece's (2010) statement on that in designing a business model, one needs to determine a set of lateral and vertical activities that must be performed, and evaluating if and how they can be performed cost-efficiently enough to enable profit, and who is to perform them. DNVPS had determined the activities to be performed, and chose Metric to conduct the technical development. However, since Metric had a certain way of structuring their work, and the dynamic development took a long time and became costly, this choice turned out to affect the pricing, and thus, the revenue model (Chesbrough, 2010; Teece, 2010) for FI. By reason of the expensive development, which DNVPS had to pay for, they would later on choose a high pricing for a subscription-based revenue model for FI in the event of "deciding on a revenue model".

4. Choice of Technology
There were disagreements as to which technology to base FI on, which is deemed an important choice in the process of BMI by Teece (2010) and Palo & Tähtinen (2013). Since DNVPS' *choice of technology* turned out having a significant effect on several elements of FI's business model, the empirical findings support the literature in that *choice of technology* is a significant

step in the BMI process.

DNVPS and Metric decided to use IBM's reporting tool, Cognos, which Metric was familiar with, to develop FI. However, this was a choice of debate and the chosen tool turned out to present limitations on the development of FI. Thus, this was another decision that entailed *configuration of business model components* (Amit & Zott, 2010). Since this choice contributed to a complicated and costly product development, it also contributed to DNVPS deciding on a high pricing with a subscription-based revenue model in a later event. Furthermore, this decision made FI dependent on the maintenance of the Cognos system by IBM as a technology supplier, which affected the business model's value chain. Kijl et al. (2005) and Palo & Tähtinen (2013) has emphasized the importance of several actors cooperating in offering a technology-based service, where its entire value chain is rarely dealt with by a single actor, which is appropriate in this setting. However, Bock et al. (2012) argue that partner reliance may reduce strategic flexibility for innovating business models, which is identified as a capability in the organizational context that is necessary for BMI. In the case of FI, it would turn out that IBM's Cognos tool would become a limitation for FI's development. Amongst other things, the tool limited the possibilities in creating a user-friendly interface for the FI solution, which would later on affect another event called "Selling FI".

Thus, the *choice of technology* turned out to affect the cost structure of developing and operating FI, which again impacted their choice of pricing and revenue model, and it affected the structure of FI's value chain with IBM as a technology supplier. Lastly, it can be argued that since their choice of technology limited the ways in which they could create a user-friendly interface and an intuitive solution, it impacted the value proposition of FI.

5. Use of Internal Experts for Initial Service Development
Chesbrough & Rosenbloom (2002) underline the importance of having an initial market focus for innovating business models based on new technology, which is supported by Alam (2002) and Kindström (2010) in the case of offering services. In the beginning of the FI project, the representatives from R&I were not allowed to talk to customers, but they received a lot of input from internal experts from DNVPS in *experimentation*. The internal experts gave input on behalf of the customers or end users. Thus, the methodology which FI builds upon seems to be based on the feedback from the internal experts from DNVPS. This relates to von Hippel's (1986) concept of lead users, where he suggests identifying users of a product or service who face needs that will become general in the marketplace in the future and who significantly benefit by obtaining a solution to those needs. Involving the right type of users becomes particularly important in high technology industries or fast-moving markets (von Hippel, 1986). The internal experts from DNVPS may be considered lead experts ahead of the market within fuel testing analytics, but the authors of this thesis argue that they did not represent all of the issues faced by the actual users of such a solution in the marketplace. DNVPS did show a few customers what they were thinking

when developing FI, which indicates customer involvement, although the customer did not get to experiment with the service at this stage.

The emphasis on use of internal experts in the early stages of development appears to have affected the complexity of the value proposition which FI ended up with, and a misalignment in how this value proposition matched the needs of different customer segments. In table 4 above this is listed as a configuration of the component market segment, which is deemed to involve the aspect of customer segments and identifying target customer. Thus, in every event the service's view of target customer is defined or altered, it is categorized as the business model component market segment. This complex value proposition which targeted different customers to varying degrees would later turn out to have an effect on the subsequent event of "Selling FI".

Furthermore, it has been stated by informants that DNVPS were reluctant to involve customers too much in fear of creating expectations in the marketplace. This relates to literature on BMI in the context of leadership. Byrd & Brown (2002) argue that the organizational context must allow for and reward risk-taking behaviours. The managers must experience a safe environment where they do not have to fear rejection or punishment.

6. Partnership with BIMCO
Partnerships may be an effective mechanism for innovating one's business model, according to Chesbrough & Schwartz (2007), and a means of positioning oneself in the value network (Chesbrough, 2010). DNVPS engaged in a partnership with the shipping association, BIMCO, for increased customer access via their network of shipping companies, which entails a *configuration of the business model component* value network. This was due to the actions of leadership. This indicates organizational capabilities of sensing a strategic opportunity and acting upon it (Doz & Kosonen, 2010). However, the partnership did not turn out as planned, since the one responsible for the partnership had several other responsibilities and obligations in a turbulent time at DNVPS, and when he eventually left DNVPS, the ownership of the partnership was lost in the organization. From the statements of the informants at DNV, it seems that the partnership was not sufficiently prioritized amongst many other obligations and thus, there may have been a lack in alignment of the two parties in the partnership (Chesbrough & Schwartz, 2007).

Moreover, the empirical findings suggest that FI relied too much on customer acquisition through BIMCO's channel instead of exploiting DNVPS' existing customer base. Hence, the partnership directly affected FI's value chain in terms of which customer channels they used. This relates to Bock et al. (2012) who argue that exploration and partnerships in turbulent settings may reduce a company's strategic flexibility as a contextual factor, and thus be obstructive for BMI. Therefore, it can be argued that FI's reliance on the partnership with BIMCO reduced its flexibility to explore other potential customer channels. Although, FI's partnership with BIMCO did turn out to affect their customer involvement since BIMCO's members became a source of this during the

development of FI, which is in line with Chesbrough et al's (2006) open innovation where use of partners can increase innovation output and reduce R&D expense (Chesbrough & Schwartz, 2007).

7. Product Testing with Customers

Later on in the development, some pilot customers were involved to a certain extent. Thus, the customers did not get to *experiment* with the service until the very final stages of the development where some trial users were shown how to use FI and got to try it out. De Vries (2006) and Kindström (2010) emphasize the importance of adapting a new service offering to the competencies of the customers and assessing their maturity in utilizing it into their routines and operations. Based on the empirical findings, it seems that there was not a sufficient customer or user involvement in the development of FI, especially a crucial lack of this in the beginning of the project. Also, the development may not have sufficiently considered the customers' maturity in utilizing such a service. Hence, the lack of customer or user involvement, appears led to a complicated service with a complex value proposition targeting several customer groups to varying degrees in *configuration of the business model* based on this event. According to the empirical findings from DNV, FI turned out to have a little user-friendly interface and the solution was not intuitive. This was uncovered through *collecting and analyzing customer intelligence* from one of the customers that actually triggered DNVPS to pursue FI.

8. Deciding on a Revenue Model

Before the launch of FI, the pricing and revenue model was decided upon by the management of DNVPS, who therefore directly impacted this event by performing the BMI activity of *configuration of business model components*. There had been several discussions and disagreements as to how the service should be delivered to the market and profit from it. Thus, the empirical findings suggest that there were considered several business model options to a certain extent (Euchner & Ganguly, 2014; Palo & Tähtinen, 2013), before deciding that FI was to be delivered as a subscription with a high yearly fee in *configuration of the business model*. The choice was made on the basis of a benchmarking against another product, which related to Teece's (2010) recommended efforts in *collecting and analyzing intelligence* during BMI. However, the choice made was not *experimented* on to test its viability, as Teece (2010) and several other scholars also recommend in deciding on a business model.

In addition to benchmarking against another product, the reasoning behind the high pricing was to obtain profits directly from FI and to cover expenses from the costly development of the service. Thus, the pricing was also based on the cost structure (Chesbrough, 2010; Porter & Heppelmann, 2015) of developing and delivering the service, and this event was affected by the events which decided upon in-house implementation and choice of technology.

5.1.3 AFTER LAUNCH

9. Selling Fuel Insight

According to Sosna et al. (2010) and Morris et al. (2005), once a suitable business model is established, it needs to be *institutionalized* in the organization. The sales team of DNVPS did not receive sufficient training in FI, i.e. insufficient *knowledge transfer*, and were not sufficiently incentivized to sell it. Ultimately, there was only one person responsible for selling FI. It seems evident that the ones responsible for FI did not manage to properly *institutionalize* it in the organization of DNVPS. Leadership has a major role in *institutionalization* and committing the entire organization to changes, such as a new service with a new business model (Chesbrough & Rosenbloom, 2002; Sosna et al., 2010). Sosna et al. (2010) contend that successful BMI requires transferring and integrating knowledge about the new product or service and its business model into the organization.

Furthermore, selling the service required a lot of customer education, which was a resource demanding sales strategy that DNVPS did not have sufficient resources to perform since there was only one person responsible for selling FI. This can be related back to the barriers of BMI called managing strategic paradoxes, where a new initiative, such as FI, needs to compete with established offerings for scarce resources (Smith et al., 2010). Since FI never became properly *institutionalized* at DNVPS, it lost when resources were prioritized, especially in terms of what the sales team of DNVPS prioritized to try to sell to their customers since they did not properly understand the complex service offering. Therefore, it may be that the prevailing business model at DNVPS and its underlying configuration of assets hindered the BMI process of FI (Chesbrough, 2010). Moreover, the offering of a complex service requires the providers and customers to engage in a close relationship in order to ensure that the customer obtains the value from the service (Maglio & Spohrer, 2008). Thus, it may be that DNVPS did not exercise the capability of resource flexibility to delegate FI enough resources in order to ensure that customers obtained the value from a complex and non-intuitive service platform.

10. Change of Leadership

Shortly after launch, DNVPS got a new managing director. The previous managing director, who was the one that initiated the development of FI, has been described as an entrepreneurial type. Both Chesbrough & Rosenbloom (2002) and Guo et al. (2013) contend that entrepreneurial skills positively affect BMI since these skills are required for identifying and executing entrepreneurial opportunities. Hence, it can be argued that the entrepreneurial skills of DNVPS' former managing director contributed to the initiation of FI. The new managing director came into DNVPS during a turbulent time when there were several other priorities and obligations to consider, such as the impending sale of DNVPS from DNV. Thus, he encountered the issue of managing the strategic paradox of cutting costs at DNVPS whilst launching a new service that created new expenditures, which may be a barrier of BMI (Smith et al., 2010). The new managing director has also been described as a more systematic and structured type of leader who delegated the responsibility of

FI to an employee at a lower level in the organization. Thus, the ownership of FI was lessened within DNVPS' management and the entrepreneurial skills necessary to execute the opportunity (Chesbrough & Rosenbloom, 2002) may no longer have been present.

The product manager of FI, who was delegated the responsibility of it by the new leader, was at a lower level in the organization of DNVPS, and did not have the necessary mandate or resources to *institutionalize*. Based on empirical findings, it seems that due to several other priorities and obligations of the top management at DNVPS, the *institutionalization* of FI was not a priority. The BMI literature recommends leadership to delegate the rights of decision making to co-locate these rights with those who possess the appropriate knowledge to make an optimal decision (Jensen & Meckling, 1992). Further, Sosna et al. (2010) assert that by delegating and distributing authority to make decisions, organizational learning can be secured, which they connect as a part of the BMI process. However, since FI lost priority and ownership within management of DNVPS, the *institutionalization* of it was affected as well as the required assets available for supporting FI's position in the value chain (Chesbrough, 2010).

11. New Perspective on Target Customer

After a while on the market, the management of DNVPS realized that the customers of their fuel testing services are not the same as the ones who buy fuel, i.e. the customers of FI. Therefore, based on *collected and analyzed intelligence* about their customers and the market (Teece, 2010), FI had to revise their view of target market and customer for FI (Sosna et al., 2010), and thus, *reconfigure the business model components*. Furthermore, this also entails that the organization and leadership performed the activity of *organizational learning* (Sosna et al., 2010) as this became the new view of FI's target customer in the organization.

This event also indicates the capability of strategic sensing (Doz & Kosonen, 2010). Here, the barrier of the prevailing business model of DNVPS' core services and its underlying configuration of assets may have created a cognitive barrier (Chesbrough, 2010) in terms of identifying and understanding the target customer of FI, which was different to the one of the prevailing business model, and was not discovered until after it was launched on the market. This resulted in a mismatch between DNVPS' existing customers and what they offered them, which was a very technical service, and then trying to sell FI, which was perceived as a much more commercial type of service to a different customer group.

The realization that FI actually served another customer segment than the core services of DNVPS meant that the managing director had to manage a continued "exploitation" of their standard customer segments, whilst also managing the "exploration" of a new customer segment for FI. This management of "exploitation" and "exploration" at the same time is described as one of the challenges in BMI by Smith et al. (2010). Furthermore, this contributed to a misalignment between FI and the core service offering of DNVPS, which is another barrier of BMI identified in

the theoretical background (Santos et al., 2009).

12. Change in Pricing

During its two years on the market, the subscription fee of FI was reduced from $50 000 to $3 000 - $12 000, depending on the customer. This means that there was a *reconfiguration of FI's business model components*. Porter & Heppelmann (2015) state that capturing value when offering data driven services requires a transition from pricing based on cost structure to value based pricing. Furthermore, Tidd & Bessant (2013) argue that a company's service advantage should be used to increase growth, and not exploited to create maximized and immediate profits. The empirical findings clearly suggest that informants think that FI was priced too high, which may have been a consequence of pricing a data analytics service based on cost structure and generating profits quickly. Thus, the pricing was not anchored with the customers' perceived value of the service, as Porter & Heppelmann (2015) recommend. This may reflect a lack of understanding what the customers valued with FI, and what they were willing to pay for it.

The reduction in price came as a reaction to difficulties in selling FI and the reaction of customers, which means that *knowledge of this was transferred* into the company as *organizational learning*. This implies strategic sensing (Doz & Kosonen, 2011), and customer feedback being *transferred* back to the management of DNVPS, who then revised and adapted the business model by reducing its pricing. The importance of this revision and adaptation based on external *knowledge* being properly *transferred* into the firm is emphasized by several scholars. Especially Sosna et al. (2010) underline that *ensuring continuous knowledge acquisition,* which is leveraged into the organization and acted upon, is vital to the successfulness of a BMI process.

13. Continuous Implementation of Customer Feedback

DNVPS attempted to continuously improve FI after the launch by integrating customer feedback via the Metric Center, i.e. they tried to *ensure continuous knowledge acquisition* which was *transferred* into the organization. This may be related to the concept of lead users, where it is stated that identifying the "right" users to involve in service or product development is vital (von Hippel, 1986). The authors of the thesis do not know which customers' feedback DNVPS chose to include in their improvements of FI, and since the authors have not interviewed any customers of FI, it is not known how they perceived the improvements of the service. It may have been misinterpretations of what the customers needed from FI, an insufficient knowledge transfer (Foss et al., 2011; Argote & Ingram, 2000) of customer feedback to the Metric Center or it may have been that DNVPS listened too closely to the "wrong" types of customers (von Hippel, 1986). Argote & Ingram (2000) highlight moving members, i.e. employees, as the most potent mechanism for knowledge transfer within organizations. Also, listening too closely to the "wrong" types of customers may lead to implementing changes that does not satisfy general customers demands since their feedback may be based on needs specific to their business or they may act opportunistically to gain improvements that particularly benefits them. However, the

authors have noticed through the empirical findings that the development of FI seems to be more affected by a lack of customer involvement, rather than listening too closely in this case.

Moreover, the continuous implementation of improvements via the Metric Center was the source of expenditure that ultimately led DNVPS to discontinue FI, in addition to the fact that it did not sell as anticipated in spite of the continuous improvements. Hence, the cost structure (Chesbrough, 2010) of delivering FI seems to be a contributor to the termination of the service offering.

5.1.4 SUMMARIZING THE DEVELOPMENT OF FUEL INSIGHT'S BUSINESS MODEL

In every identified event in the development of FI, the authors have recognized one or more of the BMI activities as outlined by literature. The activity called *configuration of business model components* is identified in every event since the authors have found it to be applicable in every event where a business model component is defined or adjusted. The authors did not identify the following BMI activities in FI - *identify and prioritize risks* and *recognize and act upon new triggers*. Figure 3 outlines the development of FI in terms of the chronological events with associated BMI activities and which resulting impact this had on the business model.

Event	Business model dimensions affected
1. Initiation of the project	Value proposition, Market segment
2. Developing the methodology	Value proposition
3. Choice of in-house implementation	Value chain, Revenue model, Cost structure
4. Choice of technology	Value chain, Revenue model, Cost structure, Value proposition
5. Use of internal experts for initial service development	Value proposition, Market segment
6. Partnership with BIMCO	Value network, Value chain
7. Product testing with customers	Value proposition, Market segment
8. Deciding on a revenue model	Value proposition, Revenue model, Cost structure
9. Selling Fuel Insight	Value chain
10. Change of leadership	Value chain
11. New perspective on target customer	Market segment
12. Change in pricing	Revenue model
13. Continuous implementation of customer feedback	Cost structure

Figure 3: Overview of FI's events and the development of its business model. The horizontal arrows indicate the impact of an event on subsequent events.

5.2 ANALYSIS OF ECO INSIGHT

The findings section on EI (ch. 4) presented its development through events. In similarity to FI's analysis, the events of EI will be analyzed to identify BMI activities and potential influences of the dimensions. The analysis of the events are summarized in table 5 below. This section is structured into the same three stages as the findings on EI (ch. 4), i.e. predecessor of ECO Insight at DNV, predecessor of ECO Insight at GL, and ECO Insight at DNV-GL. The activities prior to the merger, at GL are included although they are outside the DNV-GL context, as they have impacted the BMI process after the merger.

Table 5: Events in the development of ECO Insight's business model with associated BMI activities, dimensions, contextual factors and impact on business model

Event	BMI activities performed	Dimension(s)	Contextual factor(s)	Impact on business model
1. Initiation of the FRAM project (DNV)	Configuration of business model components	Network relations		Value proposition Value chain Revenue model
2. Initiation of the project Fleet Insight (DNV)	Recognize and act upon external or internal trigger Collecting and analyzing intelligence Configuration of business model components	Customer involvement		Market segment Value proposition Revenue model
3. Opportunity recognition in the market (GL)	Collecting and analyzing intelligence Recognize and act upon external or internal trigger Configuration of business model components	Leadership	Strategic sensitivity	Competitive strategy Value chain
4. Planning a subscription based service (GL)	Configuration of business model components	Leadership		Revenue model
5. Small scale experimentation (GL)	Experimentation Configuration of business model components	Leadership Customer involvement		Value proposition Market segment
6. Hamburg offices to pursue the development of ECO Insight	Recognize and act upon trigger Institutionalization Configuration of business model components	Leadership		Value proposition Value chain Revenue model
7. Establishment of dedicated	Institutionalization Configuration of business model components	Leadership	Capability: Resource flexibility	Value chain

team				
8. Choice of technology	Configuration of business model components Choice of technology	Leadership (directly) Network relations	Capability: Strategic flexibility	Value chain Cost structure
9. Integration of external data sources	Configuration of business model components	Network relations	Capabilities: Resource flexibility Creativity	Value chain Value proposition
10. Piloting the service	Experimentation Configuration of business model components	Customer involvement		Value proposition Market segment
11. Establishment of the Business Unit Fleet Performance Management	Institutionalization Configuration of business model components	Leadership	Barrier: Managing paradox of prevailing business model Capability: Strategic flexibility	Value chain
12. Realization about target customer value	Organizational learning Ensure continuous knowledge acquisition Knowledge transfer Collect and analyze intelligence Configuration of business model components	Leadership Customer involvement		Value proposition Market segment
13. Bundling ECO Insight with Navigator Insight	Configuration of business model components			Value proposition Value chain
14. Implementation of SCRUM methodology	Configuration of business model components Ensure continuous knowledge acquisition	Customer involvement	Capability: (Strategic flexibility)	Value chain
15. Yearly user conference	Ensure continuous knowledge acquisition Organizational learning Knowledge transfer Configuration of business model components	Customer involvement Leadership	New context Strategic sensitivity	Value proposition Market segment
16. Entering partnerships	Collect and analyze intelligence Ensure continuous knowledge acquisition	Network relations Leadership	Capability: Strategic sensitivity	Value proposition Value chain Value network

	Configuration of business model components			Market segment
17. Establishment of the department of the Department for Digital Solutions and Innovation (DSI)	Configuration of business model components Institutionalization	Leadership	Capabilities: Resource flexibility	Value chain Cost structure
18. New fuel module in ECO Insight	Recognize and act upon new triggers Configuration of business model components	Network relations Leadership	Capability:	Value chain Value proposition Competitive strategy
19. New Business Developer to Innovate ECO Insight	Ensure continuous knowledge acquisition Configuration of business model components	Leadership (indirectly)	Capabilities: Strategic sensitivity	Competitive strategy
20. Discontinuation of technology component	Recognize and act upon external or internal trigger Configuration of business model components	Network relations		Cost structure Value chain

5.2.1. PREDECESSOR OF ECO INSIGHT AT DNV

1. Initiation of the FRAM Project

FRAM was a performance management application developed by DNV in cooperation with WWF and NSA in 2013. DNV developed the portal and the technology for FRAM. The service was offered free of charge to ship owners with the goal to improve energy efficiency. This can be considered as the first step in introducing a value proposition that revolved around performance management. The idea of freemium as a revenue model was also conceived here, which remained with the managers in the future discussions on business models for EI upon the merger. Both the partnership with WWF and NSA, and the technology partner used to set up FRAM, introduced the dimension of network relationship. For Big Data, technology is highlighted as one of the main challenges when creating value (Wamba et al.,2015). Through FRAM, DNV obtained experience with data technologies, and chose a new technology which would later be selected and reused in EI. This external technology supplier represents a change to the value chain. The partnership with WWF and NSA can be considered as a form of open innovation (Chesbrough et al., 2006) wherein DNV increased its "knowledge base" through network relations.

2. Initiation of the Project Fleet Insight

After FRAM, DNV initiated a project called Fleet Insight, a fleet performance management system. The project was intended as a premium version of FRAM. The project manager of Fleet Insight at DNV had recognized the need for the service through experience from a shipping company that had developed their own solution. Thus, he recognized the need of the customer and the position of DNV, which indicates r*ecognizing and acting upon an external and internal trigger* (Sosna et al., 2010; Sinfield et al., 2010). However, he did not have the authority to initiate the project and had to lobby before he finally, with the support of business unit leaders, managed to get resources for the project.

The insight from helping two customers create their own performance management systems, contributed as a foundation for understanding the market. Teece (2010) contends that information and intelligence on customers, competitors and suppliers is necessary for developing a new business model. Hence, the identified customer segments and value propositions were acquired through *collecting and analyzing intelligence* involving customers in the process. The early attempt to configure components of the business model for Fleet Insight served as a foundation for DNV's opinions towards the discussions on the business model for EI after the merger.

5.2.2 PREDECESSOR OF ECO INSIGHT AT GL BEFORE THE MERGER

3. Opportunity Recognition in the Market

GL Maritime Solutions had been looking at firms offering advisory services in the industry, and concluded that GL was more suited to deliver a performance management service , indicating similar thoughts to DNV and Fleet Insight; *recognizing and acting upon an external or internal trigger.* Leadership has been emphasised in initiation of BMI (Sosna et al., 2010) which is in line with the findings that the management decided to pursue the opportunity. Further, it shows that leadership exerted strategic sensitivity by identifying new business opportunities. The configuration of the value chain and competitive strategy remained with GL into the future product of EI. This further aligns with Teece's (2010) explanation on triggers, claiming that understanding customer needs and the ability for improvement that the organization and technology offers. Moreover, GL also collected information about the market to understand the opportunity, which is in line with Teece's (2010) recommendation to *collect and analyze information* for developing a new business model. Leadership understood that their position and size could form a competitive strategy for the business model and that they had the right assets to support the position in the value chain.

4. Planning a Subscription Based Service

When deciding to pursue performance management, the management of GL decided that it should be a subscription based service, in contrast to the traditional business model in Advisory. Sinfield et al. (2011) suggest identifying relevant components for the business model, then looking at different combinations of them. The above event may indicate a lack of considering

different business model options, specifically other revenue mechanisms. One way to *configure the business model components* is to "lock down" one or more components and design with that in mind (ibid.). Having changed, or decided on one of the components will impact the subsequent components (ibid.). Teece (2010) further recommends that in addition to deciding on a revenue structure, one should decide on and evaluate how the firm can profit in a cost efficient manner and who should perform which activities. The revenue model component would remain throughout the whole BMI process of EI. However, Hui (2014) states that a shift from single transactions to recurring revenue is necessary to capture value from Big Data, which is in line with this decision.

5. Small Scale Experimentation
After deciding to pursue fleet performance management the appointed project leader lead a project where they gave out Excel tables to clients, which they collected to create potential designs for visual analytics. Such initial experiments are characterised to be important for developing new business models (e.g. McGrath, 2010; Chesbrough, 2010; Morris et al., 2005), to make tacit knowledge more explicit (Teece, 2010). Such experimentation is often initiated directly or indirectly by leadership, as can be observed in this event (Baden-Fuller & Stopford, 1992; Chesbrough & Rosenbloom, 2002; Sosna et al., 2010). By way of leadership, GL gathered input from customers through *experimentation*, which made them able to collect knowledge inexpensively (Mitchell & Coles, 2003; Baden Fuller, 1994). By involving customers they would get potential early feedback and validation on the value proposition and the customer segment.

5.2.3 ECO INSIGHT AT DNV-GL POST MERGER

6. Hamburg Offices to Pursue the Development of ECO Insight
After the merger, DNV and GL decided to pursue fleet performance management under the lead of the EVP of Maritime Advisory, making Hamburg the decision makers with regards to technology and business model. This event led to the initiation of the project, EI, rooted in DNV-GL, that combined intelligence and insights from GL and the portal technology from DNV. Thus, EI was meant as a subscription based service from the onset.

The event that both initiatives was merged and that a leader with position and authority chose to pursue it, represents the first step towards a business model for EI. In line with the literature, leadership, here, the EVP of Maritime Advisory, initiated the process by *recognizing and acting upon an internal and external trigger*. Thus, he recognized a valuable opportunity (Bhide, 2003, Sosna et al., 2010, Jones and Macpherson, 2006), showing entrepreneurial skills (Guo et al., 2013). This, he combined with understanding of the position of DNV-GL and the fundamental need of the customer (Teece, 2010). Being a business unit leader, he both had the authority and mandate to initiate the project and the knowledge of the market (Chesbrough, 2010).

Euchner & Ganguly (2014) state that the final, or identified business model must be deployed gradually in the organization (Sosna et al., 2010), and the firm must consider if it should be organized within an existing business unit or an independent unit (Euchner & Ganguly, 2014). EI now became more *institutionalized* as it had it belongingness with one of the offices, and a specific leader in Maritime Advisory. The subsequent result was that the Hamburg offices had more impact on the strategic direction for EI, and the previously established idea of a subscription based business model remained in focus. Thus, the same interpretation applies as for the event as for "Planning Eco Performance Manager as a subscription based service", *configuring business model components.* Hence, the business model component was already determined and the other components were subsequently adjusted according to it (Sinfield et al., 2011). The EVP of Maritime Advisory stated that the motive for developing the project was more focused on delivering a subscription based model, and then constructing a service around that. Thus, from the findings it does not appear that a consideration of other revenue models was conducted, apart from the input from DNV and their initiatives. Consequently, the value chain and value proposition would be formed by the Hamburg offices and their insights.

7. Establishment of Dedicated Team
The EVP of Maritime Advisory made sure that EI received its own project team that were dedicated full time with regards to IT development, management and sales organization. Additionally, there was an entrepreneurial leader assigned to the project. This event shows that an effort was made towards *institutionalizing* EI within the company, an activity in BMI mentioned by Morris et al. (2005), Euchner and Ganguly (2014) and Sosna et al. (2010). Furthermore, by establishing an internal organization, the first step towards "defining the value chain and required assets to support position in the chain" was taken (Chesbrough, 2010). In order to obtain the necessary resources, Doz & Kosonen's, (2010) concept of strategic agility is relevant, with the meta capability, resource flexibility, which is "the internal capability to reconfigure capabilities and redeploy resources rapidly". Thus, this capability can be promoted by leadership, and was exerted by the EVP of Maritime Advisory, and was crucial to allow for reallocation of relevant employees to pursue EI (ibid.). Thus, this event contributed to establishing the value chain for EI.

8. Choice of Technology
When deciding on the technology for implementation of EI, the product owner decided to reuse the technology from the FRAM, as this was the technology the IT team was familiar with. Thus, the choice was to build EI using the Cognos tool supplied by a technology supplier.

The literature on Big Data highlights deploying new technologies and techniques as a major challenge for firms in a data driven context, since Big Data technology is still being developed (Wamba et al., 2015). By choosing to use an external technology supplier, the value chain was configured with regards to technology, as a means to deliver the service to customers. Thus, EI made itself reliant on supplier technology to retain the value chain. Locking down the business

model component of value chain, relying on an external technology supplier, would also impact the cost structure of the business model, as indicated by Sinfield et al. (2011) who emphasise the interrelatedness of the business model components.A partner reliance may further reduce strategic flexibility (Bock et al., 2012), however, the literature emphasise the need for such network relations in business model development for technology based services, often involving more than a single technology partner (Kijl et al., 2005; Palo & Tähtinen, 2013).

The seemingly limited evaluation with regards to *choice of technology,* indicates that leadership did not consider many alternatives for the business model components and their interrelatedness. Leadership is argued to play a vital role in creating a sense of urgency to spark change (Bhide, 2000; Jones & Macpherson, 2006; Sosna et al., 2010). Thus, despite enabled a quick market entry, it was an important decision that would impact subsequent events for EI. This, due to the insufficient performance that would follow and the event that the technology supplier would later discontinue a component of the Cognos. Thus, the choice of technology impacted the subsequent cost structure of EI.

9. Integration of External Data Sources
Whilst building the first version of EI, the project team decided to integrate external data sources to enrich the insights from the service, already available at DNV-GL. Thus, EI innovated its business model by adding more partnerships to their business model, relatively effortlessly, as the relationship was already in place at DNV-GL. Partnerships have been emphasized as vital for BMI in the case of technology based services (Chesbrough & Schwartz, 2007; Wang et al., 2015; Palo & Tähtinen, 2013; Maglio & Spohrer, 2013). By deciding to add more data into EI, the value chain became dependent on more suppliers, and this may reduce the future strategic flexibility, as explained in the the previous event. The integrated data, and thus supplier relationships, now support the new value proposition, making the two components of value chain and value proposition interrelated (Sinfield et al., 2011). Hence, this event can be seen as the activity *configuration of business model components*.

This event underlines the importance of networks in BMI and further the resource flexibility of organizational assets, as the organization was able to reuse existing data for other purposes. This is in line with Wamba et al. (2015) who underlines the importance of using multiple data sources to enable business opportunities with Big Data. Additionally, the implementation and idea of using new data sources, may indicate a creative organizational context that supports and promotes BMI and changes (Teece, 2010), and that there may be an expectation of regular business model changes collectively shared in the organization (Mitchell & Coles, 2003).

10. Piloting the Service

The first pilot of EI was performed in Singapore due to the focus on a global scope, and due to established customer ties. Feedback from the first and later pilot customers was translated into features that were built into EI.

According to Chesbrough & Rosenbloom (2002), an initial focus on the market is essential to enter the process of BMI. *Experimentation* is further key to develop new business models (e.g. McGrath, 2010; Chesbrough, 2010; Morris et al., 2005), to challenge assumptions and help defining them (Doz & Kosonen, 2010). The pilots indicate that the project team used *experimentation* to gather intel not found through analysis alone (Chesbrough, 2010). Also, user involvement, for instance through pilots, has proved critical for new service development, and may help avoiding failure (Stuart & Tax, 1996).

When the industry and market is changing rapidly, using lead customers is recommended (von Hippel, 1986). In EI, it seems that the choice of customers in the case of EI was quite random and more based on existing ties than considering which customer groups would help EI obtain "forecasts on the diffusion of innovations" (de Brentani, 1995; Flowers & Henwood, 2010; Tidd & Bessant, 2013). Thus, the process contrasts what is recommended by von Hippel (1986), who emphasises the selection of the pilot customer as an important process, when developing a new service or product. The findings from the pilots resulted in alterations in the product, as new features were included into EI. This can imply a successful knowledge transfer, and indicates a *configuration of business model components* based on knowledge acquisition through customer feedback, which is in line with what the BMI literature that coins user involvement as a critical success factor for developing new services (e.g. Alam, 2002; de Brentani, 1995; Brown & Eisenhardt, 1995).

The selection process with regards to what feedback to include is unknown, however, based on the empirical findings it seems as if the project team was less critical towards what feedback to use and which features to adopt. Literature indicates that a less appropriate customer's feedback may be outdated by the time the firm implements the service, which can be avoided by using lead users in the development von Hippel, 1986). Thus, the subsequent business model, would represent the chosen pilot customer's feedback towards the value propositions and future segments.

11. Establishment of the Business Unit Fleet Performance Management

In September 2014, a new department for Fleet Management Performance was established at DNV-GL , Hamburg. Thus, EI is internalized into this unit, and an official line of management is established, which means that EI was further institutionalized at DNV-GL. This event indicates that leadership organized for incubation, through deciding that the new business should be organized within an existing business area (Euchner & Ganguly, 2014), securing a position in the

organization for EI. The new department also showed that DNV-GL was dedicated towards fleet management, and wanted to commit resources to this course of action. Thus, the context of the new organization of Fleet Performance Management may further promote the development of EI. This may also indicate that the EVP of Maritime Advisory handled the *s*trategic paradox of exploration and exploitation, where EI was moved into a separate, more autonomous unit and therefore would be less affected by the prevailing business model at DNV-GL Maritime Advisory. Moreover, this indicates managerial skill in effectively organizing and configuring firm resources (Guo et al., 2013), and the important ability to commit new resources to new courses of action via strategic flexibility (Bock et al, 2012). Thus, the Head of Fleet Management Performance got more control of resources, which may enable him to protect the value chain for EI from the prevailing dominant logic and inertia of existing business. This form of decentralized decision making and delegation may improve strategic flexibility, and thus BMI, and is beneficial in a market where fast decision making is necessary (Bock et al., 2012). Thus, this action performed by leadership may further promote subsequent BMI events.

12. Realization About Target Customer Value

Upon the launch of EI the EVP of Maritime Advisory realized that half of their market segment bought EI due to transparency towards stakeholders, not energy efficiency. Thus, the value proposition was expanded to include transparency. This event encompasses several activities; first, *organizational learning* has taken place, through customer feedback which is particularly relevant in the beginning of BMI (Chesbrough & Rosenbloom, 2002). This event happened just before launch, which raises the question whether customer involvement was sufficient throughout the development process.

Next, this realization had leadership *collect and analyze intelligence* (Teece, 2010; de Jong & van Dijk, 2015) from current customers to figure out what value the users found in EI. As a consequence, they altered the value proposition, *configuring the business model components* (Sosna et al., 2010). Thus, it shows that the management of EI was willing to seek, accept and implement changes in the business model, which indicates an attempt to *ensure continuous knowledge acquisition* and adjust accordingly. This may further indicate that leadership has established an expectation of regular business model change in the organization (Mitchell & Coles, 2003).

The event clearly shows that management used customer involvement, which was achieved through direct contact with customers. Thus, the EVP of Maritime Advisory had to ensure *knowledge transfer* within the organization, making it part of the organizational knowledge (Sosna et al., 2010). Chesbrough & Rosenbloom (2002) emphasise that leadership must engage in the business model, which he did with the investigation and explicit change of the value proposition. However, although the value proposition was changed externally, for instance

through DNV-GL's website, it is not known how this knowledge and change has been communicated to other parts of the organization, such as the sales team.

13. Bundling ECO Insight with Navigator Insight

In 2015, management decided to connect EI to another product, Navigator Insight, a software that eases reporting of data for both the customer and DNV-GL, thus enabling EI to extract data directly from Navigator Insight's server.

This alteration to the business model can be considered as *configuring the business model components* of the business model. The value proposition of EI was changed when sold together with Navigator Insight, since the customer now could receive both automatic reporting, insights or both. Thus, the accumulated value proposition would reach wider into the customer's value chain. Furthermore, the value chain of EI would be altered as the sales process would require selling two products simultaneously. Therefore, the business model of EI and Navigator Insight should be aligned, which can be a challenge according to Chesbrough & Schwartz (2007).

14. Implementation of the SCRUM Methodology

The IT team of EI employed a SCRUM methodology to make the product development more iterative and agile. Moreover, in the development, the majority of the feedback for input comes from the product manager of EI and DNV-GL employees. After each sprint of development, the design is usually demonstrated to the product manager.

The implementation of the SCRUM methodology made it easier to get feedback and implement changes more rapidly. Sosna et al. (2010) underline the importance of *ensuring continuous knowledge acquisition* and establish organizational processes that use the acquired knowledge. The empirical findings indicate an alteration of the business model's value chain, and serves to make the business more ready to take in and act on feedback continuously. Thus, there has been performed a *configuration of the business model components* altering the value chain. Furthermore, this may promote strategic flexibility as as new opportunities and feedback can rapidly be integrated, allowing for change.

Moreover, the direct involvement of external customers in this process seems limited in this event, as the majority of input into the process comes from internal customers regarding bug fixes. Furthermore, the finalized designs are only demonstrated to internal stakeholders. Kindström (2010) emphasize customer maturity and the importance of assessing it. Based on the empirical data this seems to be lacking in the fundamental development process of EI, which again may lead to a complex product (ibid.). According to Palo & Tähtinen (2013), customer involvement in the development of a service is essential to overcome organizational inertia and challenge assumptions.

15. Yearly User Conference

In 2015, the Department for Fleet Performance Management arranged a user conference, to be arranged on a yearly basis, with the intent to receive feedback from customers and stakeholders, and to provide training sessions. Due to frequent product updates, the customer's' understanding and knowledge of the product become unsynchronized. Currently, the management of EI focus more on putting customers in the position of receiving value, not currently ensuring that they obtain value.

Sosna et al. (2010) proclaim the importance of creating processes for learning to be integrated in the organization. In this empirical event, direct customer feedback was facilitated through a recurring customer conference, thus *ensuring continuous knowledge acquisition*. This introduction of the user conference shows that DNV involves users in their development process post launch, which is in line with Alam's (2002) findings that user involvement is high in the later stages of commercialization. Thus, the establishment of an arena for repeated feedback and education may serve as a point of co-creation where the management behind EI may get an understanding of the customers' maturity, competencies and issues, collectively. Thus, this knowledge must be transferred successfully, through *knowledge transfer*, to ensure *organizational learning*. The feedback may lead to altered and more sharpened value propositions, and understanding of market segments, *reconfiguring the business model components*. Hence, the established arena may serve to promote strategic sensitivity. Further, such a repeated event may aid managers with the stated issue of handling rapid product development and simultaneously conduct training and following up customers.

Again, this initiative indicates the role of leadership in involving customers to challenge their own assumptions and learn about the market, which is in line with Demil & Lecocq's (2010) recommendation to maintain a dynamic perspective on the business model. Thus, leadership indirectly affect the business model by way of establishing a feedback arena. This event may serve to open up and change the context, making the organization more oriented towards customer feedback and change (Mitchell & Coles, 2003). Moreover, the event may help the EI project team to understand the status of their customers' knowledge and competencies, and thus align EI with the customer's level of competencies, which is emphasized as critical for the customer to obtain value from the service (de Vries, 2006).

16. Entering Partnerships

To pursue the strategy of innovating EI through partnerships, a dedicated partner manager was assigned to EI. Through 2015, EI entered partnerships with two paint producers, Jotun and Hempel, to provide verification of their value propositions, and with ESI in 2016, offering discounts on the environmental module of EI promoted to ESI's customer base.

The assignment of a dedicated partner manager indicates that the management of EI explore novel ways to capture and create value with partners, hence indirectly impacting the business

model. This was a deliberate action from the management of EI, and the establishment of co-development partnerships is considered an important means of innovating a business model (Chesbrough & Schwartz, 2007). This is further in line with Hui's (2014) findings that Big Data based services requires rethinking value capture, redirecting focus from internal capabilities to focusing on partnerships and mutual value creation. Having dedicated resources to this, the organization is more ready to *collect and analyze intelligence* to extract insight (Teece, 2010). Further, it *ensures continuous knowledge acquisition* with regards to recognizing value adding activities. Moreover, it may promote BMI through increased ability to recognize opportunities promoted through strategic flexibility (Bock et al., 2012).

Specifically, the partnerships with Jotun and Hempel, led to acquisition of new customers, expanding the current customer base to horizontal suppliers. This is in line with the literature on open innovation, as the use of partners may open up to previously not accessed markets (Chesbrough & Schwartz, 2007). Thus, EI takes a new position in the value network (Chesbrough, 2010). The value network around the business, shapes the role that external actors influence the value captured from the commercialization of the innovation (Chesbrough & Rosenbloom, 2002). Thus, through both these partnerships EI would receive increased exposure, and the value proposition is strengthened as users can validate associated suppliers through EI.

With regards to ESI, this partnership represents a new sales channel, i.e. alteration in value chain, for EI, as ESI's value proposition of reduced port charges incentivises users to subscribe to EI. Thus, the value proposition of EI increases in line with ESI, which indicates an alignment of their business models as defined by Chesbrough & Schwartz (2007).

Although utilizing networks and partnerships may promote BMI, Bock et al.(2012) also contend that they may reduce strategic flexibility for BMI. All of the partnerships EI has entered require co-creation and thus sharing rewards and risks (Maglio & Spohrer, 2013). Thus, the collaborations require an alignment of business models and value propositions, as they are complementary and rely on each other in creating value. It seems that EI, managed to find mutual benefit with all the partners as they chose to enter these relationships, and as they still prevail. To organize these partnerships, governance processes such as knowledge matching and project management are important, however, the empirical foundation does not reveal how this was orchestrated for the three partnerships, except the fact that EI has a dedicated resource to manage the partnerships.

17. Establishment of the Department for Digital Solutions and Innovation
In January 2016, DNV-GL established a new department called Digital Solutions and Innovation (DSI). As a consequence, the previous EVP of Maritime Advisory, now the head of DSI, do not control the same resources as before. This decision by leadership indirectly changes the context for EI; first, it can leverage the benefit of being within the same department as other digital services and initiatives, creating synergies. This also means, that EI was further *institutionalized*. On the downside, the resource flexibility may be partially subdued as resources may not be configured as rapidly and seamlessly as before (Doz & Kosonen, 2010; Bock et al., 2012). The consequences for EI will be a reconfiguration in the value chain and cost structure in creating and

delivering the service, although the empirical findings do not state to what extent. Hence, the *business model is reconfigured* with regards to internal processes.

18. New Fuel Module in ECO Insight

In February 2016 DNV-GL entered a partnership with VPS that enabled them to offer a fuel module within EI. This new partnership constitutes an extension of the value proposition as customers of EI now can access fuel testing data. Thus, the implementation represents revision and adaptation of the business model through *reconfiguring the business model components* of value proposition and value chain. Furthermore, it entails adding another partnership in the value chain of EI as they now are reliant on VPS to deliver these insights. As before, this may reduce the future strategic flexibility of EI.

It was management's decision to implement the new module as they *recognized and acted upon an new opportunity* and considered the proprietary nature of the data as a source of competitiveness. This can be related to the business model's formulation of a competitive strategy (Chesbrough, 2010), where leadership saw an opportunity to differentiate the offering from competitors by incorporating a new, proprietary data source. The empirical findings do not state the involvement of any customers as a trigger for the inclusion of the module, or its design. The module is said to be similar, but not exactly the same as the previous product, FI, which was deemed complex by previous users and employees. Thus, the findings may indicate a lack of considering the customer's role in co-developing the service and the competencies required (de Vries, 2006).

19. New Business Developer to Innovate ECO Insight

In the beginning of 2016 a business developer was hired to identify new services to be offered within or in association to EI. The decision to hire a new business developer may indicate that leadership believes that innovation is part of the competitive strategy for EI. Furthermore, by appointing a dedicated resource to identify business model options, leadership indirectly induces potential changes in the business model and sharpens strategic sensitivity, or the awareness and attention to strategic developments (Doz & Kosonen, 2010). This is also in line with the recommendations of Sosna et al. (2010) who propose that when a business model is established in the organization, as is the current case of EI, there may come along new triggers that "challenge its status quo". Therefore, a company needs to *ensure continuous knowledge acquisition* to maintain a dynamic perspective on the business model. This finding on EI indicates efforts to achieve this.

20. Discontinuation of Technology Component

The technology supplier decided to discontinue the support of an important component in Cognos, which EI is reliant upon. This means that DNV-GL will have to perform a reimplementation with a new technology. This can be characterized as *an external trigger that is*

recognized and must be acted upon (Sosna et al., 2010; Sinfield et al., 2011), forcing DNV-GL to restructure the value chain, perhaps more rapidly than previously anticipated. Thus, the network relationship has a direct impact on the business model. The process may impact the cost structure of EI, they have to choose a new technology partner, and reimplement the previous methodologies. This incident shows the impact of the previous technology choice in 2014. However, now the business model for EI has been validated to an extent that a technology investment is more reasonable.

5.2.4 SUMMARIZING THE DEVELOPMENT OF ECO INSIGHT'S BUSINESS MODEL

Figure 4 below summarizes EI's chain of events with associated BMI activities, and their impact on the business model. The authors did not identify *demonstrate value creation*, *identify and prioritize risks* and *sustained growth and organizational learning* during the development of EI. In similarity to FI, the activity *configuration of business model components* is identified in every event of EI.

Top block (Events 1–10):

1. Initiation of the FRAM project	2. Initiation of the project Fleet Insight (DNV)	3. Opportunity recognition in the market (GL)	4. Planning a subscription based service (GL)	5. Small scale experimentation (GL)	6. Hamburg offices to pursue the development of ECO Insight	7. Establishment of dedicated team	8. Choice of technology	9. Integration of external data sources	10. Piloting the service
Value proposition, Value chain, Revenue model	Market segment, Value proposition, Revenue model	Competitive strategy, Value chain	Revenue model	Value proposition, Market segment	Value proposition, Value chain, Revenue model	Value chain	Value chain, Cost structure	Value chain, Value proposition	Value proposition, Market segment

Bottom block (Events 11–20):

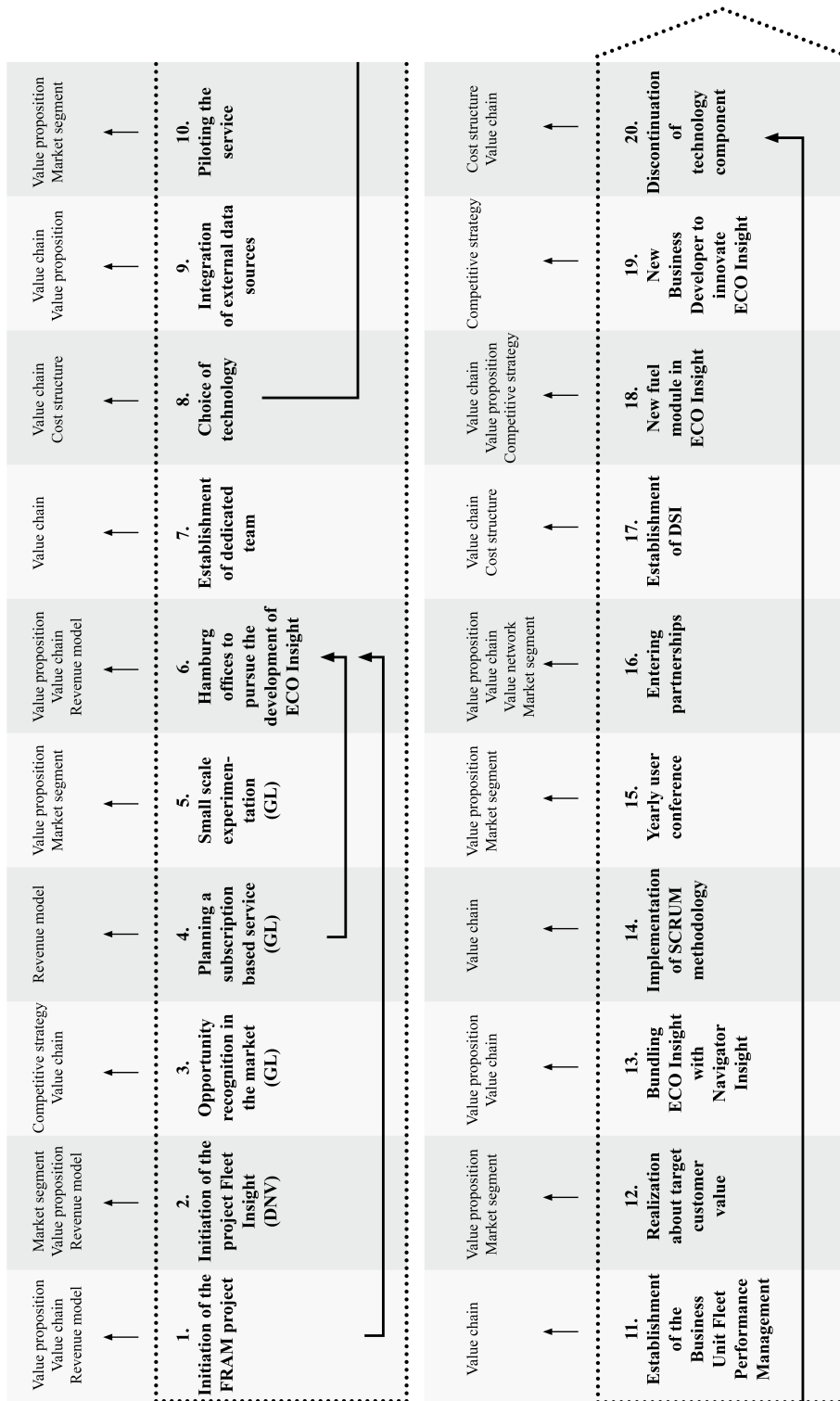| 11. Establishment of the Business Unit Fleet Performance Management	12. Realization about target customer value	13. Bundling ECO Insight with Navigator Insight	14. Implementation of SCRUM methodology	15. Yearly user conference	16. Entering partnerships	17. Establishment of DSI	18. New fuel module in ECO Insight	19. New Business Developer to innovate ECO Insight	20. Discontinuation of technology component
Value chain	Value proposition, Market segment	Value proposition, Value chain	Value chain	Value proposition, Market segment	Value proposition, Value chain, Value network, Market segment	Value chain, Cost structure	Value chain, Value proposition, Competitive strategy	Competitive strategy	Cost structure, Value chain

Figure 4: Overview of EI's events and the development of its business model. The horizontal arrows indicate the impact of an event on subsequent events.

5.3 ANALYSIS OF PUSH BASED CLASS

The findings section (ch. 4) outlined the development of PBC up until the time of the authors' research conducted at DNV-GL. In similarity to the two other projects, the findings on PBC were presented as events that resulted in an impact on its business model, which will be analyzed in this section. The events with associated BMI activities, dimensions, contextual factors and resulting business model impact are outlined in table 6. The section is structured into the same three phases as the findings on PBC, i.e. project initiation, project phase, and handover of the pre-project.

Table 6: Events in the development of Push Based Class' business model with associated BMI activities, dimensions, contextual factors and impact on business model

Event	BMI activities performed	Dimension(s)	Contextual factor(s)	Impact on business model
1. Origin of idea at the GL side	Recognize and act upon internal trigger Collect and analyze intelligence Demonstrate value creation Experimentation Configuration of business model components			Value proposition Value chain
2. Origin of idea at the DNV side	Recognize and act upon internal trigger Demonstrate value creation Configuration of business model components Collect and analyze intelligence	Customer involvement		Value proposition Market segment
3. Initiation of Project	Collect and analyze intelligence Configuration of business model components	Leadership Customer involvement Network relations		Value proposition Value network Market segment
4. First round of prototyping and demonstrations	Experimentation Collect and analyze intelligence Configuration of business model components	Leadership Customer involvement	Resource flexibility	Value proposition Market segment
5. Choosing a customer segment	Collect and analyze intelligence Configuration of business model components Identify and prioritize risks	Customer involvement		Market segment
6. Second round of prototyping and	Experimentation Configuration of business	Customer involvement	Strategic flexibility	Value proposition

demonstrations	model components	Network relations		
7. Deciding on handover of PBC	Institutionalization Identify and prioritize risks Configuration of business model components			Value chain

5.3.1 ORIGIN OF IDEA AND PROJECT INITIATION

1. Origin of Idea at the GL side

From the GL side of DNV-GL, the origin of idea for PBC arose from discussions as to how they improve internal operations based on AIS technology. This is when they came up with idea of performing survey planning based on AIS data to predict the arrival of ships to ports. Thus, it was an *internal trigger* that was *recognized*, and then *acted upon* (Sinfield et al., 2011). Furthermore, findings show that they had an initial market focus (Chesbrough & Rosenbloom, 2002), and *collected and analyzed intelligence* (Teece, 2010) when they engaged in discussions with the port of Hamburg that had a problem of congestion in the port. This led to an initial definition of the value proposition of such a solution, and can therefore be related to Euchner & Ganguly's (2014) recommendation of *demonstrating value creation* in the early phases of BMI.

Based on this idea, the Hamburg offices engaged in a small pilot run with an external Big Data consultancy. This was to investigate whether the development of this idea should be conducted internally or outsourced, and after the pilot, they chose to do so internally with SR&I. These findings show that they considered business model options (Euchner & Ganguly, 2014) in terms of developing PBC, and based on *experimentation* (e.g. Chesbrough, 2010), they made a decision which led to a *configuration of the business model* (e.g. Teece, 2010). Since they chose to pursue the development of the project internally, it consequently affected the value chain of PBC.

2. Origin of Idea at the DNV side

The origin of idea at the DNV side was also an *internal trigger*, which was *recognized and acted upon* by the SR&I unit (Sinfield et al., 2011), where a business developer at DNV-GL showed SR&I an information source of all vessels' technical condition. Based on this, they evaluated several ideas of how to leverage this publicly available information, which shows an assessment of business model options, and then chose an initial definition of the value proposition of such an idea, i.e. *demonstrated value creation* (Euchner & Ganguly, 2014).

Furthermore, they identified an appropriate market segment (Chesbrough, 2010) for PBC by conducting a project and engaging in customer involvement in order to further investigate the potential value proposition PBC could provide, which again shows an initial market focus to determine how the offering should be defined and configured (Chesbrough & Rosenbloom, 2002). This signifies a performance of *collecting and analyzing intelligence* and *configuring business model components*. Thus, in this event, it appears there was a direct link between

customer involvement and defining the value proposition of PBC, which is deemed an important step in developing a business model for a service according to Kindström (2010), who states that customer involvement is necessary for identifying a market segment.

3. Initiation of Project

It can be argued that leadership played a significant role in the project initiation since the program director of SR&I's IT program engaged in customer involvement by presenting the idea to a manager of the CSM process, *collected and analyzed intelligence* (Teece, 2010) and contributed to developing the idea and assigned resources to initiate the project. This further shaped the potential value proposition of PBC, as leadership attempted to get an in-depth grasp of user needs (Teece, 2010). Therefore, it seems that leadership played a direct role in defining the value proposition, and the role of leadership affected the customer involvement into developing the business model.

In addition to the customer involvement with the manager of the CSM process, they also engaged in discussions with other companies in the value network (Chesbrough, 2010) to investigate their interest in such an idea. Thus, the findings indicate that they *collected and analyzed intelligence* (Teece, 2010), which shaped their view of PBC's value network and further defined its potential value proposition (Chesbrough, 2010). This implies a direct influence from network relations on the outcome of the business model, which enhanced the project's progression. Again, it was leadership from SR&I who engaged in the network relations to contribute to the potential developing business model of PBC.

These leadership efforts can be viewed in light of Teece's (2010) statement that a business model reflects the management's hypothesis of value creation and capture, where the leadership seems to have engaged in *collecting and analyzing intelligence* (Teece, 2010) to create an understanding of customer needs and investigating possible partnerships or different customer groups in the value network.

5.3.2 PROJECT PHASE

4. First Round of Prototyping and Demonstrations

The project participants from different units at DNV-GL were relieved of their other tasks and were co-located to work on the PBC pre-project on a full-time basis for a short period of time, which was directly influenced by leadership who delegated the resources to do so, and indicates a support by resource flexibility in the organization (Doz & Kosonen, 2010). This can be viewed as an effort to facilitate *experimentation* for PBC by leadership since it requires interactions between various functions (Chesbrough, 2010), and this was one of the first activities performed by the project team. This was also influenced by overall efforts at DNV-GL where they have strived to utilize modern work methods, which are more intensive with cross-unit collaborations. Again, this relates to leadership influencing the development of PBC, where it is recommended by

literature that leadership should promote collaborations across functions in order to promote BMI and *experimentation* (Chesbrough, 2010).

The project team created a prototype which was demonstrated to potential users of such a service as a means to collect new ideas. Thus, they *experimented* (Chesbrough, 2010) as well as *collected and analyzed intelligence* (Teece, 2010) in this event. The fact that they involved users relates to the dimension of customer involvement, even though these were internal users as DNV-GL, they were still viewed as potential customers of such a service. Since service offerings typically have a deeper reach into the operations of a customer, it requires greater coordination with them when developing a business model (Kindström, 2010), which it seems to be an effort towards in this case. Again, it appears that they *collected and analyzed intelligence* (Teece, 2010) directly from potential customers in order to shape their view of PBC's value proposition and potential market segments (Chesbrough, 2010). This event also influenced the subsequent one since the *collected and analyzed intelligence* led to a decision impacting the business model in the next event.

5. Choosing a Customer Segment

Initially, the project team considered two different versions of PBC targeting different market segments and customers, which shows an evaluation of business model options for the service offering (Euchner & Ganguly, 2014). They decided to pursue the station manager view for PBC based on feedback from potential customers of the service. This indicates a *collection and analysis of intelligence* (Teece, 2010) through direct customer involvement in order to determine the appropriate market segment and target customer (Chesbrough, 2010) for PBC. However, as before, the customer involvement entailed only internal customers at DNV-GL since they envisioned that PBC would firstly be utilized as an internal service, but one who held the potential of being offered externally at a later time. Thus, as described by Kindström (2010), the project team involved customers in order to assess their readiness to adopt this type of service and determine an appropriate target market. However, the findings does not indicate that they chose which customers to involve strategically in terms of lead users who face issues that will become general in the marketplace in the future (von Hippel, 1986).

Moreover, this event can be related to issues in offering data driven services. Project members from PBC have stated that another reason as to why they chose to first test an offer it internally, is due to the issue of data quality. It was deemed safer to test the service with internal customers rather than external ones, which they feared could have jeopardized external customer's view of DNV-GL as a trustworthy company. Hence, they needed to be sure of their ability to ensure data quality in the service with internal customers first. This may relate to Euchner & Ganguly's (2014) BMI activities of *identifying and prioritizing risks*, and reducing them through *experimentation*. The project team identified data quality as a risk, and chose to pursue a development where PBC would initially be tested and offered internally to reduce that risk.

6. Second Round of Prototyping and Demonstrations

Since the calculation of an ETA relied upon AIS data, the product development was reliant upon access to this data from the supplier, Vessel Tracker. The product development came to a halt when they had to wait to get updated data from this supplier. This illustrates the potential issues of data access (Wamba et al., 2015) and reliance upon a supplier for offering a data driven service (Palo & Tähtinen, 2013). In this instance, their supplier hindered progress in product development, which can be related to the dimension of network relations where partnerships may reduce strategic flexibility (Bock et al., 2012). Hence, this may indicate a finding where the network relation directly affected the development in an obstructing manner.

In the second round of prototyping, they had developed a web application product that was demonstrated to stakeholders in DNV-GL, both management and station managers, which can viewed as potential customers. Thus, this was another round of *experimentation* (Morris et al., 2005) in order to obtain feedback. Based on this, they got an increased understanding of the value PBC could provide, and how potential users perceived it, which can be related to an increased understanding of the value proposition (Chesbrough, 2010) through direct customer involvement.

5.3.3 HANDOVER TO PUSH BASED CLASS PRE-PROJECT

7. Deciding on Handover of Push Based Class

When the pre-project with SR&I had ended, it was supposed to be handed over to another project, which did not happen due to a reorganization of Maritime's development portfolio at DNV-GL. However, they did consider several other options to which PBC could be handed over. Ultimately, it was decided that the Maritime DSI unit was to take the project further, which can be viewed as an *institutionalization* (Sosna et al., 2010) of PBC.

When it was decided that the Maritime DSI unit was to further develop PBC, it was also decided to make a 'manual' solution of it where they collect the customers' port schedules in order to create ETA predictions based on these. This signifies a decision that led to a revisement of PBC's value chain (Chesbrough, 2010). Furthermore, the decision was made in order to reduce the uncertainty of the predictions, i.e. reduce the risk of the product's output. Thus, this can be related to Euchner & Ganguly's (2014) BMI activity of *identifying, prioritizing and reducing risks*.

Some informants have identified *choice of technology* as an issue for the further development of PBC, which also an issue highlighted by Wamba et al. (2015) for leveraging data in a business context. Since the existing technology for processing of data is changing rapidly, this choice may have implications further down the line.

5.3.4 SUMMARIZING THE DEVELOPMENT OF PUSH BASED CLASS' BUSINESS MODEL

Figure 5 illustrates the development of PBC in terms of chain of events, which BMI activities were performed in the event and which resulting impact it had on the business model. The authors did not identify *choice of technology, sustained growth and organizational learning, ensure continuous knowledge acquisition, organizational learning* and *recognize and act upon new triggers* in the development of PBC. In similarity to FI and EI, *configuration of business model components* is identified in every event of PBC.

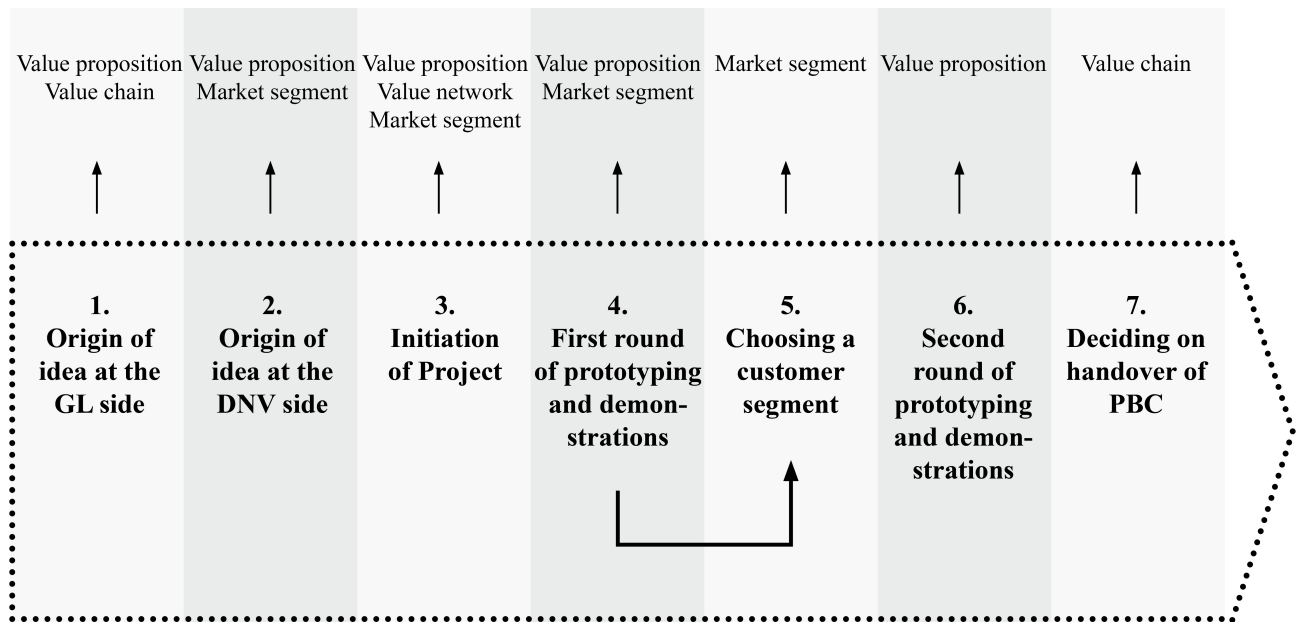| Value proposition Value chain	Value proposition Market segment	Value proposition Value network Market segment	Value proposition Market segment	Market segment	Value proposition	Value chain
↑	↑	↑	↑	↑	↑	↑
1. **Origin of idea at the GL side**	**2.** **Origin of idea at the DNV side**	**3.** **Initiation of Project**	**4.** **First round of prototyping and demonstrations**	**5.** **Choosing a customer segment**	**6.** **Second round of prototyping and demonstrations**	**7.** **Deciding on handover of PBC**

Figure 5: Overview of PBC' events and the development of its business model. The horizontal arrows indicate the impact of an event on subsequent events.

5.4 CROSS-ANALYSIS OF PROJECTS

This section will compare the projects FI, EI and PBC in order to answer the two research questions presented in the introduction of the thesis. The three projects will be compared with regards to the events and activities that contributed to establishing a business model for each project (RQ1), before answering how the dimensions of leadership, network relations and customer involvement impacted activities identified in the development of the business models (RQ2).

5.4.1 BUSINESS MODEL INNOVATION ACTIVITIES

In this section, the analysis of the projects' events with associated BMI activities will be compared with the intent of answering how BMI activities contribute to establishing a business

model for a data driven service (RQ1). In order to answer this research question, this section will first highlight the BMI activities identified in the projects. Thereafter, how the performed activities in the projects have led to an outcome on the business model will be established.

5.4.1.1 IDENTIFIED BUSINESS MODEL INNOVATION ACTIVITIES

All activities identified in the literature review were recognized at least once in one of the projects, but some activities were not identified in the individual projects. Furthermore, the empirical findings did not reveal any activities that were not already suggested by the BMI literature in the theoretical background. This subsection will analyze the BMI activities identified in the empirical findings across the three projects, and how the projects differed in terms of which BMI activities they employed. All identified BMI activities across the three projects are summarized in table 7 at the end of the section.

As can be seen from table 4, 5 and 6 in the analyses of each project, *configuration of the business model components* occurred in every identified event of each project. This is because the authors have only selected events where they were able to identify a specific outcome on the business model, i.e. a definition or adjustment of a business model components, which in turn signifies that the activity of *configuring business model components* has occurred in every event. However, the analysis of all three projects indicates a distinction to be made regarding how this activity is conducted compared to other BMI activities. The analysis indicates that *configuring business model components* may be explicitly or implicitly conducted, and it is most often implicitly performed. This will be further elaborated in the next subsection on how the performed BMI activities led to an outcome on the business model.

Collecting and analyzing intelligence was a prominent BMI activity across all three projects. However, since PBC has had a much shorter development time up until now, this signifies a greater emphasis on this BMI activity from the very beginning of this project. *Institutionalization* also appears to be an important BMI activity which has been especially decisive activities in events of FI and EI for obtaining ownership and resources. Additionally, *experimentation* has been a relatively prominent BMI activity identified through the analysis of the projects, appearing twice or thrice during the BMI process of each case. An interesting finding is that this BMI activity has been most frequent in PBC compared to the two others, even though PBC is the case with the shortest development time.

Evident BMI activities in the projects, but not as prominent as the previously mentioned ones, are *recognize and act upon internal or external trigger*, *knowledge transfer* and *ensure continuous knowledge acquisition*. However, these activities are somewhat more unevenly distributed amongst the projects. All cases performed *recognize and act upon internal or external trigger*, but it was more apparent in PBC and EI since the trigger was recognized at more than one unit at DNV-GL. *Knowledge transfer*, on the other hand, was most evident in FI, and *ensure continuous*

knowledge acquisition was most visible during EI's development. The fact that these activities were not identified for PBC may stem from the fact that PBC has not been developed far enough for this to be necessary. *Ensure continuous knowledge acquisition* seems quite prominent in the case of EI, but it was only identified once for FI.

The least notable BMI activities identified through the analysis are *demonstrate value creation*, *identify and prioritize risks*, *choice of technology*, *sustained growth*, *organizational learning*, and *recognize and act upon new triggers*. *Choice of technology* has not been shown to be a frequent activity, and not present in PBC, but the analysis indicates that it was a decisive activity for both EI and FI. *Demonstrate value creation* signifies commencing a project by determining the value proposition, which was the case for PBC and FI, but not for EI, which began by determining the revenue model. Although, it can be argued that PBC is not far enough in development for this to be necessary, and the same goes for *organizational learning* in the case of PBC. *Organizational learning* has been identified for EI and FI, but very little frequently. Lastly, in similarity to the activity of *ensure continuous knowledge acquisition*, *recognize and act upon new triggers* was only evident in EI, which may be due to the stage which PBC is currently at and FI's short time on the market before discontinuation.

Table 7: Identified business model innovation activities across the three projects

Business model innovation activity	Fuel Insight	ECO Insight	Push Based Class
Collect and analyze intelligence	X	X	X
Recognize and act upon trigger	X	X	X
Demonstrate value creation	X		X
Configure business model components	X	X	X
Identify and prioritize risks			X
Experimentation	X	X	X
Choice of technology	X	X	
Knowledge transfer	X	X	X
Institutionalization	X	X	X
Sustained growth and organizational learning	X		
Ensure continuous knowledge acquisition	X	X	
Organizational learning	X	X	
Recognize and act upon new triggers		X	

In this section, the authors will attempt to establish how the identified BMI activities within the events from the three cases led to an outcome on the business model, and what that outcome was. Through the analysis of each project, the authors have noted similarities and dissimilarities in terms of how the three business models have developed caused by events with associated BMI activities. These overarching trends across the three projects, caused by similarities or dissimilarities, will be analyzed in this section. These trends are the implicit activity of configuring business model components, differences in institutionalization efforts, the effects of choice of technology, most frequently adapting the value proposition and value chain, and differences in relatedness between events with associated business model component outcome.

Configuration of Business Model Components as an Implicit Activity
As stated in the section above, *configuration of business model components* was conducted in all events of the three projects. However, this is an ambiguous finding since the empirical data from all three projects indicate that this is not necessarily an explicit activity like the other BMI activities identified in both theoretical and empirical data. *Configuring the business model components* appears to often be an implicit activity that occurs as decisions are made and other activities conducted. The findings suggest that when conducting *configuration of business model components*, only a couple of components are altered per event, instead of it being an explicit activity where management or the project team explicitly configures all of the components or explicitly consider the interrelatedness of the components. Hence, similar empirical findings from all three projects suggest that *configuring business model components* is a major part of the BMI process, but not as an explicit activity that is conducted once in an event.

Differences in Institutionalization Efforts
Based on the analysis of the individual projects, the authors detected dissimilar outcomes from how they had conducted the BMI activity of *institutionalization* (e.g. Sosna et al., 2010). In the case of PBC, it has not been developed far enough for this activity to having had an equally crucial role as it has in FI and EI. However, it has been noted that the affiliation within SR&I, which contributed to a cross-unit collaboration with BICC, promoted the project's access to resources to develop the business model. Albeit, the more interesting findings on *institutionalization* is found in the differences between FI and EI. It seems that this BMI activity affects the amount of resources delegated to a project, which in turn influences a new initiative's ability to explore and maintain its business model, network relations and customer involvement. Furthermore, the choices made in regards to *institutionalization* may impact barriers to BMI, either overcoming them or enforcing the barriers, depending on the choices made.

In the analysis of EI, the authors have seen that the meticulous *institutionalization* efforts with full-time, dedicated resources in a relatively independent, autonomous unit from the rest of the

organization appears to have facilitated EI's business model development. This seems to have enabled them to explore business model options, potential partnerships and customer involvement. Furthermore, in EI, *institutionalization* occurred several times where the initiative obtained a greater affiliation and ownership from management, further facilitating its access to resources. The analysis of FI, on the other hand, paints a different picture with its apparent lack of *institutionalization* since it was a service which was a byproduct of the core services in the same unit and had to compete with these for the same resources, and it struggled to obtain ownership from management. This may have constrained its access to resources for maintaining position in the value chain (Chesbrough, 2010), which in turn seems to have limited its ability to alter the business model, establish and maintain partnerships, and engage in customer involvement.

In terms of barriers, FI appears to have been constrained by the prevailing business model (Chesbrough, 2010) at DNVPS and struggled with alignment of its business model (Santos et al., 2009) to that of Metric. The misalignment between DNVPS and Metric resulted in a detrimental cost structure for FI, and the competition for resources at DNVPS limited its sales efforts, i.e. value chain. EI, however, avoided these barriers by integrating all functions necessary for product development into the same team from the very beginning, which avoided any misalignments between units, and since the project was separated from the existing business of Maritime Advisory, it reduced the restrains of the prevailing business model in that unit. These findings indicate that a new initiative in an established organization may benefit from being separated from the existing business, and integrating the necessary functions to develop this initiative into a separate, independent group.

The Effects of Choice of technology
The analysis of FI and EI also revealed a similarity between the two project developments in terms of *choice of technology*, which is deemed as both an event in itself by the authors, but also a BMI activity by literature. This choice has not yet been made for PBC. Based on empirical findings it seems that in both FI and EI the *choice of technology* was made on the basis of familiarity, and not many options were evaluated in this decision. The choice was inherent with choosing in-house implementation with the IT group of DNV-GL, and in the case of EI, because they wanted a quick market entry. However, in both cases, this choice turned out to have consequences for the business model. For FI, their *choice of technology* limited their ability to make a user friendly and intuitive interface, i.e. it affected the value proposition. For EI, this choice has affected the performance of their service, i.e. the value proposition, and since a vital component of the technology will no longer be supported by the supplier, it will force a re-implementation with a new technology which affects the value chain. Therefore, empirical findings suggest a careful evaluation when choosing the technology to base a data driven service on where several options should be assessed and the long term of effects of the choice.

Frequently Adapting the Value Proposition and the Value Chain

The analysis reveals that all business model components have been determined and adjusted at least once during the course of EI. In the case of FI, however, a definition or adjustment of competitive strategy was not detected, and in PBC, there was not identified any definition of its potential revenue model, cost structure or competitive strategy. All projects show that the value proposition and the value chain were the most frequently defined and adapted business model components. The analysis reveal that across the three projects, a (re)definition of the value proposition was most frequently caused by *collecting and analyzing intelligence* (all), *experimentation* (FI and PBC), and *ensuring continuous knowledge acquisition* (EI). This finding underpins the importance of *collecting and analyzing intelligence* in the BMI process. Furthermore, *experimentation* has had a significant role in defining the value proposition, although the activity still shows limited frequency in the empirical findings. The (re)definition of the value chain was primarily due to *institutionalization*, recurring across all three projects, *choice of technology* (EI and FI), *experimentation* (PBC) and *ensuring continuous knowledge acquisition* (EI). Of these reasons, it seems evident from the analysis that the BMI activity of *institutionalization* has a significant impact on the value chain.

The events shaping the value chain has been seen to be particularly decisive for the business model since choices made in these events have affected other components of the business model. When choosing in-house implementation in FI, which defined the value chain, it also affected the resulting cost structure and revenue model. On a similar note, when it was decided that EI was to be *institutionalized* with the Hamburg offices and there was established a dedicated team to develop the service, it affected the value chain and available resources to develop the business model. Hence, findings from all three projects suggest that events wherein *institutionalization* occurs may impact the value chain, and that these choices may also affect other business model components or the overall process.

Relatedness Between Events and Business Model Components

Overall, the projects indicate little relatedness between one event and the subsequent events, apart from a few instances in each project. Particularly, there are three events in FI that seem to have impacted subsequent events; first, the choice of in-house implementation impacted the subsequent events of choice of technology and deciding on a revenue model due to the value chain and cost structure. Second, the choice of technology shaped the value proposition, which in turn affected the event of selling FI. Third, the use of internal experts for product development also shaped the value proposition, which in turn influenced the events of selling FI and revising their view of the target customer. In the case of EI, their *choice of technology* eventually led to an event where the supplier discontinued the support of a vital component, and thus affected the value chain later on. For PBC, the intelligence collected through the first round of prototyping and demonstrations served as a foundation for the subsequent decision on customer segment. Since these are the only events wherein the authors detected a relationship to another one, it

seems that the three projects can primarily be viewed as a stream of nearly unrelated events which consist of BMI activities that directly impact the business model by changing one or more of its components. A finding in support of this is the noted tendency in the development of EI where the components value proposition and value chain are consistently built upon, but they do not appear to be revised for potentially removing any elements. For instance, findings indicate that new market segments and value propositions are added to EI's business model without removing existing ones. The same tendency has not been identified in FI and PBC. Although, it has been shown in a few instances that one event can impact others later on, and deciding on one component may impact the definition of other components.

5.4.1.3 THE CONTRIBUTION OF BUSINESS MODEL INNOVATION ACTIVITIES FOR ESTABLISHING A BUSINESS MODEL

This section aims to answer RQ1 based on the findings in the analysis: *How do business model innovation activities contribute to establishing a business model for a data driven service?*

Through the analysis, several BMI activities have been identified and how these lead to an outcome on the business model through events in developing a data driven service. The identified BMI activities are *recognize and act upon trigger*, *collecting and analyzing intelligence*, *demonstrate value creation*, *identify and prioritize risks*, *experimentation*, *choice of technology*, *knowledge transfer*, *institutionalization*, *sustained growth and organizational learning*, *ensure continuous knowledge acquisition*, *organizational learning* and *recognize and act upon new triggers*. There is also an activity described in the theoretical background, *configuration of business model components*, which the authors have found to most often be an implicit activity occurring in every event that shapes the business model.

It is found that an event which shapes the business model may consist of one or more BMI activities, and that this event may define or adjust one or more business model components. One BMI activity does not appear to directly define one business model component, rather one or more BMI activities in the context of an event leads to this outcome. Furthermore, the events that shape the definition of a business model are primarily unrelated in terms of the business model outcome of a subsequent event. It appears to be a stream of relatively unrelated events that individually shape one or more business model components which step by step defines and alters the overall business model. However, one event may impact how other events shape the business model later on, or that determining one business model component may influence the definition of another component in the same event or in a subsequent event. This is illustrated by figure 6 below, through the grey, dotted lines which will be used in the same manner in the remaining figures.
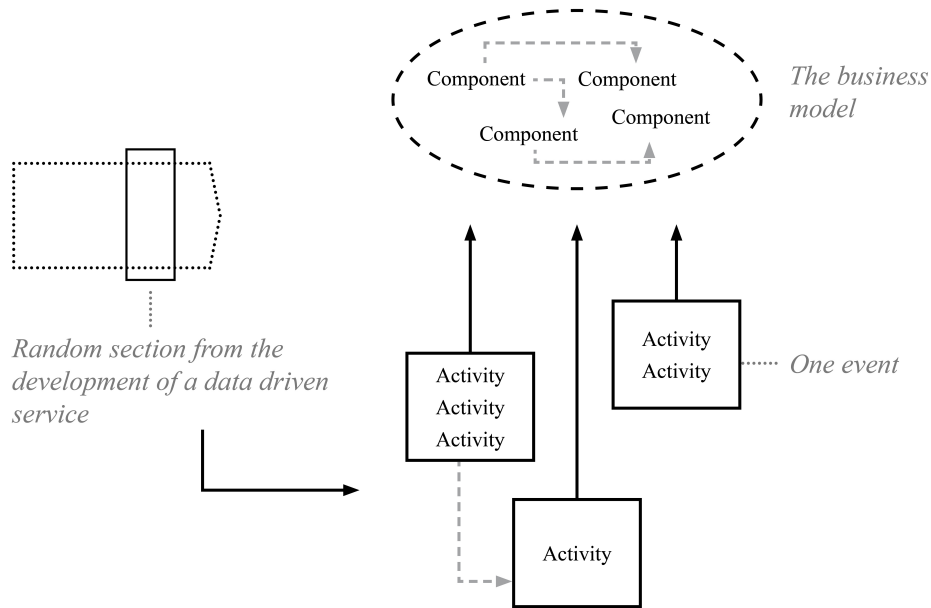
113

Figure 6: Illustration of the activity system: The development of a data driven service consists of several events, which in turn consist of one or more BMI activities. The events lead to the definition or adjustment of one or more components of the business model. An event may impact other subsequent events or defining a component may affect the definition of other components (gray arrows).

Based on the analysis, several similar characteristics of performing BMI activities when innovating a business model for a data driven services have emerged. The *configuration of business model components* is often an implicit activity that occurs in every event where a business model component is defined or adjusted. The *institutionalization* of the business model in the organization may impact the amount of resources delegated to it, which in turn can influence the service's ability to explore and maintain the business model, network relations and customer involvement. In the particular case of a data driven service, *choice of technology* may pose significant consequences for the business model. Finally, the BMI activities conducted when innovating a business model for a data driven service appears to primarily define and shape the value proposition and value chain of the business model. The value proposition is most often altered by *collecting and analyzing intelligence*, *experimentation* and *ensuring continuous knowledge acquisition*. The value chain is exceedingly defined by *institutionalization*, *choice of technology*, *experimentation* and *ensuring continuous knowledge acquisition*. The value chain component has also been shown to especially impact other events and the definition of other business model components.

5.4.2 THE IMPACT OF THE DIMENSIONS ON BUSINESS MODEL INNOVATION ACTIVITIES

This section answers RQ2, how the dimensions leadership, network relations and customer involvement, affect the activity system established in 5.4.1.3, illustrated by figure 6. This figure will be extended to include the dimensions that may impact this activity system directly or indirectly through the organizational context. Hence, the section first cross-compares the findings on the dimensions from the three projects, before discussing the relatedness between the dimensions.
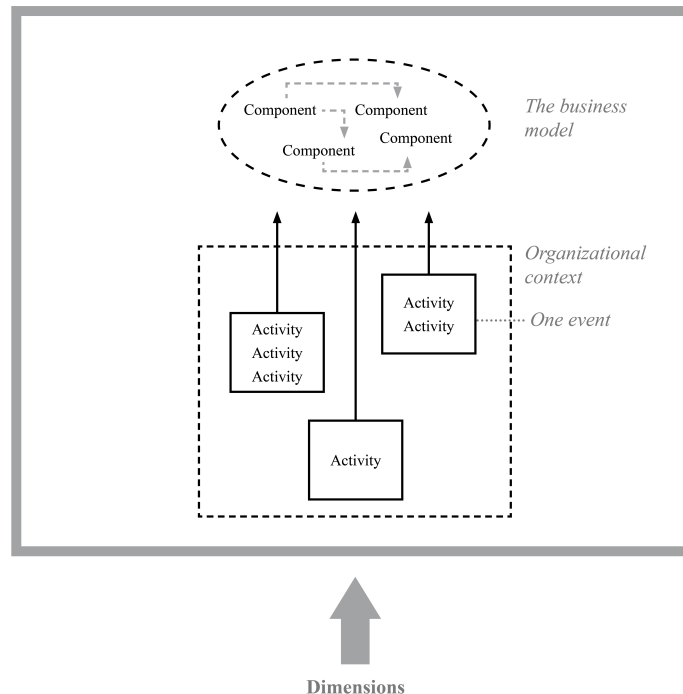

Figure 7: The impact of the dimensions; leadership, network relations and customer involvement on the activity system established in answering RQ1.

5.4.2.1 LEADERSHIP

The projects differ in the overall extent that leadership was involved in the events. EI and FI are similar in that leadership was the most frequent dimension impacting their events and associated BMI activities. Contrarily, in PBC, leadership was one of the least frequent dimensions, which may be due to the fact that it is still at the pre-project stadium. Across all three projects, leadership has been found to affect the BMI process mostly directly, but also indirectly through the organizational context. The dimension was also found to have an impact on the two other dimensions.

In all three projects, the role of leadership was seen to particularly impact the *configuration of business model components*. This was due to leadership's role as decision makers which led to a

continuous definition of the business model. *Collecting and analyzing intelligence* has been highlighted as being especially impacted directly by leadership in both FI and PBC. In FI it has also been noted that leadership affected *collecting and analyzing intelligence* indirectly through the organizational context by facilitating strategic sensitivity and resource flexibility, whilst in PBC, leadership has also been shown to affect resource flexibility. Also, in EI, leadership's impact on *recognizing and acting upon triggers* seems evident, which is also found to be impacted by leadership in the initiation of FI. Furthermore, leadership has been identified to indirectly influence the BMI process by facilitating strategic sensitivity in EI as well, which is in similarity to FI. Lastly, leadership's indirect influence on EI's business model has also been evident through *institutionalization*, *ensure continuous feedback* and *organizational learning*. However, in FI, leadership demonstrated an important role in directly influencing *institutionalization* by choosing in-house implementation, and a lack of *institutionalization* in assigning resources for selling FI. Thus, in these three projects, it seems that leadership could both promote and obstruct the BMI process directly and indirectly.

All three projects highlight the importance of leadership in initiating projects, and it is evident that these are important events in the BMI process that often entail an initial definition of the service's value proposition and *collecting and analyzing intelligence*. This underlines the importance of an entrepreneurial leader. Leadership has had a role in *configuring components of the business model*, as for instance in EI, leadership decided on the revenue model from the very beginning, which remained unaltered throughout development. In PBC, the first event of prototyping and demonstrations led to a decision in regards to choosing a customer segment, which was significant in that project and where leadership acted indirectly. In FI, leadership directly proposed the value proposition, which was affected by subsequent events altering the value proposition.

EI and FI are similar in that events involving *institutionalization* are significant events impacted by leadership, since these decisions have impacted several business model components and/or subsequently impacted other events. Especially for EI, it is evident that the *institutionalization* efforts that is continued through establishing arenas to *ensure continuous feedback*, supports the inclusion of partnerships and customer feedback that may lead to new to refined value propositions and value chain. Such efforts in institutionalization are not so evident in FI, which may be partly due to leadership, rendering FI less able to maintain and refine the value proposition and value chain. *Choice of technology* is deemed a significant event in EI that was directly impacted by leadership. In FI, leadership indirectly influenced the choice by choosing in-house implementation. In both cases, the technology altered the value chain and had subsequent impact on the value proposition and value chain. For PBC, the implementation technology is not chosen yet.

In EI, leadership coincides with both the network relations dimension and the customer involvement dimension. This is due to the leader's activities and impact on activities, such as *experimentation* and *choice of technology*, that led to the promotion of customer involvement and establishment of network relations. Leadership was found to involve the network dimension in FI, and to engage in customer involvement through *collecting and analyzing intelligence*. Similarly, in the case of PBC, leadership *collected and analyzed intelligence* through both customers and partners, directly involving the two other dimensions.

5.4.2.2 NETWORK RELATIONS

Network relations was not the most prominent dimension in neither projects, in FI it was the least used dimension, but when identified it has been found to impact BMI both directly and indirectly in all projects.

In all projects, especially in FI and EI, network relations were identified to *configure the business model components,* i.e. being used to refine a component. For all projects, the value propositions were changed due to network involvement. For FI and EI, alterations were made to the value chain, whereas for EI and PBC, network relations induced a change in the value network. It seems that in the case of FI, the intention with network relations was to expand market access prior to launch and to use the partnership as a source to customers, but the project failed to sustain it. However, the partnership turned out to be a source of customer involvement in *experimentation*. EI initiated network relations after launch and implemented *institutionalization* and structures, and leveraged these relations to increase the value proposition and the market segments of the business model. In PBC, which has not yet been launched, network relations were used to *collect and analyze* early feedback. Thus, network relations seem to be a source of feedback, being underlined by the fact that in both EI and PBC *collect and analyze intelligence* in connection with the dimension network relations. Furthermore, findings from EI also indicate the role of network relations in *recognize and act upon internal or external trigger/new trigger* and to *ensure continuous knowledge acquisition*.

Choice of technology is an activity where network relations have been evident in FI and EI, both representing significant events. Both cases showed a reduction in the strategic flexibility due to partnerships, thus, indirectly affecting the consequent BMI process. However, for EI, as previously stated, the choice of technology partner was greatly impacted by leadership. Overall, for EI the inclusion of network relations is greatly supported by leadership, which is supported by a single event in both FI and PBC. Another event in EI that had a more significant impact on the business model than other events, also supported by leadership, is the employment of a dedicated partner manager that led to entering partnerships, which in turn contributed to change in four business model components. In this event, leadership promoted strategic sensitivity through the organizational context. Similarly, in PBC, the one event deemed significant involving network relations is supported by leadership, which is the initiation of the pre-project.

The analysis has shown that the network dimension can be greatly impacted by the leadership dimension, as particularly seen in the case of EI. Apart from one instance in FI where the partnership with BIMCO became a source of customer involvement, the network dimension has not been found to affect other dimensions.

5.4.2.3 CUSTOMER INVOLVEMENT

EI and FI are similar in that the relative frequency of customer involvement in each project is approximately the same, and this is also about the same frequency as the network dimension in these projects. In the case of PBC, however, customer involvement was the most frequent dimension since it impacted five of seven events. Customer involvement has been seen to impact the BMI process directly only in the case of FI and PBC, whereas in EI, it has been mostly directly involved, but also indirectly involved through the organizational context. Although, in FI, it was shown that the organizational context, i.e. strategic sensitivity, may have contributed to the involvement of this dimension.

The BMI activities wherein customer involvement has been apparent varies across the three projects, signifying that this dimension is not distinctly related to one or a few activities in developing a business model. *Configuration of business model components* and *ensuring continuous knowledge acquisition* were most evident in EI in relation to this dimension, whereas in FI, it was in relation to *experimentation*, *knowledge transfer* and *organizational learning*. Lastly, in PBC, it was *collecting and analyzing intelligence* and *experimentation* that was related to customer involvement, and thus, the only commonality is *experimentation*. In all three projects, customer involvement seems to have particularly influenced the view of the value proposition, however least in FI, which may indicate a lack of it. The market segment was also seen to especially be impacted by this dimension in FI and PBC, whereas in EI it was primarily the value proposition and the creation of structures to facilitate customer involvement that was related to this dimension. Only in the case of EI has customer involvement been seen to influence the organizational context, i.e. influence the BMI activities indirectly, which is where structures to continuously gather customer feedback may lead to enhancements of strategic flexibility and strategic sensitivity.

The significant events impacted by customer involvement show little similarity. Project initiation, and thus *demonstrating value creation*, is highlighted in PBC since it formed the basis for leadership's decision to pursue the project. However, more significant is the event in which customer involvement in the first round of prototyping, led to a determination of the market segment and target customer in the subsequent event. In EI, however, it was the event where customer involvement led to a revisement of the value proposition that is deemed most important for this dimension since it required leadership to rethink this vital component and transfer the knowledge to the organization. Whereas in FI, the significant event involving the customer

dimension, impacted both value proposition and target customer. It was when use of internal experts led to a complex value proposition targeting several customer groups to varying degrees, which in turn affected the event of selling FI. Overall, the projects differ in extent of customer involvement, as FI shows a lack of it, EI uses it frequently through, and in the case of PBC, customer involvement is more prominent compared to the others. The fact that customer involvement is primarily based on established relationships comes across as a similarity between the projects.

The empirical findings has not shown an impact of customer involvement on the other two dimensions, but it has shown that leadership can play a crucial role in involving customers in the development of the projects, and provides an example of how network relations may be a source of customer involvement in FI. Customer involvement has been shown to mainly affect the BMI process directly, but it may also affect indirectly as seen in EI.

5.4.2.4 INTERRELATEDNESS OF DIMENSIONS

It is evident that the leadership dimension plays an important role since it may impact the influence of the two other dimensions, the organizational context and the BMI activities directly, which can be seen across all three projects. Thus, leadership impacts both directly and indirectly. Furthermore, the network and customer dimensions, and the organizational context have also been shown to directly impact the BMI process directly in all three projects.

The dissimilarities, however, are mostly found in the relationships between the network and customer dimensions, how they relate to one another and how they relate to the organizational context. In EI, it has been shown that the context may affect the utilization of these two dimensions and that they in turn can affect the context, whereas in PBC, there is not identified any relation between the organizational context and the customer dimension. Although the network dimension in PBC was seen to affect the organizational context by reducing strategic flexibility. Lastly, in FI, the context was found to influence both dimensions of network relations and customer involvement, and that the network dimension in turn impacted the context in the same way as PBC. However, unlike the two other projects, FI also revealed that the network dimension may impact the utilization of the customer dimension.

Figure 8 summarizes these findings on how the dimensions relates to one another, the organizational context and the BMI activity system described in section 5.4.1.3.
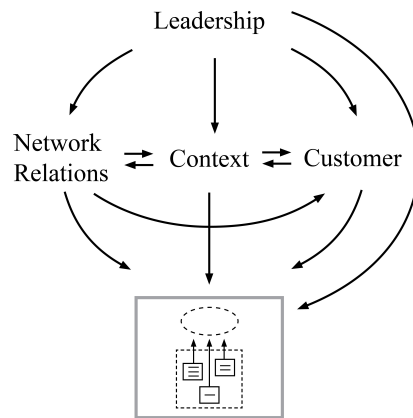
Figure 8: Summarizing the relationships between the dimensions, the organizational context and the BMI activities as identified through empirical findings across all three projects. The normal arrows indicate that the relation is found in all three projects, whereas coloured arrows indicate in which project the other relationships were identified.

5.4.2.5 THE IMPACT OF LEADERSHIP, NETWORK RELATIONS AND CUSTOMER INVOLVEMENT ON BUSINESS MODEL INNOVATION ACTIVITIES

This section aims to conclude the chapter and answer RQ2 as stated in the introduction: *How do the dimensions of leadership, network relations and customer involvement affect the business model innovation activities that contribute to establishing a business model for a data driven service?*

In RQ1, the authors established how the activities within an event contribute to configure business model components in a system of activities. Some of these activities may be affected by the dimensions of leadership, network relations or customer involvement. Based on the analysis, all dimensions were found to impact *configuration of business model components.* Additionally, both leadership and network relations were found to be involved in *collecting and analyzing intelligence* and *choice of technology.* Moreover, leadership had a role in *recognizing and acting upon internal or external triggers* and in *institutionalization.* Finally, the customer dimension was also found to be associated with *experimentation*.

Figure 9 describes how the dimensions may impact the events, and thus, the BMI activities of the activity system in section 5.4.1.3 (figure 6). This may happen in a direct manner by which a dimension directly steers an activity, or is utilized through an activity to shape one or more business model components. A dimension may also impact the event and its associated activities by influencing the organizational context, which again may impact one or more activities leading to an outcome on the business model. Based on empirical findings, it seems that the direct influence of a dimension has led to a more concrete and significant outcome than when a

dimension has affected the BMI process indirectly it. The ways in which the dimension may impact the BMI activities is illustrated in figure 9 below.
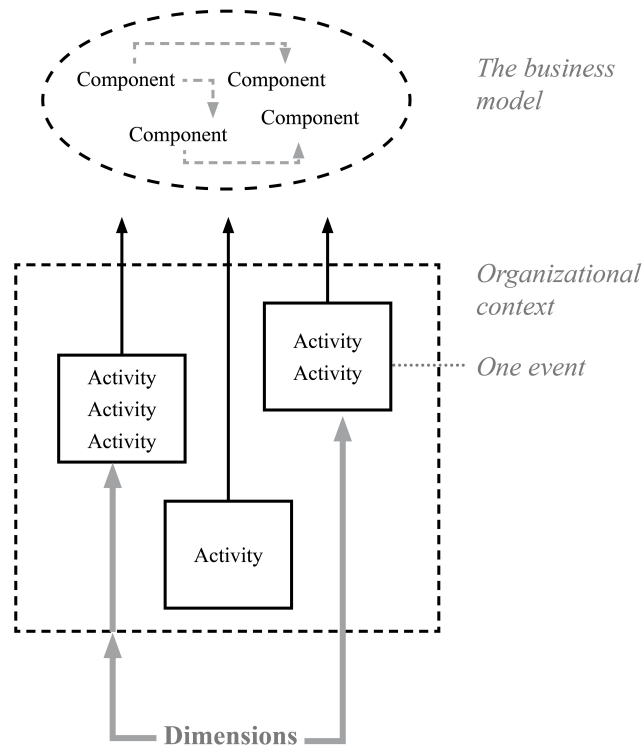
Figure 9: Illustration of how the dimensions impact the activity system. A dimension may directly affect one or more of the activities that an event comprises of, or a dimension may impact the context that subsequently impacts the event and its activities.

Through the analysis it was found that both leadership, network relations and customer involvement may independently impact the BMI activities directly or indirectly. Furthermore, these dimensions may also interact to make an impact on the BMI activities. Network relations and customer involvement may be initiated and promoted by leadership, both impacting the business model directly or indirectly via the context, or the organization may involve customers without leadership's involvement. Additionally, network was also found to facilitate customer involvement. The interrelatedness was summarized in figure 8 in 5.4.2.4.

6. DISCUSSION

In the analysis (ch. 5), the authors answered RQ1 by identifying BMI activities in the three projects, and found that events in the development of a business model consist of one or more BMI activities, i.e. it was found that BMI may be viewed as an activity system within events that occur in the development of an initiative (figure 6). These events shape one or more components of the business model, and they may impact subsequent events, or the shaping of one component in an event may shape other components in the same or subsequent events. Also, characteristics in terms of significant events with associated BMI activities were highlighted. In answering RQ2, the analysis showed how the activity system may be affected by leadership, network relations and customer involvement (figure 9). The BMI activities typically impacted by the dimensions were highlighted, and the analysis revealed that the dimensions may influence an event and its activities directly, or that it may influence the organizational context, which in turn can affect a BMI event. Furthermore, the analysis showed how the three dimensions may impact one another, and the significant events they have particularly contributed to in the three cases.

This chapter presents a discussion where the authors combine the answers to the research questions with additional findings in attempts of answering the purpose of the thesis. The purpose is to investigate how large, established firms conduct BMI for data driven services. Since the research questions do not answer the purpose in its entirety by themselves, this section will discuss findings from RQ1 and RQ2 on a process-level by discussing the activity system from the analysis and how it is impacted by dimensions on a process-level through phases. Moreover, the implications of a data driven service and an organizational context on the process of BMI will be discussed. The chapter is concluded with a summary of this which aims to answer the purpose of the thesis.

6.1 THE BUSINESS MODEL INNOVATION PROCESS

First, this section will discuss whether this thesis' findings are aligned with the chosen definition of BMI in the introduction. Further, this thesis' findings on the BMI process will be discussed by combining the answers to RQ1 and RQ2 into a process perspective that consists of phases. Next, specific findings on BMI for a data driven service and concrete findings on BMI in a large, established firm will be discussed. The chapter is concluded with a summary of the preceding sections combined, which answers to the purpose of this thesis.

6.1.1 DEFINING BUSINESS MODEL INNOVATION

In section 1.3.2 of the introduction, the authors defined BMI as the entire process from initiating BMI all the way until a suitable business model is implemented in the organization, in agreement with Sosna et al. (2010). This can be seen as an extension of Mitchell & Coles' (2003) view on that BMI is the continued configuration and implementation of business model components. The

findings of this thesis agree with the latter scholars in that BMI involves continued configuration and implementation of components (Mitchell & Coles, 2003), but this is not the whole picture since findings also show that it is most appropriate to take the perspective of Sosna et al. (2010). It appears to be necessary for BMI to be sparked through initiation, which probably is caused by a sufficiently significant trigger, and organizational measures seem to be required for choosing, implementing and supporting the business model components. Empirical findings indicate that there needs to be a sufficient reason for changing a business model component, and systems in place that sustains the changes. For instance, the attempted partnership of FI with BIMCO was initiated since they intended to use it as a sales channel, however, it seems there were not sufficient systems in place to sustain the partnership.

Also, in defining BMI, it was stated that this thesis employs the perspective that BMI is never finished since firms must continuously adapt their business models for long term success (Sosna et al., 2010). However, empirical findings have not been sufficient to corroborate this as the investigated projects have not been developed far enough to evaluate long term success, and identifying successfulness is outside the scope of this thesis. Although, the events of revising the business model components in FI and EI do provide some indications that one should maintain a dynamic perspective on the business model.

6.1.2 PHASES IN BUSINESS MODEL INNOVATION

This subsection will first describe how the empirical findings relate to the phases of BMI proposed in the theoretical background (section 2). Thereafter, the answers to RQ1 and RQ2 will be discussed by investigating the findings per phase of the BMI process.

The analysis revealed that the three projects seem to follow the same type of phases as outlined in the theoretical background and summarized in table 2, i.e. (1) initiate BMI, (2) generate business model options, (3) implement and scale, and (4) revise and adapt. All three projects recognized either an internal or external trigger, which they acted upon to initiate BMI. Next, there are findings across the cases that they evaluated options for some of the business model components, such as considering outsourcing or in-house implementation, although it was to a limited extent in all projects. Thereafter, the authors have identified *institutionalization* efforts in the three projects, which coincides with the third phase of implement and scale. Lastly, FI and EI show evidence of revising and adapting a few business model components, which is in line with the final phase.

All proposed BMI activities in the theoretical background were identified in the empirical findings, which shows empirical support of how steps in BMI is suggested by scholars. However, even though the authors have recognized these phases in the development of the projects, it is also noted that many of the identified BMI activities can occur in any type of phase, which contradicts the suggested model by Sosna et al. (2010). Their study indicates that

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institutionalization occurs after a 'suitable' business model is established (ibid.), whereas the findings of this thesis shows that this activity can play an important role in earlier stages of BMI as well in order to ensure ownership to the initiative within the organization and gain access to resources. However, there are also a few activities that appear to be more tied to a specific phase. This being *demonstrate value creation*, which is defined by Euchner & Ganguly (2014) as commencing the BMI process by defining an initial definition of the value proposition, and therefore, it has only occurred in the first phase. The other exception is *sustained growth and organizational learning*, which, according to Sosna et al. (2010), occurs only after a 'suitable' business model is identified, and the authors have not identified an event that contradicts this. The last exception is *recognize and act upon new triggers*, which inherently requires that a BMI process already has been conducted for a new trigger to come and "challenge its status quo" (ibid.).

As presented in the cross-analysis (section 5.4), the BMI activity of *configuring business model components* occurs most often implicitly in every event where a business model is defined or adjusted, i.e. regardless of which phase. In contrary to this, the literature describes the *configuration of business model components* as an explicit activity where one uses an existing business model template (Osterwalder & Pigneur, 2010) or creates one's own (Amit & Zott, 2010; Sinfield et al., 2011). An activity such as Teece's (2010) recommendation of management deconstructing existing business models to create a new one has not been identified by empirical findings. This may indicate that *configuring the business model components* rather occurs most often as an implicit activity throughout the entire BMI process where only a couple of components are altered per event, instead of it being an explicit process where management or the project team explicitly configures all of the components. Thus, empirical findings support the literature in that *configuring business model components* is a major part of the BMI process, but in a less explicit manner.

6.1.2.1 INITIATE BUSINESS MODEL INNOVATION

Sinfield et al. (2011) propose that a firm should 'lock down' one or more components, and design the rest of the business model in reference to these choices. The analysis of each project revealed a similar trend across the cases where they had a tendency of commencing the BMI process by determining one business model component first, which supports the proposition of Sinfield et al. (2011). Both FI and PBC' processes began with the BMI activity of *demonstrating value creation* in which they decided upon an initial definition of the value proposition that was continuously adapted throughout both developments. EI's development began by the management deciding to 'lock down' the revenue model, and the other components was then designed in reference to this choice. This is in line with Teece's (2010) recommendation that the business model elements, as he calls them, must be defined with reference to each other and to the external developments in the business environment. Thus, commencing the BMI process through *configuration of the*

business model components by determining one component first, is supported by both theoretical and empirical findings.

The analysis showed that leadership has played a crucial role for the initiation of the process across all three projects. This occurred through events where leadership either directly *collected and analyzed intelligence* and *recognized and acted upon a trigger*, or where leadership facilitated these activities through the organizational context. Hence, these findings on the dimension of leadership is in line with Jones & Macpherson (2006) who argues that this innovation process can be initiated by leadership who recognize a valuable opportunity. It also correlates with Doz & Kosonen (2010) in that fostering strategic sensitivity in the organization may contribute to initiating BMI. Moreover, the cases of FI and EI have shown the importance of entrepreneurial leaders for pursuing such innovation processes, which supports the findings of Guo et al. (2013) in that entrepreneurial skills may augment BMI.

Neither network relations or customer involvement have been particularly prominent in the initiation of the three projects, apart from use of internal customers in the case of PBC. This contrasts the recommendations of Chesbrough et al. (2006) who suggest open innovation as a potent mechanism for accelerating innovation.

6.1.2.2 GENERATE BUSINESS MODEL OPTIONS

The empirical findings show varying degrees of generating business model options in order to establish a 'suitable' business model for the initiatives. Euchner & Ganguly (2014) recommends generating business model options after having initiated BMI, and in a similar vein, Sosna et al. (2010) claim that the early stages of BMI are exploratory in nature where alternatives are considered and tested. In all three cases, after initiation, they had the option of outsourcing or choosing in-house implementation. This is a decision which in hindsight has proven to have significant repercussions for several components of a business models, especially in terms of structuring the value chain that in turn may affect the cost structure and revenue model, as seen in FI. However, in PBC, they ran a pilot project, i.e. *experimented*, to investigate outsourcing or in-house implementation for pursuing the project, which shows an evaluation of options and use of *experimentation* to decide upon it. Thus, empirical findings show how *experimentation* can be conducted to create a foundation for determining business model components, in similarity to what is greatly emphasized by scholars (e.g. Chesbrough, 2010; Teece, 2010). Although, *experimentation* is the most emphasized activity by the BMI literature (e.g. Chesbrough, 2010; Teece, 2010; Sosna et al., 2010), it has not been as present or crucial in the development of the projects as one would expect based on the theoretical background.

Determining where to implement a potential service offering entails *institutionalization* within the firm, if choosing in-house implementation, and has been shown to affect *choice of technology*. As previously mentioned, this contrasts the model of Sosna et al. (2010) in that

institutionalization plays an important role at earlier stages of BMI as well. The analysis indicates that early stage *institutionalization*, which must be supported by leadership, may impact its ability to explore business model options as well as network relations and customer involvement. Moreover, the choice of in-house implementation guided the projects' *choice of technology* where empirical findings suggest limited evaluation of options and potential long-term effects. Due to this choice, which also has been shown to be particularly impacted by leadership, the analysis indicates the possibility of reduced strategic flexibility when having to rely on external technology suppliers, which underlines the importance of this choice for technology-based services (Palo & Tähtinen, 2013).

6.1.2.3 IMPLEMENT AND SCALE

Several scholars have emphasized the role of *institutionalization* or *incubation in the firm* after a suitable business model has been identified (Sosna et al., 2010; Euchner & Ganguly, 2014; Morris et al., 2005). The empirical findings of this thesis supports this, but also elaborates on this process by showing how *institutionalization* can be used to overcome barriers to BMI. A comparison of FI and EI demonstrated how performing this activity may be used to avoid the issue of misaligned business models between cooperating units within a company and conflicts with the prevailing business model in the same unit. The findings suggested that a new initiative in an established organization may benefit from being separated from the existing business by being organized in small, independent group, and integrating all necessary functions to develop the new service into this group. This eliminates the need for cooperating with another unit, and competing with an existing business model for scarce resources (Smith et al., 2010).

Leadership has proven vital to the process of implement and scale. The analysis show that successful *institutionalization* requires managers with sufficient resources and mandate at their disposal as well as entrepreneurial skills (Guo et al., 2013). Furthermore, the inclusion of network relations are found to be significantly facilitated by leadership and *institutionalization* efforts. EI showed how this dimension and BMI activity combined can lead to setting up structures for *ensuring continuous knowledge acquisition* through customer involvement. Whereas FI showed how a lack of *institutionalization* may lead to the unfulfillment of a partnership, thus impacting the dimension of network relations. Hence, these findings elaborates on how to conduct this BMI activity by describing how it is implicated by the leadership dimension, and how this in turn may influence the utilization of the two other dimensions. Sosna et al. (2010) highlight the role of leadership for the entire BMI process, but does not explicitly underline leadership's role in this process, or how it potentially affects other dimensions.

6.1.2.4 REVISE AND ADAPT

Referring to revise and adapt as the final phase of BMI would be misleading, since the authors view BMI as a process that is never finished. However, this phase is one that the company may reside within for a while, continuously making adjustments and gathering feedback (e.g. Demil &

Lecocq, 2010), until a new trigger comes along which requires a new initiation of the BMI process (Sosna et al., 2010). The importance of maintaining a dynamic perspective on one's business model is emphasized by Demil & Lecocq (2010) and Casadesus-Masanell & Ricart (2010). Yet again, the analysis suggest that the leadership dimension seems to play a forceful role in this phase.

Leadership may impact the organization's ability to maintain a dynamic perspective on its business model. This influence can be performed directly by management performing BMI activities such as *institutionalization*, *ensure continuous knowledge acquisition* or *organizational learning*, or the impact can be exercised indirectly by creating structures for enabling this knowledge acquisition and transfer of that knowledge, as especially seen in EI. The empirical findings have shown two events in which leadership collected and analyzed intelligence from customers which led to the revisement of a business model component. This also implies that leadership influenced the involvement of the customer dimension. In the case of EI, the establishment of a yearly user conference can be viewed as the establishment of an arena that fosters continuous knowledge acquisition. This correlates to Doz & Kosonen (2010) who view strategic sensitivity as one of the necessary capabilities for performing BMI, where this structure that facilitates continuous knowledge acquisition can be viewed as a means to achieve this. Also, the fact that EI hired a partner manager may have further facilitated strategic sensitivity, and shows another instance where leadership influenced another dimension, network relations. Thus, customer involvement or network relations into the BMI process can be enabled by leadership who organizes and assigns resources to facilitate this through *institutionalization*.

6.1.3 BUSINESS MODEL INNOVATION FOR A DATA DRIVEN SERVICE

Primarily, the findings in this thesis are relevant for BMI regardless of it being a data driven service or another service or product. However, during the research on the development of three data based services, the authors have also uncovered some specific considerations for BMI in the context of data driven services.

6.1.3.1 CHOICE OF TECHNOLOGY

First of all, *choice of technology* has been an important event/activity on many accounts, also in terms of it being BMI for a data driven service. The empirical findings show support of both scholars within BMI and Big Data in that determining which technology to base one's offering on is important, and this decision becomes even more crucial for data driven services. Palo & Tähtinen (2013) highlights this decision as vital in the early stages of developing a business model for technology-based services, and Wamba et al.'s (2015) literature review indicated that technology was one of the main challenges when creating value with data. The analysis correlates with this since the *choice of technology* in the projects have been shown to limit the performance of these data driven services, which may affect their value proposition, and potentially force re-implementations with new technology, which affects the value chain. Thus, the findings support

literature in regards to the importance of determining which technology to use, but also adds detail by describing some of the potential consequences of this choice.

6.1.3.2 A SHIFT IN THE MINDSET OF VALUE CAPTURE

The analysis revealed that determining a revenue model for a data driven service requires some specific considerations, which correlates with the recommendations of Hui (2014) and Porter & Heppelmann (2015). They argue that creating value with data requires a shift in the mindset of value capture where pricing should be based on customers' perceived value of the offering, and not pricing based on cost structure and maximizing profits (ibid.). Also, revenue models for creating value with data tend to foster recurring revenue streams (ibid.). FI showed how pricing a data driven service based on cost structure may lead to a misalignment between the pricing and customers' expectations. Both FI and EI chose subscription-based revenue models, which supports the scholars' recommendations.

Moreover, Hui (2014) argues that to capture value with data, the new control points should be based on customization and network effects offered by the provider, and firms should engage in collaborations in order to generate value from data collectively in ecosystems. EI have showed intentions of attempting to achieve network effects, but this will require a great increase of customers connected to the platform, and sufficient scaling of it. Also, EI have already showed engagement in several partnerships to generate value from data collectively. Hence, empirical findings from one project correlates with the recommendations of Hui (2014), but how to achieve the network effects in the business model remains unknown.

6.1.3.3 CREATING TRANSPARENCY

From the five dimensions of creating value with data proposed by Wamba et al. (2015), there is one that particularly stands out in the empirical findings of this thesis - creating transparency. FI's beginning was based on the market need of creating transparency in the lucrative, but fickle bunker fuel market. This remained an important part of this service's value proposition throughout the development. Whereas, in the case of EI, creating transparency was not an emphasis from the beginning, but after a revisement of the value proposition based on customer feedback, it became central to the service offering. Thus, the findings of this thesis support Wamba et al. (2015) and Brown et al. (2011) in that creating transparency is a means to create value with data. However, Wamba et al.'s (2015) literature review also showed that creating transparency was the least emphasized of the five value creation dimensions with data across literature. Therefore, the empirical findings also contrasts this emphasis of how to create value with data.

6.1.3.4 BROKERING INFORMATION

The theoretical background outlined Wang's (2012) three business models that he deems to emerge in the era of Big Data, and all three projects in the analysis appears to coincide with his proposed business model of brokering information. The three data driven services are based upon mixing unstructured data to create specialized streams of insights (ibid.). For instance, EI blends data from several sources, such as weather data and fuel testing data, which they combine with their expertise to create insights that are of value to the customer. In other words, they provide benchmarking, analysis and insights, and thus, broker information, which is in line with Wang's (2012) proposed business model. However, Wang (2012) does not provide much detail on how to create such a business model, and therefore, the findings of this thesis can add description of how the development of such a business model may occur. The findings of this thesis show that when developing a business model for brokering information the value proposition seems to focus on creating transparency and incorporating multiple sources of data, choice of technology may have significant consequences, and relying on partnerships for data access may reduce strategic flexibility.

6.1.4 BUSINESS MODEL INNOVATION IN A LARGE, ESTABLISHED FIRM

In addition to specific considerations for BMI in the context of data driven services, this thesis has also uncovered concrete findings on how BMI may be affected by being performed in a large, established organization.

6.1.4.1 INSTITUTIONALIZATION AND ORGANIZATIONAL CONTEXT

Several of the points made in regards to the BMI activity *institutionalization* in section 6.1.1 on phases in BMI, are specifically relevant for large, established firms. First, in the early stages, it is a point that *institutionalizing* the new project or initiative within a group or unit in the company may be key to ensure that it receives sufficient resources with ownership from management. Thus, enabling the initiative to be properly developed and explore its potential. This somewhat contrasts the suggestions of Euchner & Ganguly (2014) and Sosna et al. (2010) in that *institutionalization* may be important to the BMI process at an earlier stage, and even though small-scale is important for remaining agile in the development, it must receive sufficient resources to explore its potential properly. However, the findings on leadership's role in this is aligned with the scholars emphasizing the importance of management to facilitate the process.

Furthermore, *institutionalization* plays an important role in terms of BMI in a large, established firm when deciding upon where to implement the service development and overcome barriers caused by the organizational context. Also, *institutionalization* and leadership can affect the creation of organizational structures that facilitate the inclusion of network relations and customer involvement. Thus, this thesis contributes to the BMI literature by adding detail on how *institutionalization* efforts facilitated by leadership in a large firm can be used to facilitate the BMI process and overcome its barriers, as well as promote the involvement of the two other

dimensions. Chesbrough (2010) discusses barriers caused by amongst other things the organizational context. However, he underlines the use of *experimentation* to overcome these, whereas the findings of this thesis indicate that in a large, established firm, *institutionalization* efforts may be even more important to overcome the organizational barriers, and that having done this properly may in turn facilitate *experimentation*.

6.1.4.2 LEARNING ACROSS INITIATIVES

The other aspect of BMI in a large, established firm noted by the authors is that there may occur learning across initiatives that influences the process. The three cases investigated in this thesis belong to the same BA within a large, established firm. This means that some employees involved in the projects have been involved in previous ones from which they have gained experience and learnings that have been brought into new initiatives, i.e. individuals, or members as Argote & Ingram (2000) calls them, have been moved from initiative to initiative, which is the most powerful manner of knowledge transfer in organizations (ibid.). Thus, this is a factor influencing the BMI process of new initiatives within companies that have not been particularly emphasized in this thesis, although, the authors have noted a few instances where empirical findings show learning across initiatives.

In the empirical findings on PBC, an informant noted that an important lesson from FI was that visualization and interactivity was key for accomplishing buy-in from others, both in collecting feedback from potential customers and for convincing management. This was indicated to have caused a greater emphasis on prototyping and demonstrations in PBC. Furthermore, unlike FI, the execution of EI and PBC focused on full-time, dedicated resources and cooperation across units early on. The issues of having too many tasks to focus on at once was noted as a disadvantage in FI, which may have contributed to the differences in EI and PBC. Also, several informants have noted the importance of an entrepreneurial leader who show ownership to the initiative and who manages to assign resources to its development, which has been the case for EI, and may be emphasized for future initiatives. Lastly, the involvement of customers throughout a development process is a learning from FI, which appears to have influenced PBC since the customer dimension is the most prominent one in this project which has only been ongoing for a short time relative to the other projects. Thus, empirical findings show that there occurs learnings across initiatives that affect the BMI process of subsequent ones. How learnings from different BMI processes can impact subsequent processes within a company is not an aspect that is widely emphasized from what the authors noted in the conducted literature review. Chesbrough (2010) and Chesbrough & Rosenbloom (2002) discuss BMI in an organizational context, but mostly in terms of the barriers it may pose for new ventures.

6.2 BUSINESS MODEL INNOVATION FOR DATA DRIVEN SERVICES IN A LARGE, ESTABLISHED FIRM

This section will summarize how the discussion answers the purpose and explain how this contributes to existing literature on BMI. The purpose of this thesis was to investigate how large, established firms conduct BMI for data driven services. The discussion has outlined how events with associated BMI activities can be conducted throughout the phases of the BMI process, and how these events may be impacted by leadership, network relations and customer involvement. Thus, the answers to RQ1 and RQ2 were integrated into a process perspective consisting of phases. Thereafter, specific considerations in terms of the context - BMI for a data driven services, and considerations of BMI in a large established firm were discussed.

In the analysis, the BMI activities in each event were identified, whether any dimensions had particularly affected the event was evaluated, and then it was determined how this had led to an outcome on the business model. Based on this, a manner to decompose the development of a project into a stream of events, consisting of BMI activities, was found. The authors came to view the process of BMI as consisting of activity systems within relatively unrelated events, where one event defined or adjusted one or more business model components. However, it was also found that an event may impact one or more subsequent events in the BMI process, or that the definition of a component can influence the definition of other business model components. The dimensions were found to primarily impact an event directly by performing or guiding BMI activities in that event, or the dimensions could influence an event indirectly through the organizational context. In terms of the relationships between the dimensions, the organizational context and the BMI process, it was found that the empirical findings (figure 8) were consistent with the theoretical findings (figure 1), apart from one difference detected in one of the projects. FI showed that the network dimension could affect the customer dimension, which was not detected as a relationship in the literature review. Since the network dimension is defined to include the customer dimension (Chesbrough & Schwartz, 2007), this finding may be appropriate. Also, the theoretical findings viewed the impact of the dimensions on an overall level on the BMI process, whereas the empirical findings viewed their impact on an event-level comprising of activity systems, as can be seen in figure 8. Thus, the discussion have presented these activity systems that shapes the business model with the impact of dimensions throughout the phases of the BMI process, which is illustrated by figure 10 below.
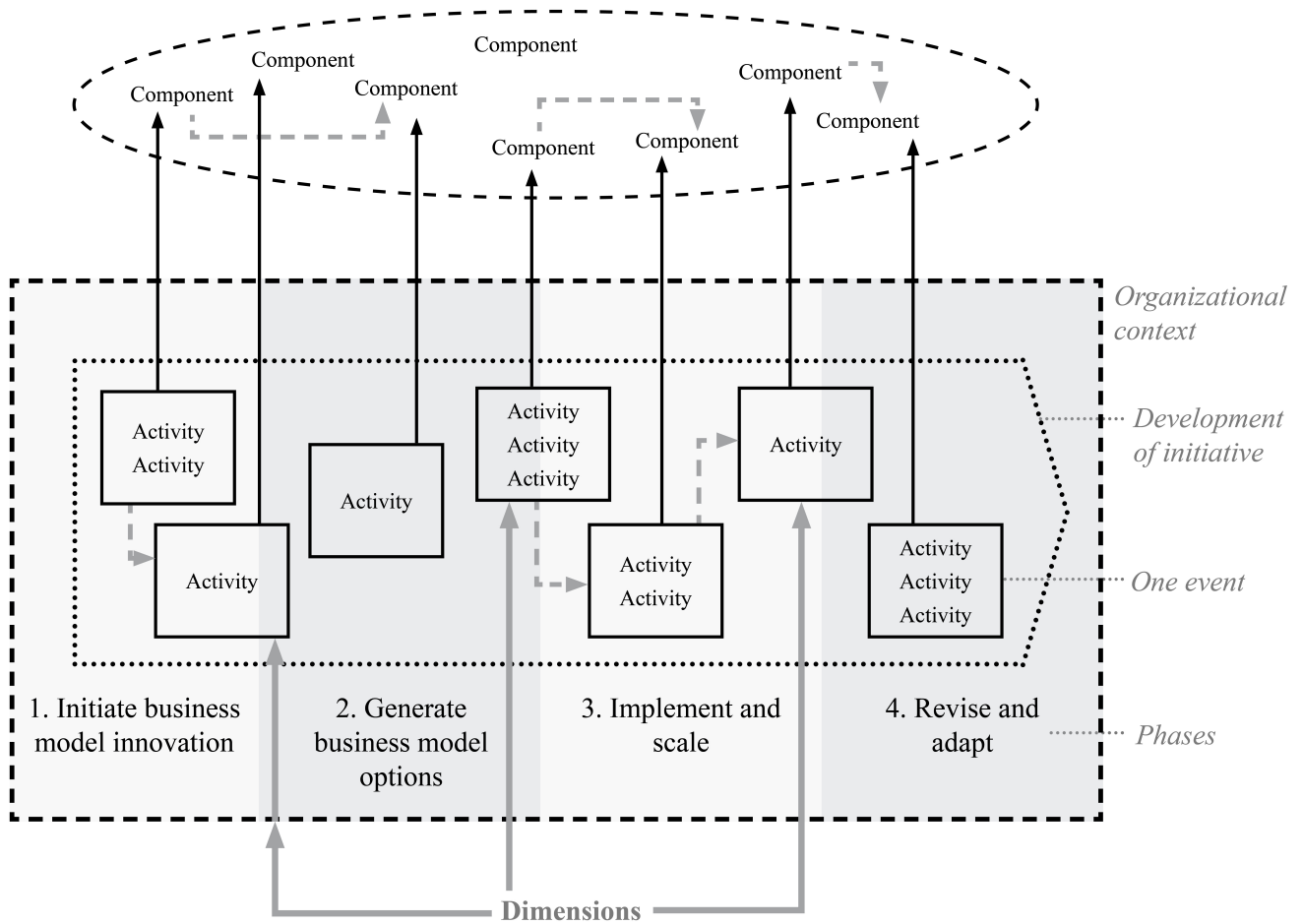
Figure 10: The Business Model Innovation Process

This model both contrasts and extends existing theory on BMI as it views the process of innovating a business model by looking at events during development or change processes of services, and the activities these events consist of. Since the authors have not identified any other literature which view the BMI process based on events, this contributes an extension to this literature. The model also represents a manner in which the recommended approaches to BMI in literature can be viewed within a process consisting of phases. This is an extension to what is recommended by Chesbrough (2010) and Teece (2010), who propose different approaches to BMI, but do not structure these approaches in light of phases or an overall process. However, the model does not assign specific BMI activities to certain phases, which contrasts the model of Sosna et al. (2010) and Palo & Tähtinen (2013) where specific choices and activities are deemed to happen in a specific phase. The empirical findings of this thesis indicate that this may not always be the case. Furthermore, Teece (2010) discusses the aspect of interrelatedness between components when configuring business model components, but he does not consider interrelatedness between events shaping these components. Thus, the model contributes an

extension to this, by showing how not only components may affect one another, but also the fact that events which shape the components can influence subsequent events.

The model further integrates the organizational context into the overall process, which adds to current literature by outlining how this aspect may be related to one another and the activities conducted in the process. This extension adds to the work of Doz & Kosonen (2010) who connect capabilities to performing BMI and Chesbrough (2010) who outline potential barriers to performing BMI, but neither views these aspects in a process-based perspective. Moreover, several scholars connect leadership as an important dimension for BMI (e.g. Chesbrough, 2010; Sosna et al., 2010), but the model offers an extension to this by relating this dimension to network relations and customer involvement, to the organizational context and the overall BMI process. This also signifies that the two other dimensions are connected into this model of the BMI process. In similarity to the leadership dimension, the authors have not found any literature that relates network relations and customer involvement to BMI activities in the context of an overall BMI process.

Ultimately, there are few scholars who define a process for BMI, the literature focuses more in terms of recommended approaches or capabilities disregarding the overall process. Consequently, this model extends current literature by incorporating these recommended approaches, i.e. BMI activities, and capabilities, i.e. dimensions and organizational context, into a model to illustrate the coherence between elements of the overall BMI process. Thus, this thesis contributes to the BMI literature by detailing which BMI activities can be performed in events of a developing initiative, how this can be done, and potentially is affected by the dimensions of leadership, network relations and customer involvement. Furthermore, this thesis describes how a BMI process can be analyzed. This provides insights to the gap identified by amongst others Palo & Tähtinen (2013), that there are few studies that focus on the development of business models (Sosna et al., 2010; Seidenstricker et al., 2014).

The discussion has also presented the specific considerations noted in the empirical findings on how to perform BMI for a data driven service. *Choice of technology* has proven an especially important decision in this context, creating value with data requires a shift in the mindset of value capture, creating transparency may be an underestimated value proposition for leveraging data to create value, and the findings provide detail on how to develop a business model for brokering information (Wang, 2012). This contributes to the gap in literature identified by Wamba et al. (2015) and Ferrando-Llopis et al. (2013) on that it is still unclear how to extract value from data and develop business models to achieve this. Also, this provides insights to business model development for technology-based services, as is sought by Palo & Tähtinen (2013).

Finally, specific considerations on how to the BMI process is affected by being performed in the context of a large, established firm were discussed. It was noted that *institutionalization* can

impact an initiative's ability to perform BMI, and that performing this properly can be used to overcome barriers to BMI. Also, findings on learnings across projects highlighted that the BMI process can be impacted by learnings from one project to another in the same company. This contributes to the gap in literature identified by Sinfield et al. (2011) on that few have collated a methodological approach to BMI for organizations and Sosna et al.'s call for more research on BMI in organizations with existing business models.

7. CONCLUSION, IMPLICATIONS, LIMITATIONS AND FUTURE RESEARCH

This chapter presents the thesis' conclusion, theoretical implications, practical implications, and finally, the thesis' limitations and associated recommendations for future research.

7.1 CONCLUSION

In this thesis, the authors have investigated how large, established firms conduct BMI for data driven services. The study has investigated empirically how three databased services from a Norwegian-German classification society have developed their business models. First, the research aimed to identify which BMI activities had been performed in the events of each project as well as how they were conducted (RQ1). Further, the thesis analyzed how the dimensions of leadership, network relations and customer involvement appeared to have impacted the identified BMI activities, and how they related to one another and the activity system for BMI (RQ2). In the discussion, the answers to RQ1 and RQ2 were combined into a process perspective of phases to elucidate the BMI process observed in the three cases, and how it compared to the existing BMI literature. This was combined into a model (figure 10) that illustrates the BMI process with the coherence of the elements within it. Lastly, findings on specific considerations for BMI in the context of data driven services and large, established firms were added onto this, in order to answer to the purpose.

Research Question 1: How do business model innovation activities contribute to establishing a business model for a data driven service?
In investigating RQ1, it was found that one or more BMI activities in the context of an event during the development of the projects shaped one or more business model components. The events which comprised of these activities seemed to be relatively unrelated in terms of how they affected the developing business model, shaping it individually step by step. Although, in some cases an event could affect subsequent ones or the definition of one component could influence the definition of other components. This led the authors to the concept of BMI as an activity system within events during the development of an initiative.

The study recognized all BMI activities proposed in the theoretical background in at least one of the projects (ch. 2, table 2). However, some activities were much more prominent across all three projects (e.g. *collect and analyze intelligence* and *institutionalization*) compared to others that may have been recognized only once in a single project (e.g. *identify and prioritize risks*). The activity *configuration of business model components* was identified in every event, but it was deemed to primarily occur implicitly in an event that shapes the business model. Furthermore, in the cross-analysis, it was identified that *institutionalization* and *choice of technology* have been crucial activities for the BMI processes. Also, the value proposition and value chain were the

most altered components, and that the events defining these turned out to further impact other components and events.

Research Question 2: How do the dimensions of leadership, network relations and customer involvement affect the business model innovation activities that contribute to establishing a business model for a data driven service?

In researching RQ2, it was found that the BMI activities could be impacted by leadership, network relations and customer involvement. Based on the outlined activity system in RQ1, it was detected that a dimension could directly impact an event through one or more of the BMI activities, or that the dimension could impact indirectly via the organizational context. The direct influence appeared to be the most prominent, and to result in a more concrete and significant outcome on the business model. Furthermore, it was noted that the dimensions may impact an event individually, but they could also appear concurrently affecting an event. Also, the inclusion of a dimension may be impacted by another, where it was found that leadership could facilitate the involvement of the two other dimensions, and that network relations could lead to customer involvement.

In terms of the identified BMI activities, all of the dimensions were deemed to influence *configuration of business model components*, whereas leadership and network relations were particularly involved in *collecting and analyzing intelligence*. Moreover, leadership played a crucial role in *institutionalization* and *recognizing and acting upon triggers*, and customer involvement was associated with *experimentation*. In terms of events, it was seen that leadership demonstrated particular importance for initiation of the BMI process, decision making regarding the business model and involving the two other dimensions through *institutionalization* and *choice of technology*. Additionally, this dimension showed importance for the organizational context in fostering organizational capabilities and overcoming barriers of BMI. Customer involvement was found to shape the value proposition and market segment through *experimentation*, and network relations impacted the capability of strategic flexibility through *choice of technology*.

Purpose: How do large, established firms conduct business model innovation for data driven services?

The findings on RQ1 and RQ2 were integrated in a process-perspective where the events with associated BMI activities, which may be impacted by the dimensions, occur in phases in the development of a project. The phases had been outlined by literature as (1) initiate BMI, (2) generate business model options, (3) implement and scale, and (4) revise and adapt, and these phases had been recognized in the empirical findings. Thus, the thesis came to view the BMI process as a stream of primarily unrelated events consisting of BMI activities that define or adjust business model components during the development of a project or a new business initiative. These events are scattered chronologically along the timeline of the project's development, where

the empirical findings suggest that the events which occurs in each phase of development corroborates with the ones suggested by literature, but that the different BMI activities are mainly not tied to a specific phase. Leadership, network relations and customer involvement may directly impact the events directly through BMI activities or indirectly through the organizational context regardless of phase. Thus, a contribution from this thesis is a model where the recommended BMI activities from literature, supported by the empirical findings, are incorporated with potential organizational capabilities and barriers for BMI and how this may be affected by the mentioned dimensions, which illustrates the coherence between the elements in the BMI process.

Furthermore, in attempts of fulfilling the purpose, specific considerations noted from the empirical findings for BMI in the context of data driven services and large, established firms are included. In terms of BMI for data driven services, it was found that *choice of technology* is a particularly important decision, and empirical findings support literature in that creating value with data requires a shift in the mindset of value capture. Also, it was detected that creating transparency using data may be an underestimated manner of value creation with data in literature, and the findings provide detail on how to develop a business model for brokering information, as is the case for all three projects in this thesis. In regards to BMI in large, established firms, it was noted that *institutionalization* is a vital activity to perform in order to facilitate the project's ability for performing BMI, and that performing this activity properly can be used to overcome barriers to BMI. Also, empirical findings showed learnings across projects, which signifies that the BMI process of a project in a large firm may be impacted by learnings from other projects in the same company.

7.2 THEORETICAL IMPLICATIONS

This thesis highlights the importance of BMI, especially in the context of creating and capturing value from data for large, established firms, which is an issue that has been overlooked in existing literature (Sosna et al., 2010; Palo & Tähtinen, 2013; Ferrando-Llopis et al., 2013). Primarily, the theoretical implications of this study is within the process of BMI, how it can be conducted through activities in the events of developing a data driven service, and how this process may be impacted by leadership, network relations and customer involvement, which is a research area lacking detail and support for practical application according to Seidenstricker et al. (2013). Thus, this thesis contributes to the BMI literature by explaining how the process of BMI may be conducted employing a more holistic view of the process. The developed process model incorporates the interactions between the elements of BMI activities, events during development, and the influences of the organizational context and dimensions along four phases of BMI. The thesis also presents a manner in which a researcher may study the BMI process of a firm by utilizing the model outlined in the discussion. This model may be employed in further studies to move the conceptual frameworks of BMI to more solid theoretical ground, as requested by Sosna et al. (2010).

Moreover, the study corroborates the view of Sosna et al. (2010) in that the BMI process should be viewed as a process from its initiation all the way until the business model is implemented in the organization. However, this contrasts the view of Mitchell & Coles (2003) who deem BMI as merely the process of configuring business model components and implementing this, which this thesis have found to only be a part of the overall process. Also, this study complements and extends current research on BMI by specifically investigating how the process is affected by leadership, which is a dimension heavily emphasized in literature, network relations and customer involvement on an activity-level.

Lastly, this thesis extends BMI literature, but also literature regarding Big Data and creating business value with data, by highlighting considerations to be made when conducting BMI for a data driven service, as is requested by Wamba et al. (2015). Additionally, the thesis accentuate considerations to be made for BMI processes within large, established firms, which there is existing literature covering, but this study extends on this by viewing the process on an activity-level and presenting recommended measures for overcoming barriers caused by the organizational context. This also contributes to an understanding of the BMI process for practical application, as is called for by Seidenstricker et al. (2014).

7.3 PRACTICAL IMPLICATIONS

General Implications for Practitioners
There are several implications of this thesis' research that are generally relevant for businesses, both large, established firms as well as small and/or nascent ones. First of all, this thesis contributes to raising awareness around the concept of BMI and how this is an underestimated and under-utilized form of innovation in companies. It details how one can define and conduct BMI, granted with some details that are mostly specific for large, established firms, but mainly BMI with activities that can be performed by any business. The thesis outlines a model which illustrates the coherence between elements of the BMI process, and how a firm may view the process in light of developing or altering an offering as events shaping the business model that comprise of BMI activities, which in turn are affected by leadership, network relations and customer involvement, and an organizational context. Thus, a company can outline and investigate performed BMI processes within their own company to generate lessons for future processes using the model of this thesis (figure 10). By identifying the events that have impacted the developing business model, how it has led to an outcome on the model, and which factors impacted this outcome, one can potentially uncover the causes of failed initiatives and extract lessons from successful ones.

Furthermore, the management's role as decision makers of the business model is another evident implication, which appears to be relevant regardless of firm type or size. All three cases of this study showed how the decisions made by management considerably affected the developing business model. Thus, this thesis offers implications as to how one may evaluate the effects of

this decision making during business model development. Management may use the final model of this thesis (figure 10) to dissect the BMI processes in the company, in order to uncover how these processes are performed within the firm and potentially how they may be improved based on the learnings of other initiatives.

Management of Business Model Innovation Processes in Large, Established Firms
This study has shown that chain of management can vary for different projects within the same BA of a large, established firm. Therefore, the practical implications for management within such a firm will be made on a general level, where some implications may be relevant for project management, BU management, BA management and/or top management, depending on its management structures.

Primarily, the findings of this thesis are directed at the management which are responsible for the development of new initiatives or the alteration of existing offerings through BMI. The implications noted in this thesis is the importance of the management's role in initiation of these new projects or initiatives, where it has been found that entrepreneurial skills within leadership are needed for opportunity recognition and acting upon these opportunities. Also, establishing ownership within management has proven to be essential to the BMI process, in order for the new initiative to obtain resources and gain flexibility to conduct BMI.

Institutionalization has crystallized as an important implication of this thesis' research. The findings show how performing this BMI activity can significantly affect the developing business model of an initiative. Firstly, for the new initiative to obtain resources and ownership, but also for overcoming barriers to BMI and facilitating exploration of business model alternatives. The choices made during *institutionalization* of a new initiative has proven to potentially crucially affect the value chain, which in turn may impact other business model components such as the cost structure. Further, *institutionalization* may be used to overcome conflicts with the prevailing business model and potential misalignment with the business models of other BUs. This can be done by keeping the new initiative separate from existing business and integrating necessary functions for its development into the same, independent group, i.e. the project team. Lastly, *institutionalization* may facilitate the inclusion of network relations and customer involvement by creating structures and routines into the organization that incorporate these dimensions.

The research of this study shows how management may influence BMI processes through the organizational context, which in turn can directly impact how a BMI process is conducted. Especially the capabilities of strategic sensitivity, resource flexibility and strategic flexibility have been found to important to foster for performing BMI processes since it may be decisive for a project's initiation, use of external knowledge and feedback, and its ability to change course. Also, on an overall level in the organization, management may facilitate BMI processes of new initiatives by promoting the alignment of business models of different BUs that need to cooperate

for these types developments. Finally, management may facilitate learnings from BMI processes across the organization which may improve the conductance of new BMI processes.

Digitizing Companies
Companies seeking to digitize their business, and who wish to start leveraging data into their offerings to update old products or services, or perhaps create entirely new ones, may find useful implications in this thesis. Since this thesis has investigated BMI in the context of three data driven services, it has uncovered certain implications in light of this. Most evident is the importance of choosing the right technology for creating data driven services. As technology changes rapidly, and the customers of such services expect optimal performance based on the leveraging of great amounts of data, this choice may have significant short- and long-term consequences for the product development and the continuous improvement and support of it. Thus, the thesis outlines the potential consequences of this choice, and how it subsequently may affect other events in the development and business model components. Moreover, this study show three cases of attempting to develop a business model for brokering information as the manner to create and capture value with data. Therefore, a company seeking to base a business model on brokering information can obtain insights and lessons from how such a business model development can occur. The lessons for brokering information from these cases is that chosen value proposition show an emphasis on creating transparency and incorporating multiple data sources, choice of technology may pose significant consequences for the value chain and/or value proposition, and that data access may be an issue when relying on partnerships.

7.4 LIMITATIONS

The authors wish to highlight three limitations connected to this thesis. First, as the aim of the study was to explore and gain an in-depth understanding of the BMI processes for three data driven services, which entails both network relations and customer involvement, a limitation to the study is that the authors have only interviewed employees from DNV-GL. Hence, the study does not reflect insights or perspectives into how these processes have occurred from any other party than DNV-GL. Second, the research of this thesis was limited within a timeframe of six months. A more longitudinal investigation of the three initiatives would have provided further detail as to the long-term consequences of decisions and actions made, which could have enabled a deeper understanding of the BMI process in a long-term perspective. The third limitation considers the implications of the context, which affects the results of this type of explorative, qualitative study. Due to the timeframe and scope of the thesis, the authors were not able to extensively investigate the context which affected the BMI processes of the three data driven initiatives at DNV-GL. Thus, the results of this study are influenced by the authors' understanding of the context at DNV-GL during the research.

7.5 FUTURE RESEARCH

During the course of working on this thesis, the authors have noted several potential areas of future research, which were beyond the scope of this thesis and/or inspired by the listed limitations. The study investigates relatively new or short-lived service developments in retrospect, where the projects have not been developed far enough for determining the long-term consequences of the choices and actions made. In light of this, the authors have two suggestions - first, to increase the analytical generalizability of the findings in this thesis by performing similar single embedded case design of several large, established firms, and to do so through longitudinal studies where the long-term consequences of choices and actions can be observed. The authors argue that when investigating several large firms at once, it should still be designed as a single embedded case study since the findings of this thesis within one company show that there may be considerable differences across projects even within the same BA. The aim of this would be to elicit more details on the BMI process, deepen the understanding of the findings in this thesis and enhance the general applicability of the findings. Following on these potential longitudinal studies, the authors would also recommend investigating 'best practices' for achieving innovative business models, as this would be the ultimate goal of performing the process, which is not covered by the findings of this thesis. Therefore, a relevant topic of research would be longitudinal studies of BMI processes where one could observe potential long-term success and identify patterns of successfulness.

Moreover, the thesis did not uncover any new BMI activities not already proposed by literature. This encourages closer investigation of several cases to truly unveil if these BMI activities are consistent across many cases. Also, the authors propose to deconstruct the events in the development of a data driven service into even more fragmented, singular events which consist of only one BMI activity to elucidate any potential specific correlation between a BMI activity and the business model outcome. In a similar vein, the authors recommend a closer investigation of relatedness between events and/or BMI activities, specifically how the BMI activities interact to shape the outcome on the business model and subsequent events. This is because the thesis did not uncover a great extent of relatedness, but the few instances where it was identified appeared to be crucial for the business model development.

Further, the authors suggest a closer examination of *institutionalization* and the leadership dimension since these two factors clearly crystallized from the findings of this thesis. This encourages an in-depth investigation of how these two factors relate to one another and the BMI process, and how they affect it. On the same note of dimensions, it is recommended to further investigate network relations and customer involvement more closely as well. This is because this thesis has employed an internal perspective of the case company during its research, and therefore, the customers and network actors of the case company have not been interviewed. To truly elucidate how customer involvement and network relations impact the process of BMI, the authors suggest a study where their views are incorporated with the views of the focal firm. This

is also related to a closer examination of the context in which the BMI process operate. Thus, the authors would recommend in-depth studies focused on uncovering the nature of the context and how it affects the BMI process. This type of study combined with one similar to the one of this thesis, could increase the external validity of the study by creating a comprehensive understanding of the context.

The findings of this thesis were primarily found to be relevant regardless of the context of data driven services. Still, the authors' research illuminated certain considerations to be made when conducting BMI for a data driven service. In light of the introduction of this thesis on how leveraging data to create and capture value requires BMI, the authors recommend studies specifically aimed at identifying how BMI for data driven services differs from BMI in general.

REFERENCES

ALAM, I. 2002. 'An Exploratory Investigation of User Involvement in New Service Development.' *Journal of the Academy of Marketing Science*, 30(3), pp.250-261.

ALLEN, T. J. 1977. Managing the flow of technology: Technology transfer and the dissemination of technological information within the R&D organization. Cambridge, MA: MIT Press

AMIT, R. & ZOTT, C. 2010. Business model innovation: Creating value in times of change. *IDEAS Working Paper Series from RePEc*.

AMIT, R., ZOTT, C., HITT, M. A., IRELAND, R. D., CAMP, S. M. & SEXTON, D. L. 2001. Value creation in E‑business. *Strategic Management Journal,* 22**,** 493-520.

ANDERSEN, A. G. & BARKOST, E. L. 2015. Innovating Business Models for Offering Big Data Based Services. Pre-diploma thesis project report at the Norwegian University of Science and Technology.

APICS 2012. Big Data Insights and Innovations, Discovering Emerging Data Practices in Supply Chain and Operations Management. Chicago, IL.

ARGOTE, L. & INGRAM, P. 2000. Knowledge Transfer: A Basis for Competitive Advantage in Firms. *Organizational Behavior and Human Decision Processes*, 82(1), pp.150-169.

ARGOTE, L., & MCGRATH, J. E. 1993. Group processes in organizations: Continuity and change. *International Review of Industrial and Organizational Psychology*, 8, 333–389.

ATUAHENE-GIMA, K. 1996. 'Differential Potency Factors Affecting Innovation Performance in Manufacturing and Services Firms in Australia.' Journal of Product Innovation Management 13:35-52.

BADEN-FULLER, C. & MORGAN, M. S. 2010. Business Models as Models. *Long Range Planning,* 43**,** 156-171.

BADEN-FULLER, C. & STOPFORD, J. M. 1992. *Rejuvenating the mature business : the competitive challenge,* London, Routledge.

BAXTER, J. 2010. Case Studies in Qualitative Research. In: Hay, I. (Ed.), Qualitative Research Methods In Human Geography. Third edition. Canada: Oxford University Press.

BENSON-REA, M., BRODIE, R. and SIMA, H. 2013. The plurality of co-existing business models: Investigating the complexity of value drivers. *Industrial Marketing Management*, 42(5), pp.717-729.

BETTIS, R. and PRAHALAD, C. 1995. The dominant logic: Retrospective and extension. *Strat. Mgmt. J.*, 16(1), pp.5-14.

BHIDE, A. 2003. *The origin and evolution of new businesses,* Oxford, Oxford University Press.

BOCK, A. J., OPSAHL, T., GEORGE, G. & GANN, D. M. 2011. The Effects of Culture and Structure on Strategic Flexibility during Business Model Innovation. *Journal of Management Studies*, 49(2), pp.279-305.

BOYD, D. & CRAWFORD, K. 2012. CRITICAL QUESTIONS FOR BIG DATA. *Information, Communication & Society,* 15**,** 662-679.

BRADSHAW, M. & E. STRATFORD. 2010. Qualitative Research Design and Rigour. In: Hay, I. (Ed.), Qualitative Research Methods In Human Geography. Third edition. Canada: Oxford University Press.

BROWN, B., CHUL, M. & MANYIKA, J. 2011. Are you ready for the era of 'big data'? *McKinsey Quarterly*, 24-35.

BROWN, S. & EISENHARDT, K. 1995. PRODUCT DEVELOPMENT: PAST RESEARCH, PRESENT FINDINGS, AND FUTURE DIRECTIONS. *Academy of Management Review*, 20(2), pp.343-378.

BRYMAN, A. 2008. *Social research methods,* Oxford, Oxford University Press.

BRYMAN, A. & BELL, E. 2011. *Business research methods*. Cambridge: Oxford University Press.

BYRD, J. & BROWN, P. L. 2002. The Innovation Equation: Creativity and Risk-Taking in Your Organization. San Francisco: Wiley.

CASADESUS-MASANELL, R. and RICART, J. 2010. From Strategy to Business Models and onto Tactics. *Long Range Planning*, 43(2-3), pp.195-215.

CASADESUS-MASANELL, R., and TARZIJAN, J. 2012. 'When one business model isn't enough.' *Harvard Business Review*, 90, nos. 1-2 (January - February 2012)

CAVALCANTE, S., KESTING, P. & ULHØI, J. 2011. Business model dynamics and innovation: (re)establishing the missing linkages. *Management Decision,* 49**,** 1327-1342.

CHESBROUGH, H. 2010. Business Model Innovation: Opportunities and Barriers. *Long Range Planning,* 43**,** 354-363.

CHESBROUGH, H. & ROSENBLOOM, R. 2002. The role of the business model in capturing value from innovation: evidence from Xerox Corporation's technology spin-off companies. *Ind. Corp. Change,* 11**,** 529-555.

CHESBROUGH, H. & SCHWARTZ, K. 2007. 'Innovating business models with co-development partnerships.' *Research-Technology Management* 50.1, 55-59.

CHESBROUGH, H., VANHAVERBEKE, W. & WEST, J. 2006. 'Open Innovation: Researching a New Paradigm.' Oxford University Press.

DALLAND, O. 2007. *Metode og oppgaveskriving for studenter,* Oslo, Gyldendal akademisk.

DAVENPORT, T. H., BARTH, P. & BEAN, R. 2012. How 'Big Data' Is Different. *MIT Sloan Management Review*.

DE BRENTANI, U. 1995. New industrial service development: Scenarios for success and failure. *Journal of Business Research*, 32(2), pp.93-103.

DE JONG, M. & VAN DIJK, M. 2015. *Disrupting beliefs: A new approach to business-model innovation* [Online]. http://www.mckinsey.com/Insights/Innovation/Disrupting_beliefs_A_new_approach_to_business-model_innovation?cid=other-eml-alt-mkq-mck-oth-1507: McKinsey. [Accessed 15.06.2016].

DE VRIES, E. J. 2006. Innovation in services in networks of organizations and in the distribution of services. *Research Policy,* 35**,** 1037-1051.

DEMIL, B. & LECOCQ, X. 2010. Business Model Evolution: In Search of Dynamic Consistency. *Long Range Planning,* 43**,** 227-246.

DOZ, Y. L. & KOSONEN, M. 2010. Embedding Strategic Agility: A Leadership Agenda for Accelerating Business Model Renewal. *Long Range Planning,* 43**,** 370-382.

DREJER, I. 2004. Identifying innovation in surveys of services: a Schumpeterian perspective. *Research Policy*, 33(3), pp.551-562.

DUNN, K. 2010. Interviewing. In: Hay, I. (Ed.), Qualitative Research Methods In Human Geography, 3rd edition. Canada: Oxford University Press.

DUTTON, J. E., DUKERICH, J. M. and HARQUAIL, C. V. 1994. 'Organizational images and member identification'. *Administrative Science Quarterly*, 39, 239–63.

EISENHARDT, K. 1989. Building Theories from Case Study Research. *Academy of Management Review*, 14(4), pp.532-550.

EISENMANN, T. R., PARKER, G. & VAN ALSTYNE, M. W. 2006. Strategies for Two-Sided Markets. *Harvard Business Review*, 84.

EUCHNER, J. & GANGULY, A. 2014. Business model innovation in practice: a systematic approach to business model innovation can help capture value and reduce risks. (Feature article). *Research-Technology Management*, 57**,** 33.

FERRANDO-LLOPIS, R., LOPEZ-BERZOSA, D. & MULLIGAN, C. 2013. Advancing value creation and value capture in data-intensive contexts. Big Data, IEEE International Conference on, 6-9 Oct. 2013. 5-9.

FITZSIMMONS, J. A. & FITZSIMMONS, M. J. 2005. *The Role of Services in an Economy. Service Management: Operations, Strategy and Information Technology,* New York, McGraw-Hill.

FLICK, U. 2015. *Introducing research methodology : a beginner's guide to doing a research project,* Los Angeles, Calif, SAGE.

FOSS, N., LAURSEN, K. & PEDERSEN, T. 2011. Linking Customer Interaction and Innovation: The Mediating Role of New Organizational Practices. *Organization Science*, 22(4), pp.980-999.

FRANKFORT-NACHMIAS, C. & NACHMIAS, D. 1992. Research Methods in the Social Sciences, Fourth Edition. Edward Arnold, London.

GALBRAITH, J. R. 1974. Organization design: An information processing view. Interfaces 4(3) 28–36.

GALBRAITH, C. S. 1990. Transferring core manufacturing technologies in high technology firms. *California Management Review*, 32(4), 56–70

GANDOMI, A. & HAIDER, M. 2015. Beyond the hype: Big data concepts, methods, and analytics. *International Journal of Information Management*, 35**,** 137-144.

GARTNER. 2015. *Big Data* [Online]. Available: http://www.gartner.com/it-glossary/big-data [Accessed 19.12.2015 2015].

GAWER, A., CUSUMANO, M. A. & STRATEGY, D. S. 2012. How companies become platform leaders. *MIT/Sloan Management Review*, 49.

GAWER, A. & HENDERSON, R. 2007. Platform Owner Entry and Innovation in Complementary Markets: Evidence from Intel. *Journal of Economics & Management Strategy*, 16**,** 1-34.

GERRING, J. 2004. What Is a Case Study and What Is It Good for?. *Am. Pol. Sci. Rev.*, 98(02).

GIROTRA, K. & NETESSINE, S. 2014. Four Paths to Business Model Innovation. *Harvard Business Review*. Available at: https://hbr.org/2014/07/four-paths-to-business-model-innovation [Accessed 15 Jun. 2016].

GULATI, R. & SYTCH, M. 2007. 'Dependence asymmetry and joint dependence in interorganizational relationships: effects of embeddedness on a manufacturer's performance in procurement relationships'. *Administrative Science Quarterly*, 52, 32–69.

GUMMESSON, E. 2010. *The Future of Service Is Long Overdue*. Handbook of Service Science. Springer Science+Business Media, LLC.

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GUMMESSON, E., MELE, C., POLESE, F., NENONEN, S. & STORBACKA, K. 2010. Business model design: conceptualizing networked value co-creation. *International Journal of Quality and Service Sciences,* 2**,** 43-59.

GUO, H., ZHAO, J. & TANG, J. 2013. The role of top managers' human and social capital in business model innovation. *Chinese Management Studies*, 7(3), pp.447-469.

HAGERTY, J. & GROVES, T. 2013. Unlock Big Value in Big Data with Analytics. *IBM Redbooks Point-of-view publication*.

HAMEL, G. 2000. *Leading the revolution,* Boston, Harvard Business School Press.

HILL, T. P. 1977. On Goods and Services. *Rev. Income Wealth,* 23**,** 315-338.

HUBERTY, M. 2015. Awaiting the Second Big Data Revolution: From Digital Noise to Value Creation. *Journal of Industry, Competition and Trade,* 15**,** 35-47.

HUI, G. 2014. How the Internet of Things Changes Business Models. *Harvard Business Review***,** 32-36.

JENSEN, M. C., W. H. MECKLING. 1992. Specific and general knowledge and organizational structure. L. Werin, H. Wijkander, eds. Contract Economics. Blackwell, Oxford, UK, 251–274.

JOHNSON, J. E. 2012. Big Data + Big Analytics = Big Opprotunity. *In:* ECEC., F. (ed.).

JOHNSON, M. D. & SELNES, F. 2004. Customer portfolio management: Toward a dynamic theory of exchange relationships. *Journal of Marketing,* 68**,** 1-17.

JOHNSON, M. W., CHRISTENSEN, C. M. & KAGERMANN, H. 2008. Reinventing Your Business Model. *Harvard Business Review*.

JONES, O. & MACPHERSON, A. 2006. Inter-Organizational Learning and Strategic Renewal in SMEs: Extending the 4I Framework. *Long Range Planning,* 39**,** 155-175.

KIJL, B., BOUWMAN, H., HAAKER, T. & FABER, E. 2005. A dynamic business model framework for emerging mobile services. *ITS 16th European Regional Conference.* Porto, Portugal.

KINDSTRÖM, D. 2010. Towards a service-based business model – Key aspects for future competitive advantage. *European Management Journal,* 28**,** 479-490.

KLEIN, K., TOSI, H. & CANNELLA JR, A. 1999. MULTILEVEL THEORY BUILDING: BENEFITS, BARRIERS, AND NEW DEVELOPMENTS. *Academy of Management Review*, 24(2), pp.248-253.

LAKEMOND, N., BENGTSSON, L., LAURSEN, K. & TELL, F. 2016. Match and manage: the use of knowledge matching and project management to integrate knowledge in collaborative inbound open innovation. *Ind Corp Change*, 25(2), pp.333-352.

LAKSHMAN, C. 2007. 'Supplier-focused knowledge management in the automobile industry and its implications for product performance'. *Journal of Management Studies*, 45, 317–42.

MAGLIO, P. P. & SPOHRER, J. 2013. A service science perspective on business model innovation. *Industrial Marketing Management,* 42**,** 665-670.

MCAFEE, A. & BRYNJOLFSSON, E. 2012. Big Data: The Management Revolution. *Harvard Business Review***,** 59-68.

MCGRATH, R. 2010. Business Models: A Discovery Driven Approach. *Long Range Planning*, 43 (2-3), pp. 247-261.

MITCHELL, D. & COLES, C. 2003. The Ultimate Competitive Advantage of Continuing Business Model Innovation. *Journal of Business Strategy*, 24, 15-21

MORRIS, M., SCHINDEHUTTE, M. & ALLEN, J. 2005. The entrepreneur's business model: toward a unified perspective. *Journal of Business Research*, 58(6), pp. 726-735.

NELSON, R. R. & WINTER, S. G. 1982. *An evolutionary theory of economic change,* Cambridge, Mass, Belknap Press.

OSTERWALDER, A. & PIGNEUR, Y. 2010. *Business model generation: a handbook for visionaries, game changers, and challengers*, John Wiley & Sons.

OSTERWALDER, A., PIGNEUR, Y. & TUCCI, C. L. 2005. Clarifying Business Models: Origins, Present, and Future of the Concept. *Communications of the Association for Information Systems,* 16**,** 1.

PALO, T. & TÄHTINEN, J. 2013. Networked business model development for emerging technology-based services. *Industrial Marketing Management,* 42**,** 773-782.

PORTER, M. E. & HEPPELMANN, J. E. 2015. How Smart, Connected Products Are Transforming Companies. *Harvard Business Review***,** 96–112, 114.

RAYNOR, M. & CHRISTENSEN, C. 2003. The innovator's solution. *Optimize***,** 64-74.

ROTHWELL, R. 1978. Some problems of technology transfer into industry: Examples from the textile machinery sector. *IEEE Transactions on Engineering Management*, EM-25, 15–20.

RUNESON, P. & HOST, M. 2008. Guidelines for conducting and reporting case study research in software engineering. *Empirical Software Engineering*, 14(2), pp.131-164.

RUSSOM, P. 2011. Big Data Analytics *TDWI Best Practices Report.* TDWI.

SANCHEZ, R. 1995. 'Strategic flexibility in product competition'. *Strategic Management Journal*, 16, 135–59.

SANTOS, J., SPECTOR, B. & VAN DER HEYDEN, L. 2009 'Toward a theory of business model innovation within incumbent firms'. INSEAD, Fontainebleau, France.

SARASVATHY, S. D. 2008. *The effectuation Elements of Entrepreneurial Expertise,* London, UK, Edward Elgar Publishing.

SEIDENSTRICKER, S., SCHEUERLE, S. & LINDER, C. 2014. Business model prototyping–using the morphological analysis to develop new business models. *Procedia-Social and Behavioral Sciences,* 148**,** 102-109.

SHAFER, S., SMITH, H. & LINDER, J. 2005. 'The power of business models'. *Business Horizons*, 48(3), pp.199-207.

SHANE, S. & VENKATARAMAN, S. 2000. The Promise of Entrepreneurship as a Field of Research. *The Academy of Management Review,* 25**,** 217-226.

SHIMIZU, K. & HITT, M. A. 2004. 'Strategic flexibility: organizational preparedness to reverse in effective strategic decisions'. *Academy of Management Executive*, 18, 44–59.

SIMONS, H. 2009. Case Study Research in Practice. London: Sage Publications Ltd.

SINFIELD, J. V., CALDER, E., MCCONNELL, B. & COLSON, S. 2011. How to identify new business models.

SMITH, W., BINNS, A. & TUSHMAN, M. 2010. Complex Business Models: Managing Strategic Paradoxes Simultaneously. *Long Range Planning*, 43(2-3), pp.448-461.

SOSNA, M., TREVINYO-RODRÍGUEZ, R. N. & VELAMURI, S. R. 2010. Business Model Innovation through Trial-and-Error Learning: The Naturhouse Case. *Long Range Planning,* 43**,** 383-407.

SPOHRER, J. & MAGLIO, P. P. 2008. The Emergence of Service Science: Toward Systematic Service Innovations to Accelerate Co‐Creation of Value. *Production and Operations Management,* 17**,** 238-246.

STABURSVIK, K. M. 2014. Scaling from Research to Operative Services. The Failure of DNV's Data Driven Service Innovation Fuel Insight. Master thesis, University of Oslo.

STEWART, D. W. 1984. Secondary Research: Information Sources and Methods. Sage, Beverly Hills.

STUART, F.I. & TAX, S. S. 1996. Planning for service quality: an integrative approach. International Journal of Service Industry Management, 7(4), 58-77.

SUNDBO, J. 1997. Management of Innovation in Services. *The Service Industries Journal*, 17(3), pp.432-455.

SVEJENOVA, S., PLANELLAS, M. & VIVES, L. 2010. An Individual Business Model in the Making: a Chef's Quest for Creative Freedom. *Long Range Planning*, 43(2-3), pp. 408-430.

TEECE, D. J. 2010. Business Models, Business Strategy and Innovation. *Long Range Planning,* 43**,** 172-194.

TIDD, J. & BESSANT, J. 2013. Managing Innovation. Integration Technological, Market and Organizational Change. Fifth edition. West Sussex, UK: Wiley

TJORA, A. 2012. *Kvalitative forskningsmetoder i praksis*. Oslo: Gyldendal Akademisk.

UHLENBRUCK, K. 2003. 'Organizational transformation in transition economies: resource-based and organizational learning perspectives'. *Journal of Management Studies*, 40, 257–82.

VARGO, S. L. & LUSCH, R. F. 2004. Evolving to a new dominant logic for marketing. *Journal of marketing,* 68**,** 1-17.

VON HIPPEL, E. 1986. Lead Users: A Source of Novel Product Concepts. *Management Science*, 32(7), pp.791-805.

WAMBA, S. F., AKTER, S., EDWARDS, A., CHOPIN, G. & GNANZOU, D. 2015. How 'big data' can make big impact: Findings from a systematic review and a longitudinal case study. (Case study). 165**,** 234.

WANG, Q., VOSS, C., ZHAO, X. & WANG, Z. 2015. Modes of service innovation: a typology. *Industrial Management & Data Systems,* 115**,** 1358-1382.

WANG, R. 2012. What a Big-Data Business Model Looks Like. *Harvard Business Review*.

WIRTZ, B. W., PISTOIA, A., ULLRICH, S. & GÖTTEL, V. 2015. Business Models: Origin, Development and Future Research Perspectives. *Long Range Planning*.

WORREN, N., MOORE, K. & CARDONA, P. 2002. 'Modularity, strategic flexibility, and firm performance: a study of the home appliance industry'. *Strategic Management Journal*, 23, 1123–40.

YIN, R. K. 2014. *Case study research : design and methods,* Los Angeles, Calif, SAGE.

ZEITHAML, V. A., BITNER, M. J. & GREMLER, D. 1996. Services Marketing McGraw Hill. *New York*.

ZOTT, C., AMIT, R. & MASSA, L. 2011. The Business Model: Recent Developments and Future Research. *Journal of Management,* 37**,** 1019-1042.

APPENDICES

APPENDIX A: INTERVIEW GUIDE

Note: For each interview, the interview guide was somewhat adapted with regards to how many projects the interview would cover. For instance did many interviewees cover both Fuel Insight and ECO Insight.

Introduksjon
- Vi vil begynne med å introdusere oss selv, hensikten med masteroppgaven og strukturen av intervjuet:
    - Masterstudenter ved NTNUs Entreprenørskole
    - Hensikten med masteroppgaven: å undersøke hvordan tre prosjekter ved DNV-GL har eller holder på med å utvikle sin forretningsmodell og hvorfor de har gjort de valgene de har gjort. Dermed bygge videre på litteraturen om forretningsmodeller for databaserte tjenester.
    - Er det i orden at vi tar opp intervjuet med lydopptaker og transkriberer det senere?
    - Vi har noen spørsmål som muligens kan overlappe basert på hvordan du svarer, og hvis du synes at vi stiller deg spørsmål som du allerede har svart kan du bare fortelle oss det, og vi har liten tid slik at det kan være vi må avbryte et svar for å hoppe videre til de andre spørsmålene
    - Vi ønsker først og fremst og spørre deg spørsmål rundt Eco Insight, men også noe angående Fuel Insight ettersom du har vært involvert i begge prosjektene, men vi har en del informasjon å gå utifra med Fuel Insight.
    - Rollene til intervjuerne:
        - En intervjuer er ansvarlig for å ta opp intervjuet og ta notater
        - Den andre intervjueren er ansvarlig for å stille spørsmålene
- Struktur på intervjuet:
    1. Om intervjuobjektet
    2. Om prosjektet
    3. Tidslinje for utviklingen av prosjektet med utdypende spørsmål basert på tidslinjen
    4. Avsluttende spørsmål
    5. Etter intervjuet

1. Om intervjuobjektet
- Hva er din stilling ved DNV-GL?
- Kan du beskrive din rolle i prosjektet?

2. Om prosjektet - korte svar
- Kan du kort forklare tjenesten?
- Hvem er involvert i prosjektet?
    - Kan du sende oss en oversikt over dette på e-post?
- Hvem er beslutningstakerne for prosjektet?
- Hvordan vil du beskrive statusen til prosjektet per nå?
- Hva slags respons har dere fått fra markedet angående produktet?
    - Kunder, leverandører, konkurrenter, etc.
    - Industrimodenhet for utnyttelse av data
- Kan du forklare hvordan tjenesten eller prosjektet utnytter data? Hvordan skaper dere verdi av dataen?
- Kan du utdype om dere har opplevd noen fordeler eller ulemper med det å basere en tjeneste på utnyttelse av data?
    - Eksempelvis tilgang til data, tilgjengelig teknologi, reguleringer, behov for riktig kompetanse
    - Eksempelvis det å skape gjennomsiktighet, forenkle eksperimentering, automatisering
- Bruker dere data generert fra dette prosjektet i andre prosjekt?
- Er dette prosjektet annerledes fra andre prosjekter hos DNV-GL, og i såfall hvordan? (Spesielt med tanke på det at det er data-basert)
- Hvordan sikrer dere læring mellom prosjektene hos DNV-GL, og hva har dette prosjektet lært fra andre prosjekt?

3. Tidslinje for utviklingen av prosjektet med utdypende spørsmål
For å få en oversikt over intervjuobjektets perspektiv på utviklingen av prosjektet ønsker vi at han skal tegne opp aktivitetene, fasene og milepælene prosjektet har vært igjennom.

- Kan du tegne opp en tidslinje for utviklingen av prosjektet og samtidig forklare oss hendelsene du skisserer?
    - Eksempelvis fra førstemann som hadde idéen, fra idé til prosjekt, da prosjektet tok en ny retning, nye ressurser bevilget til prosjektet, nye roller, kundeavtaler, konflikter, viktige avgjørelser, ol.

De påfølgende spørsmålene er ment for utdypelse av tidslinjen dersom ikke intervjuobjektet implisitt dekker følgende under øvelsen:

Om prosjektet og dets utvikling
- Hvem kom opp med idéen bak prosjektet, og hvordan kom han/hun på det? Når var dette?
    - Kom det fra internt på DNV-GL eller fra eksterne parter?
- Hvordan ble denne idéen videreutviklet og hvem hadde ansvar for det?

- Hvem initierte prosjektet og når skjedde det?
- Hvordan gikk idéen fra å være en idé til å bli initiert som et prosjekt hos DNV-GL? Er det en standardisert prosess for dette hos DNV-GL?
- Hvem bestemmer rammebetingelsene for slike prosjekt og hva er de i dette tilfellet?
- Hvordan identifiserte dere hva dere behøvde av ressurser og gjøremål for prosjektet?
- Hadde dere et sett med muligheter eller hypoteser som dere ønsket å teste ut for prosjektet?
- Utførte dere eksperimenter for å teste slike muligheter/hypoteser? Kan du i så fall forklare hvordan?
- Med tanke på dette prosjektet, hva slags forskning og informasjon samlet dere for å verifisere at dette var verdt å gå videre med?
- Ved hvilket punkt følte dere at dere hadde verifisert prosjektet, og at DNV-GL ville gå videre med prosjektet? Hvordan gikk dette seg til?
- Hvordan har produktet forandret seg over tid, og hva har forårsaket endringene?

Organisering
- Hvordan har organiseringen av prosjektet endret seg over tid?
- Hvordan organiserer dere aktiviteter mellom rollene i prosjektet?
- Hvordan fungerer samarbeidet mellom ulike avdelinger involvert i prosjektet og hvem har ansvar for hva?

Utvikling av forretningsmodell
- Kan du utdype om, hvordan og hvorfor prosjektet har måtte gjøre forandringer med tanke på eksempelvis kunde, markedssegment, verdikjede, ressurser, nettverk, partnere, inntektsmodell, kostnadsstruktur, konkurransestrategi eller lignende?
- Kunder:
    - Hvordan bestemmer dere hvilke kundesegmenter dere bør satse på for tjenesten? Har dette synet noen gang forandret seg, og har dere noen prosesser for å re-evaluere det?
    - Hvordan involverer dere kunder i utvikling av tjenesten? Hvordan sikrer dere at feedbacken fra kundene blir nyttiggjort?
    - Hvordan valgte dere hvilke kunder dere involverte?
    - Har dere gjort noen forandringer basert på kundefeedback?
    - Hvordan sikrer dere at kundene får verdi fra tjenesten deres?
- Verdikjede og ressurser:
    - Kunne du skissert verdikjeden for produktet for oss? Hvem er leverandørene deres og hvem er kundene?
        - Hvordan organiserer dere produksjonen og leveransen av tjenesten?
        - Hvordan organiserer dere forholdet til leverandørene og kundene deres?
        - Hvordan får dere tilgang til dataen dere trenger for å levere tjenesten?

- Verdinettverk:
    - Har dere involvert andre aktører med i utviklingen eller leveransen av tjenesten?
        - Hvordan initierer dere disse partnerskapene?
        - Hvordan organiserer dere disse partnerskapene?
    - Er det noen tredjeparter dere må ta hensyn til ved tilbydelse av denne typen tjeneste? Hvis ja, hvordan organiserer dere forholdet til disse tredjepartene?

4. Avsluttende spørsmål
- Basert på din erfaring fra prosjektet, hva har gått bra så langt og hva har ikke gått så bra så langt?
- Har dere hatt et bevisst forhold til hva forretningsmodellen for denne tjenesten er underveis i utviklingen?
    - Hvis ja, hvordan definerer dere en forretningsmodell?
    - Hva skal til for at dere føler dere har landet på en fornuftig modell og hva anser du som en passende forretningsmodell?
    - Hvilke alternative forretningsmodeller ble vurdert? Hvorfor valgte dere den dere gjorde?
- Hvordan ser fremtiden ut for denne tjenesten og hvem har ansvaret for veien videre? Hva er de store utfordringene og hvordan tenker dere å løse de?
- Dersom du har vært involvert i flere prosjekter ved DNV-GL, hvordan ville du sammenlignet dette prosjektet med andre du har vært med på?

6. Etter intervjuet
- Ønsker du å lese og kommentere transkriptet fra intervjuet?
- Er det i orden om vi sender e-post med oppfølgingsspørsmål, hvis det blir nødvendig for oppgaven?
- Kjenner du andre som jobbet med prosjektet som det kan være relevant for oss å prate med?
- Vet du om noen rapporter eller artikler relatert til prosjektet som kan være relevant for denne masteroppgaven som vi kunne fått tilgang til?
- Er det i orden om navnet ditt blir brukt i masteroppgaven?

APPENDIX B: OVERVIEW OF PERSONS INTERVIEWED

Interview subject	Position	Department/Unit	Date	EI	FI	PBC
Knut Ljungberg	Principal Consultant	Business Area Maritime	15.02.2016	x		
Grunde Løvoll	Senior researcher	Strategy, Research & Innovation (SR&I)	16.02.216		x	x
Bjarte Walaker	Project manager	Business Intelligence Competency Center	15.02.2016	x	x	
Thomas Mestl (twice)	Researcher / Data Analyst	Strategy, Research & Innovation (SR&I)	15.02.2016, 25.02.2016		x	x
Kristian Ramsrud	BI Architect	Business Intelligence Competency Center	16.02.2016		x	x
Niels Leikvang	Partner Manager for Fleet Performance (ECO Insight)	Department of Fleet Performance Management	16.02.2016	x	x	x
Jørgen Kadal	Programme Director - Information Technology and Analytics	Strategy, Research & Innovation (SR&I)	15.02.2016	x	x	x
Albrecht Grell	Executive Vice President	Digital Solutions and Innovation	29.02.2016	x	x	
Thilo Dückert	Product Manager	Fleet Performance Management	29.02.2016	x		
Kay Dausendschön	Manager Digital Platforms	Department of Digital Solutions & Innovation	29.02.2016	x		x
Lars Petter Blikom	Digital Accelerator Manager	Group Level	16.02.2016	x		x
Kenneth Vareide	Vice President, Business Enhancement	Business Area Oil & Gas	25.02.2016			
Total: 13				**8**	**7**	**7**

APPENDIX C: INTERVIEW GUIDE OF STABURSVIK (2014)

Intervjuguide
Navn:
Dato:
Stilling:

1. Forståelse av prosjektet Fuel Insight
- Gi din presentasjon av prosessforløpet (raskt)
- Hva ble din rolle i utviklingen av tjenesten?
- Ansvarsoppgaver?
- Hvem ga premissene for prosjektet?
- Var formål, organisasjon, fremdrift avgjort på forhånd? - Hvem har sittet med styringa/autoritet?
- Største utfordringer?

2. Avgjørende faktorer (personlig oppfatning)
- Hva var ditt inntrykk av Fuel Insight?
- Hva er de viktigste faktorene for at resultatet ble som det ble?
- Er det noen særlig avgjørende beslutninger som har spilt inn på resultatet? - Hva var dine prioriteringer i prosjektet?
- Hvordan ble resultatet i forhold til dine forventninger?
- Hva har fungert bra? Hvorfor?
- Hva har fungert dårlig?

3. Organisasjonsstruktur, samarbeid og kommunikasjon
- Hvordan vil du beskrive samarbeidet mellom avdelingene i DNV underveis i utviklingen? - Hvordan var kommunikasjonen?
- Hvem opererte som beslutningstakere?
- Var noen mer passive/aktive enn andre?

4. Marked og utviklingsprosess
- Hvordan vil du beskrive Cognos?
- Hvordan vil du beskrive bunker fuel-markedet?
- Var det vanskelig å selge Fuel Insight inn i markedet?
- Hvordan vil du beskrive kommersialiseringen (kommersialiseringsprosessen) av Fuel Insight?
- Hvordan markedsførte dere prosjektet underveis i utviklingen og testperioden?
- Hva tenker du om involveringen av kunder i utviklingsprosessen?
- På hvilken måte ble disse kundene involvert?
- Hvordan vil du beskrive samarbeidet?

- Hva slags tilbakemeldinger fikk dere fra testkundene (spesielt da Fuel Insight ikke slo an)?
- Ble markedet involvert på andre måter?

5. Resultat
- Hva slags tanker har du om resultatet av tjenesten?
- Har du tenkt at ting burde blitt gjort annerledes?
- Hvilke ting? Hvorfor?
- Hva tror du er grunnen(e) til at Fuel Insight ikke slo an?

APPENDIX D: OVERVIEW OF PERSONS INTERVIEWED BY STABURSVIK (2014)

Name	Position	Department	Type	Date
Grunde Løvoll Thomas Mestl	Senior Researcher Senior Researcher	DNV R&I	Introductory group interview	12.02.2014
Tore Morten Wetterhus	Managing Director (former)	VPS	Interview	19.02.2014
John Stirling	Business Development Manager (former)	VPS	Interview	06.03.2014
Sten Svendsen Jørgen Kadal	Head of Section – Production Data Management External Business Domain Responsible	DNV Metric Centre (IT)	Group interview	07.04.2014
Kristian Ramsrud	Business Intelligence Architect	DNV Metric Centre (IT)	Interview	07.04.2014
Jostein Furnes	CFO DNV GL Maritime, Oil and Gas	DNV Advisory Board	Interview	21.05.2014
Eirik Andreassen	Managing Director (present)	VPS	Skype interview from Singapore	02.06.2014
Grunde Løvoll	Senior Researcher	DNV R&I	Interview	16.06.2014
Thomas Mestl	Senior Researcher	DNV R&I	Interview	20.06.2014
Bjørn Olav Odland	Customer Service Manager	VPS	Interview	03.07.2014