Scaling from Research to Operative Services

The Failure of DNV's Data Driven Service Innovation Fuel Insight

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Abstract

It has become increasingly clear the last decades that the service sector constitutes the majority of employment and output in most industrial countries. While the traditional view on innovation and growth has emphasised the manufacturing industry, innovation within the service sector received little attention until the 1980's despite the economic importance of the sector. Services play important roles in innovation processes throughout the economy, hence it is important to understand the nature of innovation in the service sector. This study provides empirical evidence on the importance of the innovation process from the research stadium to market launch within services. The purpose is to identify key factors central to the success, and, if turned around, the failure of service innovation.

This thesis takes form of an embedded case study of an unsuccessful service developed in-house, from research to launch, by Det norske Veritas (DNV) to the global bunker fuel market. On the background of ten qualitative interviews, challenges occurring in the innovation process have been outlined. I explore the blurred lines between manufactured innovations and service innovations, asking to which degree innovation within these sectors differ. This approach turns the focus towards organisational innovation, discussing organisational factors surrounding the service itself as contributing causes to the outcome of a service.

On the background of this case, it is argued that innovation in services differ to a degree from innovations in the manufacturing sector, but that several of the same factors apply. Especially organisational factors play an important role in service innovations, and if these are not in place, the likeliness of an innovation to succeed decrease. Studying the effect of user-involvement, management and knowledge transfer on service innovation, this thesis contributes to the integrative approach of service innovation. By exploring these effects on the performance of a data driven service, it also adds a new dimension to the characteristic issue of 'simultaneity' in this type of hybrid service, opening up for increasing the gap between production and consumption within the service industry. Although there is no 'recipe' for successful innovation, this thesis directs attention towards issues firms should be aware of when developing new services, to avoid failure and instead increasing the chances of enhanced firm performance.

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Six years of studying culminate with this thesis and complete my Master in Society, Science and Technology in Europe (ESST) at the centre of Technology, Innovation and Culture (TIK) at the University of Oslo. The process of writing the thesis has been interesting and provided me with invaluable knowledge on, and an interest in technologies I had barely heard about a year ago.

I was hoping it would rain all summer, but instead I found myself sweating in the reading hall throughout the warmest July in over 100 years. Hence, there are a few people I want to thank who made this summer bearable despite the terribly good weather.

First and foremost, I want to thank my supervisor Magnus Gulbrandsen for providing me with constructive and invaluable feedback. Magnus' knowledge on service innovation has provided me with a deeper interest and understanding of the field of innovation studies. Further, I want to thank all my informants at DNV GL and VPS. I am grateful for the interest you showed in the thesis. You have shared your knowledge generously and contributed with valuable feedback, and I am thankful for your time and the knowledge you provided me. I would also like to thank my dad who has proof-read my thesis. Finally, I want to thank my fellow students with whom I have spent the summer inside the reading hall. Without your bad jokes and the 'research closet', this period would have been rather dull. Instead, I will remember it as a fun summer despite the lack of rain and holidays.

In this thesis I will consistently refer to DNV GL as DNV, for two reasons; in September 2013 DNV merged with Germanischer Lloyd (GL), hence, when Fuel Insight was developed (2010-2011), the company was still DNV. Additionally, in 2013, DNV Petroleum Services (DNVPS) was sold. It has recently changed its name to VPS and is no longer part of DNV GL. Throughout the thesis I will use the current name of VPS even when referring to events prior to the sale. When referring to DNV, it is a collective term for VPS and other DNV (GL) units that were part of DNV prior to merging with Germanischer Lloyd.

Kaja Stabursvik

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Abbreviations

BIMCO	Baltic and International Maritime Council
BDN	Bunker Delivery Note
CCAI	Calculated Carbon Aromaticity Index
CIS	Community Innovation Survey
DNV GL	Det norske Veritas Germanischer Lloyd
DNV R&I	Det norske Veritas Research & Innovation
DNVPS	Det norske Veritas Petroleum Services
ECA	Environmental Control Areas
ESST	Master of Society, Science and Technology in Europe
FI	Fuel Insight
ICT	Information and Communications Technology
IT	Information Technology
ISO	International Organisation for Standardisation
MCR	Micro Carbon Residue
R&D	Research and Development
R&I	Research and Innovation
SIBCON	Singapore International Bunkering Conference
TSP	Total Sediment Potential
VPS	Veritas Petroleum Services

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1.0 Introduction

The field of innovation studies is to a large extent based on successful innovations, and there is a seemingly lack of studies on innovation failures. Innovation varies tremendously, and despite all the research done on successful innovations, there are no easy answers on how to avoid failure. Nevertheless, it appears to be some characteristics of failure. Being capable of developing successful innovations is a learning process, however, the pattern of mistakes often seems to be repeated as it seems to be a tendency to fail to learn from the hardship of others (Tidd & Bessant 2013:86).

Additionally to a focus on successful innovations, there has long been a bias towards innovation in manufacturing sectors in the innovation literature, arguing that the service industry is a passive adopter of technological innovation. This thesis recognises that there are high levels of innovation in services, and contributes to the field of innovation studies by elucidating the case of a failed service innovation. Further, it will contribute to enlighten the debate on organisational structures in service innovation.

This thesis will use a service innovation developed by Det Norske Veritas (DNV) in 2011, called Fuel Insight to explore the field of new service innovations. The purpose is to analyse the innovation process and the stages of development leading to an innovation's launch to the market.

Fuel Insight is a data-analytical tool developed by DNV as a response to customers' request to get a faster and easier way to purchase bunker fuel. The launch of a service such as Fuel Insight was believed to contribute to a more efficient way of purchasing bunker fuel by providing reliable measurements of fuel quality, evaluations of suppliers and potential financial savings in a market with few such regulations and regular occurrences of bribing. The service was believed to revolutionise the bunker industry as it would provide transparency by making the suppliers' delivered fuel quality and reporting quality available to all stakeholders. From DNV's point of view, this is important not only to the buyers of the oil, due to reduced costs and more value for money, but also for the environment and users, as measuring of fuel quality would lead to risk reductions. However, Fuel Insight did not succeed, and this thesis aims to identify the reasons why, using theory and literature on service innovation and innovation processes.

Thus, the main research question is:

Why did Fuel Insight fail?

In chapter 2, I will elaborate on which issues I single out to focus on in regards to answering why Fuel Insight failed, based on literature on service innovation. I will look at the theory in service innovation on two different levels. I will begin by outlining on a general level the main literature, and I will argue that there are high levels of innovation in services. I will present different approaches to innovation in the sector and analyse the differences between innovation in the service industry versus innovation in the manufacturing industry. I will highlight characteristics in service innovation on a general level before I go in-depth studying the role of user-involvement, planning and management, knowledge transfer and price, design and their potential effect on success or failure in service innovation. In chapter 3, the research design and method chosen for the thesis will be described before DNV's Fuel Insight will be elaborated thoroughly in chapter 4. In chapter 5, I will analyse and discuss the empirical findings, connecting it to the theoretical framework outlined earlier, before I conclude in chapter 6.

The ESST field of study provides students with knowledge and tools to better understand the complex issues of modern innovations; the challenges faced by actors in society; and society as a whole, when trying to take advantage of technological and scientific innovations. This thesis contributes to that understanding by studying the innovation process of a technological service from the research stage to the application to the market. It examines the challenges encountered by the developers and the company during the process, as well as the challenges of the inter-related worlds of the developers and the market when trying to make use of and implement new service innovations.

2.0 Theoretical Framework

2.1 What is Service Innovation?

Innovation is regarded as fundamental to the growth and competitiveness of firms and economies (van der Aa & Elfring 2002:155, Tether & Tajar 2008:720). For an innovation to be successful, it has to be novel and to generate positive outputs for the producer and the consumer. An innovation is the "commercial application (…) of a new process or product" (Freeman 1982:110); the successful exploitation of something qualitatively new (Smith 2005:149). Thus, when analysing innovations, one has to pay attention towards market development, organisational behaviour and financial and project management, to mention some important factors (Tidd & Bessant 2013:19).

While there has been a bias towards research on innovation in the manufacturing industry, innovation in services has received less attention in the innovation theory. The debate on the causes for, and consequences of growth in the service sector dates back to the 1930s, and it has long been argued that services are dismissed as 'supplier-dominated' users of technologies instead of true innovators, as substantial research and knowledge on service industries as innovators is lacking (van der Aa & Elfring 2002:157, Tether & Tajar 2008:722). This bias has contributed to an underrating of the innovative performance of service activities. The debate still has not reached a ground of agreement, but in the later years, the focus on innovation in services has gained more attention (Drejer 2004:551, Tether & Tajar 2008:722, Gallouj & Savona 2009:150,155).

One of the reasons service innovation has been underestimated might be due to the fact that it is difficult, if not impossible to standardise service innovations. Innovation in general is intricate, and with the diffusion of Information and Communication Technology (ICT), innovation in services is becoming even more complex. Service transactions are produced in interaction with clients, which makes each transaction unique. They are produced in response to the clients particular and non-standardisable problems in an environment that is always different (Gallouj 2002:37). It is also difficult to distinguish the product from the process in service innovation as the 'product' in services is – in many cases – a process; a set of procedures and protocols, a formula, a problem solution or a service package (Gallouj 2002:40). Hence, the immateriality of the outcome of production in service innovation is

blurry, which makes it hard to measure, as the output is not physically quantifiable (Gallouj 2002:XV, Gallouj & Savona 2009:154).

2.2 Approaches to Service Innovation

The literature on service innovation can be classified into three different approaches. The oldest and most dominant approach is the *technologist* approach. This approach reduces the service industry to be a passive adopter of technology- and capital-intensive innovations, and it leaves out the aspect of non-technological innovations. The second approach, the *service-oriented* approach, evolved as an opposed response to the technologist approach focusing on the specificities of innovation in services while attempting to develop a specific framework for service innovation. It tries to balance the focus on technology with non-technological aspects by including the latter in the approach. Finally, there is an *integrative* approach that attempts to develop a conceptual framework applicable to both tangible and intangible products (Gallouj 2002, Drejer 2004, Gallouj & Savona 2009). The latter approach argues that there is a convergence between manufactured goods and services, and that the boundaries between the two are blurry. However, Gallouj & Savona (2009:162-163) argue that this approach is slightly underdeveloped, but that it is the most promising approach in terms of theoretical advancement in the field of service innovation. This view is also supported by Drejer (2004) and Tidd and Bessant (2013:65,449) who argue that the underlying innovation processes between service innovation and manufacturing innovations are the same, although services may appear less tangible. They point out that services are increasingly being offered along with manufactured products as after-sale service and customer support.

Services create over two thirds of the added value in European Union countries and the USA (CIS-2, Freeman & Soete 1997:4, Miles 2005:434). Both high-tech (software and telecommunications) and low-tech (retail, cleaning) services are major innovators, although the high-tech services tend to be more innovative (CIS-2). As argued by Gallouj (2002:18), technology is unequivocally a key element in innovation in services. However, technology cannot count for the full range of innovations, and it seems peculiar that the field of service innovation is still not well understood.

The point of view in this thesis will fall within the scope of the integrative approach, focusing on both the possible role of non-technological forms of innovation and the importance of technologies.

2.3 Characteristics of the Service Industry

The service sector is huge and of extreme diversity, including low- and high-skilled personal services, business and mass consumer services and public administration. Service innovations are often interactive, and much service activity involve high levels of contact between the service supplier and the customer. In modern economies, the service sector includes the most concentrated, knowledge-intensive and IT-intensive sectors, as well as the least (Gallouj 2002:XV, Miles 2005:435-436). The range of service innovation has grown remarkably with the rise of the internet. With web-based technology it is possible to customise services to a wide range of customers, thus it becomes possible to offer a variety of customised services while retaining a wide reach. However, service innovations are often easy to imitate, and there are less barriers of intellectual property protection than is the case with manufactured products. Thus, the comparative advantage of a service firm may be lost as competitors imitate. The risk of being left behind as other firms take the lead in changing their offerings, business strategies or operational processes is huge, unless the firm is able to move into further innovation. Thus, there is a strong drive to personalise service experiences leading to customer 'lock on' (meaning that customers choose the service due to the superior value it provides) and reducing the churn rate (Vandermerwe 2004:41, Tidd & Bessant 2013:62-64).

2.3.1 Factors of Success and Failure

As mentioned earlier, new service development is a complex process which has received much less attention than innovations in the manufacturing goods sector. While key factors that separate winners from losers has been identified in the manufactured goods sector, such research on the service sector is lagging behind. Key success factors identified in the manufactured goods sector are product advantage or superiority, project synergy, a clearly defined product concept, market(ing) orientation and proficiency, customer need and market attractiveness and quality of execution of the new product process. In accordance with the integrative approach, there is a convergence between manufacturing and service activities. Although there are some similarities between the success factors in manufactured goods sector and the service sector, the latter does have some unique characteristics. Some of the

characteristics that distinguish services from physical goods are simultaneity of production and consumption that involves some degree of customer participation, as well as service intangibility and "variability and perishability of the service offering" (de Brentani 1995:93, Gallouj & Savona 2009:154). If firms want to remain competitive in today's market, new services must often be developed quickly. Significant risks are associated with such innovations as new services can require large inputs of human and capital resources, and the need to make the right decisions becomes critical (de Brentani 1995:93). De Brentani (1995) identifies several key factors of success and failure in service innovations. Crucial factors for success are high degree of customer orientation and client contact. Company expertise, resources for marketing and designing new services are central, along with a high degree of synergy with management preferences in the firm. De Brentani (1995:99) concludes that new services that are continuously customised to meet the needs of the customer are the ones that succeed. Other positive contributions to success is for a company to be the first to market innovative services, and to be detailed and have high quality execution of the stages of the new service development process through highly planned and formal management (ibid).

Accordingly, factors leading to failure in the service industry are identified. Key factors of failure tend to include poor planning and judgement along with poor understanding of the market and clients, and lack of commitment at the developing firm. Lack of commitment can be correlated to the finding that these new services tend to be peripheral to the firm's core services, hence little effort is made to research the market potential and to cautiously blueprint the design. Thus, services do not respond to customer needs and problems, or present any real improvements over competitive products, and are launched after more innovative firms have covered most of the market. There is low corporate synergy, and launch strategies do not attempt to make the service more tangible for customers (de Brentani 1995, Stuart & Tax 1996:58). Factors such as project management, marketing orientation, product advantage, customer need and quality execution of the new product are also identified in the service sector. These factors might be more intangible and difficult to identify in service activities due to the simultaneity of production and consumption and the 'fuzzy nature' of service products (Gallouj 2002:XV, Gallouj & Savona 2009:153).

2.3.2 Organisational Innovation

In addition to the characteristics mentioned above, there has also been identified a number of innovation forms that are of special relevance to firms in the service industry (van der Aa & Elfring 2002). These are forms of organisational innovation that have proven to play a significant role in the service industry. The first form focuses on the reproduction of the service management system when a firm expands; the importance of standardising the services as well as making the concept as explicit as possible; and on internal benchmarking of managerial and limited experimentation. The second form focuses on creating new combinations of services that in turn will lead to innovations. The third emphasises that as the process of producing services is more open than the manufacturing process, customers have a great opportunity to influence parts of the service process. The flexibility between the activity of the producer and that of the customer provides opportunity for new organisational arrangements, hence the customer's role as co-producer of new service innovations is emphasised. Although being categorised into three forms of organisational innovation, these forms reflect the attributes characterising innovation in the service industry mentioned in section 2.3. The examples of success and failures, along with the different forms of organisational innovation, show a clear emphasis on the importance of including users, of highly planned and well executed management and of new combinations of linkages to improve the service experience.

2.3.3 High Innovators

As reflected in the literature on service innovation, the sector is wide, and several characteristics are mentioned. Due to the size and complexity of the sector, it is hard to identify common characteristics for service innovators. However, a study executed by Tidd and Bessant (2013:449-453) on 100 service businesses generated some findings on common characteristics for this sector. According to the study, high innovators spend more on R&D, they often have experienced technology change, and it usually takes them less than one year to introduce new service concepts to the market. These high innovators are also more likely to compete in open markets dominated by international trade. They tend to avoid overcomplicating their customer base, and they usually have fewer key customers who account for a high proportion of their total income. High innovators are also more likely to focus their purchases on a few, but larger suppliers, as well as they are less vertically

integrated. The 'innovation winners' in the study are using parity pricing as it tends to be difficult to persuade customers to pay for new services at a premium.

The literature on service innovation may seem rather ambiguous. How close should a firm be to the market and the users? To what extent should one listen closely to the feedback provided? To what extent does knowledge transfer occur through tools, tasks, people and their sub-networks, and is it efficient? The term disruptive innovation introduced by Clayton Christensen and elaborated further in his book *'The Innovator's Dilemma'* (1997), is debated and criticised for being generalising based on a limited number of cases.[1] This critique contributes to the ambiguous nature of innovations; when should one follow practices of good management? When does it lead to success, and when does it lead to failure? Is there a 'recipe' for successful innovation?

When studying the innovation process of a case such as Fuel Insight, there are several approaches to choose from. The reasons why the service did not succeed are manifold, but in this thesis I identify three reasons I consider of major importance in explaining why Fuel Insight failed. As the general presentation of the literature on service innovation has posed, service innovation share several characteristics with innovation in manufacturing industries. However, there are some characteristics that stand out as crucial in the service industry, and these are user-involvement, knowledge transfer from the firm to the market, and thoroughly planned and highly executed management. Attempting to answer how Fuel Insight came to fail, I hereby introduce three sub-questions targeting characteristics that seem to be of crucial importance in the service sector: *Was user-involvement sufficient? How was the project managed; was management planning sufficient? How was technical knowledge transferred to the market?*

This brings us to the next part of the thesis. Here I will go in-depth, constructing a theoretical framework to answer the sub-research questions. Firstly, I will discuss the role of the user, before innovation management will be studied. Finally, I review literature on knowledge transfer, discussing how new combinations can be combined into a new concept, and how this new concept is communicated and commercialised to the market. It is important to keep in

[1] http://www.newyorker.com/magazine/2014/06/23/the-disruption-machine

mind that the issues of user-involved innovation, management and knowledge transfer are not mutually exclusive, but that they are related and share same characteristics to a certain extent.

2.4 User-Led Innovation

A firm's ability to include users in the innovation process is outlined by literature on the service sector as crucial in order to succeed. The role of the consumer as co-producer receives a great deal of attention in innovation studies on service innovation, as customers are identified as the most important type of collaboration partner (Drejer 2004:552,555). Users are a heterogeneous group, and although this poses difficulties, the success of new products are improved when user needs and preferences are fully understood (Flowers & Henwood 2010:163). Innovation has become more open, and innovation is now to a larger extent than ever driven by networks of individual users and not firms. In many sectors one can find active users within all stages of the innovation process (Tidd & Bessant 2013:492). User-led innovation can take form of engaging one or several customers or users, and sometimes even involves including communities which create and use innovative solutions on an ongoing basis (Flowers & Henwood 2010:114, Tidd & Bessant 2013:254). This part of the thesis will structure a theoretical framework on the role of users in service innovation which in turn will be discussed along with the empirical findings in the analysis to decide whether user-involvement was sufficient in the case of Fuel Insight.

As mentioned earlier, service innovation is relatively easy to imitate, and it is important that firms renew themselves and move into further innovation in order to keep their competitive advantage. As we have seen, end-user understanding is crucial to success as many services are simultaneously created and consumed. Thus, successful service innovation is highly dependent on demand side knowledge (de Brentani 1995:101, Flowers & Henwood 2010:163). Compared to manufacturing organisations, service businesses may not always have a formal R&D department, and they are less likely to engage in R&D. However, almost half of the service firms studied in the Community Innovation Survey 2 engaged in R&D (CIS-2, Miles 2005:436-437). It is argued that these firms undertake a developing process similar to that of manufacturing firms. This process includes search, experiment and prototyping, before the product eventually is launched onto the market. The search process will often have a much stronger emphasis on the demand side than in manufacturing firms, while the experiment and prototyping process often extends from laboratory testing to trials

with potential end-users. Although service businesses might not have a formal R&D department, they still engage in the same sort of activities. However, it involves a much higher level of user insight and experience than that of manufacturing firms (CIS-2, Miles 2005:438, Tidd & Bessant 2013:65).

2.4.1 Lead-Users

There are several good reasons to involve users in the innovation process. Sometimes, users are ahead of the market when their ideas (and sometimes frustrations with existing solutions) create early versions of what later become prevailing innovations. Motives to engage users in the development process may be the desire to acquire knowledge from the users and to achieve so-called user 'buy-in', i.e. that the user approves of the innovation and assures to use it (Tidd & Bessant 2013:375). Thus, engaging users in co-creating innovative solutions might be a smart strategy as these are often ahead of the market in terms of innovation needs (Gallouj 2009:154, Flowers & Henwood 2010:114). Especially identifying so-called 'lead-users' is of vital importance. Lead-users will often be early adopters, but they are also active innovators. These users might require something at a higher level than the current performance that does not yet exist in the market, and their ideas and insights can create new services (or products) that later might become an integral part of mainstream expectations and even create new markets. This kind of innovation is called disruptive innovation, and it focuses on needs that are not being met, or poorly met. It can also target areas where there is an overshoot (Flowers & Henwood 2010:114, Tidd & Bessant 2013:245).[2] However, it is important to understand that the relationship between user involvement and user satisfaction is not straightforward. Very low levels of user involvement are associated with user dissatisfaction, but comprehensive user involvement does not necessarily result in user satisfaction (Tidd & Bessant 2013:375). However, as we have seen, service firms engaging in extensive customer orientation and client contact have the highest success rate (de Brentani 1995:99).

Whose needs should one address when involving users in the innovation process? Users are not a homogenous group, and potential users may have very different needs. This diversity can trigger innovations and new directions (Miles 2005:437, Flowers & Henwood 2010:168). Hence, a service business that seeks to develop innovative and complex services should look

[2] http://www.claytonchristensen.com/key-concepts/

within the customer base to identify possible lead users that are ahead of the market and recognise requirements early. They should be able to identify and develop their own innovations, and they should be perceived to be pioneering and innovative. The aim is that these users will contribute to the co-development and early adaption of the innovation. Such lead users might also be able to "provide insights to forecasting the diffusion of innovations" (de Brentani 1995, Flowers & Henwood 2010:114, Tidd & Bessant 2013:491).

2.4.2 Pilot Runs and Design

It is argued that the importance of design is not well understood and that it has a reduced status in services. As the understanding of design in services has received more attention, use of testing and pilot runs with trial users in the innovation process has increased. It is argued that the risk of failure can best be avoided through controlled experiments and field pilot trials (Stuart & Tax 1996:63). Involving potential customers or lead-users in this pilot testing to get feedback on the service and its usability, whether the design is appealing to the users and evaluate the service's user-friendliness, is of vital importance to succeed. If an innovation is not used by customers or clients, it is not successful. But "if the users of new products and services are involved in designing what they need, there is generally a better chance of success than if something is being designed for them" (Dodgson & Gann 2010:54). Active communication and engagement between producer and customer can overcome barriers between the actors, identifying demands and needs that are articulated across organisational boundaries between the producers and their customers and suppliers (ibid). However, customers may also hinder innovation as they can be conservative and locked into ways of doing things that inhibit novelty and risk. This is what Christensen (1997) named 'the innovator's dilemma' – the problem of listening too closely to the customers. By responding too immediate to customer's demands, innovators might risk to miss out on big changes occurring in markets and technology that eventually can put them out of business. Instead there is an advantage in working with 'lead users' or firms, individuals and governments who are prepared to take risks to promote innovation (Dodgson & Gann 2010:56).

As users are getting more involved in the innovation process, as well as extending and developing technologies by themselves, the boundaries between consumers and producers has become less distinct. As if innovation was not complex enough to begin with, this turn towards a more open and democratised process has made it even more complex (Gallouj &

Savona 2009, Flowers & Henwood 2010:230, Tidd & Bessant 2013:492). It is also important to note here that customer expectations change over time, and recognising these changes are of vital importance for a firm to stay atop in its industry (Stuart & Tax 1996:69). Hence, involving users in the innovation processes is closely connected to, and has implications for our understanding of the management of innovation.

2.5 Innovation Management

Seeking to identify and promote 'best practice' management and organisation is dominant in the management research and literature. However, it is being argued that "different types of organizational structures and management processes are appropriate for different kinds of tasks" (Tidd & Hull 2003:4). As discussed earlier, commitment, judgement and planning on the part of managers is a crucial key factor in service innovation. Regarding management prescriptions, also the majority of research has been based on experience from manufacturing sectors. Within this field of research, there are two main stands, where the majority seems to think that management practices can be applied equally in manufacturing and service sectors. Others argue that services differ fundamentally from manufacturing sectors. There is also a third stand which argue that there do exist some generic practices which apply to both service and manufacturing offerings, but that management and organisation must be matched to the specific technology and market environment (Christensen 1997:9, Tidd & Hull 2003:4). As already emphasised, there is great variety in the service industry, and one must be careful when making generalisations about this sector. However, some differences between manufacturing and service operations that challenges innovation management are identified. One of these differences is the already mentioned 'simultaneity'. While there is a greater lag between production and consumption of manufacturing goods, this is almost non-existent in many services. This creates challenges for capacity planning and quality management, as it is more difficult to correct errors in services. The issue of 'storage' does also create problems for capacity management as services usually cannot be stored, and thus this inability to hold stocks can create challenges matching supply and demand. Identifying the differences between goods and services is important because these differences require a different approach to organisation and management (Miles 2005:435, Tidd & Bessant 2013:448-449).

2.5.1 The Role of the Manager

The ability to manage innovative knowledge is crucial because it can lead to a sustained competitive advantage and a continuous increase in enterprise benefits (Tsai 2009:11324). However, 'the innovator's dilemma' argues that competent and logical management decisions that are critical to the success of companies are also the reasons why some companies lose their positions of leadership. There are examples of well-managed firms where good management was the main reason why the firms failed to keep their competitive advantage and stay atop their industries. The reasons emphasised is that because they carefully studied market trends, listened to their customers and invested in technologies corresponding to the customers' wishes, they lost their leading positions. This implies that what are widely accepted principles of good management are highly situational (Christensen 1997:xii-xvi).

Research suggest that leadership directly and indirectly account for "half of the variance in performance observed across organisations" (Tidd & Bessant 2013:112). Of this, direct influence counts for 15 percent of the differences found in performance of businesses, and indirectly it contributes to an additional 35 percent through the choice of business strategy (Bowman & Helfat 2001). The role of the leader has been further elaborated through a study of scientists where it was found that inputs from the leader was valued in the beginning of a new project, and that feedback was appreciated at later stages to achieve insights on the implications of their work. The study thus concluded that rather than to simply generate ideas, providing feedback and evaluation is one of the key roles of creative management (Farris 1972:26).

2.5.2 Price and Planning

A firm might fail when it gives customers more than they need or ultimately are willing to pay for. It tends to be difficult to persuade customers to pay for new services at a premium, hence several firms characterised as innovation winners are using parity pricing. By doing this, the firm's service advantage is being used to increase growth rather than exploiting it for maximum immediate profits (Tidd & Bessant 2013:449).

However, the management's understanding of market needs is not the only crucial role of a manager. Commitment from the top management is highly associated with successful innovation (de Brentani 1995). There is a lot of uncertainty connected with innovation, thus

long-term commitment from the management is important, as returns might not emerge quickly. The top management must be aware of, and prepared to take risks, as well as accepting failure, which is an opportunity for learning and development (Christensen 1997:228). They also need to have knowledge on factors affecting new service performance. However, it is important to note that innovation might happen in spite of senior management. Leadership and commitment does not always have to be an active change agent, but it is definitely a key factor to successful innovation (Tidd & Bessant 2013:110-111). The planning process is an important aspect of quality management as planning efforts – such as process design and analysis, market research and staffing levels and training – are often linked with the introduction of new products and services (Stuart & Tax 1996:62). A company that does not have a systematic or planned way of targeting its development resources towards customers' needs will fail. Additionally, the organisation's structure is an important asset. The way an organisation is structured and the way its employees work together is important as this can affect the way the firm can and cannot design products (Christensen 1997:30,84).

Despite all the theory on 'best practice management', Christensen (1997:225) argues that "managing better, working harder, and not making so many dumb mistakes is not the answer to the innovator's dilemma". He argues that managers who leave room to try and fail, learn quickly and try again, can succeed at developing an understanding of markets, customers and technology needed to commercialise their innovations. But in practice, it is the company's customers who effectively control what the company can and cannot do, and the challenge is to break out of customer control (Christensen 1997:101-104,228).

2.6 Knowledge Transfer

Research shows that a majority of service firms look for and create new combinations of services in order to meet customer needs and become more efficient and competitive (van der Aa & Elfring 2002:161-162). However, adding new services to an existing service portfolio does not necessarily indicate innovation. Hence, it is crucial to know how to meet market demand and target the market through beneficial commercialisation when launching new technologies.

Innovation is the commercial use of a new (or improved) equipment or process. Thus, for an invention to be an innovation it has to create value, and in order to create value, it must be

applicable to needs in society. Knowledge produced in a laboratory or in any type of technology or knowledge-specific environment might seem incomprehensible for someone from the outside. Therefore, the challenge when developing an innovation from 'scratch', is to make it comprehensible for the market, or at least the targeted customer group, being aware that culture and institutions are important components of knowledge (Mokyr 2002:18). Thus, as an innovator, or an innovating firm, it is important to understand the cultural context within which one is operating, and to know how to target customers with the right type of marketing. Basically, if an innovation, be it service or manufactured, is to be successfully launched and adopted by customers, the developers of the innovation have to know how to 'decode' the technical knowledge and to 'translate' it into a language that the customer speaks (Latour 1983:145, Mokyr 2002:14,18). In other words, scientific and technical knowledge is often codified by developing a suitable vocabulary. This language used to exchange technical messages is not the same language as that of the broader community and market (Breschi & Lissoni 2001:988). Thus, knowledge transfer from researchers and the laboratory to a wider audience when launching innovations is crucial.

2.6.1 Scaling from Research

New technologies or new combinations of existing technologies to improve the service experience can be developed in-house or with external expertise (Bekkers & Freitas 2008:1848). Several firms have in-house expertise or collaborate with research institutes or universities in their development of innovations (Beise & Stahl 1999:398,406). Although this kind of research and knowledge transfer is expected to have an important influence on the commercialisation of research, this research "seldom leads to ready-to-produce innovations" (Beise & Stahl 1999:409). What actually happens is that knowledge that enables firms to develop a new product or process is transferred (ibid). When analysing commercialisation from university scientists and research to the industry, low levels of commercialisation have been reported. This is explained in structural terms of the faculty and university system and culture, as well as it is argued that scientists and researchers have little knowledge on markets and the commercial value of new knowledge (O'Gorman et al. 2008:24). This thesis argues that the low levels of commercialisation from universities can also be applicable to scientists and researchers working in firms and their knowledge on how to target potential customers in a language understood by the broader community. Studying the in-house development of a

service innovation, this thesis provides a good case as it exposes the innovation process from research to market, encountering challenges of commercialisation and knowledge transfer.

Argote and Ingram (2000) developed a framework in which they argue that the creation and transfer of knowledge is "a basis for competitive advantage in firms". They define knowledge transfer in organisations as "the process through which one unit (e.g. group, department, or division) is affected by the experience of another" (Argote & Ingram 2000:151). This ability to transfer knowledge from one unit to another contributes to the organisational performance of firms in the service and in the manufacturing sector. Further, Argote and Ingram (2000:153) argue that in an organisation, knowledge is embedded in the three basic elements members; tools and tasks and the sub-networks that are formed by combining the basic elements. Members are the human components of organisations while tools, both hardware and software, are the technological components. Finally, tasks reflect the organisation's intentions, goals and purposes. For successful transfer of knowledge, tacit knowledge and face-to-face interactions are emphasised as crucial factors as some knowledge might be more difficult to transfer via formal channels of knowledge exchange. There are also findings pointing in the direction that most industries have a well-established informal network through which knowledge is traded (Cowan & Jonard 2004:1559). These networks tend to evolve in response to agent's experiences which means that if an agent or a firm has had a good exchange with one particular agent or firm, it is likely that one will try to return to that agent in the future (Christensen 1997:34, Cowan & Jonard 2004:1573). Hence, addressing the well-understood needs of known actors within the network is a key determinant of the probability of an innovative effort's commercial success (Christensen 1997:54).

2.6.2 People and Tools

The framework posed by Argote and Ingram (2000:158) mainly focus on knowledge transfer *within* organisations. Nevertheless, it also points out ways to facilitate knowledge transfer externally. As mentioned, knowledge transfer occurs when "experience in one unit of an organisation affects another unit" (Argote & Ingram 2000:154). However, knowledge transfer can also occur without the recipient unit being able to express the knowledge it has obtained. An individual might use a tool that has been modified to improve its performance, and that the user can benefit from the productivity improvement in the tool "without necessarily understanding the modifications or being able to articulate why the modifications improved

the tool's performance" (Argote & Ingram 2000:154-155). Hence, knowledge transfer occurs when experience in one unit of the organisation affects another unit, but in order for the members, tools and tasks transferred to be effective at the new unit, it has to "adapt or be adapted to the new context" (Argote & Ingram 2000:156). This is crucial as "a division of labour developed in one organisational unit that fits the skills of its members may not work in another unit where members have different skills and areas of expertise" (Argote & Ingram 2000:156-157).

The effect of moving tools through technology transfer has been studied. The success of technology transfer attempts varies significantly although this way of transferring knowledge through moving technology can be effective. In order for it to be effective, the technology needs to be adapted to the context at the recipient site. Codified knowledge embedded in technology transfer more easily than knowledge not enclosed in technology. Furthermore, attempts of technology transfer have been found to be more successful when the technology is well understood and not complex. Embedding knowledge in technology is thus argued to be an effective way to transfer knowledge both within the firm and externally (Argote & Ingram 2000:157-158). Galbraith 1990 (in Argote & Ingram 2000:163) studied knowledge transfer on both the 'recipient' and the 'source' site, finding that the recipient's productivity recovered faster when the technology was not complex and when the recipient and the source were close geographically.

2.7 Summary

In this chapter, issues regarding user-involvement, management and expertise, and the diffusion of technological knowledge from the firm to the market and the end-users, have been raised. These issues are relevant as they are highlighted in the literature on service innovation as crucial components for innovations to succeed. Based on literature provided in this chapter, it can be argued that the process of service innovation to some extent takes the same shape as the manufacturing process, albeit there are certain differences that are important to recognise and pay attention to when analysing service innovation.

Regarding involving users in the innovation process, there is no doubt that this is beneficial for firms wanting to increase the probability that they succeed with their innovation. Literature provided in this chapter shows that firms that have not focused adequately on

potential customers also have the lowest rate of success. However, high levels of user involvement is not a guarantee for user satisfaction. Nevertheless, it is shown that low levels of user involvement is correlated to user dissatisfaction, hence there seems to be no need *not* to involve users in the innovation process. However, as proposed by 'the innovator's dilemma', one can argue that there are times when it is right not to listen to the customers if wanting to stay atop in the industry (Christensen 1997:9,18,98).

Concerning management, it is found that managers play an important role in demarcating the direction and the strategies of the firm, as well as supporting and creating an environment of high corporate synergy. Findings show that managers play a significant role, but the literature does not provide a sufficient picture of the influence different units within a firm might have to affect the outcome of the innovation process. Opposing interests, collaboration and communication within involved parties in the firm might also play an important role in the process of developing new services.

Finally, we turned to the extent to which knowledge transfer play a role in service innovations. When developing a technologically complex innovation, it is important that the producer speaks the same language as the customer when communicating and launching the new service to the market. It is important to distinguish between inventions and innovations as a good invention is not a guarantee for commercial success (Tidd & Bessant 2013:19). An innovation is not successful unless it creates value and is carried out in practice (Schumpeter 1934:88).

3.0 Methodology

In this chapter, choices and procedures for gathering empirical data will be elaborated. First, I review the qualitative case as a method before elaborating the data collection process, using documents, interviews and artefacts. The process of analysing will be discussed before I review the validity and reliability, and question ethical concerns of my research at the end of the chapter.

3.1 Qualitative Case as Method

In this thesis I have decided to undertake a qualitative perspective on the innovation process of a new service developed in-house, from the research stadium to the launch to the market. To undertake such study, I was introduced to the DNV case of Fuel Insight to explore the innovation process of the development of the service.

There are several research methods that may be used for three different purposes: exploratory, descriptive and explanatory studies. Regarding case studies, there may be explanatory case studies, descriptive case studies and exploratory case studies. The boundaries between these three types are not always sharp, and it consists large overlaps amongst them (Yin 2014:8-9). However, one can differentiate between the tree types by asking different research questions. In general, *what* questions can either be exploratory or about prevalence, while *how* and *why* questions are more explanatory and more likely to favour the use of a case study (Yin 2014:10). If the intention is to undertake a descriptive study, open questions allowing a description of the case in all its particularity is convenient (Simons 2009:32). Qualitative studies focus on *how* and *why* questions, and with the research question: W*hy did Fuel Insight fail? Was user-involvement sufficient? How was the project managed; was personnel with sufficient expertise involved? How was technical knowledge transferred to the market?* I seek to analyse the process of technological services from research to market, examining potential barriers preventing its success. For this reason, an explanatory case study is a good strategy to pursue, as it would give further insight in the factors that facilitates and obstructs the successful launch of a new service in the bunker fuel market.

The case study allows for the researcher to get a wider insight in possible relevant factors and variables. However, doing case study research is one of the most challenging of all social science endeavours (Yin 2014:3,23). The case study tries to explain a decision, or a set of

decisions, elucidating why they were taken, how they were implemented and with what result (Schramm 1971 in Yin 2014:15). Gerring (2004:342) defines the case study as "an intensive study of a single unit for the purpose of understanding a larger class of units." This type of study allows the investigator to focus on a case, and maintain a holistic and real-world perspective (Yin 2014:4). One reason why case study research is perceived difficult is because the data collection procedures are not routinized. The case study has a unique strength in the way that it is able to deal with a great variety of evidence, such as documents, interviews, artefacts and observation (Yin 2014:12). Relying solely on interviews when collecting data could cause damage to the validity of the research. Hence, the researcher has to be aware not to become too dependent on key informants. It is crucial to rely also on other sources of corroborate evidence or search for contrary evidence (Yin 2014:111).

3.2 Access to Case

I came in contact with Thomas Mestl, senior researcher at Research and Innovation (R&I) in DNV in December 2013 via an email where I explained that I was interested in writing about service innovations and the scaling from research to operative services in DNV due to their heavy focus on technologies. Mestl turned out to be a great student contact as he already had a case in mind that he wanted me to study. He gave me several pamphlets and information documents on the case for me to read to see whether this was something I wanted to do. This is how I came to use the Fuel Insight service as the case study when undertaking research on the scaling from research to operative services.

3.3 Collecting Data

When collecting qualitative data, there are several methods one can apply. The main ways of collecting qualitative data are through interviews, documents, (participant) observation, archival records and artefacts (Punch 2005:168, Yin 2014:102). To paint an as complete picture as possible of the innovation process of Fuel Insight, I have used several sources of evidence to collect as much relevant information as possible. No source has an advantage over the others rather they complement each other (Yin 2014:241). There is a difference between what is officially told by documents and how people really experience situations. Hence, in the thesis, I apply a qualitative method, using interviews with staff from DNV who were part of the development process. I have also been investigating documents and artefacts

(Fuel Insight data tool), thus the thesis applies an investigative approach to service innovation.

I have collected data from several sources to assure the credibility of the information applied. It is necessary to make use of these methods in order to figure out what really happened in the process of developing Fuel Insight as they go in-depth and contribute to our knowledge on organisational, social and managerial phenomena (Yin 2014:4). Before conducting the interviews, it was important to have a basic understanding of the bunker fuel market and the work of DNV. I was given the desk at the R&I office in DNV's office in Høvik, and spending a few days a week in the DNV office gave me a unique possibility to observe and understand the dynamics of the R&I unit, as well as the threshold to ask questions was lowered. I got access to written documents and pamphlets on the service. I was also given access to try out Fuel Insight myself. This gave me valuable knowledge and a greater understanding of the topic before I started conducting the interviews.

3.3.1 Interviews as Data Source

Interviews are one of the main data collection tools in qualitative research (Punch 2005:168). It is a good method of collecting information about opinions and experiences as it can provide insight into differing opinions both within and between groups (Dunn 2010:102). However, when undertaking interviews, one has to be aware of a possible bias, both in response, but also due to poorly articulated questions. There is also a chance of experiencing reflexivity, which means that the informant says what the interviewer wants to hear. However, using interviews as a source of evidence gives great insight to the case as it provides explanations as well as personal views (Yin 2014:106). In addition to single interviews, I have also made use of group interviews when conducting the research. By doing group interviews, the informants can help each other out remembering details in the case studied, as well as such interviews may reveal dynamics in the group through interaction which will not be apparent in individual interviews. However, data from such interviews might be patchy and incomplete (Gillham 2005:69).

By conducting singular- and group interviews with employees from all involved units within the DNV, I seek to find answers and explanations of the relevance of the above-mentioned issues put forward by the literature. By using semi-structured interviews I was given the

flexibility to ask questions exceeding the interview guide, and to adapt questions to each informant (Gillham 2005:79, Dunn 2010:110). The informants naturally possessed more knowledge than me on the field, and I wanted to give the informants the possibility to add remarks and address new topics during the interviews. Hence, I found semi-structured interviews to be the most appropriate form of interviewing for my research.

3.3.2 Conducting Interviews

Together with Mestl and my supervisor, we figured out that I had to interview representatives working closely with the project from all the DNV units involved, including customers involved in the innovation process. This includes DNV Research and Innovation (R&I), Veritas Petroleum Services (VPS), and the DNV Metric Centre. I was not given access to interview customers, and this will be further elaborated in section 3.5. By conducting ten interviews, the more formal data collection procedure was carried out. Since the informants had different expertise and different tasks during the development of Fuel Insight, semi-structured interviews allowed me to ask relevant questions to all informants despite the diverse expertise. Conducting the interviews, I used a recorder as this allowed me to lead a more natural conversation and not being busy taking notes. It also allowed me to pay more attention to the conversation and ask relevant follow-up questions. However, I always made sure to gain informed consent to use the recorder, and the respondents were given the interviews transcribed back word for word for a review. By doing this, I received feedback on some of the interviews with extensive comments, and additional thoughts and arguments. Although transcribing the interviews word for word is time-consuming, it made me start the process of analysing at an early stage. It was important not to ‘lock on’ to hypotheses from early on, and I kept reminding myself to keep my assumptions open and be open to developing new hypotheses along the way.

Most of the interviews were conducted at DNV’s offices in Høvik, either as singular or group interviews. At one occasion, I also went to Drammen for an interview, and one interview was conducted over Skype. In the occasions where group interviews were used, the reason was that the informants were from the same unit within DNV and had worked together as a team on the project. In the analysis I consistently refer to the interviews by using footnotes to distinguish them from literature references.

When undertaking case study research it is important to acknowledge the strengths and limitations of the research. After conducting the interviews, some weaknesses have been identified as I have ran across some methodological problems during the research process. Regarding informants, there is a risk of biased selection as Mestl took part in selecting interviews. However, this is not very likely as this research could be of help for DNV in future innovative big data projects.

During the first two interviews, my two key informants at R&I who were the ones introducing me to the case, sat in on the interviews. Those informants have been crucial in getting in touch with other essential informants involved in the process of developing Fuel Insight. There are both strengths and weaknesses to this way of conducting interviews, as the presence of the key informants helped a great deal in explaining complicated technological details in the bunker fuel industry. Their presence also helped refreshing the memory of the other informants remembering details from the project. However, sitting in on interviews like this might lead the informant to hold back on essential information. Additionally, this is methodologically problematic as it conflicts with the guidelines of qualitative methods. When I explained this to my key informants from R&I they understood the importance of the methodology, and the rest of the interviews were conducted with only the informant and myself present.

3.3.3 Documents

Documents are a rich source of data, and in case studies, documentary data is often collected in conjunction with interviews and observation (Punch 2005:184). When using documents, one has to be aware that there might be a biased selectivity or a reporting bias reflecting (unknown) bias of the author of the document. One does also have to take into account that the accessibility might be deliberately withheld either for privacy reasons or other reasons. Therefore, it is important to be critical of the sources since the documents are written for a certain purpose in a certain context and take this into account when using the data (Yin 2014:106-108).

I applied textual analysis of reports and documents from DNV, and the data tool (Fuel Insight) from the case study to undertake the research. In this case, documents include emails, internal and external reports, information leaflets and research publications. By using

documentation, I anticipated to see the progression of the work and to understand to a greater extent how the project was executed through communication, feedback and collaboration between the involved units. I received several emails and reports from the project as well as documents that helped me understanding the reason why DNV decided do go for the Fuel Insight service.

3.3.4 Artefacts

In general it is argued that artefacts are of less relevance in most case studies, but when it is relevant it can be an important component in the overall research as it helps the researcher develop a broader perspective on the case (Yin 2014:117-118). In recent years, the design of the tool has gained more attention in the innovation literature. Although the technology applied might be complex, it is crucial to make the innovation applicable for the user, and the design is thus of vital importance (O'Gorman et al. 2008:24).

To broaden my perspective and to secure the trustworthiness of my research, I gained access to use the Fuel Insight data tool developed by the Metric Centre. This increased not only my knowledge of the technology in itself, but also the understanding of what the customers were faced with when introduced to the service. I was also shown another tool that provides the same service and benchmarks as Fuel Insight, developed as an alternative tool by R&I. The access to these tools was important to paint a complete picture of the innovation process and the service.

3.4 Analysing Data

As each case study is unique and since each researcher has her own opinion and way of interpreting data, it was important to me to be as neutral as possible when analysing the acquired data. However, analysing the same data could result in different results since the researcher is a part of the process as well as she is shaped and perceived by societal norms (Dowling 2010:35).

Through transcribing the interviews and receiving feedback from the informants, I started the process of analysing during data collection. I made notes in the transcribed interviews where I found similar statements across interviews, and where the informants came up with information that either could be linked up to or challenge the theoretical framework applied in

the thesis. When the informants came up with new aspects that I had not thought of, I made sure to include this in other interviews to see whether this was an opinion reflected across units or just within them. By taking such notes, I often developed follow-up questions to validate assumptions or clarify uncertainties that I asked the informants who were all helpful to answer my additional questions via email.

I started analysing the findings within each unit of DNV involved in the development of Fuel Insight before I started analysing findings across the units. First, I identified statements that either fit with the theoretical framework, or provided alternative hypotheses to the research questions. Subsequently, I cross-checked statements within and between units to see if there were any evident patterns.

3.5 Validity and Reliability

Doing case study research raises certain concerns. One of the most common concerns argues that there is a seemingly inability to generalise from case study findings (Yin 2014:20). The counter argument is that well-studied case studies can produce credible, robust and trustworthy theoretical explanations and thus are generalizable to theoretical propositions (Baxter 2010:96). When judging the quality of the research case study, the reliability and the validity of the study is of vital importance. To achieve high levels of reliability one has to make sure to minimise errors and biases in the study so that, if a later researcher follows the same procedures as described, she will arrive at the same findings and conclusions (Yin 2014:46-49).

Internal and external validity is important when undertaking an explanatory case study to provide a good analysis and reach a valid conclusion. To ensure validity one has to make sure that the concept studied, and the interpretations made are well-founded and can be translated into an operating reality.[3] Internal validity creates credibility during the process of analysing by seeking to establish a casual relationship, while external validity is ensured by identifying correct operational measures for the concept being studied, ensuring that the findings can be generalised (Yin 2014:46).

[3] http://www.socialresearchmethods.net/kb/measval.php

During the data collection and analysing processes, I constantly reminded myself to assure reliability to my thesis as far as possible. I remained as neutral and objective as possible and conducted interviews in locations where the informants were comfortable. This was important to me because it limited the chance of extrinsic contamination to the findings. Since I conducted semi-structured interviews that took the shape of a conversation, making an exact replica of the interviews would be almost impossible although I loosely followed an interview guide.[4] The results from such interviews are dependent on the connection the researcher gets with the informant as the relationship between the interviewer and the informant is often critical to the collection of insights and opinions (Dunn 2010:113-114).

Regarding the validity of my research, I was aware of potential hazards. Although I operated after a method using semi-structured interviews, I made sure to have certain key questions that I asked everyone to make sure that information I had gained through reading reports and formal interviews and informal conversations were correct (Bradshaw & Standford 2010:78). I also had to consider the role I got when R&I were the ones wanting me to assess Fuel Insight and gave me a desk in their office. I did my best to balance the information I obtained, not being too influenced by their viewpoints and staying reflective and conscious of my own actions and choices (Dowling 2010:31). It was important not becoming biased in favour of R&I as well as making sure to appear neutral especially when interviewing informants from other units of DNV. To strengthen the validity of the research and accuracy of the information acquired, I chose a triangulation collection of data through interviews, documents and artefacts. This cross-checking of the relevance and significance of issues and arguments strengthen the validity of the research (Bradshaw and Standford 2010:77, Simons 2009:129).

One weakness to the validity of my research is the issue of the two R&I representatives sitting in on the first two interviews. On one hand, this might have weakened my findings as their presence could have restricted the informant from mentioning potentially vital or sensitive information. On the other hand, in the two interviews where the R&I informants joined, they brought additional and clarifying information to the table that might not have occurred if they were not present.

[4] See Appendix B

However, the largest shortcoming of my research is the issue of interviewing customers that were involved in the development process of Fuel Insight. My informants whom could put me in touch with the customers were reluctant to give me information about who the customers were, and there was a great scepticism of having me talking to the customers. This is a big disadvantage for my research as meeting and talking to the customers would have provided me with information from another perspective than solely from DNV's point of view, and would have made it easier for me to draw trustworthy and reliable conclusions.

3.6 Ethical Concerns

I made an ethical choice of not anonymise my informants. I made sure to ask whether anyone would prefer to stay anonymous, but nobody felt the need to do so. Another ethical concern is the aspect that the bunker fuel market is characterised with close ties, networks and even bribes; thus parts of the statements surrounding the market and its mechanisms may be perceived as politically sensitive.

3.7 Summary

This chapter has provided an explanation for the methodological choices made when choosing to assess DNV's Fuel Insight service. I have explained my choice of conducting a qualitative case study and elaborated on the methods of data collection employed. I have discussed weaknesses to the research method, and I have explained how I worked with interpreting and analysing the data. Further, I reflected on the reliability and the validity of my research, and I elaborated how I attempted to assure high quality. Finally, I introduced ethical concerns I encountered during my research. This chapter has sought to provide the reader with information to explain the background for the choices made and conclusions drawn in this thesis.

4.0 Case Outline

In the following chapter, I will give a brief introduction of DNV and the bunker fuel market as a backdrop to elucidate the development of Fuel Insight. DNV's understanding of the bunker fuel market explains why the service was developed, and what issues it was intended to solve. The benchmarks behind Fuel Insight will be elaborated to provide the reader with a technical understanding of the service. This is done to provide a thorough understanding of the service, what it was intended to bring to the market, and of the bunker fuel market, which Fuel Insight was intended to revolutionise. A lot of the information provided in this chapter derives from informal conversations and feedback from DNV personnel. DNV is one of few actors who have written about this subject, hence, there might be other ways of perceiving this topic.

4.1 DNV

Det Norske Veritas (DNV), founded in 1864, is an international company offering ship classification, certification and consulting services with its headquarters in Oslo. DNV forms the world's largest ship and offshore classification society, and is a leading technical advisor to the global oil and gas industry. DNV is also established within the electrical power industry, being a world leading company within the market for emission reductions verification.[5] The organisation is divided into several branches where the oil and gas and the software headquarters are situated in Oslo. At the time of the development of Fuel Insight, the DNV Petroleum Services (now VPS) with headquarters in Singapore was also a part of DNV. VPS was founded by DNV in 1981 to provide fuel testing services to the maritime and power sectors. VPS primarily operates within two segments, Fuel Quality Testing and Bunker Quantity Surveys, and is a market leader within fuel quality testing with approximately half of the global contracted volume (approximately 65% market share) (Mestl et al. 2012:1).[6] Since the early eighties VPS has done comprehensive fuel testing, and now has a database covering more than 1.54 million fuel tests. Annually, their labs test approximately 100.000 bunker fuel

[5] http://www.dnvgl.com/about-dnvgl/history.aspx
http://www.dnvgl.com/news-events/news/dnvgl-top-verification-company-2014.aspx

[6] http://www.dnv.com/press_area/press_releases/2013/ik_investment_partners_to_acquire_dnv_petroleum_services_from_det_norske_veritas.asp

samples. (DNVPS 2011:4). However, in 2013 VPS was sold to IK Investments Partners and is no longer a part of DNV.[7]

4.2 The Bunker Fuel Market

According to DNV, bunker fuel is the largest cost factor in the shipping industry; between 60%, and for some vessels up to 90% of their operational expenses are fuel costs. The bunker industry is a lucrative business, and over the past 20 years, the number of fuel suppliers have doubled (DNV 2012:6). There are several reasons why the bunker fuel industry is regarded as lucrative. Firstly, there are few, if any regulations with respect to processes and suppliers. Secondly, there are few regulations in regards to fuel quality. The only sort of regulations are 'generous' max/min limits, mostly set by refineries and not much influenced by the user. Thirdly, large quantities of fuel and sums of money are transferred over short time periods. Fourthly, there is a split incentive as the charterer usually pays for the fuel, whereas the ship owner (fuel user) is responsible for the transport. As a result, the only focus when purchasing fuel is the bunker price and not the quality of the fuel. Finally, there are great opportunities for the supplier to deceive the customer when selling bunker fuel. This is possible due to time pressure when bunkering, which leaves the customer little time to control the stated quality and volume of the delivery. Additionally, the ship owner is less focussed on monitoring the delivery as he is not the one paying for it. Hence, this makes it possible to reap huge profits for profit oriented suppliers. These are some basic reasons forming the business foundation of Fuel Insight.[8]

Bunker fuel is delivered by volume, but paid per ton. The conversion is done by the supplier who reports the fuel density. Hence, even minor differences between the reported density and the actual fuel density can lead to financial losses for the charterer. Anfindsen et al. (2012:109-110) give an illustrating example of how over-reporting can lead to a financial loss: "If a density of 977 kg/m³ is stated when the actual value happens to be 960 kg/m³, this will give rise to a difference of nearly 35 ton when bunkering 2000m³, the value of which, in the current market, is close to US$20,000 – just for a single bunkering." This phenomenon where the supplier overstates the delivered fuel density and thus charges for more fuel than physically supplied, is called shortlifting. Based on VPS' database on fuel sample tests, it is

[7] http://shipandbunker.com/news/world/106185-bunker-testing-agency-dnvps-unveils-new-name-new-branding.

[8] Informal conversation with Mestl 17.07.2014.

quite evident that there has been a systematic over-reporting of density since the late 1980's (Mestl et al. 2012:1). Unfortunately, this seems to be exploited by many fuel suppliers as a way of "making a quick buck" (Anfindsen et al. 2012:110, DNVPS 2011:Appendix A, Mestl et al. 2012:1-2).

The global marine bunker fuel market is estimated to be more than 300 million metric tons annually, and with DNV R&I's calculations, it is estimated that more than 300,000 tons of bunker fuel is shortlifted every year. When adding the opposite phenomenon, longlifting, (which is density under-reporting meaning that the supplier loses money and the buyer gets more than he pays for), it is estimated that bunker fuel worth more than US$200 million seems not to be properly accounted for every year (Anfindsen et al. 2012:110). Longlifting occurs if the buyer is able to bribe a disloyal employee at a fuel supplier firm so that the buyer and the employee benefit from the purchase on expense of the supplier.[9]

Hence, DNV developed Fuel Insight to provide a service where they could measure and compare suppliers, ports and vessels, making sure to get the fuel they paid for. Before Fuel Insight, this was done manually if a customer asked for such comparison and measurement. Fuel Insight was going to automate these processes and allow for better comparison and more transparency in the bunker market. The launch of a service such as Fuel Insight to the market was believed to be very attractive to the price-conscious buyer as a tool for assisting in fuel purchase and to contribute to a fuel market where suppliers were measured, short- and longlifting was revealed, and where all suppliers could be compared against each other. This is important to the buyers of oil due to reduced costs and more value for money (energy pr. dollar). It is also important for the ship owners who could point to low quality fuels or require a certain technical quality of fuel (which was more stringent than the 'wide' ISO limits) and thereby lowering the risk of engine damage, and the environment benefits from it as it might lead to risk reductions (Anfindsen et al.2012, DNV 2012). However, the main reason to develop Fuel Insight was to provide an easily interpreted quality measure based on a number scale and not raw data.[10]

[9] Informal conversation with Mestl 17.07.2014
[10] Ibid.

4.3 Fuel Insight

VPS had received signals from customers that they did not have time to order fuel, and that they wanted an online solution that could provide them with fuel statistics in an efficient way. Hence, in 2010 VPS and DNV R&I started developing the data-analytical tool, Fuel Insight to provide customers with a faster and easier way to obtain information about bunker fuel suppliers and their previously delivered bunker fuel. The service would also provide an easy way to access information on fuel quality and fuel suppliers in different ports worldwide.[11] The service is based on analysis of the large amounts of bunker fuel-testing data that has been accumulated since the start of VPS in 1981, which contains information about almost all bunker fuel suppliers operating in the global market as of the early 1990's and onwards (DNV 2012:5). The customers had access to the 'Fuel Quality Statistics' book published annually by VPS which provide some of this information. However, the information in this book was not updated continuously, as it would be in the online service Fuel Insight.

The main value proposition of the service to its potential users was to reduce financial risk, i.e. achieve cost savings in the bunker purchase process by providing info on who is the 'best' fuel provider ('best' with respect to value for money, and least risk of buying fuel that doesn't fulfil mandatory regulations). The primary target group were those who are buying fuel, such as charterers and brokers. An important secondary target group were ship owners who are interested in the history of technical quality of their fuel purchases. Approximately 1/3 of ship owners buy their own fuel, so this secondary group is quite big. Hence, Fuel Insight was created to help fuel buyers and fleet operators increase their efficiency in purchasing bunker fuel as well as getting the best value for money and reduce risk from their bunker purchases (DNVPS 2012b).[12] The initial goal was to launch the service at Singapore International Bunkering Conference (SIBCON) in October 2010. However, it turned out to be too ambitious, and the full launch was instead scheduled for May 2011.

4.3.1 Benchmarks

Fuel Insight is a way of benchmarking suppliers according to their reporting behaviour and their delivered fuel quality. As some shortlifting strategies are not easily unravelled by the use of standard measures, the benchmarks offered by DNV provides easier access to information

[11] Odland; Stirling

[12] Informal conversation with Mestl 17.07.2014

about bunker trends and supplier characteristics (DNV 2012:7). Even though a bunker fuel delivery may meet the fuel standard ISO 8217, there will be a quality difference between one that barely passes, and one that is 'best in class' (ibid). Therefore, DNV developed a benchmarking methodology to better characterise the compliance of the fuel to

- Statutory regulations
- Technical quality of the oil
- Reporting behaviour
- Financial benchmarking

By using these benchmarks, DNV states that it is possible to characterise to what extent a bunkering could be considered to be within best practice. The benchmarks range from 0 to 100, where 100 is good and 0 is bad, and all levels in-between are possible. The idea was to allow benchmark customisation, i.e. the user can determine what is important to him by adjusting the weight factor of the above mentioned four benchmarks in the overall score (DNVPS 2011:15). [13]

Statutory Benchmark

The statutory benchmark evaluates the compliance with legal regulations with regards to flash point and sulphur content. Flash point is an indication of how easily a chemical burns,[14] while high levels of sulphur contents are environmentally damaging and illegal in Environmental Control Areas (ECAs).[15] With respect to flash point, the statutory limit is 60°C, and values at this limit is accepted, but given the score 0. Values below 60°C are treated as 'not accepted'. Within ECAs, there are strict limits on sulphur contents allowed. However, these regulations do not apply outside the ECAs.[16] Hence, the sulphur score is measured by taking different statutory sulphur levels into consideration, measuring the "probability of having a sulphur level below the statutory limit scaled from 0 to 100" (DNVPS 2011:16). In other words, the statutory benchmark reflects the distances to the statutory limits and gives "a score according to the probability that the oil is outside the limits for a specified confidence level" (Mestl et al. 2012:7). The reason this benchmark may be interesting for the buyer is that if the flashpoint is

[13] Informal conversation with Mestl 17.07.2014
[14] http://www.engineeringtoolbox.com/flash-point-d_924.html
[15] http://www.transportenvironment.org/publications/sulphur-marine-fuels
[16] http://www.imo.org/OurWork/Environment/PollutionPrevention/AirPollution/Pages/Sulphur-oxides-(SOx)-%E2%80%93-Regulation-14.aspx

too low (easier flammable) or sulphur too high, in the worst case scenario everything must be de-bunkered. De-bunkering takes time that the charterer does not have, and high sulphur levels can be heavily fined when entering ECAs.[17]

Technical Benchmark

The quality of the fuel is the most important aspect for the ship operator (apart from having enough fuel). Therefore, the technical benchmark for a fuel was developed. This benchmark marks the technical quality of a selected supplier's products by evaluating critical ISO 8217[18] bunker parameters weighted according to their levels of importance and with respect to the specified ISO limits.

For instance, a very central fuel parameter are the so-called catalyst fines (cat-fines). When developing the service, DNV registered that there had been a downward trend of fuel quality over the past 5 years due to rising cat-fines (DNV 2012:10). Cat-fines include very hard and abrasive silicon and aluminium compound particles that are required as catalysts in the refining process known as catalytic cracking. This method of crude oil treatment splits large, high-boiling hydrocarbon molecules into lots of smaller, low-boiling molecules (like diesel, petrol and kerosene). The problem with this process is that a small fraction of the cat-fines waste ends up in heavy fuel oil, and can be very damaging to machinery.[19] If little attention is given to the technical quality of the fuel, purchase of oil with e.g. high cat-fines might occur. Although the fuel might be within the ISO limit, it may still cause damage to the engine. Additionally, there are eight other fuel parameters included in the computation of the technical benchmark, such as salt water content, density, difference between reported and measured viscosity, difference between reported and measured sulphur, ash content, total sediment potential (TSP), calculated carbon aromaticity index (CCAI) and micro carbon residue (MCR) (DNV 2012:33).

Reporting Benchmark

The reporting benchmark measures the reporting quality of the oil supplier. After bunkering, the customer receives a Bunker Delivery Note (BDN) from the supplier stating the delivered

[17] http://bunkerindex.com/news/index.php (Login required)
[18] http://www.intertek.com/marine/8217/
[19] http://www.westfalia-separator.com/applications/oil-gas/cat-fines.html#c4273

quantity, grade, viscosity, density and sulphur content (DNV 2012:31).[20] The reporting benchmark compares the difference reported in the Bunker Delivery Note with the test results from the VPS laboratory also measuring values for the viscosity, density and sulphur content (Mestl et al. 2012:7). This information is important to the ship operator because the information gained is used to fine-tune the fuel cleaning system. Deviating information may result in a suboptimal cleaning which in turn leads to a higher risk of abrasive or corroding particles to enter the engine. This information is also important because if it sulphur levels are higher than stated, the ship operator (or in some cases the charterer) may be fined if checked by authorities.[21] This benchmark is also believed to be a good proxy for the quality of the supplier, both in terms of the quality of their internal processes and their honesty.[22]

Financial Benchmark

The financial benchmark measures how much you get for your money, and is primarily interesting for the fuel buyer (Mestl et al. 2012:7). It is a ranking of delivered energy per unit (kg) where it is adjusted for short-/longlifting and sediment content (substances that are removed before combustion). Energy is measured by comparing delivered energy to the global energy average for that particular fuel grade (DNV 2012:27).[23] Hence, if a supplier wants to achieve the score 100, he has to deliver fuel with a significantly higher energy content than the world average, or underreport the density (Mestl et al. 2012:7).

Finally, DNV developed a price calculator where the user can insert quoted prices from different suppliers in a port. A comparison of estimated 'corrected prices' of the fuels from the different suppliers is then possible, based on past fuel deliveries found in VPS' database (DNVPS 2012a:3).

[20] Marpol 73/78 Annex VI, p.22; http://www.kittiwake.com/fuel_oil_delivery
[21] Informal conversation with Mestl 17.07.2014
[22] Feedback from Løvoll 17.09.2014
[23] Ibid.

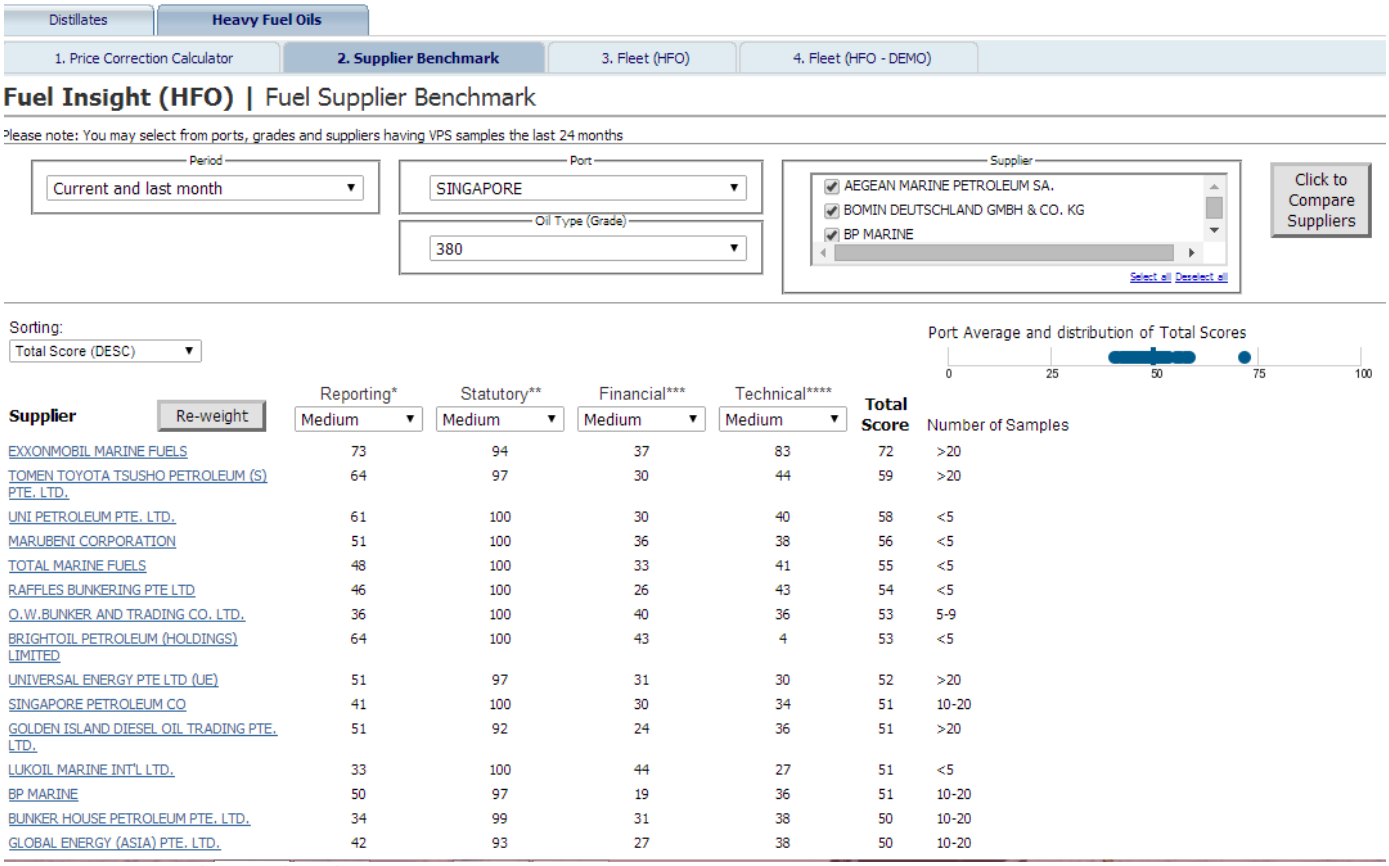

Figure 1: Screenshot of the interface of Fuel Insight.

To illustrate how the benchmarking method works e.g. to reveal shortlifting, one can look at the reporting benchmark and drill into the underlying parameter scores to better understand the reason behind scores. For instance, if the reporting score is low, the user could drill-in and see that the reason for the low score is shortlifting.[24] If a bunkering gets a density-benchmark of 100, then no shortlifting has occurred. A score of 0 means a delivery was far outside the acceptable practice (either heavy shortlifting or substantial understating the fuel density). Although the reporting quality in general has increased on average over the last years, the fraction of what could be considered the worst possible density reporting actually grows. This means that in order to maintain a profitable margin, more oil suppliers will simply use the upper ISO limit, 991 kg/m³ in their BDN – irrespective of the actual oil density (DNV 2012:7). The larger the difference, the more profit they make, and the worse the financial benchmark will become. As a corrected stated density is important for operating the fuel cleaning system on board, a large deviation will therefore also negatively affect the technical benchmark. In other cases, if the real fuel density is above 991 kg/m³ (upper ISO limit) then in order to sell it at all, they simply state it is exactly at the limit (corresponding to

[24] Feedback from Løvoll 17.09.2014

longlifting). A denser fuel will in general contain more energy and the financial benchmark in Fuel Insight would be better, but the corresponding technical benchmark would become worse.

4.4 Summary

In this section, DNV's position in the bunker fuel market has been elaborated to explain motivation behind the development of the benchmarks providing a fuel measurement platform on which Fuel Insight has been constructed. We have seen that shortlifting is a common practice in the bunker fuel market which is a financial loss for the fuel buyer.[25] By studying the benchmarks developed by DNV, we have seen how the buyer can select suppliers in different ports to increase the probability of getting most value for money, to get high technical quality of the oil, to characterise the suppliers by their reporting behaviour (stated vs. actual values) and to characterise the oil with respect to statutory limits. This has been done to provide the reader with knowledge on the background for the service, as well as the methodology on which it is constructed. When launched in May 2011, there were high expectations to the Fuel Insight service, and it was hoped to contribute to a revenue increase in "the multi million US$ range over the next decade" (DNVPS 2011:23). However, so far, this has not happened, and in the next section, I will use theory and case knowledge provided in the first sections of the thesis to analyse why this has not happened.

[25] http://www.bunkerworld.com/news/Millions-lost-to-density-shortlifting-in-2011-116343

5.0 Empirical Findings and Analysis

In this chapter I will present the empirical findings excerpted from interviews, documents and artefacts at DNV. I conducted the analysis to answer the following research questions: *Why did Fuel Insight fail? Was user-involvement sufficient? How was the project managed; was management planning sufficient? How was technical knowledge transferred to the market?* I will connect the findings to the theoretical framework presented earlier in the thesis when analysing the data. This will frame the discussion when analysing the innovation process of Fuel Insight attempting to answer the research questions. [26]

5.1 How to Select Findings

The theory chapter introduced three approaches to service innovation, the technologist, the service-oriented and the integrative approach (Gallouj 2002, Drejer 2004, Gallouj & Savona 2009). By using the integrative approach which argues that there is a convergence between manufactured goods and services, Fuel Insight can be categorised as a service innovation. The data tool Fuel Insight is a tangible product, however, it came with after-sale service and support to customers as the sales personnel in VPS were supposed to teach the customers how to use the tool when they had bought the service.[27] Hence, this combination of a manufactured good and providing a service strengthens the integrative approach and allows us to categorise Fuel Insight as an innovation within the service industry.

When analysing the entire innovation process of a service such as Fuel Insight, several findings appear when trying to identify reasons why the service did not succeed. Due to lack of space in this research, I can only elaborate on three issues that I identified as the most crucial factors for the outcome of Fuel Insight, namely user-involvement, management and knowledge transfer. These issues were chosen due to a combination of findings from interviews, documents, artefacts and existing theory on service innovation.

5.2 User-Led Innovation

It is argued in the literature of service innovation that user-involvement is of crucial importance for a company to succeed with an innovation (de Brentani 1995, Drejer 2004, Flowers & Henwood 2010, Tidd & Bessant 2013). In this section I will discuss the following

[26] All citations in this chapter are translated from Norwegian by the author.
[27] Stirling

in an attempt to answer the research questions; to what extent were end-users involved in the innovation process of Fuel Insight? Did DNV have a strong emphasis on the demand side in the process, and was the search, experiment and prototyping sufficient?

It is important to note that this chapter will only contain findings from interviews with DNV employees, as I was not given access to interview any of the customers. Therefore, it is difficult to know what views the customers might have on the innovation process and the final result of Fuel Insight. Not having access to customers is an aspect that makes it difficult to do research on failed innovations. However, the reluctance to give me access to customers is in itself an interesting finding as this scepticism can be reflected in the Fuel Insight process regarding a reluctance to test incomplete versions of Fuel Insight in the market. Throughout the process and even after the close-down of Fuel Insight, DNV was afraid of creating expectations that may not be met.[28]

5.2.1 Pilot Runs and Design

VPS had received signals from customers that they did not have time to order fuel, and that they wanted an online solution that could provide them with fuel statistics in an efficient way. Hence, the service was first initiated when a benchmarking methodology was available, and VPS allowed to provide fuel statistics in an online solution. When developing software solutions, companies often release their products in 'beta' form, that is, in prototype, to allow users to play with the software and suggest improvements. This strategy is pursued when companies aim to profit from their products, and it essentially allows customers to do much of the final polishing of the products. Excluding customers from the process of product improvement can be very shortsighted (Dodgson & Gann 2010:55-56). Some pilot customers were involved to a certain extent in the development process through customer meetings. Here VPS showed them what they were thinking and they got an indication if they were on the right track. The pilot customers did not get to experiment with the service, but in the final stages of the process VPS taught trial customers how to use Fuel Insight and gave them access to play around with it.[29] However, according to informants at DNV, this trial version was pretty much the same type as the final product apart from some minor adjustments.[30]

[28] Mestl; Odland
[29] Odland; Stirling
[30] Mestl

According to VPS staff, the intention was always that VPS would sit down and teach customers how to use the service. Although Fuel Insight turned out not to have an intuitive and user-friendly interface, it was "never the intention that the customers would look at it and understand instantly how they would use it and what it was."[31] Although teaching customers to use the service was part of the strategy, the fact remains that customers who had previously expressed an interest in such a service, were less interested when the service was launched.

5.2.2 Assumptions vs. User-Involvement

Involving potential customers in pilot testing to get feedback on the service and its usability, the design and user-friendliness, is of vital importance to succeed (Dodgson & Gann 2010:54). Some of the feedback VPS did get from the customers was that the web solution looked old-fashioned with numbers and tables and slow performance.[32] According to DNV Metric Centre, the interface was limited by the functionality of the tool 'Cognos', in which they developed Fuel Insight. Cognos is a reporting tool, and not a web application tool.[33] This limited the user-friendliness and the interface of Fuel Insight, but despite modifications during the development process, the final result does still look old-fashioned with tables and numbers and slow performance.

One reason user-involvement was limited in the process of Fuel Insight may be that VPS was afraid of creating high expectations in the market that it could not fulfil and then 'lose face'.[34] Thus, there is an assumption that the customers did not feel they had enough influence on how Fuel Insight was developed to feel adequate ownership to the service.[35] This assumption made on behalf of the customers is something that seems to characterise the Fuel Insight project. Although some customers were consulted from time to time, it seems the service is based on assumptions on how the customers wanted the service rather than including them throughout the process and letting them take part in the development.[36] The chance of success is generally higher if users of new products and services are involved in designing what they need, than if something is being designed for them (Dodgson & Gann 2010:54).

[31] Stirling
[32] Kadal & Svendsen; Løvoll & Mestl
[33] Løvoll & Mestl; Ramsrud
[34] Stirling; Løvoll & Mestl
[35] Odland
[36] Furnes; Løvoll & Mestl

The ‘innovator’s dilemma’ highlights the problem of listening too closely to the customers (Christensen 1997). Although users might hinder innovation as they can be conservative and locked into ways of doing things that inhibit novelty and risk, I argue that this is not the case with Fuel Insight albeit the bunker fuel market is characterised as conservative, network-based and with little experience in handling risk and data analytics.[37] Rather than to suspect that VPS was listening too closely to the customers, findings revealed in this section point towards the opposite.

The success of new products improve when user-needs and preferences are fully understood (Flowers & Henwood 2010:163). In this section we have seen that findings point towards insufficient user-involvement in the development of Fuel Insight. There is reason to argue that contact with customers should have been more frequent throughout the process.[38] There is also reason to believe that the customers were included too late in the process. VPS received feedback from the customers, but since the customers were involved at a later stage, “the atmosphere to take in and make the changes suggested from the users was less present.”[39] De Brentani (1995:99) concludes that new services that are continuously customised to meet the needs of the customer are the ones that succeed. Hence, I argue that the user-involvement in the development process of Fuel Insight was not extensive enough, and when they were involved, it was too late in the process and their feedback opportunities were limited. VPS was afraid of creating high expectations in the market, and instead of involving the customers continuously throughout the process, they developed and designed a tool that did not satisfy the customers. The end-users were not part of shaping the service and its interface, hence the final result did not satisfy the customers’ demands. By not involving the end-users adequately, I argue that VPS did probably not fully understand the customers and use their preferences to shape Fuel Insight.

In the next sections we will look at management and the pricing of the service, as well as the challenge of translating technological knowledge into a language the customers understand, as other possible factors for Fuel Insight’s lack of success.

[37] Wetterhus
[38] Furnes; Odland
[39] Odland

5.3 Innovation Management

Managing innovative knowledge is crucial because good management can lead to a sustained competitive advantage for the firm (Tsai 2009:11324). Managing in the service sector is argued to be quite similar to managing in the manufacturing sector. However, some differences between manufacturing and service sectors were identified in the theory chapter, such as simultaneity and storage. As the service was never launched successfully, several managerial issues has been identified during research that possibly have played an important role in the outcome of Fuel Insight.

5.3.1 Organisational Management

First, one has to look at the DNV organisation as a whole. Three units were involved in developing Fuel Insight; DNV Petroleum Services (VPS), DNV GL Research and Innovation (R&I), and the DNV GL Metric Centre (IT).

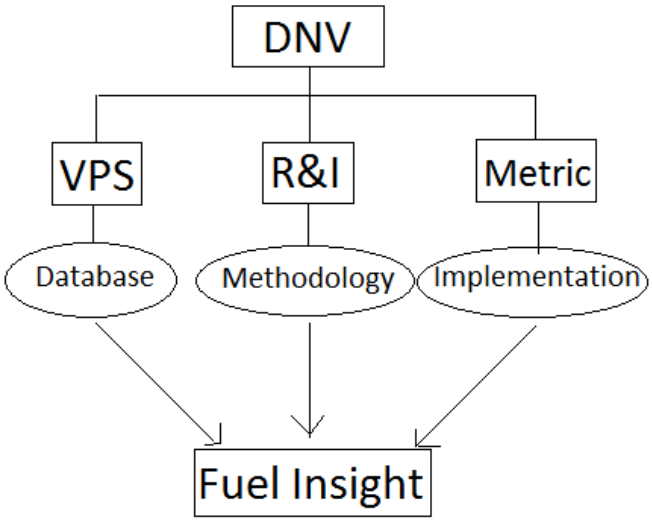

Figure 2: DNV units involved in the development of Fuel Insight and their responsibility.

These are different units with different and complimentary competence and knowledge. There was collaboration within the organisation, as it was believed that developing Fuel Insight in-house would reduce costs of developing the service, provide different knowledge sets and skills and be an opportunity to learn from each other. However, collaboration can be difficult to manage as units might have different priorities, organisational culture and tools (Dodgson & Gann 2010:58). Developing Fuel Insight, there was a consensus that the aims and objectives of the service as well as the genuine wish for the service to succeed were the

same.[40] However, incidents of miscommunication arose. There were occasions where the units talked past each other, as there were different understandings on *how* to develop Fuel Insight.[41] Cultural differences between units are also mentioned. While R&I wanted to try out and implement ideas quickly, IT was bound by governance to make sure the DNV production system would run safely and stable. Additionally, the tool used to generate the service by the Metric Centre was limited compared to the idea of range posed by R&I and VPS.[42]

From the beginning, the VPS management wanted to do all parts of the project in-house within DNV.[43] However, there turned out to be high internal costs in financing the Metric Centre to do the implementation of Fuel Insight. The main reason why the implementation was so expensive was due to the process of automating data collection, manage data quality, program underlying calculations and prepare arrangements for (any) reporting tool in the database.[44] This became an issue to VPS as they were the ones paying the Metric Centre.[45]

Despite a lack of interest for Fuel Insight in the market, the service was available and up and running from the launch in 2011. However, with few customers buying the service and high invoices from the Metric Centre, the running of Fuel Insight turned out to be a budget drain. Therefore, VPS figured they could not keep on financing the project and closed it down in 2013.[46] Although the project was terminated, Fuel Insight is still 'alive' (Metric does still provide support to the service), however further development of the service is stopped. The present Managing Director who was also in charge at the time, gave this explanation for the termination of Fuel Insight: "Some way down the road you have to be able to earn money on the service. And I believe the realisation was that it was not going to happen with the way the cost structure was set up."[47]

All informants mentioned resources and internal costs as a challenge, and this is an issue of organisational innovation that is a challenge for the service management system (van der Aa & Elfring 2002). One of the informants argued that "the result could have been better if we

[40] Kadal & Svendsen; Løvoll & Mestl; Ramsrud; Stirling; Wetterhus
[41] Kadal & Svendsen; Løvoll
[42] Kadal & Svendsen; Løvoll; Odland; Ramsrud
[43] Løvoll; Mestl; Odland; Wetterhus
[44] Kadal
[45] Andreassen; Kadal & Svendsen; Mestl & Løvoll; Odland; Stirling; Ramsrud; Wetterhus
[46] Andreassen
[47] Ibid.

had worked together as one company instead of discussing budgets internally".[48] This observation supports the view that the way an organisation is structured and the way its employees work together is important as it can affect the way a firm can and cannot design products (Christensen 1997:30).

5.3.2 Price

The price DNV wanted to charge for Fuel Insight is also mentioned as a possible barrier to the success of Fuel Insight. There was disagreement internally as some wanted to get the service out in the market for free, while others wanted to hold it back to get money for it.[49] Those who wanted to give the service away for free argued that it would establish a closer tie with already existing customers, attracting new customers and increase the fleet.[50] However, VPS management wanted to make profit of the service, and entered the market with a high price. But they overestimated what the market was willing to pay, and when they introduced the price "the customers were laughing at us [VPS]." [51] The customers were already paying for fuel testing at VPS, so additional costs for statistics was not always accepted.[52] Charging customers more than they are willing to pay, is one reason some firms fail as it is difficult to persuade customers to pay for new services at a premium (Tidd & Bessant 2013:449). The pricing of Fuel Insight might reflect a lack of understanding of the market and the end-users, as it does not seem like VPS knew what the customers were willing to pay for the service (de Brentani 1995). Despite the overestimation of the market, the Managing Director of VPS does still not believe Fuel Insight should have been offered for free. "My experience is that the customers will not appreciate something when it is free, and it will not be perceived as a differentiator."[53]

5.3.3 The Role of the Manager

A third managerial issue that has been emphasised addresses commitment from management. To develop and launch an innovation with such impact on a market as Fuel Insight might have, is challenging and requires tight leadership. Support and positive affirmation from leadership throughout the organisation when innovating is crucial to provide encouragement

[48] Stirling
[49] Ibid.
[50] Odland
[51] Andreassen
[52] Stirling
[53] Andreassen

and resources (Dodgson & Gann 2010:36). Successful innovation is also highly associated with long-term commitment from the top management, as returns might not emerge quickly (de Brenani 1995, Christensen 1997). In the case of Fuel Insight, there was a change of Managing Director in VPS in June 2011. The two Managing Directors who have been working in VPS during the process of Fuel Insight are described as two very different Managing Directors. While the first one is described as someone who is entrepreneurial, who generate ideas and sees possibilities, the second is described as more systematic, and someone who is concerned with structures. [54]

Although the former Managing Director played an important role in getting the project up and running,[55] the new Managing Director did never consider to end the project when he started in 2011. However, as Fuel Insight kept on being an item of expenditure the next two years, the closure of Fuel Insight became a fact.[56] Both Managing Directors saw a big potential in Fuel Insight, but this change of Managing Director in VPS changed the centre of gravity of the personal ownership to the project. The responsibility for the project was moved further down the organisation to the Business Development Manager in VPS who was one of the actors who had been part of the project from the start.[57] Hence, it is argued that the ownership to the project from management was decisive for the drive in the beginning of the process, but that this ownership disappeared when the Managing Director was replaced.[58] Fuel Insight was launched May 2011, and when the new Managing Director started in June the same year, the service was already on the market. VPS kept improving the system based on customer feedback after the launch, however none of these improvements did catch on. Instead VPS paid DNV Metric Centre to make changes that did not satisfy the customers' demands.[59] In this case, it might seem like support, or at least long-term commitment and the feeling of ownership from management faded as the Managing Director changed.

5.3.4 Staff Training

As we have seen, quality management such as planning efforts, process design and market research was probably not optimal in the case of Fuel Insight. These efforts, together with

[54] Andreassen; Furnes
[55] Wetterhus
[56] Andreassen
[57] Løvoll
[58] Ibid.
[59] Andreassen

training of staff are often linked with the introduction of new products and services (Stuart & Tax 1996). In interaction with the customers, simultaneity is key, as it is difficult to correct errors, and it is important that the seller knows the service he is selling (Tidd & Bessant 2013:448-449). VPS has a trained sales team who were supposed to sell Fuel Insight to customers. However, the service was difficult to understand even for the sellers.[60] The experience was that the sellers struggled to use Fuel Insight, as well as struggling to make the service relevant for their customers. Or as one of the Managing Directors put it; "Selling and having to give support on a software solution that you don't really understand how to use, and that you don't really believe in is a difficult sale."[61] Thus, one can ask whether the sales personnel received enough training or whether they had too many additional tasks next to selling Fuel Insight so that focus on learning the complex service came second, and the sellers never really managed to perform when trying to sell Fuel Insight to their customers.

In this section we have seen that issues regarding the organisation structure can affect the way employees work together and the way a firm can and cannot design products. The decision to develop Fuel Insight in-house created large internal costs and incidents of miscommunication. Additionally, there is reason to argue that DNV overestimated the price they could charge for Fuel Insight. This reflects a lack of planning regarding market research, pricing of the service and customer's needs that are all closely linked to the success rate of innovative firms (de Brentani 1995, Stuart & Tax 1996, Christensen 1997, Tidd & Bessant 2013). Findings point towards that the change of Managing Director possibly affected the outcome of Fuel Insight as it challenged the feeling of ownership and commitment to the service. I argue that a continuous drive from the top could have led to further development of the product, development of business models and more sale. I also questioned the training and motivation the VPS sales team had when attempting to sell Fuel Insight to customers. I argue that it seems like the sales personnel did not have sufficient expertise to sell Fuel Insight. Whether that was due to poor training or the complexity of the Fuel Insight tool itself will be elaborated in the following section.

[60] Andreassen; Kadal & Svendsen; Stirling
[61] Andreassen

5.4 Knowledge Transfer

Innovation is the commercial use of a new and useful equipment or process. However, for an invention to become an innovation, it has to create value. In the case of Fuel Insight, data findings were generated to give actors in the bunker fuel market information on fuel quality from suppliers in ports worldwide. DNV created new combinations of services by providing already existing data online in real-time together with consultancy services. Behind the interface of Fuel Insight are numerous formulas and algorithms enabling the generation and comparison of suppliers. This kind of technological knowledge is often codified by using a suitable vocabulary, hence the challenge for the developers is to translate this knowledge into a language the customer understands (Latour 1983:145, Mokyr 2002:14,18, Breschi & Lissoni 2001:988). In this section I will discuss whether DNV managed to 'decode' this technological knowledge and make it accessible.

In the theory chapter, I introduced a framework posed by Argote and Ingram (2000:151) where they argue that the creation and transfer of knowledge are "a basis of competitive advantage in firms". To adapt this framework to the case of DNV's Fuel Insight, one has to be aware that the knowledge transfer in this case happened on two levels. On the one hand, there was knowledge transfer between the units within DNV; VPS, R&I and the Metric Centre when developing the service. On the other hand, external parties (customers) became part of the knowledge transfer process when they were updated on the progress of the service, while some trial customers were allowed to play around with the software in the end stages of the process, and finally, when Fuel Insight was launched on the market and more customers could access the service.[62]

5.4.1 Scaling from Research

Several firms have in-house expertise or collaborate with external institutions such as universities and research institutes when developing innovations (Beise & Stahl 1999:398,406). When developing Fuel Insight, DNV decided to use in-house expertise in the implementation of the service by giving the task to DNV Metric Centre, as well as using its own scientists at DNV R&I to derive the methodology for Fuel Insight. However, research argues that scientists and researchers have little knowledge on markets and the commercial value of new knowledge (O'Gorman et al. 2008:24). Scientists at R&I admit that they find it

[62] Stirling

hard to 'productify' their thoughts as they have limited knowledge on the commercialisation process.[63] Therefore, when developing a service in-house, from research to the commercial implementation to the market, it is important that the firm possesses personnel with sufficient expertise in all phases of the process. Just as important is the ability to transfer knowledge from one unit to another, as it contributes to the organisational performance of firms (Argote & Ingram 2000:151).

5.4.2 People and Tools

In general, moving people is seen as a powerful way of facilitating knowledge transfer in organisations, as individuals are able to restructure and adapt knowledge so that it applies to new contexts (Galbraith 1990; Rothwell 1978; Allen 1977; Berry & Broadbent 1984, 1987 in Argote & Ingram 2000:157). In developing Fuel Insight, the three units moved people to facilitate knowledge transfer through workshops to explain their thoughts and learn from each other.[64] Especially the cooperation between VPS and R&I was described as productive and inspiring,[65] while cooperation with the Metric Centre was characterised as more challenging due to miscommunication, internal costs and limitations of the operative system Cognos.[66] These limitations made it difficult to implement changes to the service requested from VPS or R&I.[67] Moving people as facilitators for external knowledge transfer was also the intention as they would move people from VPS to translate and teach knowledge on Fuel Insight to customers.[68]

Although people are considered to play the "most critical role in the success of technology transfer" (Argote & Ingram 2000:164), interaction and knowledge transfer involving people is simultaneously considered more problematic than those involving tasks or tools, as people are likely to vary more across sites than tools and tasks. Attempts of technology transfer have been found to be more successful when the technology is well understood and not complex. Embedding knowledge in technology is thus argued to be an effective way to transfer knowledge both within the firm and externally (Argote & Ingram 2000:157-159). Although Fuel Insight is a tool consisting of codified knowledge that has the potential of transferring

[63] Løvoll
[64] Kadal & Svendsen; Løvoll & Mestl; Odland; Stirling
[65] Løvoll & Mestl; Odland; Wetterhus
[66] Kadal & Svendsen; Løvoll; Ramsrud
[67] Løvoll; Odland
[68] Stirling

more readily than knowledge not embedded in technology, there are reasons to believe that the technical implementation was too complex for the customers to understand. The idea was to allow benchmark customisation, i.e. the user can determine what is important to him. However, it turned out that this flexibility/customisation was confusing for the user and made Fuel Insight rather complex.[69] The tool used to implement Fuel Insight, Cognos, is described as being very limited and little flexible, hence, Fuel Insight turned out to be too technical and complex with rating numbers and benchmarks with too many options and buttons to click, poor interface, poor layout and slow response.[70] One of the informants explained the technical implementation of Fuel Insight as very little intuitive: "One had to be an expert to use it. You did not only have to be an expert on fuel, you had to be an expert on Fuel Insight to use it efficiently. I don't think there were many who were willing to invest their time in that."[71]

Although knowledge was transferred internally through workshops and cooperation, there were incidents of miscommunication and disagreement on how to develop the online platform.[72] As the final result turned out, it is obvious that it was too complex, not just for the customers, but also for DNV staff. Putting this into the framework of Argote and Ingram (2000), it seems like DNV struggled to adapt the technology to the market context. In order for knowledge transfer to be successful, members, tools, tasks or their sub-networks that are being moved, must fit or be compatible with the new context. However, this compatibility is not to be taken for granted as these elements may have to adapt or be adapted to the new context (Argote & Ingram 2000:159). Research shows that the recipient's (e.g. the customers) productivity recovered faster when the technology was not complex (Galbraith 1990 in Argote & Ingram 2000:163). In the case of Fuel Insight it can be argued that the tool and technology was too complex. Thus it is important for employees to learn how to use innovative knowledge more effectively as this will improve the capacity for problem solving and goal achievement (Tsai 2009:11323).

5.4.3 Commercialisation

As we have seen this far, DNV struggled to translate their data into something comprehensible for the end-user. DNV has years of technological experience, but there seems

[69] Informal conversation with Mestl 17.07.2014
[70] Andreassen; Kadal & Svendsen; Løvoll & Mestl; Ramsrud; Wetterhus
[71] Løvoll
[72] Kadal & Svendsen; Odland

to be an agreement among the informants that there is a lack of knowledge within the firm on how to commercialise and sell data driven services. [73] Fuel Insight is a new kind of service that DNV has not had any experience with earlier. This was the first time DNV made such automatic data driven service, and there was little experience available on these types of services in the firm.[74] Hence, it is a challenge to communicate this kind of new technological knowledge to the market. Several of the informants argue that external expertise should have been used when implementing and commercialising Fuel Insight.[75] One informant put it this way:

> *"I believe a lot of good work was done with regards to structure and systematics, but when it comes to how to operate the project forward in the real world with user interface, professional IT, choosing right technology and all that; we were not there at all. Too much was left with the technologists, and too little to business people who we probably should have hired externally. Because this is not competence that we possess."* [76]

In other words, Fuel Insight was in the periphery of what DNV is good at.[77] In the aftermath of the Fuel Insight process, involved DNV parties believe there are great things to learn from the process that challenged their traditional domain of services and way of working.[78] There are indications that the focus on soft issues such as corporate culture, knowledge management and commercialisation rather than the technology in order to succeed, should have received more attention.[79]

In this section we have seen how the Fuel Insight project went from being a research project and was scaled to become an operative service where all stages of the innovation process took place in-house. Knowledge transfer appeared on two levels in the development process of Fuel Insight; internally in DNV, and from DNV to the market. However, DNV failed at translating their technological knowledge to the market as Fuel Insight turned out to be a complex and intangible tool that was not intuitive, neither for DNV staff, nor for customers. Due to the trouble of expressing technical knowledge within the firm and towards the

[73] Furnes; Kadal & Svendsen; Løvoll; Wetterhus
[74] Kadal & Svendsen; Løvoll
[75] Furnes; Løvoll & Mestl; Odland
[76] Furnes
[77] Kadal & Svendsen; Furnes
[78] Mestl; Kadal & Svendsen; Wetterhus
[79] Kadal & Svendsen

customers, and the lack of commercialisation competence, it is reason to argue that the technology was not successfully adapted or understood at the recipient site, and that DNV to a large extent failed to transfer their technical knowledge to the market.

5.5 Additional Findings

As mentioned, the space provided in this research limits a thorough elaboration of other factors that might have played a role on the outcome of Fuel Insight. However, several additional findings have been identified, and I will present them shortly in this section:

- Bunker Fuel Market: networks and politics affect bunker purchases. By providing transparency, Fuel Insight challenges these networks and reveal short- and longlifting.
- Rumours of an impending sale of VPS: may have affected the motivation and created insecurity amongst employees working with Fuel Insight.
- Focus on wrong customers due to cooperation (that did not happen) with BIMCO instead of focusing on already existing customers.[80]
- Sales strategy: DNV tend to use the same network and contact persons when approaching their customers, but in this case it is argued that one should have aimed at decision-makers higher up in the target organisations when marketing Fuel Insight.[81]

Understanding organisational innovation is crucial (van der Aa & Elfring 2000). DNV is an organisation, hence, it is important to understand the organisation and its structures when analysing the process of developing Fuel Insight. Being innovative provides the firm organisational and personal learning. Thus, an organisation learns to improve the things they already do, and the more an organisation does something, generally the better it becomes at doing it. However, innovations that involve "significant breakthroughs and fracture past ways of doing things pose great difficulties for organizations and the way they learn" (Dodgson & Gann 2010:35). With this in mind, Fuel Insight can be described as an innovation which would involve a radical new way of delivering a service in the bunker fuel market. Issues surrounding the bunker fuel market and its established networks, relations and politics is one of the main findings besides user-involvement, management and knowledge transfer, that possibly played an important role for the outcome of Fuel Insight. The influence of this

[80] Unfortunately there is not enough space provided in this thesis to introduce and elaborate further on the cooperation with the Baltic and International Maritime Council (BIMCO). However, due to findings from the interviews I have decided to include this point as an additional finding.
[81] Andreassen; Furnes

market might be more important than I have been able to point out in the thesis due to my choice of methods. Therefore, the remaining space of the analysis will provide a short discussion of this issue, as it is an important aspect to understand when looking at the innovation process of Fuel Insight as a whole.

5.5.1 Politics and Networks

The bunker fuel market is intricate, and a frequent argument for the failure of Fuel Insight concerns relationships and bribery within the bunker fuel market. How people choose suppliers is complex and not always rational. Acquaintances, culture and networks seem to play an important role in the selection of suppliers.[82] The introduction of Fuel Insight was controversial as suppliers making an extra profit on short- and/or longlifting would be more easily unveiled. This could have led to a tensing of relationships for many fuel suppliers in numerous ports where shortlifting is likely to occur (Mestl et al. 2012, Fuel Insight (tool))[83]. Actors in the bunker fuel market are well aware that short- and longlifting happen, although do not seem to be talking about it much, probably due to existing relations and networks. Or as one of the former VPS employees stated; "There is always someone who does not want to find out what Fuel Insight says (…) because of relations. They have suppliers they have used for years that they prefer."[84] Hence, introducing Fuel Insight to this market could strain traditional collaboration between customers and suppliers, and the service could thus be perceived as 'naming and shaming' the actors in the market.[85] Due to the strong ties in the bunker fuel market, one may argue that Fuel Insight most likely conflicted with these networks, leading to failure when attempting to launch the service to the market (Argote & Ingram 2000:158).

[82] Andreassen; Kadal & Svendsen; Løvoll; Mestl; Ramsrud; Wetterhus
[83] Andreassen
[84] Stirling
[85] Svendsen & Kadal; Stirling; Wetterhus

5.6 Summary

In this chapter I have identified what I believe were contributing factors to the unsuccessful launch of Fuel Insight.

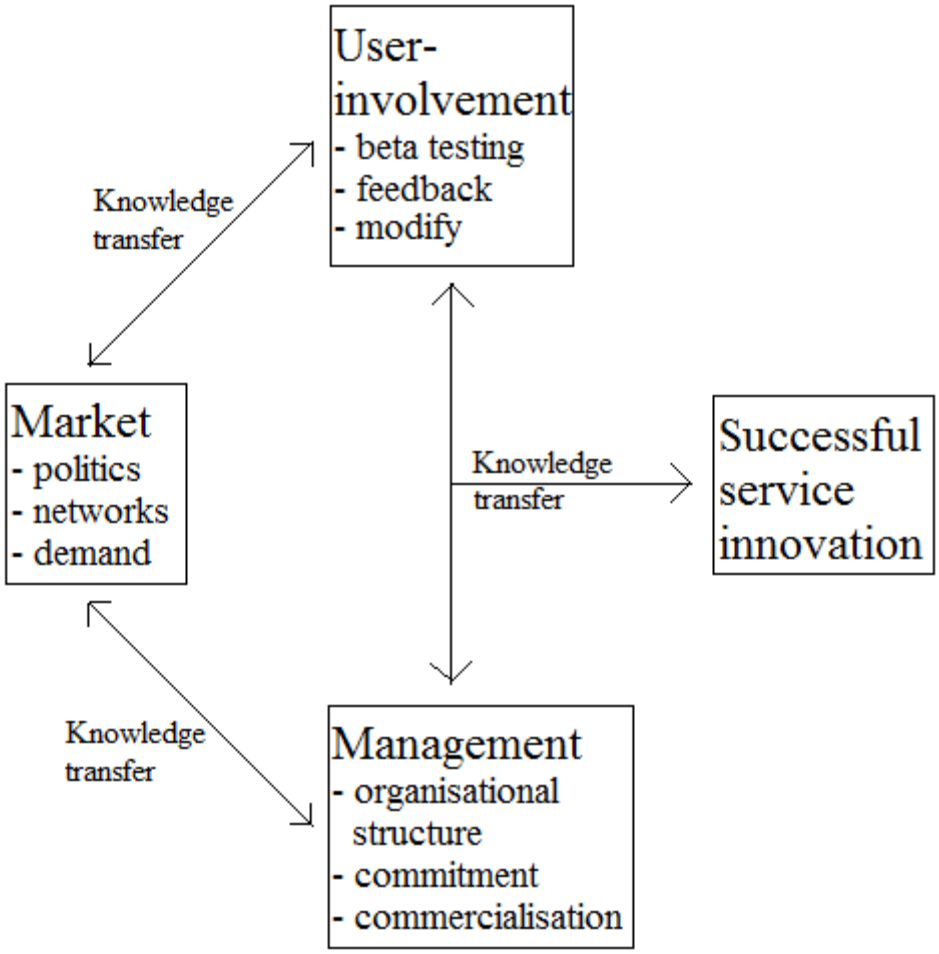

Figure 3: Elements that need to be in place for successful service innovation to happen.

First, I elaborated on the issue of user-involvement by using the literature on service innovation to validate my assumptions that user-involvement was insufficient during the entire development process of Fuel Insight. Although I did not get the chance to interview any of the customers, I argued that the reluctance to give me access to interview the customers is strengthening my hypothesis on insufficient user involvement in the innovation process. The customers should have been involved to a larger extent in developing and shaping the service as active parties throughout the entire process.

Next, I focused on management, mainly directing attention towards the organisational structure and price, as organisational innovation is emphasised by the literature as an

important form of innovation in the service industry. I argued that the structural organisation leading to internal costs as well as communication between the units were suboptimal. There is reason to argue that management planning was not sufficient as VPS overestimated what the market was willing to pay for the service, which in turn points to lack of market research. I also argued that commitment from the top management is of importance as the feeling of ownership to the service decreased and was delegated downwards in the organisation when the first Managing Director quit.

Following, I argued that DNV was lacking competence on commercialising technological research with the additional complication that this was a new kind of service. They did not manage to translate complex technology into a language understood by the customers as Fuel Insight turned out to be a complex service that both DNV employees and customers struggled to understand. The implementation tool Cognos was not an optimal solution and the lack of flexibility in the tool made it difficult to develop a user-friendly service with an intuitive interface.

I chose to focus on these three issues because user-involvement and knowledge transfer are emphasised frequently in the literature on service innovation. Management, on the other hand, has mostly been researched in connection with innovations within the manufacturing sector. Hence, my research contributes to studies on management in the service innovation (with an integrative approach). I argue that much of the same principles apply to management in the service sector as in the manufacturing sector, although there are some other concerns attributed to managing service innovation. One can clearly see from these three main issues that they overlap to a large extent. This demonstrates that an innovation process such as this is intertwined, and that there is not one singular reason to why Fuel Insight failed.

Finally, I identified other factors that possibly influenced the outcome of Fuel Insight, and I highlighted the politics and networks of the bunker fuel market. I argued that the introduction of Fuel Insight to the market was controversial and may have turned out as a failure partly because it conflicted with the networks already in place in the market.

6.0 Conclusions

In this research I have attempted to answer the research questions *Why did Fuel Insight fail? Was user-involvement sufficient? How was the project managed; was management planning sufficient? How was technical knowledge transferred to the market?* Introducing literature on service innovation focusing on user-involvement, management and knowledge transfer together with a case outline explaining the background for Fuel Insight, I have laid the foundation to do empirical research on the case which in turn provided me with several findings. These findings show that Fuel Insight failed mainly due to a combination of insufficient user-involvement, management planning and the challenge of commercialising and translating technological knowledge into market terms. However, additional findings may also possibly have affected the outcome of Fuel Insight.

6.1 Implications

This study has offered an insight into scaling research to operative services in-house in a highly technological firm with its main expertise on technology. Conducting the research, I logged my method to ensure potential replications. However, if given access to interview the customers, or if interviewing other informants at DNV, the conclusion may possibly have turned out different. Nevertheless, based on the conclusion of the thesis, this research has implications for both theory and practice.

6.1.1 Theory implications

This thesis has presented a case study on the entire innovation process of a service from research to market launch. It has revealed thorough information on the innovation process in this particular case. However, that does not mean that the same findings and conclusions will emerge from other cases of failed service innovations as it is not possible to make generalisations based on this single case study (Yin 2014:20). Undertaking such research, one has to be aware that there might be other ways of interpreting the case studied and the findings. If the findings can be repeated with similar results when following the same procedures in this and similar cases, it can contribute to theoretical propositions (Baxter 2010:96). However, although trying to remain neutral, the interpretation of the findings will always be coloured by the researcher to a certain extent.

This research has studied innovation in services and contributed to the theory of service innovation by combining theory from the service-oriented and the technologist approach with findings from a case situated in the blurry line between the two approaches, strengthening the relevance of the integrative approach.

6.1.2 Practical Implications

This study has shown that developing a service from research to launch in-house requires expertise at each stage of the innovation process. The findings indicate that clear communication and thorough user-involvement can take the innovation a long way, but that management planning and access to personnel with sufficient competence in each stage of the process is necessary for the innovation to succeed.

When developing new services where it is possible to increase the gap between production and consumption of the service, companies should seek to exploit this gap to involve users and adjust the service according to the feedback by making use of beta testing with end-users in the intended market. When deciding to develop a service from research to market application in-house, it is important to have support from upper management, to clarify the function of the service and to be aware of the company's weaknesses and involve external expertise if necessary. It is important to do proper market research, involve users and not make decisions based on assumptions on the market at the users.

6.2 Limitations of this Research

A limitation of this study is that it has not included the opinions of the customers involved in the development process of Fuel Insight. The focus has solely been from DNV's point of view and their experience with the project.

It would be interesting to get access to the customers' opinions and ideas, as this would strengthen the validity of the research. Including the customers even after the service was closed down, could contribute to assist DNV in future project of similar characteristics, as well as it might open up for a re-launch of Fuel Insight if relevant feedback is provided, and if the customers still request such service.

6.3 Practical Suggestions

Based on theory and empirical findings presented in this research, I come up with the following advice to firms that plan to develop a similar IT service and to DNV if they choose to try the luck with Fuel Insight once more:

- Users: involve customers throughout the entire process
- User-friendliness: have users participating actively in developing the interface and layout
- Make use of beta types: it is ok to launch the benchmarks (or functions) one at a time instead of all benchmarks at once
- Organisation: sort out organisational structure and internal costs
- Management: commitment from top management
- Commercialisation: use external expertise if the firm has little experience with this
- Sort out the complexity of the system, agree on the function of the service and be clear about the limitations and opportunities of the tool
- Communicate: be clear about what you think, your aims, and listen and explain

6.4 Suggestions for Further Research

Services create over two thirds of the value added in most industrial countries. Hence, it is important to understand innovation in services due to the economic importance of the sector, and the impact it has on growth, both in terms of economy and social aspects. Suggestions for further research would be to include more studies approaching customers examining their interaction in the development of services throughout the innovation process. Further research may also adopt a different approach by addressing the bunker fuel market to broaden the comprehension of the failure of Fuel Insight.

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DNVPS 2012b. Fuel Insight Poster

Appendix

Appendix A

List of informants [86]

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

[86] DNV R&I: Det norske Veritas Research and Innovation, VPS: Veritas Petroleum Services, DNV Metric Centre: Det norske Veritas Metric Centre

Appendix B

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?