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Innovating Competitive Advantage – Remote Monitoring of Petroleum Distillates

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Abstract

The business models and technologies of bulk automotive liquids logistics have remained unchanged for decades. However, digital innovations such as sensor networks are likely to enable a new level of operational efficiencies. Widely adopted, sensor data from bulk containers could transform the industry's cost-efficiency, customer service and added-value services.

However, currently it is unclear how the industry business models should adapt to the looming leap in available technology. If not embraced in magnitude and extent large enough, the promise of technological innovation will fail in revolutionising the way petroleum distillates are distributed.

This study researches how a conservative industry such as distillates logistics can best embrace innovation opportunities within technology and business models. First a review of current research in the fields of distillates logistics and disruptive innovation is conducted. The identified gaps in knowledge are then reflected upon extensive interviews with industry experts.

Key findings of the research include a notion on potentially disruptive technological opportunities requiring particular approaches to spotting and nurturing them. Also, especially in the industry of distillates logistics, ecosystems and Value Networks play a significant role in developing operational value from first pure technological developments.

Keywords distillates, logistics, remote monitoring, disruption, innovation, ecosystems

Tiivistelmä

Petrokemian logistiikan liiketoimintallit ja teknologiat ovat pysyneet miltei muuttumattomina vuosikymmeniä. Digitaaliset innovaatiot kuten anturiverkot tulevat kuitenkin todennäköisesti mahdollistamaan ennennäkemättömiä operatiivisia tehokkuuksia. Otettuna käyttöön laajasti esimerkiksi pinnanmittauksen sovelluksissa, voivat nämä innovaatiot mullistaa muun muassa tehokkuudet, asiakaspalvelun sekä lisäarvopalvelut.

On kuitenkin epäselvää, kuinka teollisuuden pitäisi hyödyntää lähitulevaisuuden digitaalisia innovaatioita erityisesti olemassaolevien liiketoimintamalliensa varjossa. Lisäksi mikäli syntyville teknologisille murroksille ei anneta oikeaa mahdollisuutta potentiaalinsa tavoittamiseen, voivat liiketoimintamalleihinkin liittyvät murrokset jäädä kokonaan saavuttamatta.

Tämä työ tutkii, kuinka petrokemian tapainen perinteinen toimiala voi parhaiten hyödyntää teknologian ja ja liiketoiminnan saroilla tapahtuvia innovaatioita. Työ alkaa katselmuksella olemassaolevaan tutkimukseen petrokemian logistiikan sekä disruptiivisten innovaatioiden osalta. Yleisessä tiedossa tunnistettuja aukkoja peilataan teollisuuden kokeneiden osaajien kanssa tehtyihin haastatteluihin.

Tutkimus toteaa, että potentiaalisesti disruptiivisetkin innovaatiot vaativat omanlaatuista vaalimista sekä niiden tunnistamisen että lisäarvoksi kehittämisen saralla. Lisäksi erityisesti lisäarvon luomisen kannalta teknologian innovaatiot pitää vahvasti liittää ekosysteemien kehittämiseen.

Avainsanat petrokemia, logistiikka, pinnanmittaus, disruptio, innovaatio, ekosysteemit

The more you know,
the less you need.

— Unknown

ACKNOWLEDGMENTS

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ACRONYMS

OTIF On Time In Full

SCM Supply chain management

GNP Gross national product

JIT Just-in-time

QR Quick Response

DIFM Do-it-for-me

IoT Internet of Things

RFID Radio-frequency identification

ROI Return on investment

TCO Total cost of ownership

MVP Minimum viable product

Part I

INTRODUCTION

The first part of the research consists of two chapters and focuses on presenting the background of the study and extracting a research goal. Also, research methods and limitations are presented.

BACKGROUND

This chapter presents the context, approach and significance of the research. The goal of the chapter is to give readers an understanding of the background and structure of the research. The latter are important not only as they're needed to navigate the rest of the study, but as they highlight the significance and motivation of the work.

Introduction

The goal of this chapter is to introduce the research and present its significance. The chapter reaches this goal by first reviewing the research context, problem and structure. Second, the limitations and assumptions at play are presented, followed by a chapter summary.

1.1 RESEARCH CONTEXT, PROBLEM AND STRUCTURE

The following subsections present the context, scope, research problem, overall goal as well as structure of the research.

Context and scope - focusing on last-mile oil distribution

This research takes place in the field of logistics of oils, fuels and other automotive liquids. Logistics is one of the largest areas of global business, and especially an efficient fuel distribution supply chain is vital for society at large. Whilst most automotive liquids are commodities, upcoming technologies are likely to disrupt both the business and technology of the market.

The scope of this research spans a pallet of business actors, products and geography. The main focus is on and findings apply to the logistics operations of bulk fuels and oils - also known as petroleum distillates. More specifically, the research extracts value for practitioners within the so-called downstream logistics. Terminology is explained in more detailed below.

Geographically the research context spans mostly western countries, especially the Unites States.[1] The products created in the downstream sector are products nearly everyone in developed nations will

The research takes place in the field of bulk distribution of fuels and oils

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1 The extracted managerial implications should be adapted to, for example, Asian countries with caution. Viswanadham et al note that *"The realities of the logistics industry in Asia are sometimes quite different from the developments in the rest of the world, particularly with regards to the penetration of new technologies and the lack of infrastructure."* [1]

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come into contact with daily. They can be seen as making up the backbone of society's dynamics, including via the number of industry jobs. In all, the downstream sector is an extremely important part of everyday life in most Western countries.

In order to go into further details, some key terminology of the research is explained below, with further terminology arising in coming chapters.

PETROLEUM DISTILLATE Petroleum distillates ('distillates') refer to products made from crude oil that have been distilled in a refinery and then usually processed further and purified in some manner. Common examples include gasoline and diesel as well as hydraulic and motor oils.

DOWNSTREAM Downstream refers to the marketing and distribution of products derived from crude oil. The logistics of the products transported to various places to be sold, used or redistributed relies typically on conventional tanker trucks.

REMOTE MONITORING Remote monitoring refers to a fuel or oil distributor's capability to remotely monitor the fill level and other attributes of their customer's tank. The technology is typically based on combined capabilities of measurement and telecommunication and enable more efficient deliveries.

Compared to many other branches of logistics, especially those related to e-commerce, the business of downstream logistics of distillates, including for example risk-taking and investing in new technology, can be seen as rather conservative. The bulk delivery of fuels and oils hasn't developed much since the introduction of the modern tanker truck, and industry can be said to center around the low-tech delivery of a commodity product.

> *"The industry of petroleum distillates bulk delivery can be said to center around the low-tech delivery of a commodity product."*
> - Author

It can be concluded that technology hasn't fulfilled the promise of competitive advantage nor developed business models for the downstream market. However, the technology for cost-efficient, reliable sensor hardware with accompanying software is emerging. The low-margin, steady business of fuel distribution will thus most likely see technological turbulence in the coming years partly introduced by remote monitoring.

Problem and goal - helping a conservative industry embrace technology

With the previous subsection as backdrop, the goal of this research is to extract managerial implications for petroleum distillates logistics practitioners. Combining both technological and business points-of-views, the study aims to advice companies as they pursue increase delivery efficiencies as remote monitoring and other technologies emerge as industry standards.

In order to fulfil the aim of the research and to introduce structure, two research questions are synthesised from the aforementioned research aim and context:

RESEARCH QUESTION 1 What are some potential directions in which distillates distribution business models might develop as a result of the availability of next-generation remote monitoring?

The first research question examines existing business models and is descriptive and explanatory in nature. To explore the space for managerial implications, the goal is to build an understanding on the likely reception these business models will give to a rise of potentially disruptive technologies such as widely-spread remote monitoring.

RESEARCH QUESTION 2 Which best practices for the distillates distribution business are likely to support embracing a new generation of remote monitoring solutions?

The second research question aims directly at delivering value to industry practitioners and can be described as rather explorative. Combining insight from recent research as well interviews, the goal is to extract implications for managers to take into account when embracing technologies that can put their companies at the industry forefront.

Structure of research

The aforementioned research aim will be achieved through the attainment of the following steps:

1. To specify the gap in current research by reviewing salient literature.

2. To conduct a series of semi-structured interviews with experts in the aforementioned as well as adjacent industries.

3. To mirror the interview findings with those from literature to extract managerial implications.

To further structure the study, the research flow is organised into parts, chapters and sections as follows:

PART I - INTRODUCTION The goal of the first part is to give the reader an understanding of the purpose of the research. This is achieved through a thorough review of the background and goals of the research.

PART II - LITERATURE REVIEW The goal of the second part is to identify a research gap. The gap will serve as a mirror upon which the empirical data from the following chapters will be reflected upon. A gap is identified through a review of salient research in the fields of logistics, business innovation and technological disruption.

PART III - EMPIRICAL RESEARCH The aim of the third part is to critically present empirical data in the form of interview findings. Data from six interviews is reviewed, with interviewees ranging from the logistics industry to various adjacent industries.

PART IV - ANALYSIS The goal of the fourth part is to critically analyse findings from and summarise the research. The findings of the empirical research will be mirrored to the research gap identified in the second part of the research, answering the research questions.

In this section the research questions, research problems along with the aim, scope and methods of the research have been established. In addition to setting the research context, the importance and significance of the research has been emphasised. The next section will further review some relevant assumptions and limitations present in the research.

1.2   ASSUMPTIONS AND LIMITATIONS

Albeit partly trivial, it is necessary to state the following assumptions and limitations of the research:

- Regardless of a comprehensive approached being adopted, it's not suggested that the literature review is completely exhaustive. This is mainly due to research on the related, rapidly evolving topics being constantly published. This suggests also that choosing salient literature based on amount of citations alone isn't feasible. The approaches adopted are further reviewed in the next chapter.

- Some adjacent academic fields in management research like strategy, change management and business innovation are merely outlined. It is assumed that the reader will review the relevant literature from these fields in order to grasp the nuances needed

for understanding and applying the extracted managerial implications of this research.

- In terms of feasibility and time constraints, some prioritisation was necessary, resulting in issues and approaches relevantly adjacent to the research being left outside the scope of enquiry.

- The research topic context is focused on petroleum distillates. However, the research approaches and results apply with limitations also to other liquids commonly used in the automotive industry, typically wind washer fluids, coolants, waste oils and so on.

- The oil industry's supply chain is long, ranging from exploration, construction and upstream transport to refining, distribution, wholesaling and retailing. The supply chain part researched, however, is restricted to the downstream part of the logistics chain.

It is also worth noting that adjacent relevant literature is typically within fields such as fuel tank regulations, service levels of fuel logistics and the global oil market. With this section having laid out the key assumptions and limitations of the research, the chapter will next be concluded by a summary.

SUMMARY

This section concludes the first chapter of the research. The first chapter has introduced the background and goal of the research as well as the field it takes place in.

The context of the study was presented as the business space of downstream logistics of petroleum distillates, underlined as a key sector for Western societies at large. The market deals with commodity products most people in developed nations will come into contact with daily and can be characterised as rather conservative. However, even if highly competitive, technology is not embraced as a competitive advantage by business practitioners.

Thus, with technologies such as remote monitoring becoming mature and potentially disruptive, the goal of the research was set as extracting managerial implications to help the industry embrace technology. Two research questions were introduced, relating to how the industry as it currently exists will embrace a wide-scale availability of remote monitoring and what a related best practice might be:

1. How are current business models likely to adapt to wide-scale remote monitoring?

2. Which future best practices can be extracted from current knowledge?

Limitations such as results lacking empirical validation were presented. Also, transferability to downstream logistics operations of nearly any bulk fluid was highlighted. With the background and goal of the research reviewed, the next chapter will present the study's research methods in more detail.

RESEARCH METHODOLOGY

This chapter reviews the research methods of the study and is the second and last chapter of the introductory part of the research. The goal of the chapter is to give the reader a cross-section of the research methods applied and the basis on which they were chosen. Understanding these will enable readers to critically assess the research findings presented later in the research.

Introduction

The previous chapter introduced the context, purpose and aim of the research, including reviewing extracted research questions. In addition assumptions, limitations and the structure of the research were presented.

The goal of this chapter is to further expand on the introductory nature of the first part of the study, explaining the research methodology and related limitations and assumptions. This is done by first reviewing the research process and methods, whereafter aspects of credibility are critically assessed.

RESEARCH METHODOLOGY

The following subsections present the research process of the study, including the background to how it was chosen and which limitations the aforementioned choice results in. Tools and others aspects to both the literature review as well as the empirical part are reviewed.

A flow of primary and secondary data

The intention of bridging a gap between academia and practice and inductively coming up with new and relevant managerial implications seemed best approached qualitatively. Thus, the research process pursued closely resembles that of a classical qualitative research process presented by Bryman. [2] The research flow is briefly presented below.

First, an overall maturity of the research context is established, leading to a justification of the study and extracting of research questions. Next, in order to get a complete overview of the academic field, secondary data is reviewed thorough a pursue of a thorough literature review.

According to Bryman [2], qualitative research usually emphasises words over quantification both in collection and analysis of data

The literature review can be seen to have a narrative approach. This is more wide-ranging and less focused than what can be seen in systematic reviews [2]. Choosing a narrative approach enables developing a deeper understanding of the topic through a linking with adjacent academic fields.

The aforementioned theoretical platform then forms the basis for further specification of interview questions. For primary data collection, it was noted that a multiple case study approach would be suitable. It would allow getting a broader understanding of how practitioners view the topics and domains of the research context. By sampling two main data sources, industry practitioners as well as individuals with strong, adjacent insight, coupling the research questions, the literature findings and the research goals seems likely..

Next, on the basis of primary data gathered from practitioners and research found in academia, both adapted and new theory relevant to practitioners is inductively extracted. The complete research process is presented below in figure 1.

Extracting of research questions (chapter 1)

Literature review (chapters 3-5)

Extracting of interview questions (chapter 6)

Interviews (chapter 7-9)

Interpretation of interviews (chapter 9)

Conclusion (chapters 10-11)
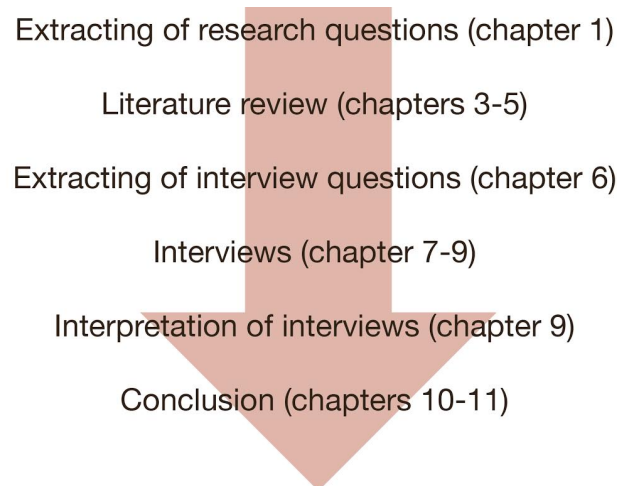
Figure 1: The research process pursued closely resembles that of a classical qualitative research process presented by Bryman. [2]

The completed flow of the research is visualised above. Next the approach to the literature review and interviews is presented in detail.

Choosing literature

As rapidly developing areas of business innovation and technological disruption are part of the research context, literature was chosen not

only based on citations but on their synthesising and summarising natures.[1]

It is also worth noting that published academic papers and research done by practitioners are not separated, but their potential difference in approach and methodology is noted. In fact, the literature review is merely used as a lens through with empirical data is analysed, the latter which is examined more in detail next.

Designing the interviews

In order to develop an understanding of the status quo among practitioners, a multiple case study approach was chosen.[2] In total six companies and practitioners where studied to develop an understanding of their approach to the research topic. Data on each case was gathered by interviews with one or several representatives from each company.

The cases were selected by different types of non-probability sampling, mostly purposive sampling. According to Bryman [2], the aim of purposive sampling is to strategically select interviewees that are relevant to the research topics. Saunders et al. [5] describe purposive sampling as selecting informants believed by the researcher to be able to answer the relevant questions. This was done by identifying individuals in industry companies while taking into account existing pools of contacts of the author. These individuals represented the management of the company and could thus be expected to be well positioned to discuss various themes.

Three interviews were conducted with industry practitioners and three with individuals with adjacent experience. This was done in order to get an understanding within an industry, but also to be able to see across industries and businesses of a different nature. Taking into account both the business and technology approach of the research, interviews were conducted both in the US, where the industry is immense in volume, as well as in Finland where the industry is foremost technologically advanced.

Interviews with informants where conducted as semi-structured thematic interviews. Semi-structured interviews follow a pre-set list of topics but the list of questions, the order in which they are discussed, and the extent to which they are discussed will vary depending on the person being interviewed [5]. All interviews were conducted in-person by the author and recorded.

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1 For example Stanford Global Supply Chain Management Forum's Sustaining the High-Performance Business: Research and Insights on the Role of Supply Chain Mastery reflects financial performance on that of supply chains based on an analysis of data from 636 global 3,000 companies in 24 industries. [3]
2 According to Eisenhardt [4], case studies can be used to accomplish various aims, such as test theory, generate theory and provide description.

Empirical data analysis

As the goal of the empirical data collection was not to, for example, produce summary statistics about a set of observations or other quantitative data, the analysis method was chosen rather freely. The overall guideline was to become intimately familiar with each case as a stand-alone entity. However, coupled with within-case analysis is cross-case search for patterns.

The analysis of the empirical research data was eventually done in three steps. First, the interviews were transcribed and read through several times in order to get a general understanding of the content. This was followed by a conceptual coding process performed in two steps:

DESCRIPTIVE AND PROCESS CODING The first step of the coding process consisted of descriptive coding and process coding. Descriptive coding and process coding is done by assigning categories to sections or phrases in the transcribed qualitative data that describe either the topic or the action that is referred to [6]. In this way, passages related to the different parts of potential managerial implications could be identified.

PATTERN CODING Next a second round of so called pattern coding was done. Pattern coding is used to identify similarities and relationships between the different categories previously identified [6]. The data for each case company was analysed individually after which cross-case comparisons could be done.

Each interview is translated and presented with a clear distinction between the interviewees' statements and interpretations by the author. All synthesises, without comments and interpretations of the author were also sent to the interviewees for respondent validation. Some corrections, deletions and additions were received from the interviewees.

This section has presented the research approach as well as the resulting overall research flow. Methodologies related to the retrieving primary and secondary data have been presented in details. The next section will critically evaluate the chosen methods.

EVALUATION OF RESEARCH METHODS

In order to support the reader in personal assessment of the trustworthiness of the research findings, the above-mentioned methods and approaches are next critically reviewed.

Trustworthiness

To evaluate the research the methods used are reviewed below in light of Guba and Lincoln's [7] four criteria of trustworthiness - credibility, transferability, dependability and confirmability:

CREDIBILITY By recording the interviews and gathering respondent validation on the translated synthesis it is believed that a degree of credibility has been ensured.

Also, the author spent approximately 100 hours in more than 50 meetings with various industry practitioners while conducting the research, resulting in significant prolonged engagement and persistent observation, as defined by Lincoln & Guba [7].

Finally, triangulation was emphasised as literature of very different natures was chosen along with interviews being conducted with interviewees of very different connections to the research domains.

TRANSFERABILITY Six interviews, albeit across a significant pool of insight, is somewhat limited in order to exhaustively transfer the resulting findings to several approaches and aspects.

Thus, in order to increase the transferability of the findings, interviewees with experiences from several adjacent industries and individual ventures were approached in addition to the logistics industry practitioners.

This approach of using multiple observers with rich insight can be seen as a form of triangulation and thus increase the transferability of the study.

DEPENDABILITY Recordings and transcripts from the interviews are not attached to this document for several reasons, including sensitive strategic information, different source language (Finnish) and in some cases the need for anonymity.

In order to increase the dependability, to a degree a supervisor has been used as an auditor by reporting on progress and discussing findings related to the interviews.

CONFIRMABILITY In order to increase the confirmability of the study the interview synthesis is structured and presented in a way that clearly separates the interviewees' statements and the author's interpretations.

Also, confirmability has been pursued by choosing language carefully when discussing semantically difficult topics with practitioners.

With the four criteria of trustworthiness presented above, it is, nevertheless, acknowledged that complete objectivity is difficult to maintain. Also, a more thorough evaluation of the research design quality is conducted in chapter 11.

Criticism of research methods

With the level of trustworthiness set, below are some key points for the reader to note when taking a cross-section of the overall research approach.

- Even with emphasis on added transferability, the sample pool of six interviews is a relatively small space of empirical data.

- Interviews have limitations as a data source as situations and processes described are personal experiences and retrospective rationalisation and collective reconstructions can be at work.

- The audit trail is poor in depth, mainly consisting of a high level description of the research process but lacking rich detail.

- Albeit shallow in experience, the author is an industry practitioner himself, possibly risking the trustworthiness of the research. Research is conducted by a sole author, limiting possibilities for triangulation and continuous peer review for example in the case of assessment of interview findings.

- Due to time constraints, negative case analysis had to be left out of the research methods.

- Also due to time constraints, the extracted managerial implications have not been subject to empirical validation or verification.

- Case study research methods of questionnaires, observation and archives were omitted in favour of interviews.

This concludes the critical evaluation of the methods and approaches chosen for this research. Next the chapter is summarised below.

SUMMARY

This chapter has presented the research flow and methods along with criticism thereof. The choice of a multiple case study approach combined with a literature review was justified and the resulting research flow was presented in detail. Particular attention was paid to explaining the selection of the collection methods of primary and secondary data.

The methods chosen were noted to be based on a rich variety of approaches while sustaining a moderate level of credibility, transferability, dependability and confirmability. A critical assessment of the methods was presented in detail, including general notes on the overall trustworthiness of the research.

This chapter concludes the introductory part I of the research. The next chapter is the first in a three-chapter literature review, or the second of four parts in total of the research.

Part II

LITERATURE REVIEW

With the research background reviewed in the previous chapters, the goal of the following part of four chapters is to give the readers an overview of salient literature, enabling reflecting on the research findings presented later in the study. The goal is reached by further expanding on the context in which this study takes place, ending in specifying a gap in research in the form of interview questions.

BULK DISTILLATES LOGISTICS

This is the first of four chapters of the literature review part of the research. The chapter goal is to build an in-depth understanding of not only technological but also business aspects relating to the bulk delivery of oils and fuels. This is done by critically reviewing the most relevant literature. The chapter enables readers to grasp the logistics context of the study, building a meaningful backdrop to reflect upcoming chapters upon.

Introduction

The previous chapters presented the approach and methodology of the research and aligned the structural elements and limitations. The overall research goal was concluded to relate to how industry practitioners could best embrace a leap in technology enabling next-level operational efficiencies.

This is the first chapter of a three-chapter literature part of the research. The goal of the chapter is to give the reader a thorough cross-section of the business and technology of delivering oil and fuel in bulk, enabling assessment of research results in later chapters. The chapter goal is achieved through presenting core business and technological challenges and practices along with key industry metrics and terminology.

INTRODUCING LOGISTICS

This section will introduce logistics on a general level, focusing on the aspects that apply to the market on a broad level.

Defining logistics

Logistics[1] is often explained as the art and science of managing and controlling the flow of goods, energy, information and other resources. It encompasses a business function generating revenue through pro-

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1 The terms logistics and Supply chain management (SCM) are often used interchangeably. Logistics focuses on the actual transportation and storage of goods, dealing with things such as inbound and outbound freight, storage and warehousing. Supply chain, however, covers all aspects of the sourcing and procurement of goods, including finding and obtaining the goods to sell, negotiating pricing, manufacturing, packaging and inventory control.

vision of availability, requiring resources in the form of fixed and working capital.

Logistics is often defined as positioning of resource at the right time, in the right place, at the right cost, at the right quality. Additionally logistics plays a role in best practice sharing and continuous improvement, adaptability to change and reducing environmental externalities. Gordon identifies inventory/sales ratio as a key logistics efficiency metric [8].

> *"Throughout the history of mankind wars have been won and lost through logistics strengths and capabilities - or the lack of them."*
> - Martin Christopher [9]

Martin Christopher [9] presents logistics as *"the link between the marketplace and the supply base"*. He notes that the scope of logistics has always spun the organisation, including operations from manufacturing and storage to the movement of goods, providing means by which the product can reach the end user. Also Rushton [10] notes that the scope of logistics covers strategic, tactical and operational natures.

The key mission of logistics

The mission of logistics can be seen as providing means whereby customers' service requirements are met at the lowest cost or as "*matching supply and demand*", as described by Rushton. Rushton further notes that in practice this often means achieving On Time In Full (OTIF) deliveries. [10]

OTIF refers to the aforementioned states of right quantity, place, time and so on being fulfilled by a delivery

The goals of logistics are met using a subset of various physical and trading channels, as illustrated by figure 2 below. Also information systems play a crucial role in logistics, enabling, among others, demand planning, forecasting and inventory management. Information management is at the heard of success of logistics both in the so-called inbound side or materials management as well as so-called outbound side or physical distribution. [11] The most important information thus flows in a reverse direction from the customer to source, described by Alan Rushton as *"the lifeblood of any logistics system"*. [10]

Magnitude and cost of the logistics sector

The ways logistics achieves its business goals haven't changed much throughout time. It matches supply with demand through forecasting ahead of demand and creating inventory against that forecast. However, even with developing information systems, the cost and magnitude of the logistics sector remains significant. In the world's largest
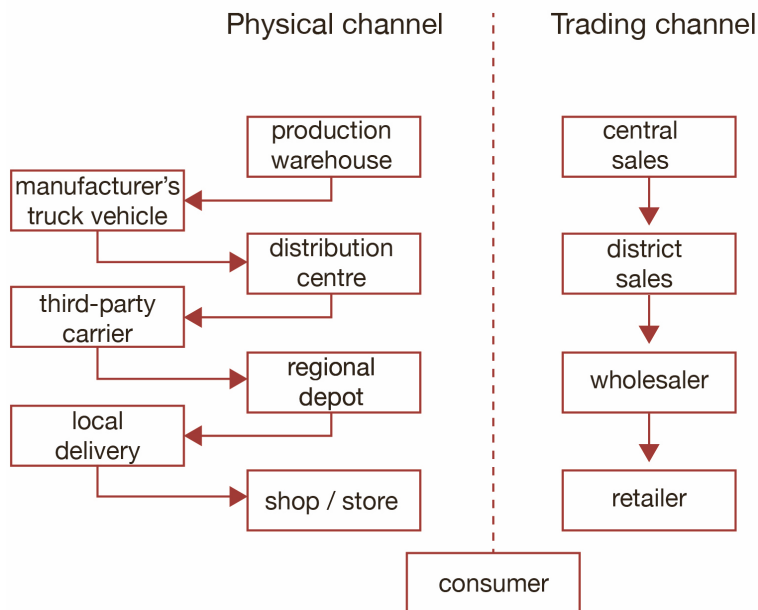
Figure 2: A typical channel of the distribution as divided into physical and trading routes. Adapted from Rushton. [10]

economies the annual cost of logistics is estimated to be between 8% - 17% of Gross national product (GNP) [12].

For example for office equipment overall logistics costs could amount to 15% dividing into administration, inventory investment, warehouse and transport. A series of studies in 2008 revealed that the global logistics market is dominated by retail logistics services with nearly 64% or the market. In a typical case the logistics and total cost of a product could be broken down as illustrated below in figure 3. [10]

Traditionally logistics is looked at on a functional level, resulting in functional errors such as large build-up of finished goods inventory and a need for warehousing space.[2] For example, in the USA it's estimated that the annual costs to the country's textile and apparel industry of conventional, inventory-based logistics systems is USD25Bn, divided into forced markdowns, stock-outs and inventory carrying costs. [9]

Efficient inventory management is based on accurate forecasts, taking into account historical data as well as external drivers such as sales, promotions and changes in trends and competition. All of the latter are indeed challenging operations to succeed in. It's also worth noting that moving a pallet into a warehouse, repositioning it, stor-

It is said that all mistakes in forecasting end up as an inventory problem, whether too much or too little

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2 Viewing from a functional level typically results in processes being focused on operating efficiency. For example manufacturing focusing on volume while simultaneously marketing strives for variety, high service levels and frequent product changes. This lack of communication results in functional errors - the functions in the logistics chain are working efficiently individually, but not as a whole.
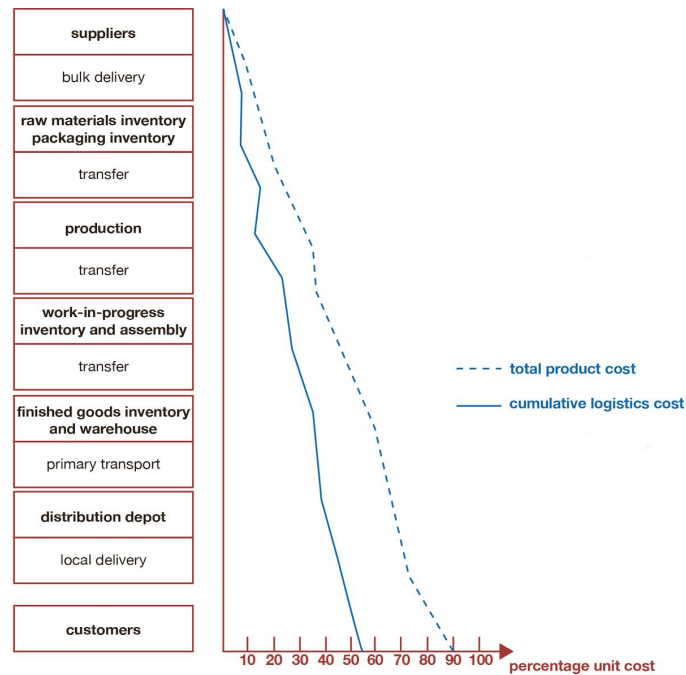
Figure 3: Cumulative logistics and total product cost. Adapted from Rushton. [10]

ing it and then moving it out in all likelihood has added no value but considerably to the total cost. [11]

Cost versus customer service in logistics

Across markets companies can strive to be cost leaders or service leaders, and logistics development drivers have indeed always been cost versus customer service. Logistics drives commercial success both through cost and value advantage.

Other drivers of logistics development are often related to speed, integration of information systems and globalization. [10] While the drivers of cost and service are broken down differently in different companies, it can be noted that most organisations strive for a subset of the goals illustrated below in figure 4.

Core terminology in modern logistics

To continue our review of logistics the introduction of terminology is needed. Terms often stumbled upon in logistics include Just-in-time (JIT), Agility, Quick Response (QR) and Leanness, which are briefly introduced below.

JIT is said to be the opposite of 'Just-in-case', where high inventory levels compensate for imperfect processes

JUST-IN-TIME JIT refers to a manufacturing system in which delivery of parts and materials as well as production itself takes place exactly at the right time rather than before. Just-in-time systems
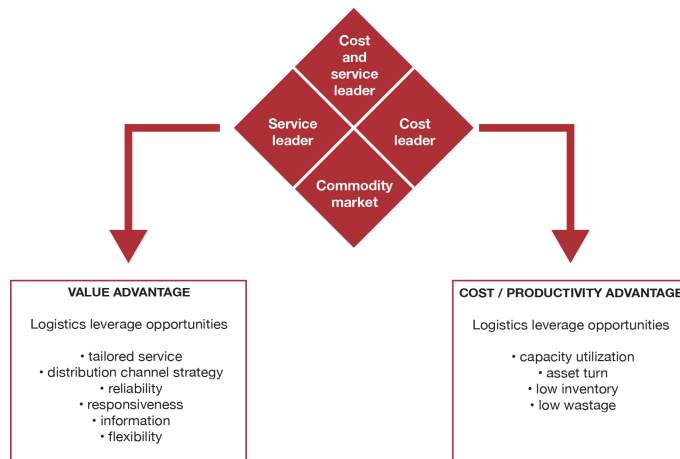
Figure 4: Different ways in which logistics can be used to leverage cost and/or service leadership. Adapted from Rushton. [10]

reduce the cost of storing parts and materials and reduce waste. [13]

AGILITY Agile supply chain is defined by Rushton [10] as *"the development of a strategic structure and operation that allows for the rapid response to unpredictable changes in customer demand"*. The Cambridge Dictionary [13] defines agile more generally: *"able to deal with new situations or changes quickly and successfully"*.

LEANNESS Lean focuses on eliminating the non-value adding activity of logistics or *"having no surplus"*. In other words, *"producing goods in large numbers using methods that avoid waste and reduce the time taken"*. [13]

QUICK RESPONSE QR is an umbrella term for responsive and fast logistics information systems related to reducing internal and external lead times. Essential logic includes capturing demand as close to real-time as possible and as close to end customer as possible. Rushton [10] describes QR as *"a further development of the JIT approach where the manufacturer is more closely linked to the actual demand at retail level"*.

The QR of Procter & Gamble is based on receiving sales data directly from check-out counters of North America's largest retailer Walmart [11]

With the roles and magnitudes related to logistics, along with relevant terminology reviewed, the next subsection presents the most common challenges.

Common logistics challenges

A wide variety of external factors have emerged as drivers for the development of logistics systems, some of which are illustrated below in figure 5. Globalisation effects logistics, increasing significantly

the complexity of its management. The redistribution of wealth and demographics has also resulted in environmental and infrastructure issues. Even though transportation has been deregulated and legislation harmonised, road congestions and environmental regulations are putting increasing pressure on supply chains. [9, 10]
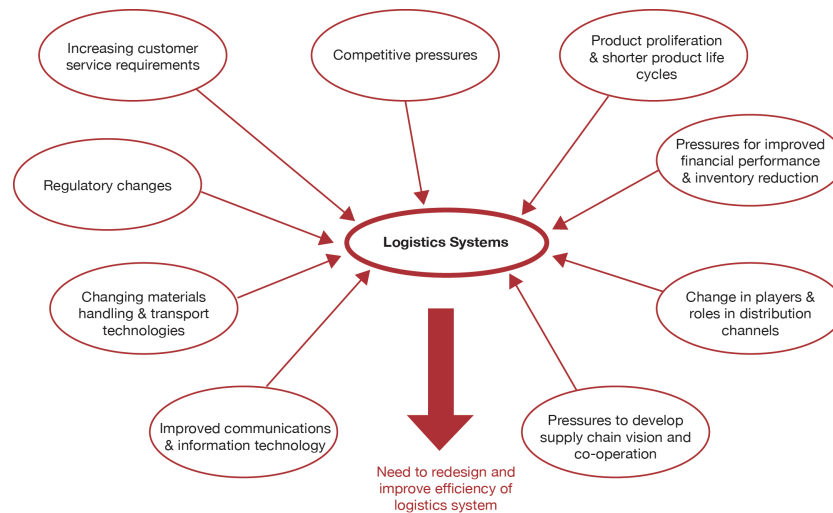
Figure 5: Pressures influencing logistics systems. Adapted from Rushton. [10]

The requirements placed on supply chains have changed. The role of customer service has increased significantly as product availability has become the driver of demand. This along with shorter product life cycles has led to a need for compressing the overall supply chain lead time, as illustrated in figure 6 below.

The role of customer service has increased significantly as product availability has become the driver of demand

Supply chains need to be capable of rapid change as per the turbulence and complexity introduced by the aforementioned external drivers. However, many of these issues are difficult to address as globalisation also means that the demand penetration point is too far down the logistics pipeline. [9, 10]

A challenge is to design supply chains from the 'customer backwards' instead of 'the factory outward' [9]

Simatupang et al. [14] recognise globalisation, product diversity and technological breakthrough as the current three major drivers of logistics. The Material Handling Institute [15], the largest logistics association in the US, recognise urbanisation, automation, sensors, Internet of Things, Big Data and predictive analytics as the "megatrends reshaping logistics through 2025". Gorgon [8] adds that "*Security requirements make logistics more complex.*"
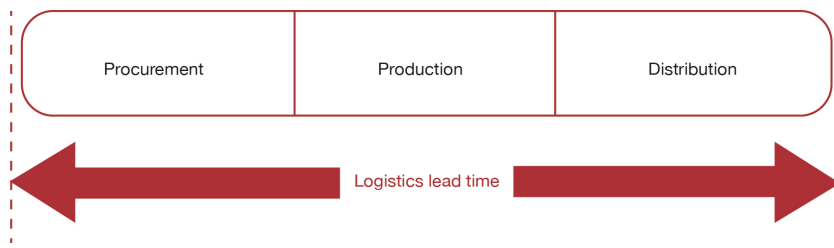
Figure 6: The logistics lead time comprises of processes divided into procurement, production and distribution. Adapted from Rushton. [10]

Current logistics practices

As a result of the challenging trends reviewed above, recently the impact of logistics on competitive advantage has been recognised. Previously logistics has had tactical focus on optimising costs, now more strategic with creation and delivery of value.

Thus, leading organisations can often be seen including supply-side issues in the development of their strategic plans and invest in logistics structure, organisation and operations. Logistics has become a challenging strategic issue. In the era of so-called *'supply chain competition'*, logistics plays the role of key enabler of business improvement.

Rushton [10] notes, however, that *"There is a direct conflict between globalisation and the move to the Quick Response, Just-In-Time operations that are being sought by many companies. In global companies there is a tendency to see order lead times increase and inventory levels rise because of the distances involved and the complexity of logistics."*

Businesses are said to have entered an era of so-called 'supply chain competition'

> *"Leading organizations recognized that there was a positive 'value added' role that logistics could offer, rather than the traditional view that the various functions within logistics were merely a cost burden that had to be minimized."*
> - Alan Rushton [10]

Reflecting the above findings to the external drivers recognised in the previous subsection, it seems the real logistics challenge for today's organisations is in fact enabling the benefits of methodologies such as Just-in-time without incurring financial and environmental disadvantages [10]. Christopher [9] adds that logistics information systems achieve this goal by improving the visibility of demand along with enhancing the velocity of the supply chain making it more responsive.

Integrated logistics

Leading organisations have long recognised that the key to logistics success is related to information system and related integration, the latter of which is discussed next [10].

INTEGRATED LOGISTICS   Integrated Logistics refers to system-wide management of entire logistics chain as a single entity instead of separate management of individual logistics functions, as reviewed earlier.

Christopher [9] summarises Integrated Logistics as taking place when "*flows of information and material between source and user are coordinated and managed as a system*". Integrated Logistics is based on the realisation that the series of interrelated functions of transport, storage, materials handling and packaging must be linked together. Recognising a relationship among the functions enables a systems approach and a total cost perspective, allowing the functions to be studied holistically and managed more efficiently - awareness of total cost enables one to analyse and improve.

To summarise on current logistics trends, supply chain management should be called *'demand chain management'*. The chain should be driven by the market instead of the suppliers as businesses are transforming from forecast-driven to demand-driven. [9] Key drivers and challenges influencing development of modern logistics systems are illustrated in figure 5 above.

> **"One thing is certain, as supply chains become ever more virtual and network-based, and as global mega-trends shape the business landscape, the role of logistics and supply chain management in ensuring a sustainable future will become ever more critical."**
> - Martin Christopher [9]

DISTILLATES LOGISTICS

So far logistics has been presented from a broad scope, reviewing challenges and practices that relate to logistics of both discrete and liquid products. In this and the next sections focus will be on the downstream part of petroleum distillates logistics.

The logistics subsegment of distillates downstream

The business and technology of distillates distribution is both similar and different from the more traditional logistics environments presented in the sections above.

AMOUNT	EXPLANATION
220,000	vehicles serviced by US Postal Service
150M litres	annual US transformer fluid use
750M litres	annual US hydraulic fluid use
2.2Bn litres	annual US motor oil use
3.0Bn litres	total annual US automotive service fluids use

Table 1: Magnitudes of US annual distillates use in the automotive industries. Adapted from Klatch. [16]

Similarities between distillates downstream and more general logistics start with opportunities and challenges. The player with optimal logistics system can establish industry standards and assume industry leadership areas such as service provided to customers, quality assurance and pricing. However, for example customer behaviour visibility is challenging especially in the delivery of oils and fuels: marketing and sales departments have a better view of the whole flow of the product than internal departments such as production and logistics.

Logistics characteristics of liquids naturally include that they flow, leading to the use of tanks and pipes. Liquids also have a constant level, leading to the use of sensors to measure the volume of liquid at specific points along the supply stream. However, even if the operational tools seem superior to, for example, trucking discrete goods, the costs related to downstream distillates typically form the second biggest cost after the product itself.[3]

As mentioned earlier, petroleum distillates are typically consumed by the automotive and agricultural industries. The automotive transportation industry covers manufacturing, automobile dealerships, automobile repair, fleet-maintenance facilities and so on. The industry's need for petroleum distillates in the USA alone is large, as illustrated by table 1 above.

However, even if liquid fuel -intensive industries such as transport and agriculture are some of the largest in the world, from a logistics point-of-view they're not the most developed. The next section will review the logistics development of these industries.

Downstream - from refinery to end-user

The major stages of a petroleum distillate's supply stream include production, distribution and usage. In order to fully grasp the im-

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3 Possibly this is partly the reason why in many industries the customer dictates the methods used for logistics flow, but with liquids typically the producer/distributor is the driving party.

plications of this research, it is vital to understand the underlying context. Thus, next the businesses of production and distribution are briefly reviewed, expanding on the definitions presented in the first chapter.

PRODUCER The producer works with exploration, development and production of crude oil or natural gas. Furthermore, their role in the supply chain also covers refining, transportation and storage of finished products.

The producer of fuels and oils works with stages of fuel logistics called upstream and midstream. Upstream is typically a pipeline, railroad or tanker route starting at the source, going from off-shore or inland oil fields to refineries for refinement. Midstream refers to the wholesale marketing of petroleum products of various grades of refinement. The refining sector, often characterised as slow and stable, is dominated by a small handful of large players.

Refining refers to physically, thermally and chemically separating crude oil into fractions and further conversion to finished products

The business of distillates production is based on margins where both the raw material and product are commodities. Goals of production include maximising utilisation rates and production of high value products while minimising costs related especially to energy and raw material. A key challenge is making the most appropriate production decisions to minimise system-wide inventory while maintaining required service levels. [16, 17]

DISTRIBUTOR As with most products, with petroleum distillates the distributors form the last leg in the logistics chain. Their business resides on the customer interface and deals with not only transportation and products, but also with sales and customer service.

The up- and midstreams of the oil industry result in separate, narrower streams of petroleum product addressed to the end user. From a refinery, the product is typically bought in wholesale and transported in tanker trucks to large bulk containers at terminals of distributors or other regional, central or national distribution centres.

A distributor works with supplying product typically to workshops, small industry and farms. Key business challenges relate to increasing sales in a mature market while minimising delivery costs in an technologically conservative industry.

Daily movement of US petroleum products amounts to 6Bn barrel-miles, and the daily cost of a tanker truck to an operator is as high as USD700 [16]

Distributors typically face challenges on the information side of the flow, especially relating to product demand. A large automotive centre such as a fleet service facility has a relatively regular flow of a predictable set of automotive maintenance fluids, typically performing preventive maintenance according to a pre-defined schedule. Do-it-for-me (DIFM) centres such as quick-lube shops, automobile dealers and service stations often experience more sudden surges in demand.

Figure 7 below illustrates the central components in the business of the above-mentioned two key distillate downstream players.

(a) Refinery

(b) Depot / Terminal

(c) Truck

(d) Container
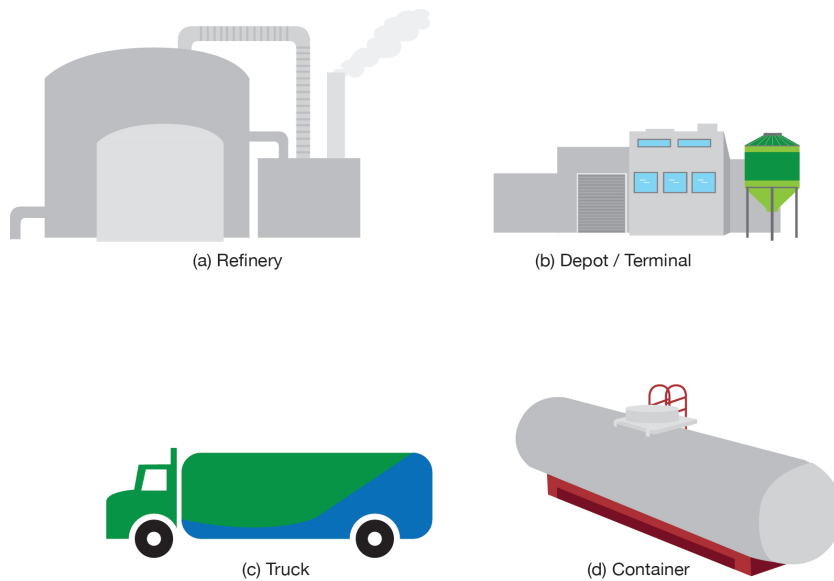
Figure 7: A refinery, depot / terminal, tanker truck and tank fare key elements in the supply chain of distillates.

Integration in distillates logistics

Klatch continues on the topic of Integrated Logistics raised by Christopher and Rushton in the previous sections. He notes that "*Techniques, technology and equipment should be deployed to provide a fully synergetic system.*" The entire flow of product should be planned, monitored and controlled by a wide-ranging but simple information-processing scheme, he continues.

According to Klatch [16], a scheme exemplifying Integrated Logistics in the petroleum industry can be broken down into monitoring, processing and actioning, carried out by sensors in the field, a main computer system and dispatchers, respectively. Klatch continues noting that capabilities for efficient liquid operations include expertise in

- Production and trucking of the product

- Physical equipment at locations of the producer/distributor/-customer, including electronic equipment such as sensors

- Making product use information readily available and emanating close to the point of usage

- Processing and analysis of the aforementioned data

- Procedural elements such as the guiding and monitoring work of a dispatcher

As summarised above, Integrated Logistics in the petroleum industry has many aspects. Next, a summary concludes the chapter.

SUMMARY

The chapter started by defining logistics as a business function that generates revenue through the provisioning of availability. The scope of logistics was mentioned to cover a wide scope in business, including strategic, tactical and operational natures.

Major drivers of logistics development were noted to include globalisation, urbanisation and automation. With product availability an additional key logistics driver, the role of customer service has increased significantly. Furthermore, shorter product life cycles has led to a need to compress the overall supply chain lead time.

In all, supply chains are introduced to turbulence and complexity. Thus, a central logistics challenge emerges as enabling the benefits of the best logistics methodologies without incurring financial and environmental disadvantages. The player with the most optimal logistics offering can establish industry standards and assume industry leadership in areas such as service, quality and pricing.

Fuel supply chain winners will be those who develop their use of information, getting from firefighting mode to proactive mode

As follows, the impact of logistics on competitive advantage has been recognised. Traditionally logistics has had a tactical focus on optimising costs, now more strategic with the creation and delivery of value. Logistics has become a challenging strategic issue as a key enabler of business improvement.

Recently it has become clear that leading organisations include supply-side issues in the development of their strategic plans, investing in logistics structure, organisation and operations. The key to success lies in information systems and integration - improving the visibility of demand along with enhancing the velocity of the supply chain making it more responsive.

As a result of a market evaluation, the business of distillates downstream can be seen as being centred around the low-tech delivery of a commodity product. Logistics costs form the second biggest cost after the product itself.

The goal of this chapter was to give the reader a thorough cross-section of the business and technology of the last-mile delivery operations of automotive liquids. The goal was reached by presenting the related trends, challenges and practices. Key technology and terminology was introduced and the magnitude of the industry evaluated. The competitive business role of logistics was identified along with the importance of information management.

This concludes the first in chapter of a four-chapter literature review. The next chapters will further review the adjacent fields of dis-

ruptive technologies and business innovation as they relate to the research goals.

TECHNOLOGICAL DISRUPTION

This is the second of a four-chapter literature review. The chapter critically reviews salient literature in the field of technological innovation with a special emphasis on the Internet of Things and Big Data. The chapter goal is to build an in-depth, conceptual-level understanding of technologies that up-coming industry disruptions could be based on. The chapter gives the reader the tools to assess the overall results of this research from perspectives of technology and disruptive innovation.

Introduction

In the first chapter of the literature review the current state of logistics was reviewed, including a special emphasis on the practises and challenges related to downstream distillates logistics. Logistics was concluded to currently face technological turbulence.

The goal of this chapter is to review salient research on technological disruption, adding a crucial tool for the reader to assess the research findings. The chapter goal is reached via reviewing related definitions, classifications and processes. The current state of research is approached by surveying seminal papers and other literature.

4.1 IDENTIFYING DISRUPTIVE POTENTIAL

This section defines disruptive technologies and separates them from those that could be characterised as merely sustaining. Also the role of so-called Value Networks is presented. Two central approaches to identifying technologies of disruptive nature are reviewed.

From sustaining to disruptive on a conceptual level

In order to discuss how disruptive potential can be recognised, it is essential to define what exactly is meant by disruption. This is done next by comparing disruptive and so-called sustaining technologies.

SUSTAINING TECHNOLOGIES Sustaining technologies are improvements that sustain an organisation's focus, goals and customers, allowing it to do it's job better, improving its products and increasing customer satisfaction. [18]

Typically seen at established firms, sustaining innovation is focused on improving the performance of established products and meeting

demands of mainstream customers in major markets. An industry's leading firm often also leads in developing and adopting sustaining technologies. The evolution of standard nail polish to quick-dry nail polish is a common example of a sustaining innovation.

DISRUPTIVE TECHNOLOGIES Disruptive technologies are new ways of doing things that disrupt or overturn the traditional business methods and practices. [18]

A disruptive technology is either one that displaces an established technology shaking up an industry or a ground-breaking product creating a completely new industry. [18] Popular examples of disruptive innovations include the steam engine in the age of sail and the Internet in the age of post office mail.

VALUE NETWORKS Value Networks refer to the context within which a firm identifies and responds to customers needs, solves problems, procures input, reacts to competitors and strives for profit. [18]

Often seen as a business analysis perspective, Value Networks describe social and technical resources within and between businesses. They describe how different internal and external roles interact with tangible and intangible deliverables, accounting for the overall worth of product and services. [18] Figure 8 below illustrates the Android operating system as an example of a Value Network.
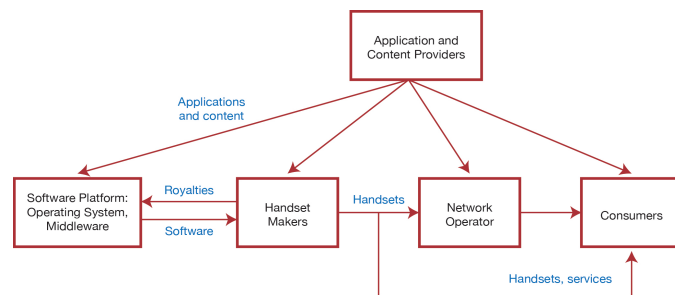
Figure 8: The Value Network of the Android operating system includes among others content providers, handset makers and network operators.

Disruptive technology initially typically is an order of magnitude cheaper, of lower quality and offers lower value [18]

From the definitions above it can be concluded that sustaining innovations are typically innovations in technology, whereas disruptive innovations change markets. Expanding on the differences between sustaining and disrupting innovations, one of the leading business innovation researchers Clayton Christensen [18] argues that disruptive innovation typically is cheaper, simpler, smaller and pursued by entrant firms.

In fact, generally products and services of disruptive nature underperform established products in mainstream markets - a market must be developed and new customers are to be found. *"Disruptive technologies have other performance attributes that are not valued by current customers that make them prosper in a new value network."*, Christensen notes. [18]

The nature of disruptive technologies

Christensen states that disruption *"triggers a fundamental change in the basis of competition in the product's market along four dimensions of functionality, reliability, convenience and price"*. Simply put, when a sustaining innovation migrates from an existing value network to a new one, it has potential to be disruptive in the latter. [18]

> **" [disruption] triggers a fundamental change in the basis of competition in the product's market along four dimensions of functionality, reliability, convenience and price."**
> - Clayton Christensen [18]

Also, Christensen [18] notes that disruptive technologies usually combine existing technologies in new ways - thus disruption can be seen as rising more often from innovations based on existing technology rather than from distinctively new inventions. This is partly a result of business models mattering economically more than technological sophistication itself, as discussed further in the next chapter.

Christensen [19] widens the scope in a further publication, noting that if one's idea for a product or business appears disruptive to some established companies but might represent a sustaining improvement for others, then one should go back to the drawing board. *"You need to define an opportunity that is disruptive relative to all the established players in the targeted market space, or you should not invest in the idea."*

Understanding disruption through Value Networks

Value Networks were above defined as referring to the context within which a firm conducts business as well as a business analysis perspective. Indeed, Value Networks can also be used to understand the emergence of disruptive innovations. In fact, Clayton Christensen [18] builds his theory of disruptive technologies around them.

According to Christensen [18], a Value Network *"builds upon the understanding of the effect that new technological paradigms can have on mainstream paradigms"*. He argues that *"As the performance demanded by the customers of a value network increases over time so does the performance provided within a technological paradigm."*

However, quite often the performance improvement provided has a different trajectory to the trajectory of performance improvement demanded by customers in the value network. Furthermore, when the aforementioned trajectory slopes differ and performance provided exceeds performance demanded, new technologies that were only performance-competitive in remote Value Networks may migrate into other networks. [18]

According to Christensen [18], the aforementioned difference in performance improvement trajectory slopes provides innovators with a vehicle to new customers previously having viewed the innovation as substandard. This enables the former to offer established mainstream markets a new set of performance value attributes that are now more relevant than the current paradigm. The idea is illustrated in figure 9 below.
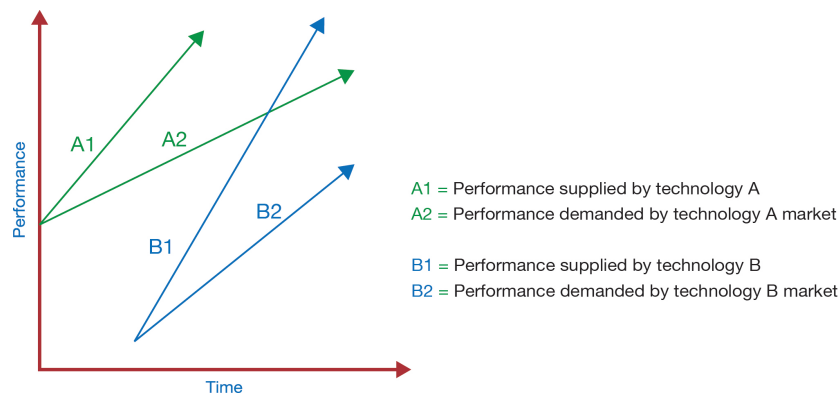
Figure 9: When performance provided exceeds performance demanded new technologies may migrate into other networks. Adapted from Christensen. [18]

Evaluating Christensen's [18] concept of Value Networks critically, it can be seen as vastly overlapping with that of business ecosystems as well as value chains. Both of the latter, however, are deemed outside of the scope of this research.

Nevertheless, Peppard and Rylander [20] note that even if the concept of a value chain has assumed a dominant position in the strategic analysis of industries, it is underpinned by a particular value creating logic. According to them, *"Adopting a network perspective provides an alternative perspective that is more suited to New Economy[1] organisations, particularly for those where both the product and supply and demand chain is digitized."*

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1 The term New Economy was born amidst the dot-com bubble of the late 1990s, referring to the result of the transition from a manufacturing-based economy to a service-based economy.

Disruption through extrapolation and imagination

As discussed above, Christensen [18] ties his approach on disruptive technologies with Value Networks. Krotov and Junglas [21] take a different, somewhat more practice-oriented approach on dividing innovations into sustaining and disruptive. The approach of Krotov and Junglas can be seen as calling for an addition of emphasising long-term scope when evaluating disruptive potential².

Krotov and Junglas [21] offer radio-frequency identification (RFID) as an example of their *"object-oriented"* or *"visionary"* approach. They present a vision of broad adoption of RFID, imagining a world where each individual, animal, and physical object has an RFID tag. They also assume a ubiquitous wireless network that can identify the location and retrieve properties of every individual, animal, or human object. With this vision in mind, they ask the following questions:

Radio-frequency identification (RFID) refers to object tracking through wireless data transfer

- What new forms of knowledge can this data produce?

- What improvements to existing business models can be made by utilizing this knowledge?

- Which new business models can be created with this newly available knowledge?

To summarise the above review, the authors argue that a potentially disruptive technology should be *"addressed with the possible future applications"* in mind. In fact, being what they describe as forward-looking is, according to them, not a matter of *"rigor, methodology, theoretical stance, or subject matter"*. [21]

Disruption - comparing two views

It's clear that Krotov and Junglas [21] analyse potential disruption in a different approach than Christensen [18] above, offering a partly overlapping while also challenging view. Completely disregarding Value Networks and the analytical perspective of Christensen, they emphasise more a long-term analysis.

While presenting different approaches, however, Christensen, Krotov and Junglas agree on the relevance of the topic of assessing disruptive factors in innovations. They all emphasise it as aiding in spotting the signals of industry change, determining the outcome of competitive battles and assessing whether a firm's actions will ensure or threaten future success.

Having presented key terminology and a palette of approaches to assess and classify innovations, this section has contributed towards

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2 The theory of Krotov and Junglas [21] can, in fact, in many ways be associated with Schoemaker's [22] widely-used planning tool "Scenario Planning" - a strategic tool designed to deal with major, uncertain shifts in a company's external environment.

the chapter goal of summarising research. To exemplify the presented ideas as well as to deepen the theoretical backdrop on the topic, the next section will present two examples of disruptive technology.

4.2 BIG DATA, INTERNET OF THINGS

In the previous section we introduced key terminology and reviewed salient theories of current innovation research. To deepen understanding, it is worth reviewing more closely a few examples commonly identified as extremely disruptive.

As will be seen later, Big data and Internet of Things (IoT) will further connect the research to the related context of remote monitoring

This section will review the so-called Internet of Things (IoT) and Big Data - two concepts that will turn out to be closely related. The goal of this section is to uncover aspects of the aforementioned innovations that will further help in understanding approaches to disruptive innovation and, as follows, to the research findings. However, this section does not aim to provide a comprehensive, cross-disciplinary review of IoT nor Big Data research.

The Internet of Things - from objects to smart assets

In the so-called Internet of Things, physical objects are linked with each other, typically using the same communication protocols that connect the Internet. When embedded with sensors and actuators in addition to communications capabilities, physical objects are able to absorb and transmit information on a large scale as well as adapt to changes in the environment.

These networks of devices produce large volumes of data that flow to computers for analysis. According to Chui et al. [23] with IoT *"assets themselves become elements of an information system, with the ability to capture, compute, communicate, and collaborate around information"*. As follows, IoT supports longer-range, more complex human planning and decision making through a heightened awareness of real-time events.

With IoT, objects become so-called *'smart assets'* - tools for understanding complexity and responding to it swiftly and accordingly. According to Chui et al. [23] the result is that connected objects can *"make processes more efficient, give products new capabilities, and spark novel business models"*.

> **"When objects can both sense the environment and communicate, they become tools for understanding complexity and responding to it swiftly."**
> - Michael Chui et al. [23]

The current IoT applications can be see as falling into categories of analysis and automation, as further explained below. As they relate

to remote monitoring, IoT applications related to enhanced situational awareness are especially relevant to this research. [23]

ANALYSIS The category of analysis comprises applications related to tracking behaviour, situational awareness and sensor-driven decision analytics, such as presence-based advertising and environmental awareness.

AUTOMATION The category of automation includes optimisation of resource consumption and processes as well as autonomous systems. Examples include collision avoidance systems and smart energy grids.

The Internet of Things is enabled by advances in wireless networking technology, greater standardisation of communications protocols, silicon chips with falling physical size as well as costs and increases in storage and computing power. However, the technology requirements - especially the tremendous storage and computing resources linked with advanced software systems - rise accordingly.

The uncovered enabling advances of IoT are typical prerequisites for disruption as laid out by Christensen [18] in the previous section

Increasing use will require further decreases in prices as well as more collaboration within networking technologies and related standards. Chui et al. [23] conclude that IoT has great promise yet business, policy, and technical challenges must be tackled before these systems are widely embraced. Early adopters will need to prove that the new sensor-driven business models create superior value.

The rise of Big Data

Nie [24] presents Big Data as referring to datasets extremely large (terabytes to even exabytes)[3] in size and typically collected passively in the private and public sectors from various sources. The sources can include, among others, social networks and device networks such as IoT. McAfee [25] presents Walmart as an example of both the data magnitude and the variety in sources, as the retailer is estimated to collect more than 2.5 petabytes of data every hour from its customer transactions.

In Big Data vast amounts of IoT and other data meets affordable computing power for storage, retrieval, and analysis

Big Data as a concept was born when the related massive amount of data went beyond the ability of average tools to capture, store, manage and analyse effectively [24]. With dedicated tools, however, Big Data is used in many fields ranging from economics to science. Mayer-Schonberger and Cukier [26] define Big Data as *"The ability to harness data to produce novel insights and valuable goods and services."*

A popular example of the disruptive nature of Big Data is e-commerce. The analytics capabilities of booksellers in physical stores has always been restrained to tracking which books sold and which did not.

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3 A terabyte of data can hold around 120 hours of High-definition video. Petabyte and exabyte refer to 1,000 and 1,000,000 terabytes, respectively.

Online shopping, however, revolutionised the understanding of customers. Online retailers track not only what customers buy, but also what else they look at, how they navigate through the webshop as well as how much they are influenced by promotions, reviews, page layouts etc. [25]

> *"Online retailers track not only what customers buy, but also what else they look at, how they navigate through the site, how much they are influenced by promotions, reviews, and page layouts etc."*
> - Mayer-Schonberger and Cukier [26]

Big Data in business - comparing approaches

Traditional business analytics can be seen as focusing on understanding of business performance based on data and statistical methods. McAfee and Brynjolfsson [25] analyse Big Data from this point-of-view, noting that Big Data differs from traditional analytics from the aspects of volume, velocity and variety, as explained further below.

VOLUME Big Data gives companies an opportunity to work with immense amounts of data in a single data set.

VELOCITY For many applications, the speed of data creation is even more important than the volume - (near-)real-time information makes it possible for a company to be much more agile than its competitors.

VARIETY As more and more business activity is digitised, new sources of information and ever-cheaper equipment come together.

Large amounts of data exists on virtually any topic of interest to a business [25]

As implied above, Big Data is an extension to analytics-enabled capabilities of managers being able to measure their businesses and directly translating knowledge into improved decision making and performance. As McAfee and Brynjolfsson [25], also Nie [24] compares Big Data to more traditional business analytics, noting a wide range of advances, benefits and the opportunity for greater innovation in business models, products, and services.

Widespread implications of Big Data

Big Data has widespread implications - and resulting issues - beyond those of economics. For example, Big Data vastly improves the ability to locate and analyse the impact of so-called *'Rare Events'* - events that occur with low frequency but have potentially widespread impact. Rare Events might escape detection in smaller data sets with more limited variables and observations.

Nie [24] continues noting that access to larger datasets with powerful tools means greater accuracy, transparency, and predictive power: *"Through access to Big Data, data scientists and statisticians from all sectors of the economy are now empowered to experiment with large datasets and discover new opportunities and needs, expose greater variability, and improve performance and forecasting."*

> *"[Big Data] offers the capacity to collect and analyse data with an unprecedented breadth and depth and scale."*
> - Danah Boyd [27]

Boyd & Crawford [27] take an even wider - and also less praising - approach to the possible implications of the Big Data era, noting that *"Big Data not only refers to very large data sets and the tools and procedures used to manipulate and analyse them, but also to a computational turn in thought and research."* The authors present various challenges faced by Big Data, referring to areas such as privacy, ethics and accuracy.

The authors [27] continue by asking questions about the related analytic assumptions, methodological frameworks, and underlying biases. They note that in the near future the emergence of three classes of people can be seen - those who create data (both consciously and by leaving digital footprints), those who have the means to collect it and those who have expertise to analyse it.

Boyd & Crawford [27] summarise implications of the emergence of Big Data by noting the technology *"requires understanding the properties and limits of a dataset, regardless of its size."* [27]

> *"There is a problematic underlying ethos that bigger is better, that quantity necessarily means quality."*
> - Danah Boyd [27]

As Boyd & Crawford [27], also McAfee's and Brynjolfsson [25] have a more critical approach to the implications of Big Data. The authors argue that even if the technical challenges of using big data are very real, the managerial challenges are even greater. As with any other major change in business, the challenges of becoming a big data-enabled organisation can be enormous and require hands-on (or in some cases hands-off-) -leadership. *"Nevertheless, it's a transition that executives need to engage with today."*, McAfee's and Brynjolfsson summarise.

SUMMARY

The chapter started by defining disruptive technology, sustaining technology and Value Networks. The key difference between disruptive

and sustaining technology is that the latter are typically innovations in technology whereas the former can be seen as changing markets. Value Networks play a role as business analysis perspectives describing social and technical resources within and between businesses.

The nature of disruptive technologies, including contradictions and established common ground as seen in current research, was reviewed. Several conjunctive features of disruptive technology were revealed when summarising current research. Christensen [18] noted that disruptive innovation typically is cheaper, simpler, physically smaller and pursued by entrant firms. It is often based on existing technologies and is in fact more related to innovating than inventing.

Christensen [18] added that disruptive technologies do the opposite to sustaining technologies - initially the market and potential customers are missing, and the technology probably strives in attributes not appreciated by the market. Krotov and Junglas [21] offered another perspective, relying on scenario planning and approaching disruption with questions reflected upon assumptions and hypotheses.

Technological innovation was approached with the examples of the Interner of Things (IoT) and Big Data. Using e-commerce as an example it was concluded that both Big Data and IoT have great promise yet business, policy, and technical challenges must be tackled for wider embracement.

However, along with Big Data rises even ethical complexities. Mayer-Schönberger and Cukier [26] noted that *"Today data can be used beyond proving or dismissing a pre-defined hypothesis".* Also, moving from small quantities of data at a high cost to large quantities of data at a lower cost increases variety in data quality. With Big Data one needs to settle for a general direction instead of striving to know a phenomenon down to extreme detail. Mayer-Schönberger and Cukier describe Big Data as *"messy"*, noting that *"What is lost on accuracy at the microlevel is gained as accuracy on the macrolevel."*

The goal of this chapter was to deepen the understanding on what defines radical technological innovation and how this type of innovation should be nurtured. More detailed chapter goals were set to include uncovering conjunctive features, the nature as well as implications of technologies that could potentially empower disruptive business models. The next chapter will build on this one, adding business-related aspects to form an overall review on disruption.

BUSINESS DISRUPTION

This is the third of a four-chapter literature review. The chapter critically reviews salient business innovation literature with a special emphasis on opportunities based on technological advancements as outline in the previous chapter. The goal of the chapter is to give the reader necessary business development and innovation insight to fully assess the overall results of the research.

Introduction

The previous chapter continued the literature review by discussing key terminology and research related to disruptive technologies. Disruptive technologies were concluded as being difficult to spot as well as requiring a specific environment and type of nurture to thrive.

The goal of this chapter is to develop an understanding of how an identified technological disruption can be further developed into a disruptive business. The chapter goal is met by not only bridging technology and business, but also by defining the concept business models and underlining their importance. Approaches to and challenges of disruptive business are reviewed.

5.1 TECHNOLOGY IS ONLY AN ENABLER

The second chapter discussed disruption from a technological point-of-view. However, as it will turn out, a successful business model is one of the key enablers for a business to become a leader in its market.

From technology innovation to conceptual innovation

Christensen [18] argues that with disruptive technology as enabler, striving for a leadership position is essential. If contenting to take action on merely sustaining innovation and technologies, leadership is not essential for success: *"Being a follower in sustaining technologies is a viable and possibly desirable strategy, but leadership in disruptive technologies creates enormous value."*

Also Hamel [28] prioritises aspects of business over those of technology when discussing the pursuit of disruption. "*If you look at the companies that have created new wealth over the last decade, almost all of them had more than just a new product or a new technology. They had a completely different conception of the entire business*", he notes.

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> *"Of course a lot of the most interesting innova-*
> *tions have nothing to do with technology anyway.*
> *They're examples of conceptual innovation."*
> - Gary Hamel [28]

Hamel's approach on putting more relevance on conceptual inno-
vation rather than that of product or technology is worthy of further
review and examples. One of the most commonly recognised concep-
tual innovators of the 2010s is California-based so-called *'ride-sharing'*
company Uber. Also called *'the world's largest taxi company'*, Uber op-
erates in fact without owning any vehicles, completely innovating the
concept of the business they're in.

Common pitfalls in nurturing disruption

e-Strategy refers to
strategies related to
Internet business
models

Hamel [28] notes that information technology has been the target for
immense capital investment in the last decade, but efficiency gains
have not ended up on the bottom line. He argues this is partly be-
cause many companies have similar e-strategies, a potentially disrup-
tive technology can be reduced into merely a trend should it be com-
bined with the same business perspective by most players. "*It's not
self-explanatory that companies will see competitive advantage coming out
of a disruptive technology should it not be coupled with a disruptive way of
thinking*", he notes.

Lindgardt et al. [29] also argue for coupling disruptive technology
with business model innovation, noting that the latter "*can not be imi-
tated as easy as product or process innovation*". Also, Bower [30] notes that
most well-managed, established companies are consistently ahead of
their industries in developing and commercialising new technologies.
"*However, these same companies are rarely in the forefront of commercial-
ising new technologies that don't initially meet the needs of mainstream
customers and appeal only to small or emerging markets*", he adds.

The previous aspects and examples have shed light on the impor-
tance business has on taking advantage on disruptive innovation. The
following chapter continues the conversation from an aspect of busi-
ness models.

5.2   BUSINESS MODELS

The previous section framed disruptive technology merely as an en-
abler, requiring it to be paired with business innovation to achieve a
truly breakthrough disruption. This chapter reviews this idea further,
taking a closer look at the role business models in particular play.

The potentially crucial role of business models

Giesen et al. [31] separate business model innovation and disruptive technologies and even praise the former as a value in itself. Indeed, researchers such as Giesen et al. argue that understanding ways to leverage business model innovation is a key source of competitive advantage in today's economy. *"Products and services can be copied; the business model is the differentiator"*, they note.

> **"Business model innovation has been found to correlate to a higher degree with operating margin growth than other types of innovations, like product or service innovation."**
> - Breiby et al. [32]

In their research firms that were financial outperformers put twice as much emphasis on business model innovation as underperformers, Giesen et al. note. [31]

Definitions - or the lack thereof

A consensus on the definition of the term Business model has not been established in the research community. In fact, Schallmo and Brecht [33] found 52 definitions for the term in academic literature with several focuses, with the most salient ones summarised in table 2 in the Appendix.

In the paper The Power of Business Models from 2005, Shafer et al. [34] note that *"no generally accepted definition of a business model has emerged to date"*. Five years later in 2010 Zott et al. [35] published a working paper with the goal *"to provide the most comprehensive and up-to-date literature review on business models"*. Their publication searched through 1253 articles on the subject from a range of research databases and business publications, stating that *"Despite the overall surge in the literature on business models, scholars [still] do not agree on what a business model is."*

Figure 10 visualises the rise in related literature in the past two decades. Despite a seeming lack of common ground throughout an increasing amount of literature, most researchers tend to agree that business models describe how an organisation combines a set of elements to create value to customers and partners.

> **"Business models describe how an organisation combines a set of elements to create value to customers and partners."**
> - Author
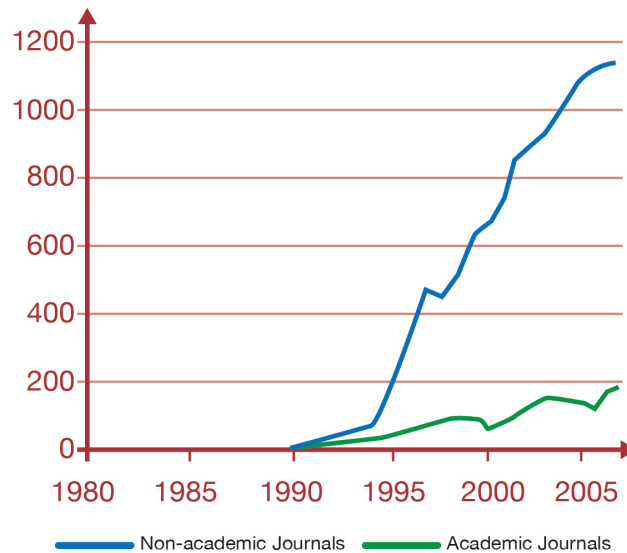
Figure 10: Published business model articles in the business and management fields. Adapted from Zott et al. [35]

Two main schools of thought can be uncovered when researchers have explicated their business model definitions into concepts: the structural and the behavioural approach. The former focuses on structuring activities, functions and assets as well as describing their interconnectedness. The latter explores the logic cause-and-effect relationship between decisions, consequences and feedback in the system as a whole. To shed more light on the types of business model frameworks that are being researched, one of the most common examples is reviewed next.

A business model framework example

Osterwalder and Pigneur [36] define a business model as *"the rationale of how an organisation creates, delivers and captures value"*. As an example of one of the most essential business model frameworks, the authors present below elements of their widely adopted business model framework The Business Model Canvas. The nine components of the business model ontology together give an approximation to a holistic view on the business model of a company.

- Value proposition: describes products and services that create value for a customer segment.

- Customer segment: defines different groups of people or organisations a company aims to reach and serve.

- Channels: describe how a company communicates with and reaches its customer segments to deliver a products and services.

- Customer relationships: describe the types of relationships a company establishes with customers.

- Revenue streams: cash a company generates from each customer segment.

- Key resources: most important assets required to make a business model work.

- Key activities: describe the most important activities a company needs to do to make its business model work.

- Key partnerships: network of suppliers and partners that make the business model work.

- Cost structure: all costs incurred to operate a business model.

Giesen et al. [31] note that especially the revenue model of the above-listed Revenue streams -element allows leveraging new technologies. The authors lift as examples Gillette's strategy of under-priced razors boosting sales of the blades and Netflix introducing a new way of billing for movie rentals.

Alternative approaches to business model frameworks

In addition to identifying elements in a business model, Schallmo and Brecht [33] consider business models on the two separate levels of industry and company. However, they note that the levels of business models as well as their elements are still strongly disagreed on, emphasising that *"a procedure for business innovation on an industry level is missing"*.[1] The authors further present a definition for business model environment comprising of micro- and macrolevels, as elaborated below:

MACRO ENVIRONMENT The Macro Environment consists of six drivers of political, economical, social, technological, environmental and legal nature. [33]

MICRO ENVIRONMENT The Micro Environment consists of forces driving industry competition, including potential new entrants, buyers bargaining power, substitute products or services, suppliers bargaining power, rivalry among existing firms. [33]

This section reviewed business models and related innovation. It was concluded that currently there is no consensus on what a business model is. However, the most salient research can be concluded

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1 Note that in the previous chapter it was established that disruption typically indeed does change entire industries, additionally emphasising Schallmo's and Brecht's aspect.

to share the same underlying purpose for business models - they all explain on or more aspects of the value creation nature of companies.

With the first section underlining the role of business in disruption and the previous section having presented the concept of business models, the last section of this chapter will discuss aspects of pursuing disruptive business in general.

5.3   PURSUING DISRUPTIVE BUSINESS

As the previous sections have unveiled, technology is merely an enabler of disruptive business, but at the same time business model innovation isn't yet well researched. This sections aims to uncover further approaches to their cross-section, reviewing both related challenges as well as approaches.

Customers spotting disruption

There are several challenges in successfully taking advantage of potentially disruptive technologies. Below are listed some of the findings of the most salient research on the topic.

First, recognising disruptive technologies is difficult. Generally, disruptive technologies look financially unattractive to established companies, as concluded in the previous chapter. As a result, managers typically conclude that the technology cannot make a meaningful contribution to corporate growth. [30]

Second, disruptive technologies introduce a very different package of attributes than the ones mainstream customers historically value. They also often perform far worse along one or two dimensions that are particularly important to those customers. This often yields key customers not being interested in the proposed technology, as suggested in the previous chapter. [30]

Failing by doing the "right thing", eg. listening to customers is what Christensen [19] calls an 'innovator's dilemma'

Clayton Christensen [19] reflects on the same approach as Bower [30], and in what he calls Resource Dependence Theory, he notes that "*Established companies are held captive by their most profitable customer who impose a great indirect control of the resource allocation process inside the firm.*"

> **"Customers allocate an organisation's resources, not management."**
> - Clayton Christensen [19]

Thus, sensible resource allocation can be seen as being at the root of companies' upward mobility and immobility to lower markets. "*Good resource allocation processes are designed to weed out proposals that customers don't want, and will weed out disruptive innovations.*", Christensen summarises. [19]

Organisational dynamics obstructing disruption

According to Christensen [19], with the aforementioned lower initial performance of disruptive technologies, companies would need to present them initially to lower markets. However, while leading companies of a certain sector can move easily and steadily to high-end markets, moving down to lower-end markets is difficult because of the image of the company. Also, down-market development would mean decreased financial performance, as noted above.

Christensen [19] further notes that "*When confronted with a disruptive technology, established firms typically view them as a tech challenge, seeking to improve the tech to suit known markets.*" However, when architectural technology change is required, organisations that facilitate components level innovations - such as the aforementioned technology challenges - fail. Also, when companies are required to make changes to their whole system of activities on an architectural level, organisational politics may become an issue, note Kim et al. [37]

Furthermore, it is worth noting that an opportunity that excites a small company typically isn't large enough to excite a larger corporation - as companies become large, they lose the ability to enter small, emerging markets. This is caused by an evolution in values, according to Overdorf. [38]

The lack of market research

It's of no help that standard market research can provide little or no benefit for exploring the potential of disruptive ideas - in fact market research can even obstruct radical idea development [39]. Bowers [30] agrees in his research, noting that "*at the point a company needs to make a strategic commitment to a disruptive technology, no concrete market exists*".

Johnson [40] presents architectural-level challenges to a company's business model. The first is a lack of definition: "*Very little formal study has been done into the dynamics and processes of business model development.*", he notes. Second, few companies understand their existing business model well enough - "*the premise behind its development, its natural interdependencies, and its strengths and limitations*". This results in companies not knowing when they can leverage their core business and when success requires a new business model.

With challenges related to the role of customer feedback, organisation dynamics and lack of market research reviewed, salient approaches to the aforementioned challenges are discussed next.

Focusing on spotting disruption

Above it was noted that recognising a disruptive technology is a key challenge for businesses. Indeed, Bower [30] notes that few compa-

nies have systematic processes in place to identify and track potentially disruptive technologies.

> *"There is a method to spotting and cultivating disruptive technologies."*
> -Joseph Bower [30]

As an approach, Bower [30] points to internal disagreements: "*Marketing and financial managers, because of their managerial and financial incentives, will rarely support a disruptive technology. On the other hand, technical personnel with outstanding track records will often persist in arguing that a new market for the technology will emerge—even in the face of opposition from key customers and marketing and financial staff.*" Disagreement between the two groups often signals a disruptive technology that top-level managers should explore, Bower explains.

Evaluating disruptive potential

With a suspected disruptive technology spotted, the next step is to define it's strategic significance. Bower [30] offers a simple graph plotting exercise. First, define product performance as it is defined in mainstream markets on the vertical axis and time on the horizontal axis. Then, with expected trajectories, plot performance enjoyed by customers, performance actually required by market and performance of disruptive technology.

As seen in figure 15, if believed the new technology might progress faster than the market's demand for performance improvement, then that technology, which does not meet customers' needs today, may very well address them tomorrow. However, note that many of the disruptive technologies Bower studied in his research never surpassed the capability of the old technology. It is the trajectory of the disruptive technology compared with that of the market that is significant.[2] [30]

Tackling information and marketing challenges

To avoid allowing small, pioneering companies to dominate new markets, executives must personally monitor the available intelligence on the progress of these businesses, Bowers [30] notes. He recommends this to take place through monthly meetings with technologists, academics, venture capitalists and other nontraditional sources of infor-

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2 For example, the reason the mainframe-computer market is shrinking is not that personal computers outperform mainframes but because personal computers networked with a file server meet the computing and data-storage needs of many organisations effectively, intersecting with the performance demanded by the established market. [30]

mation. "*They [challenged executives] cannot rely on the company's traditional channels for gauging markets because those channels were not designed for that purpose*", he explains.
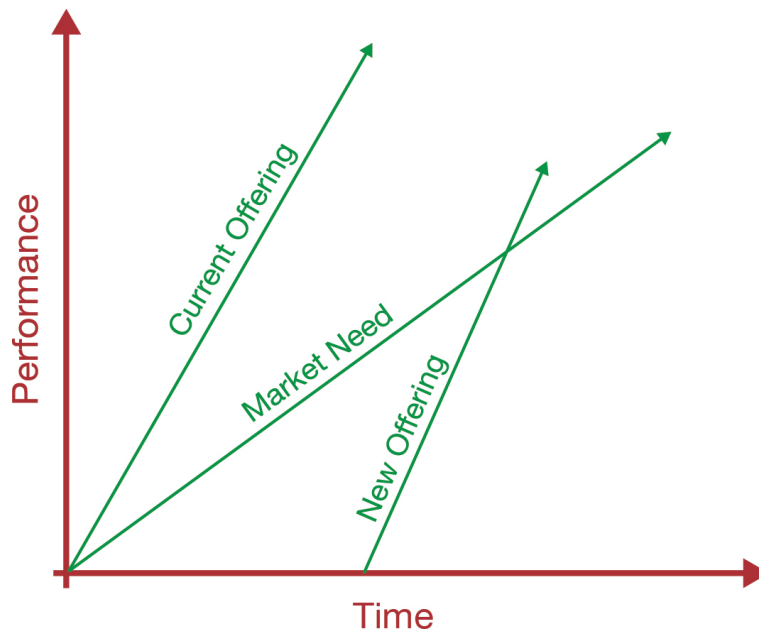
Figure 11: A technology's rate of development should exceed that of the market, not necessarily also competition. Adapted from Bower. [30]

Earlier in the section Christensen [19] presented established companies as typically being challenged by a habit of framing disruption as a technology challenge. They often try to develop disruptive technologies to suit known markets, he summarised. However, Christensen believes disruption indeed is a marketing challenge, noting that "*Firms successful at commercialising a disruption frame it as a marketing challenge, finding a market embracing the attributes of the tech. A market must be developed and new customers found*", he summarises.

Taking on organisational challenges

Bower [30] continues to urge building disruption-pursuing businesses in independent organisations. "*The strategy of forming small teams into skunk-works projects to isolate them from the stifling demands of mainstream organisations is widely known but poorly understood*", he notes.

Bower [30] also recommends keeping the aforementioned organisations independent, noting that "*Most managers assume that once a spin-off has become commercially viable in a new market, it should be integrated into the mainstream organisation. However, with disruptive technologies, folding the spin-off into the mainstream organisation can be disastrous.*"

When the independent and mainstream organisations are folded together in order to share resources, debilitating arguments inevitably arise over which groups get what resources and whether or when to cannibalise established products, Bowers summarises.

Overdorf [38] has researched the same topic as Bower, also warning of changing an organisation when facing disruptive change: "*Before taking action towards the change, an organisation must understand what types of change the current org can and can't handle. The core capabilities of the org must be systematically recognised. The suggestion is that three factors affect - resources, processes and values.*"

When looking at embracing an innovation, it's important to understand how these aforementioned factors might affect, Overdorf [38] continues. He extracts three ways for a large company to develop processes for embracing disruptive innovation - creating new organisational structures, spinning out an independent organisation and acquiring a new organisation.

Christensen [19] presents a similar approach to that of Overdorf's above, noting that it's important to "*match the size of the organisation to the size of the market*". He explains that projects aimed at commercialising disruptive innovations should be given to organisations small enough to get excited about small market opportunities. "*Johnson comprises 160 independent companies, each of which can introduce small disruptive products such as disposable contact lenses*", he offers as an example.

Approaching disruption-pursuing business model design

Wirtz [42] defines the process of creating disruptive business as a business model design process. He presents it with four phases: idea generation, feasibility study, prototyping and decision making. However, in his model customer needs are not strongly considered. Osterwalder and Pigneur [36] argue against the approach of Wirtz, noting fact the development of business models should be based on customer benefit, which *"is created by fulfilling customer needs"*.

In addition to emphasising the organisational units discussed in the previous subsection, Schallmo and Brecht [33] argue that even business models can vary inside a company. They note that especially functioning in several business fields or countries justifies even simultaneously implementing several business models.

High-level guidelines for business model innovation

Kim and Mauborgne [37] note that since value to buyers comes "*from the offering's utility minus its price*", and because value to the company is generated from the offering's price minus its cost, value innovation is achieved only when the whole system of utility, price, and cost is aligned. Osterwalder and Pigneur [36] take a similar approach, stat-

ing that business model innovation is not about looking back or looking to competitors, but instead "*about challenging orthodoxies to design original models that meet unsatisfied, new or hidden customer needs*".

Instead of introducing occasional strategic business development, Hamel [28] points out that business innovation must be made continuous. "*It is becoming more difficult to maintain a distinctive strategy for a variety of reasons*", he notes. For example, employee mobility and consultants transfer insight very efficiently: "*the diffusion mechanisms for strategy insights are so much better today than they ever were before*". The dilemma for many companies is, Hamel points out, that they don't have enough variety and experimentation in their strategies. He also notes that *if you want scale and scope advantages, you have to do things consistently over time and across projects*".

Practical notes on innovating business models

In Blue Ocean Strategy, Kim and Mauborgne [37] discuss what they call "*breaking the Value-Cost Tradeoff*" - something which is very relevant also when maximising advantage of disruptive innovations. Their approach encompasses studying the following questions:

Note that Blue Ocean Strategy as an independent aspect is left out of the scope of this research

- Which of the factors that the industry takes for granted should be eliminated?

- Which factors should be reduced well below the industry's standard?

- What factors should be raised well above the industry's standard?

- What factors should be created that the industry has never offered?

Hamel [28] further concludes that creating a sustainable strategic approach for embracing disruptive innovation requires researching the underlying, enabling organisational elements. He identifies three different kinds of capital serving as "*the catalyst translating the traditional sources of capital into wealth*":

- Imagination capital: the ability that people have to imagine entirely new uses for their traditional capital.

- Entrepreneurial capital: the courage and the guts of people to actually experiment and try new things.

- Relationship capital: the connections that people in the organisation have with each other and with organisations and individuals outside of the company.

The role of competition as a design variable and metric

In addition to the aforementioned capitals, Hamel [28] notes that there are at least a dozen major design variables in a business. "*How you go to market, which competencies you use, how you put together your value web, what is your core mission, where do you look for differentiation, and so on*", he lists. However, a challenge turns out to be that "*Most people don't see those as design variables after a while. They just start accepting them for what they are.*"

Kim and Mauborgne [37] find that in sharp contrast to companies playing by traditional rules, the creators of what they call uncontested market space - or *'Blue Oceans'* - never use the competition as a benchmark. Instead they "*make it [competition] irrelevant by creating a leap in value for both buyers and the company itself*".

"*Company and industry are the wrong units of analysis. The traditional units of strategic analysis—company and industry - have little explanatory power when it comes to analysing how and why blue oceans are created. The most appropriate unit of analysis for explaining the creation of Blue Oceans is the strategic move - the set of managerial actions and decisions involved in making a major market-creating business offering*", Kim and Mauborgne continue. [37]

Emphasising cross-sectional industry overlook

Furthermore, it seems current research on the successful interplay between business and disruptive technologies points out external collaboration as a key point of focus. Giesen et al. [31] refer to the industry level introduced by Schallmo and Brecht [33] in the previous section, noting that harnessing disruptive technologies for business leadership requires most of all "*understanding the industry context, defining one's current position as well as building capabilities to manage business model innovation*".

Kim and Mauborgne [37] urge companies to "*focus on the big picture, not the numbers*", labelling popular strategic planning processes as all too often simply number-crunching exercises keeping companies locked into making incremental improvements.

The above notion of Kim and Mauborgne can be seen to have similarities with the approach Krotov and Junglas [21] have to evaluating technological disruption potential, as presented in the previous chapter. Krotov and Junglas as well as Kim both emphasise imagination and vision over strictly fact-based analytics.

SUMMARY

To contribute to a thorough literature review on current research, the goal of this chapter was set to develop an understanding on how an

identified technological disruption can be further developed into a disruptive business. Continuing the literature review started in the previous chapters, the goal was met by extracting concepts on how a business can best nurture technological disruption.

As Christensen and Hamel concluded, technology is merely an enabler and true disruption is born from business and concept innovation [**christensen**] [28]. Also, the lack of a shared definition of a business model was uncovered, even if the practical implications related to how a company operates around value are clear.

> *"A better business model will often beat a better idea or product."*
> -Henry Chesbrough [43]

Disruptive business model innovation was concluded to face a palette of obstacles, starting from disruptive innovations typically being extremely difficult to spot early on. Bower noted that many companies are ahead of their industries in commercialising new technologies, but only regarding innovations that excite their current customers. [30]

Christensen points out the aforementioned as part of his theory titled The Innovator's Dilemma, summarising that purposeful resource allocation processes weed out proposals that customers don't want, including disruptive innovations in their early phase. [19] However, the disruption potential of an innovation can be studied using extrapolated graphs that include the offered performance. This performance should, however, be compared to the performance requirement of the market, not competition.

> *"However, these same [industry leading] companies are rarely in the forefront of commercialising new technologies that don't initially meet the needs of mainstream customers – "*
> -Joseph Bower [30]

Christensen notes that with the lower initial performance of disruptive technologies, companies would need to present them initially to lower markets. However, challenges in moving downmarket were presented both in the light of brand deflation and financials. Also, standard market research was concluded to provide little or no benefit for exploring the potential of disruptive ideas.

Bower underlined creating organisations completely independent from a company's mainstream business. Also, the organisation size should match that of the market. It was also added that management needs to sustain a thorough outlook into their industries using various non-traditional information sources. [30]

Hamel and Johnson emphasised future business innovation being based on understanding well enough the business model currently employed by a business. However, Hamel further notes that companies tend to stop being able to differentiate the most fundamental business model elements after a while. [28] [40]

Finally, some aspects of the well-known Blue Ocean Strategy were reflected upon leveraging on disruptive technological opportunities. The findings support the earlier mention of market performance requirements being one's benchmark instead of competition. In all, business model innovation was concluded to best be executed continuously with lots of variety and experimentation.

This summary concludes the third chapter of the research. The next chapter will further analyse the findings of both this and the previous chapter in preparation for further research in the form of interviews.

LITERATURE FINDINGS AND CRITIQUE

This is the fourth and last chapter of the literature review. The chapter summarises the findings of the three literature review chapters presented earlier and defines interview questions. The goal of the chapter is to extract a backdrop against which an empirical study can be conducted in the following chapters.

Introduction

The goal of the literature review was defined in the second chapter as to build grounds on which a purposeful empirical research can be concluded in the third part of the research. The underlying aim was outlined as to give readers an overview of literature relevant to the research, enabling proper reflecting on the research findings. The goals will in this chapter be reached by not only summarising the literature findings, but by also presenting a gap in research by extracting interview questions for an empirical study.

The first chapters of the literature review focused on logistics as well as the research and practice fields of technological and business innovation. The approach was to construct an understanding of logistics as well as technological and business aspects of radical innovation. Related definitions, classifications and processes were reviewed and the current state of research was approached by surveying seminal papers and other literature.

The following insight can be seen as the author's comments when taking a cross-sectional approach to the material. The chapter can be used to get an overview of the examined aforementioned fields, or used as a starting point to sample only parts of the literature review.[1] The literature review findings continue below with literature findings as well as critique. Links to related academic fields are reviewed and interview questions extracted.

Literature reviews summarise related research and identify a gap therein

LITERATURE FINDINGS

As illustrated by the research flow visualised in figure 1, the literature review holds a significant role in the research structure. The literature review has covered the current state of affairs of research in the fields

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1 It is worth noting that while the summary represents some of the main points presented in the previous chapters, it is by no means a substitution to a full reading. The coming sections in the research, especially the discussion, assume knowledge of the aspects covered in the literature review.

of logistics, technological disruption and business innovation. Next a brief cross-section of salient findings from a survey of seminal papers and other literature is reviewed.

- Common themes and drivers cutting through all the research fields examined seemed to include globalisation, urbanisation and automation. Possibly partially as a result, the role of customer service can be seen as increasing in areas of logistics, business innovation and technological disruption.

- Supply chain development seems to be under more turbulence and complexity than ever. In all fields companies are facing increasing competition and are forced to innovate.

- In both the at one time slow-moving industry of logistics as well as the new, fast-paced world of disruption, markets are up for grabs. Incremental changes in relative strength of companies seems to be a thing of the past as landslide development steps are frequent and unpredictable.

- Access to and analysis of information seems to nearly create value in itself regardless of the industry. Improving visibility for gains in efficiency both on operational as well as strategic levels is industry standard.

- Research seems to describe disruptive innovations as typically initially lacking in market pull, driven by attributes not valued by customers. It seems Internet of Things -based disruptions such as remote monitoring of bulk distillate tanks need to be derived into producing either significant increase in customer service or decrease in costs in order to thrive.

- It seems leaps in progress in logistics, business modelling and technological development all face some degree of severe obstacles in policies. The bigger implied picture can be seen as being aware of seemingly simply things not getting in the way of nurturing conceptual level innovation.

- Having interdisciplinary insight is important for an increasing amount of industries. Capturing a market in distillates distribution by introducing a business model based on remote monitoring might need strong branding- and services-related innovation know-how, for example.

- To be able to develop a business, its current position must be very well understood. However, not only are markets developing faster than ever, but even academics don't have a clear consensus of a what a business model is. The resulting challenge for practitioners is to keep recognising all design variables in their business model.

- Practitioners must stay active. In all reviewed fields, variety and experimentation rose as common enablers of increasing understanding of the present business models, seeing industry trends and creating windows for disrupting the predominant status quo. Keeping variety on all levels of operations must be constant to ensure the resulting business innovation.

- Existing organisational structure must not be allowed to interfere with nurture of disruption. Size, structure and independence of teams built around individual innovations in forward-thinking companies reflect how seriously opportunities of disruption are taken.

- Staying up-to-date is more important than ever. As industries as developing fast, practitioners cannot rely on past guidelines and sources of insight, but need to consistently seek varied knowledge on topics that even seem disconnected at first.

- Ecosystems around value propositions must be nurtured; technology must combined with business, software with hardware, products with services.

- Seeking for disruptive success instead of that of sustaining and embracing as well as quickly learning from failure is a must.

- As a difference to tackling past business challenges, those related to disruption require approaches beyond excelling at traditional strategy and management.

> *"Early adopters will need to prove that the new sensor-driven business models create superior value."*
> -Michael Chui et al. [23]

LINKS TO OTHER ACADEMIC FIELDS

This research has focused on the areas of logistics, technological disruption and business innovation. Related areas include mainly flavours of management disciplines such as innovation management, change management, strategy and organisation theory. Together these fields form the necessary theoretical platform to successfully facilitate, initiate, and implement processes related to taking advantage of disruption. These adjacent academic fields are further briefly touched upon below.

INNOVATION MANAGEMENT Innovation management focuses on the importance of information and idea flows from both internal

and external sources, emphasising processes more than innovation results. Ideas and information should be actively aided to flow between functions, both in terms of internal information in the functions but also from their external interfaces, like marketing's connection with customers. Innovation management capabilities give the organisation the ability to sense both innovation opportunities and markets threats.

CHANGE MANAGEMENT Change management deals with creating change acceptance in the organisation and mitigating rigidities hindering the process. It is focused on changing the organisational system supporting the business model. Change management includes management of attitudes, behaviours and issues related to the change. Especially with regards to business model innovation, change management is an integral part from the start of the process.

STRATEGY Strategy and disruption -related efforts are tightly integrated. Disruption activities in a business can be seen as an input, a process tool, a roadmap in strategy process or as an implementation of realised strategies. Different elements of disruption efforts can be mapped to different strategy levels, and strategic context plays an integral part in the input to generating new disruption. Disruption activities entail such systemic changes to the business that it cannot be decoupled from strategy.

ORGANISATION THEORY Organisation theory relates to designing structures and processes of and in organisations. An organisation, by its most basic definition, is an assembly of people working together to achieve common objectives through a division of labor. It provides a means of using individual strengths within a group to achieve more than can be accomplished by the aggregate efforts of group members working individually.

LITERATURE CRITIQUE

Before concluding the literature with a summary below, a brief general critique of the literature review is presented. These comments are based on shortcomings that have been observed during the review of the literature and create the foundation for the reader's assessment of the empirical case studies. A more explicated empirical approach strategy is outlined in the next section.

- Several of the business model concepts and ontologies presented here are quite novel and therefore have a relatively short application history. Research into the effects and usefulness of busi-

ness models in businesses is lacking. This reduces the emphasis that can be put on business models in the research conclusion.

- The diverging and fragmented nature of the academic field of disruption is difficult and overwhelming for practitioners to fully grasp and synthesise at this point in time. The breadth and depth of new literature in the field is large and no dominating paradigms have been formed. This further reduces the trustworthiness of the research results.

Some of literature included in the literature review could be classified as 'airport literature'

- Disruption has in the recent years become very popular among general media while not yet attracting significant academic research efforts. While an exhaustive scope of material was reviewed for this research, a large part of it can be classified as more general literature instead of research literature per se. This awakens cracks in the solid credibility of the research conclusions.

- Many examples of disruption feature famous business cases from the 1900s. However, when looked at more broadly, these business cases are often used as examples for a wide variety of aspects on business success. Thus their relevance in showcasing attributes of specifically disruption can be questioned.

With the aforementioned aspects presented, it can be concluded that the literature review does indeed include some aspects of inconsistency. However, this is partly explained and excused by the researched fields being novel and suspect to heavy on-going research, respectively.

According to Webster [44], a literature review on an emerging issue can be less encompassing in terms of the scope and number of included articles. This supports the literature review's intention of not exceeding analysing a representative sample of related articles found in mainstream publications and literature.

EXTRACTING INTERVIEW QUESTIONS

Interview questions are formed below. However, to ensure sufficient backdrop for reflection, the problem statement, research goals and research questions of the research presented in the first chapter are briefly reviewed.

The first chapter related the research problem to how distillates distributors best could take advantage of reliable, cost-efficient fill level measurement technology. The goal of the research was set at extracting meaningful managerial implications combining both technological and business aspects, contributing both to the areas of logistics practitioners as well as research on business innovation. Finally, research questions were concluded to be the following:

RESEARCH QUESTION 1 What are some potential directions in which distillates distribution business models might develop as a result of the availability of next-generation remote monitoring?

RESEARCH QUESTION 2 Which best practices for the distillates distribution business are likely to support embracing a new generation of remote monitoring solutions?

The research questions stated above were mirrored against the findings from the literature review. Based on a gap in the offering of current research, and to answer both research questions, interview questions were synthesised. To answer the first research question, the following interview questions emerged:

- What are some key principles when separating innovation between sustaining / incremental and disruptive?

- What types of core principles dictate investing in new technology?

- What are some general guidelines for innovation in the automotive liquids delivery industry in the next ten years?

- What general implications might broad introduction of remote monitoring bring?

We argue these questions illuminate the first empirical research goal. To answers the second research question, the following interview questions were synthesised:

- What type of signals reveal potentially disruptive opportunities?

- How do you replace a lack of long-term insight when creating new markets with disruptive innovations?

- How do you prevent processes from weeding out disruptive opportunities, as described in Clayton Christensen's [19] Innovator's Dilemma?

- What are some main principles to follow when cultivating technological disruption into business innovation?

- How do you ensure your organisation is constantly engaged in conceptual-level business innovation?

- How do you keep a large organisation capable of entering small, lower-end markets?

With the design flow review in the this chapter, the interview questions listed above can be seen as supporting well the research questions. Combined with a thorough discussion of the literature review findings in later chapters, the research goal will be achieved.

SUMMARY

This chapter concludes the literature review, the second part of the research. The findings from the literature review's previous three chapters were extracted and summarised. Although no dramatic inconsistencies were uncovered between the reviewed sources, several different approaches to same concepts were found.

Links to other academic fields were presented and the sources were assessed critically. It was concluded that the while the literature review can be seen as not completely solid, it is thorough enough as the researched fields are novel and constantly developing.

The research goal and research questions were revisited. Interview questions were extracted by mirroring the literature review findings on the research goal and research questions. The next part of the research presents interview findings and critique.

Part III

EMPIRICAL RESEARCH

The third part of the research contributes towards the research goal by addressing the research gap identified in the literature review. The goal is reached by presenting interview findings along with criticism thereof.

INTERVIEWS, DISTILLATES DOWNSTREAM

This is the first of three chapters of empirical research of the study. The chapter comprises of data collected from interviews with three industry practitioners. The goal of this chapter is to critically summarise the interviews conducted based on findings from the literature review. Rich exposure to empirical data also encourages critical assessment of the study findings from the reader's side.

Introduction

This is the first chapter of the third part of the interview, and it moves the research focus forward onto empirical methods. The chapter reviews collected primary data to answer the first research question: *How are current business models likely to adapt to wide-scale remote monitoring?* The interview subjects were chosen from a pool of practitioners within the distillates distribution industry.

The previous research part presented a thorough literature review. As research questions were reflected on the identified research gaps, the following interview questions were synthesised:

- What are some key principles when separating innovation between sustaining / incremental and disruptive?

- What types of core principles dictate investing in new technology?

- What are some general guidelines for innovation in the automotive liquids delivery industry in the next ten years?

- What general implications might broad introduction of remote monitoring bring?

The next chapter will further review interviews conducted with adjacent industries. In the last chapter of part III all empirical data will be synthesised and critically discussed. The fourth and last part of the research covers a summarising discussion.

Interview subjects

As explained in the second chapter, the research approach included the use of semi-structured interviews. Thus the above-mentioned interview questions were used merely as discussion theme guidelines instead of strictly enforced questionnaires.

The interviewed companies of Wallis Lubricants, Energy Petroleum and ST1 are briefly presented below:

WALLIS LUBRICANTS Wallis Lubricants is a Missouri-based petroleum marketer the parent company of which was founded in 1968. Today the Wallis family of companies supplies petroleum products throughout most of the Midwest United States and also operates a gasoline transportation division Wallis Transport. Wallis Lubricants supplies more than 2,000 different lubrications solutions for industrial, automotive, metalworking and commercial businesses with combined annual fuel deliveries of more than 500M gallons.

ENERGY PETROLEUM Energy Petroleum & Marketing, founded in 1927, is a fuel and lubricant distributor and convenience store chain in the Midwest United States. Energy Petroleum offers premium products to commercial and industrial customers in a variety of industries including transportation, agriculture, and construction. Products include gasoline, diesel fuel, aviation fuel, kerosene, lubrication products and total product solutions.

ST1 St1 is a Finnish energy company founded in 1995 under the name Greenergy Baltic. The company operates service stations in Finland, Sweden, and Norway under the St1 and Shell brands. St1 is also engaged in various ventures related to alternative energy sources.

The rest of the chapter presents findings from conducted interviews.

7.1 MR TOM MARVAL, MR GREG PORTELL / WALLIS LUBRICANTS

Figure 12: Wallis Lubricants is part of Wallis Companies, founded in 1968.

Mr Tom Marval and Mr Greg Portell are the Logistics Manager and Director of Strategic Planning, respectively, at Missouri-based petroleum marketer Wallis Lubricants.

The nature of the industry and the role of innovation

Greg starts by noting the general background of the industry: *"It* [the fuel marketing industry] *has developed from a small, family-owned background to forced becoming 'smarter', powered by M&As"*, he says. *"I*

wouldn't recognise a single innovation from the past ten years that I would call ground-breaking. Systematic steps in technology are common, though. For example, we're engaged in a project to implement software to help us in our day-to-day routing and load planning challenges. We're also looking into finally getting barcoding along to simplify our processes", he adds.

Greg continues noting that the main challenge for a small company to participate in these incremental technological developments is the capital needed. While capital is scarce, if a company doesn't constantly take small steps in developing it's technology and processes, there will be a visible competitive disadvantage in, say, five year's time, he emphasises.

Remote tank monitoring

With regards to remote tank monitoring, Greg notes that *"Remote tank monitoring has helped us cut costs and increase service levels. However, the capital investment required is significant."* Tom adds that *"Technology typically is expensive at first. However, with time many technologies become the norm. As prices come down, I can see tank monitoring becoming a norm. With time, tank monitoring might become something that you can't live without; the tables will have turned."*

Regarding practices related to mobilising remote tank monitoring investments, Greg notes that *"The placement decision* [of remote monitoring sensors] *is going to be volume-driven, as volume drives the ROI. We would provide this level of service the category of our best customers. The second category would be those customers that 'cause you the most problems'; a feasibility study and decision would be made with these."*

Greg continues noting that remote monitoring wouldn't, however, bring a change to business models: *"I wouldn't, however, say that bringing in a line of technology would have us change our business model in where we start categorising our customers in terms of service levels. One of our key business challenges is that we want to be 'everything to everybody', but we can't - we must employ an 80/20-rule, ie. recognise our most profitable customers."*

> *"One of our key business challenges is that we want to be 'everything to everybody', but we can't."*
> -Greg Portell

Tom sees a very wide deployment of tank monitoring as unlikely: *"True-/real-time data definitely supports our business decisions. I see tank monitoring foremost as a way to drive efficiencies and improve profitabilities. However, as efficiencies improve, at some point the ROI-level will even out, and you'll have to start justifying the cost of the service."*

Investing in technology

Regarding underlying general principles affecting investments in technology, Greg brings up aspects relating to making jobs easier and more fun, increasing competitive advantage and a *"great place to work"* -mentality. The underlying driver, however, is the amount of demand from the customer's side, he adds.

Tom emphasises asking the question *"Is it* [investment opportunities] *going to be strategic to keep our current customers? Is it going to be strategic to get those customers that we need in the future?"* Only if the answer is yes, Tom would consider the technology.

Tom also mentions that one needs to have a vision on where the industry is going five or ten years out. Greg adds the aspect of the importance of investments in general: *"If you're not making those investments in your infrastructure, people and footprint, somebody's going to come along and make an offer"*, referring to the above-mentioned trend of M&As.

> **"Capital investment -wise there is no luxury for making that one big mistake."**
> -Tom Marval

However, regarding compulsory general investments to keep up, Tom adds caution, noting that *"Previously the focus was on taking care of customers and delivery, less on costs. Now it's more on go-to-market - margins are thin, investments must be smart. Capital investment -wise there is no luxury for making that one big mistake."*

Recent technology investments at Wallis

When enquired on an example on a recent successful technological investment, Tom mentions truck tracking hardware supplied by Qualcomm.*"It enables us to track our deliveries. Both from a standpoint of efficiency and customer service it's been great. We can call the customer and tell them we're going to be there within an hour or half an hour. Also, the tracking hardware supports our current routing optimisation efforts."*

As for Greg, he points out their recent developments with inventory management: *"Our inventory management process implemented last year has proven to be very successful."* He elaborates by presenting impressive product service level figures enabled by investments in technology in the past 18 months.

Regarding the above-mentioned inventory management developments, Tom explains the underlying train of thought: *"From a point of profitability and improving those turns - you don't want to sit on anything longer than what you really need it to be. The goal naturally is to start using someone else's dollars to start using your product."*

Past and current industry trends

Both Greg and Tom base their business insight on emphasising several past and current industry trends. Greg mentions the most visible trend being that of industry M&As: *"Ten years ago there were 600 distributors of lubricants in the US, now there are a 100. There is a huge trend of M&A going on. Now there are also 'mega distributors', 15-20M gallon distributors"*, he notes.

> **"Ten years ago there were 600 distributors of lubricants in the US, now there are a 100."**
> -Greg Portell

Greg also mentions that in the recent past one could see the end of the trend of adding offered skews. *"Removing skews[1] has got to do with, again, not being able to be everything to everybody"*, he says, calling for strategies to be based on identified areas of industry insight as well as segments of potential leadership. Tom adds that recently a need to drive business relationships into partnerships has emerged. Greg agrees, adding that *"Simple order-takers are less and less, and companies have been forced to become true salesmen."*

> **"Simple order-takers are less and less, and companies have been forced to become true salesmen."**
> -Greg Portell

Greg further notes that one of the biggest recent changes in the industry has been that of the prices of finished lube starting to reflect that of crude oil. *"That's one of the biggest changes we've had. For a long time, finish lubes just stayed flat, not reflecting crude - there was a period of seven years with no price adjustments. Now, however, the prices of product reflect that of crude, eg. rising several times a year"*, he elaborates.

Also, customers' requirements have evolved not only related to the product offering, but value-adding services, Greg notes. *"In the past you'd roll up on site with your fleet, fill the tanks, get a ticket signed and be done. Now customers are demanding more - they want eg. to know the input cost specific to an equipment; 'How much fuel am I putting into this, how much is the lubricants cost? What's the difference between machine operators' efficiencies?'"*, he explains.[2]

> **"We have to adapt to a change in business model. The old model used to be 'Hey I just need some oil.'"**
> -Greg Portell

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1 *Skew* is industry terminology and refers to types of product. There are, for example, several types of motor oil, such as 5W20 and 10W30.

2 As an example of value-added services, Greg mentions trucks with digital meters, enabling scanning barcodes by the truck at site after delivery for automatised billing per unit. *"The customers can then use this data for better decisions"*, he says.

Regarding changes in customer behaviour, Tom adds that *"People out there are smarter - and wiser - to some degree. Companies want to have hard data on the ROI of paying a little more for another product or having less oil changes, for example."*

Greg notes that the Internet itself has changed relationships to customers. *"Consumers now have access to more information and are more educated; they're not anymore calling in asking for a sales rep to come and explain the product offering. You have to have something unique - a skill, for example - to be able to catch people's attention. In a commodity-driven sale it's just price. We need to find value in services or a Total cost of ownership (TCO)-type[3] of approach - we're driving the partnership."*

Tom agrees on the increase in customers' role and knowledge - *"We see more and more reliability engineers in-house at customer locations. They're ensuring not only that the correct products are delivered, but that that each oil and grease point has a scheduled maintenance practice."* He points out an emerging trend also in working life in general, making the following remarks:

- *"As a younger generation not only joins the workforce but starts leading it, we're seeing a lot of taught and conscious knowledge on Lean. There's now more focus on nickels and pennies, when before it was about dollars. When you look for nickels and pennies you better have good hard data to find it."*

- *"One of the biggest challenges we face in the future is the change of culture as baby-boomers are being replaced in the workforce. Brand loyalty has started dramatically decreasing. Also, millennials aren't following their parents' culture, in difference to the generation before. There is a whole new outlook on what is valued in life from just a work aspect, for example increase in family time vs earned money."*

- *"It's difficult to read which products and brands new customers are loyal to. This relates to our business for example when dealerships see generations change in business ownership. Customer service means different things for different generations, and few technological leaps shock anymore."*

Greg further notes a trend in product innovation - *"When before 'any oil' used to take you 3,000 miles, now it's up to 10,000 miles or more."* He also notes that tolerances are getting tighter and tighter.

The dilemma with delivering efficiently

Greg and Tom agree, nevertheless, on that the most important underlying business logic hasn't changed - getting to know your customers,

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3 *Total cost of ownership* (TCO) is a financial estimate intended to help buyers and owners determine the direct and indirect costs of a product or system. It is a management accounting concept that can be used in full cost accounting or even ecological economics where it includes social costs.

including who they are and what they want. *"If you're focusing instead on a new technology, you've missed the boat"*, they summarise. However, it's important to find the tools that you need to make your business successful, they add.

> *"When you look for nickels and pennies you better have good hard data to find it."*
> -Tom Marval

Towards the end of the interview Tom explains a dilemma of capital investment resulting from a seeming strive for efficiencies. *"Regarding inventory management, the rule of thumb has always been to fill up and to ensure availability of product. Now a more JIT-focused approach is embraced - when we think we won't be needing a drum of specific product we won't invest in it. However, also our customer are embracing this approach; we see customers who don't want to invest in a thousand-gallon tank. They'd rather buy 200 gallons at a time for a small up-front investment. For us, though, it's clearly more efficient to deliver a 1000 gallons at a time less frequently."*

7.2 MR STEVE MADRAS / ENERGY PETROLEUM

Figure 13: Energy Petroleum is a Missouri-based Midwestern fuel marketer founded in 1927.

Mr Steve Madras is the president at Missouri-based petroleum marketer Energy Petroleum.

Approaching innovation, remote tank monitoring

Regarding innovations in his industry, Steve notes that there hasn't been a single disruptive innovation lately. *"Going from horse-drawn wagons to motorised tanker trucks about 70 years or so ago was a really big innovation. We're all looking for the next big thing, but there's nothing glaring right now."*

When asked whether remote monitoring might in the future reduce the amount of dispatchers in his company, Steve notes that *"We could*

get by with one dispatcher. The problem is, when one of them wants to take a vacation or gets sick, you have to have someone helping them. Phil is a full-time dispatcher while Bob does lubricants dispatching and other things, too. However, remote monitoring might allow us to add satellite locations without adding a lot of dispatching resources."

Regarding the potential implications of a wide deployment of remote monitoring, Steve comments that *"It would remove the guesswork currently present. It would also make driving more efficient as unnecessary as well as emergency deliveries at odd times would be reduced. Just everything would be a heck of a lot better."*

As a side note on the efficiencies gained by using remote monitoring to minimise deliveries, Steve notes that *"Even if nothing is delivered per se, the driver still has to stop, check the tank etc. Now this might not take more than five minutes - until somebody comes out and starts talking to them* [the driver]."

> **"Our business isn't rocket science; it's just common sense."**
> -Steve Madras

Regarding general guidelines for investing in new technologies, Steve mentions always asking himself a few simple questions. *"Does it make sense, number one. Is it cost-effective, affordable? Is it a long-term solution?"* He continues noting that *"We like to have a competitive advantage, whether it's price, technology, industry equipment, intellectual, ... I try to look five years into the future. You have to see what's coming down the road at you. However, I like to go to the newest proven technology. Proven - I don't want to be the alpha and beta tester of these things."*

Past and current industry trends

The biggest trends include the environmental side, Steve notes and further points out related challenges of new energy sources. *"For example natural gas is really big in the US"*, he says. Another relatively recent change in the petroleum distribution industry is that of vehicle services being replaced by convenience services, he continues. *"Unattended pump stations represent a change in the past 20 years in the convenience store -side of business. The service side that used to be common has been swapped for the c-store side. Now one can see even more food represented; they're* [gas stations] *becoming more shops."*

There's a recent change in the way fuel is bought, too, according to Steve. *"You're hedging[4] fuel instead of just buying it off the rack. As the*

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4 Fuel hedging is based on so-called futures contracts - a standardised contract between two parties to buy or sell a specific quantity and quality of a commodity for a price agreed upon at the time the transaction takes place, with delivery and payment occurring at a specified future date.

price of fuel is volatile and might change, say, 10c in one day, people are protecting their investment."

Steve mentions another trend being a growth in the size of the product transportation capabilities of trucks, it having gone up from 1,000 gallons to 5,500 gallons and up in addition to the introduction of up to 10,000 gallon transport trailers. *"Also, we're looking at getting larger tanks at site to get those economies of scale – and you're fighting the government because they don't want large tanks everywhere. They'd rather have smaller tanks with a more centralised replenishment system."*

However, despite the emerging trends, Steve concludes that *"The model of fuel delivery per se, where fuel is delivered to a tank, hasn't changed in many years. Technology is making things 'a bit more efficient, a bit more accountable', though."*

General remarks

Steve mentions fuel marketing to be based on very basic business principles. *"You have to keep your customers, keep your profit margins up, keep your costs low. Try to do stuff your competition is not doing or can't do. It's a very competitive business. Also, you've got to pick the right suppliers to partner with. Suppliers are very key in our business. If you can work contracts, different supply agreements, that's a way to go, too."*

As a general goal in his business, Steve mentions that *"It's nice to shift the inventory cost to the customer while reducing our delivery cost. This is done with a bigger tank and bigger delivery vehicle."*

When asked about how acquisition of new customers works in his industry, Steve immediately replies that *"It's hard."* He continues noting that *"You basically start forging relationships by spending time over dinners, ball games. You try to undercut them on price, give them better products than what they're getting, give them knowledge on upcoming changes - they like knowledge - and use that against them."*

> *"It's hard to keep margins up and grow because the industry is so mature. You have to steal or buy it from somebody. "*
> -Steve Madras

Regarding the looming trend of M&As, Steve notes that *"If you're not part of M&A right now you're not going to grow. We get notices every day of somebody wanting to come in and buy us. Typically for those who don't want to participate in M&A their business is actually more of a job instead of a business, per se."*

Figure 14: St1 is a Finnish energy company established in 1996 under the name Greenergy Baltic Oy.

7.3 MR MIKA ANTTONEN / ST1

Mr Mika Anttonen is a major shareholder and chairman of the board in St1 Group and St1 Nordic. A Finnish entrepreneur, Mika is known for initiating ventures and projects related to alternative energy sources.

General remarks on industry practices

Mika starts the interview by noting that the margins in the industry of fuel and oil delivery are in the magnitude of per milles. This is significant since most small- and medium-sized fuel marketers compete with large companies such as Shell and Exxon, which typically have an advantage due to their incomes from upstream operations, he adds.

   Also, small industry and especially farmers don't want to place orders before the last minute as a the price of product is followed closely. Similarly Mika notes it being common to not order a full tank since prices might drop and unnecessary commitment of capital can be avoided.

   Fuel marketers on the other hand, Mika continues, optimise deliveries also based on production prices, as recently the prices of end products have started to reflect those of crude oil.

   Continuing on the topic of general business practices, Mika points out that a customer bringing in only, say, a 100 euro margin[5], can and should be *"given to the competitor"*. Pointing out recent trends, Mika also notes that the amount of individual deliveries customers prefer has risen, even if this results in added transportation premiums.

Remote monitoring

Regarding remote monitoring, Mika immediately states there definitely is a market. *"It's all about price"*, he notes. Mika continues noting that as the added value of remote monitoring first and foremost comes from reducing transportation costs, someone offering the solu-

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5 This means a customer ordering about 10,000 litres of product per year, according to Mika.

tion should first target applications with large transportations costs compared to delivered product volume.

Mika summarises the North American market to *"initially probably being the most fruitful for entry"* for remote monitoring solutions:

- *"For example Nordic countries have significant amounts of legislation related to theft and leakage."*

- *"Among other things taxation yields relatively expensive products to be delivered, resulting in small volumes. The USA, on the other hand, accounts for more than 40% of global gasoline consumption."*

- *"The American remote monitoring market seems to be relatively unsaturated."*

- *"America has the communications infrastructure required by remote monitoring, setting it apart from eg. India."*

A successful entry to the remote monitoring market would thus require identifying not only the right sub-segment, but thoroughly understanding the business logic of the fuel marketers. If enough value up for capture cannot be identified, sales should be more based on other notions such as increased customer service levels. Also, the transitional period related to stealing remote monitoring customers from competitors must be dealt with professionally, Mika underlines.

SUMMARY

This was the first chapter in a three-chapter empirical study. Three distillate distributors were interviewed with the goal of answering interview questions extracted in the previous chapter.

Insight was extracted regarding key principles related to identifying innovations and disruptions as well as separating the two. Several comments also touched the principles that dictate how practitioners invest in new technologies. Lots of information regarding industry trends and the role of remote monitoring was also presented.

The next chapter will present findings from interviews with industries and individuals adjacent to the distillates distribution industry. The two chapters of primary data are then synthesised and analysed in chapter 9, concluding the empirical research part.

INTERVIEWS, ADJACENT INDUSTRIES

This is the second of a three-chapter empirical research. The goal of this chapter is to summarise the interviews done with seasoned individuals as well as practitioners in industries adjacent to the distillates distribution business. For readers the chapter combines with the previous chapter, enabling a review of research findings from a varied perspective.

Introduction

This is the second chapter of interviews. It presents collected primary data to answer the first research question: *Which future best practices can be uncovered based on literature and expert interviews?* The interview subjects were chosen from a pool of seasoned individuals as well as practitioners in industries outside but adjacent to the distillates distribution business.

The previous research part presented a thorough literature review. As research questions were reflected on the identified research gaps, for the aforementioned group of interview subjects the following interview questions were synthesised:

- What type of signals reveal potentially disruptive opportunities?

- How do you replace a lack of long-term insight when creating new markets with disruptive innovations?

- How do you prevent processes from weeding out disruptive opportunities, as described in Clayton Christensen's [19] Innovator's Dilemma?

- What are some main principles to follow when cultivating technological disruption into business innovation?

- How do you ensure your organisation is constantly engaged in conceptual-level business innovation?

- How do you keep a large organisation capable of entering small, lower-end markets?

In the next chapter all empirical data will be synthesised and critically discussed. The fourth part of the research includes a summarising and concluding discussion.

Interview subjects

As explained in the second chapter, the research approach included the use of semi-structured interviews. Opposite to the previously presented interviews with industry practitioners, the interviews reviewed below were conducted following more strictly a pre-defined formula. Interviewees were asked a subset of the above-mentioned interview questions, the following discussion which is presented next.

The interviewed individuals of Mr Esko Aho, Mr Risto Siilasmaa and Mr Fredrik Kekäläinen are briefly presented below:

MR ESKO AHO Esko Aho (born 1954 in Finland) is a Finnish politician and former Prime Minister of Finland. In addition to his parliamentary career, Aho has served, among others, as resident fellow at the Institute of Politics at Harvard University, as member of the executive board at Nokia and as president of SITRA, the Finnish National Fund for Research and Development.

MR RISTO SIILASMAA Risto Siilasmaa (born 1966 in Finland) is the chairman, founder and former CEO of F-Secure Corporation (formerly Data Fellows), an anti-virus and computer security software company based in Helsinki, Finland. A member of Nokia's Board of Directors since 2008, he has been its chairman from 2012 onwards, as well as Nokia's interim CEO 2013 - 2014.

MR FREDRIK KEKÄLÄINEN Fredrik Kekäläinen is the co-founder and CEO of Finnish logistics optimisation company Enevo. Kekäläinen is seasoned especially in serial entrepreneurship and Internet of Things applications.

In the coming sections, selected excerpts from the interviews with the above individuals are presented.

8.1   MR ESKO AHO

Spotting disruptive innovation

Aho starts off by noting that disruption typically falls upon services that are already available, but used in a new way - "*It's something very different from an incremental improvement.*" Regarding how an enterprise can approach engaging in disruptive ventures, he lists several ways:

- Some forms of venture funds or other organised mechanisms are among the most common approaches.

- Scouting for disruptive innovations can be made part of the company's strategy. "*Cisco - at least in the past - used to organise*

internal searches for innovation with pitching competition -like events, including internal 'funding' for a winning idea."

- A technology unit can be made to invest in trial and error. "*This can be done as a secondary objective besides supporting more traditional R&D efforts, typically with very free hands.*"

- A company can also systematically screen and acquire startups that are strategically close.[1]

As the above approaches typically apply for larger enterprises, companies of smaller size can have 1-3 smaller product branches exposed to experimentation. "*Project durations are typically tied to budget and failure rates are high. However, one success typically covers the losses*", Aho describes.

Avoiding weeding out disruptive opportunities

In Innovator's Dilemma Clayton Christensen [19] describes proven enterprise resourcing mechanisms by default often weeding out potentially disruptive innovations. "[Danish plastic toy manufacturer] *Lego integrated the business development* [of a new product line] *to the matrix of the existing organisation. Even if well planned with the new business venture intersecting which each level of the existing organisation, old management mentalities wouldn't let the new innovation grow*", Aho elaborates.

However, in the example of Lego, a new approach created an independent organisation with only one third of resources coming from the parent company, Aho explains. "*Also, the new business unit was placed directly under the CEO.*"

Cultivating identified potential for disruptive innovation

Aho starts off by noting that "*It has turned out really difficult to cultivate disruption with money.*" He explains that very often when innovations are to be developed the task is deemed impossible by the people responsible. "*Quite on the contrary, some degree of scarcity of resources turns out to force one to make smart decisions*", he explains.

> *"What makes many disruptive technologies challenging is that their ecosystem requirements can be fairly large."*
> - Esko Aho

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1 Aho notes, however, that "*This approach has turned out to fail relatively often since the dynamics driving the acquired innovation is damped by the strategy of the acquiring body. The newly acquired business concept isn't given room to grow. This is a very challenging situation from the aspect of strategic management.*"

"*Also, very rarely a product in itself is enough for market entry*", Aho continues. "*Especially when dealing with digital solutions, the ecosystem in fact plays as much a role as the product.*" He elaborates further that one can present a technically fantastic sensor or technology for measuring something, but if the measured data cannot be transformed into a part of a business solution, there is no use of the information. "*That said, what makes many disruptive technologies challenging is that their ecosystem requirements can be fairly large*", Aho summarises.

The role of ecosystems

"*Big innovations are typically conceptual and contextual. Conceptual in the way that the service or product concept has to be carefully thought. Contextual in a way that it has to integrate into the operating environment and respond to it's needs*[2]", Aho notes.

Healthcare presents interesting examples on conceptual innovation, especially with regards to how digital healthcare data can be used, Aho continues. "*For example many physiological processes can be measured for very precise data, the latter which is very useful in the hands of a doctor*", he adds. "*However, true disruption can emerge only when the data is placed in a context of automation. For example in the context of diabetes, data might set off an alarm without interference of humans*", he continues.

> *"Only data can offer value of 1 or 2, but for value 9 or 10 one needs the context."*
> - Esko Aho

Aho continues elaborating on the topic: "*There are large variations in the requirements of the ecosystem scales. An erroneous conclusion often made is ingenuity being the core success factor behind many American social media and digital entertainment ventures spreading to other areas of business. However, it's not a question of ingenuity but context. Requirements for context - or ecosystems, if you will - is indeed very narrow in the entertainment industry.*

"*For example, transferring music from a device to a listener requires merely only copyright-related solutions and simple digital devices. Implementing digital innovation in healthcare or education yields much more complex ecosystem requirements.*"

"*A startup can change this* [entertainment, social media], *but a startup cannot change the education system. It is very hard for an individual innovation to thrive in the context of schools, for example, which have not been built from the ground up to be digital. For many digital innovations a big*

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2 Regarding conceptuality, Aho offers as an example electric cars: "*They have to be placed in a suitable context, which is not that of combustion engines. The context in which a car typically is used is very challenging for electric cars, relating for instance to long distances and security of adequate charging opportunities.*"

challenge is convincing the user to change their habits, which typically defies the forces currently in power", Aho summarises.

8.2 MR RISTO SIILASMAA

Reflecting on The Innovator's Dilemma

The interview with Risto Siilasmaa was started off by discussing Clayton Christensen's [19] notion on the performance of disruptive innovations typically being initially worse than that of established services, resulting in customer rejection. Siilasmaa labels Christensen's theory as slightly incomplete as it's presented in Innovator's Dilemma in that it "*emphasises too much the high-end-low-end[3] dimensions of a clearly multi-dimensional topic*". Sometimes the other dimensions carry more weight - especially in cases of proven disruptions, Siilasmaa explains.

Siilasmaa continues to point out that the first iPhone, for example, was deemed a bad product by many critics - and it did indeed lack in features compared to competition - but was nevertheless a success among customers. Clearly an other dimension than that of high-end-low-end set in motion the disruption at hand. Also, Siilasmaa notes that for books Amazon offered a service that already initially was a better one - "*All disruptions are not low-end disruptions*".

Cultivating disruptive potential

The topic of best practices related to cultivating technology identified as disruptive was discussed next. Siilasmaa started off by identifying a guideline in the form of a simple framework[4] dividing strategy planning into four styles according to levels of predictability and malleability, as presented in figure 15. Next the framework was briefly reviewed with examples of its application.

Siilasmaa explains that in the upper-left corner you must approach through experimentation, striving to constantly measure and change direction. As an investor this can relate to the contents of a portfolio, and as a game company to the contents, mechanics and monetisation of games, for example. "*You don't know, what is going to work*", Siilasmaa summarises.

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3 Low-end disruptions target customers not needing the full performance valued by customers at the high end of the market. As explained in chapter 4.1, Clayton Christensen [19] argues that "*disruptive innovation typically is cheaper, simpler, smaller and pursued by entrant firms*", referring to low-end disruptions.

4 The framework Siilasmaa referred to is presented in Martin Reeves' [45] recent publication on strategy.
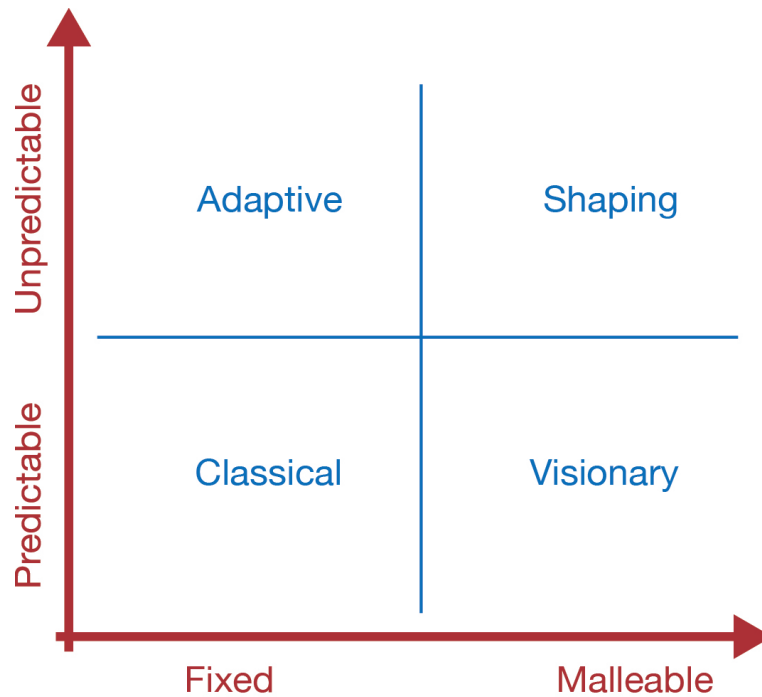
Figure 15: A framework dividing strategy planning into four styles according to how predictable the business environment is and how much power one has to change it.

Nokia's mobile broadband business is given by Siilasmaa as an example of a business located in the lower-left corner of the framework. "*Options can be analysed beforehand and with a relatively high precision a correct mix of structure, action lists, schedules, leadership and resource allocation can be decided on*", he notes.

Siilasmaa points out that with time companies will move between the sections. Amazon was initially in a market looked at as fixed and predictable - "*No one came to think of books not being bought in stores*". However, the market turned out not to be fixed, and Amazon started to change it, first by bringing physical books into e-commerce and then by disrupting their own business by bringing e-books to e-commerce. Also, how e-commerce will develop in general has been unpredictable, now putting Amazon in a totally different market than it started with, Siilasmaa explains.

A large enterprise typically has ventures in all sections. To know in which way you're looking for investment targets, you must first identify the nature of the environment potential ventures currently reside in. "*In the framework, in the left column you must have a portfolio, in the right column you can have only one bet, but it needs to constantly adapt based on customer feedback etc. The right-hand side is more about adapting than exploring. The planning horizon and accuracy is very different from the left side*", Siilasmaa summarises.

Siilasmaa summarises the topic by noting that if a service clearly is the best for customers but faces challenges in go-to-market - for example related to partnerships - one must stay resilient until the market accepts and changes. As an example he offers two aspects of the go-to-market strategy of online security and privacy company F-Secure's initial consumer product:

- Partnerships with operators took years to establish before exponential growth began. Operators were extremely reluctant to offer F-Secure's consumer security solutions as they would be held liable.

- However, competitors were reluctant to copy the to-be successful model, as F-Secure's go-to-market strategy accepted giving a cut of the recurring monthly fee to the channel partners.

The rest of the interview with Siilasmaa was spent discussing around the topics of conceptual-level innovation and organisational agility.

> *"The best way to prevent your competitors from stealing your business model is to make sure they don't want to."*
> - Risto Siilasmaa

Conceptual-level business innovation

"*The aforementioned go-to-market innovation is an example of conceptual innovation*", Siilasmaa starts off. He explains that in practice technological innovation is not separated from conceptual innovation. With seasoned practitioners the different aspects and levels of business innovation are self-explanatory and not always separately discussed.

Thus, it is challenging to distinguish unique features of practice related to conceptual innovation. "*Engaging in conceptual innovation is actually related to culture more than innovation mechanics, per se*", Siilasmaa summarises.

Maintaining a capability of entering small, lower-end markets

Siilasmaa explains that large companies indeed need to constantly feel the pulse of the startups in their industry. This can be done, for example, in the form of corporate venturing[5]. Another way for companies to engage in innovations is directly founding new ventures themselves.

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5 Cambridge Dictionaries defines corporate venturing as "*a large company investing money in a smaller company in return for a share of its profits*" and "*a large company creating a new business within the existing structure of the company.*" [13]

The above-mentioned ways of engaging in startup venturing are based on the startups functioning as independently from founding companies as any venture capital -funded venture. "*This results in the bureaucracy, slowness, stiffness and processes not slowing down the progress of the small venture*", Siilasmaa explains. "*For example in the case of Nokia, it's unlikely a good decision to place among the existing 20,000 product developers a group of five individuals developing a disruptive innovation*", he continues.

Highlighting the issues with an innovation group placed in the middle of a large organisation underlines the importance of the mentioned corporate venturing models. Siilasmaa presents as an example of successful nurture of enterprise innovation the very well-refined processes Google uses to cultivate in-house ideas.

8.3 MR FREDRIK KEKÄLÄINEN

Kekäläinen begins by pointing out the different ways disruption can be defined. He notes that recent popular examples of industry-changing ventures undermine the fact that disruption can also happen in a seemingly simple fashion.

> *"Bringing the 'Apple-effect' to industrial enterprise can indeed be seen as highly disruptive."*
> - Fredrik Kekäläinen

As an example, Kekäläinen refers to bringing usability and pricing familiar from consumer products to the industrial enterprise. He calls this the 'Apple effect', and emphasises it's potential implications.

Moving forward without market research

Using his company Enevo as an example, Kekäläinen discusses young ventures pursuing disruptive innovations and not being able to tap into market research. Before Enevo was born, he refers to having with his co-founder both spotted a significant inefficiency in waste management as well as feeling compelled to take action.

Not being able to tap into existing market reports to validate their business idea, the co-founders did so by getting in touch with industry practitioners. While not market research in the word's traditional meaning, Kekäläinen and his co-founder reflected their hypotheses against the realities of the industry by visiting most of Finland's waste management companies.

As a result, the co-founders were able to replace the lack of a more traditional, exhaustive market research. Kekäläinen emphasises that the initial push to develop the idea, including building early pro-

totypes, was driven more by an identified problem than a market opportunity identified by market research.

> *"It was because the problem was identified so first-hand that I got components from Radioshack and started tuning."*
> - Fredrik Kekäläinen

In addition to the lack of market research, Kekäläinen also discusses the lack of long-term industry insight as a competitive advantage. He repeats the solution being rigor in spending sufficient initial time with customers and being very hands-on.

Cultivating disruptive innovation

Kekäläinen mentions several things to note when developing a business on top of a significantly disruptive innovation. First and foremost, he underlines putting enough focus on truly understanding the customer pain points as well as the business dynamics of the industry. "*The finger must initially and thereafter constantly be kept on the customer pulse*", he summarises.

Second, having collected sufficient industry insight, Kekäläinen explains the role of not letting the focus of the company deviate. "*It's easy to let the focus drift and become technology-oriented instead of customer-oriented*", he notes. Without constant review the company automatically starts spending more time on non-essentials, "*resulting in your company suddenly having 29 MVPs[6] instead of one*".

Finally, Kekäläinen emphasises the need for large, architecture-level technology decisions to be made carefully. Key is to have experienced people join the company as soon as possible. As a lesser, albeit potentially deadly mistake, Kekäläinen mentions over-engineering, which also takes control if not consciously watched over.

Enabling company-wide conceptual innovation

The last topic to discuss with Kekäläinen was enabling innovation on a higher, conceptual level throughout the company. Kekäläinen underlines tackling also this issue based on a deep understanding of the industry value chain as well as customer pain points. He admits that at Enevo it would be beneficial for as many employees as possible to understand very well the industry the company is in, even if the effort required doesn't directly support their daily activities.

Understanding what are the 'big things' in the industry enables one to change them, Kekäläinen emphasises. He notes that in order to get

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6 Minimum viable product (MVP) refers to a product having just those core features that allow the product to be deployed.

everyone in the company to work hard and 'think big', it's essential that the company vision is well-communicated. "*Everyone doesn't have to constantly 'think big' as they're working on their daily tasks. However, understanding the big picture enables everyone to reflect on the relevance of their current focus*", he explains.

> **In waste management Enevo is now changing the entire industry, going from static routing to demand-based collection."**
> - Fredrik Kekäläinen

"*The bottom line of the 'sharing economy' - or whatever you want to call it - is striving for higher resource efficiency*", Kekäläinen explains as an example of higher-level insight. "*At the core, also Enevo is working with making resource utilisation more efficient, and we're going to change the business dynamics of the whole industry.*"

SUMMARY

This was the second chapter in a three-chapter empirical study. The chapter reviewed findings collected via interviews with three affluent individuals. The chapter goal was to answer interview questions extracted as a result of a synthesis of the literature review findings and research goals.

Insight was presented regarding many areas relevant to the research goals. Both identifying and cultivating disruption was covered as well related challenges presented by academics such as Clayton Christensen. Adjacent themes such as those related to organisational issues were also reviewed.

The next chapter synthesises and analyses the findings presented in this and previous chapter, concluding the empirical research part of the research.

INTERVIEW FINDINGS

This is the third in a three-chapter empirical research. The goal of this chapter is to summarise the findings extracted from all conducted interviews. The previous chapters' insight from both seasoned individuals as well as industry practitioners will be synthesised under conjunctive themes. The chapter gives the reader an overview on the empirical data that will affect research findings in upcoming chapters.

Introduction

The two previous chapters presented interviews conducted with both industry practitioners and seasoned individuals. The goal of this chapter is to give the reader the ability to follow how the overall research goal will be reached in later chapters. This is done by presenting a summary of all the empirical data collected, highlighting criticism of themes surfaced in the literature review and topics particularly relevant for the research space of this study.

Identified themes having emerged throughout all interviews function as the chapter's section dividers below. Synthesis of empirical findings with those of the literature review will take place in the following chapters along with a general research conclusion.

UNCOVERING AND NURTURING DISRUPTIVE POTENTIAL

Disruptive potential was noted to significantly benefit from being placed directly under the CEO, being worked on by a small team and ensured a sufficient level of independence from the parent company. Also, a notion on financial resources per se not being a critical factor in disruption success was also made.

Regardless of company size, developing business ideas further was presented as best done alongside customers as soon as possible as well as embracing opportunities of being hands-on. Aggressively and consciously keeping the finger on the customer's pulse was pointed out as crucial for spotting emerging trends and potential disruptions.

INVESTING IN NEW TECHNOLOGY

With a focus on the distillates delivery industry, it was noted that there are few looming technological trends practitioners must embrace. Luckily, at the same time traditionally the industry doesn't

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invest heavily in technology. However, unless one incrementally updates tools and processes, suddenly the tables of competition might have turned, as pointed out by several actors. One's company might even be acquired if it's development is left adrift for too long.

Because of the nature and status of the industry, few businesses have the luxury of making even one big mistake in technology investments. That said, success in recent investments were referred to as having taken place mostly in the areas of solid Return on investment (ROI), typically related to warehousing and truck management.

However, while the clearest driver for technology investments was identified as different types of ROI, also additional aspects came up. Organisational aspects and making the company better as a workplace seem to be important secondary drivers.

TRENDS IN THE DISTILLATES DISTRIBUTION INDUSTRY

The trend of M&As of the past decade seems significant, even resulting in so-called 'megadistributors' of annual delivery amounts of a new magnitude of scale. At the same time, and possibly as a result, the industry trend is moving from an emphasis on customer service to cost and go-to-market, emphasising thin margins and ROI.

As for most commodity industries, there seems to be a call for decreasing the amount of offered products and searching for areas where one can lead. This goes hand-in-hand with companies needing to learn how to sell well and the risen demand for value-added services. Especially in the Nordics it seems to be more and more difficult to win customers over for a longer period of time.

The prices of finished products have recently started to reflect those of raw material or crude oil. This along with trends such as convenience stores focusing more on other products than fuels and oils might potentially alter the business models of distributors. Already now the way distillates are bought is changing with hedging gaining popularity.

Product tolerances are becoming tighter as environmental and legislative aspects are driving product development, and possibly partly as a result the amount of product types or 'skews' is increasing.

REMOTE MONITORING IMPLICATIONS AND CHALLENGES

As in most industries, while technologies come and go, some become the norm with their cost dropping subsequently. While currently capital-intensive, remote monitoring is seen by most interviewees as indeed becoming the industry norm. Those distributors taking advantage of existing remote monitoring solutions have been getting desired savings as well as abilities to offer increased service levels.

To reinforce the positive remote monitoring ROH, however, emphasis needs to be placed on carefully choosing customers and related installation premises when allocating the remote monitoring capabilities. Also, as a result of the current high cost of the technology, after a certain amount of deployments of remote monitoring capabilities to high-volume customers, there are no more customers left justifying the installation of remote monitoring. The incurring savings wouldn't be sufficient.

Not all implications of remote monitoring are, however, clear. Suppliers strive to minimise delivery costs by delivering unfrequent loads of maximum volume, while customers would prefer more frequent top-off deliveries in order to minimise capital investment. How this dynamic will develop as a result of remote monitoring is to be seen.

Rich justification for the US being a more fruitful market for remote monitoring than Europe, developing countries and other places of the world came up. Also, a notion on go-to-market of remote monitoring being based on increased customer service over cost-cutting was emphasised.

ORGANISATIONS, ECOSYSTEMS AND OTHER TOPICS

A challenge for distillates distributors seems to be finding a way to drive partnership with customers. With competition, M&As and commodity-sale driving the industry, value needs to be found in services and aspects of Total Cost of Ownership (TCO). At the same time savings need to be found in more detail than before.

The implications of more general trends in the workforce are yet unclear. Brand loyalty is changing and the role of customer service isn't the same anymore. Also, nearly all product information can be found online, and the value that sales skills and partnerships bring isn't well understood.

The ecosystem requirements of especially digital disruptions were noted to be significant - measured data must be transformed into a meaningful part of a business solution. In other words, measured data must be cultivated and placed in the correct business context.

Also, culture was presented by one actor as in fact a more important catalyst for innovation than actual innovation mechanics per se. Finally, the praised theory of Christensen's [19] Innovator's Dilemma was challenged, with a notion of it being too simplifying regarding classification of disruptions.

SUMMARY

The goal for this chapter was set as giving the reader the ability to critically assess the grounds on which the research will be concluded

in the next chapters. The chapter goal was reached by presenting a summary on interviews presented in the previous chapters.

Findings were grouped into themes of disruption, technology investments, industry trends, remote monitoring and others. While no contradictions between the interviewed actors emerged, some of the predominant innovation research presented in the literature review was challenged. The next three chapters will form the fourth part of the research, analysing the findings and concluding the study.

Part IV

CONCLUSION

The fourth and last part of the research presents and analyses the findings of the study. The research goal is reached, the significance of the findings is evaluated and further research is suggested.

10

DISCUSSION AND RESULTS

This is the first chapter in the last, concluding part of the research. The goal of this chapter is to present and assess the research results. Emphasis is placed on clearly reviewing which managerial implications can be seen as emerging from the wealth of research conducted.

Introduction

This chapter presents both the research results and a qualitative analysis thereof. The research results are formed via a synthesis of the results of the literature review and the empirical study. The analysis is conducted by extracting managerial implications with an emphasis on meaningfulness and practicality.

The chapter begins with a brief review of the research goals and methods as they were presented in the beginning of the research. The next section reviews synthesised managerial implications as well as the context and analysis from which they were extracted.

RESEARCH GOALS AND METHODS REVISITED

In this section the problem statements are briefly revisited and it is argued to what degree they have been answered through the course of the study. The problem statement was presented in it's full in the first chapter.

The aim of the research was to extract managerial implications for the distillates distribution industry to embrace a new generation of remote monitoring and other technological innovations. This was achieved by merging insight gained from a literature review with findings of a semi-structured empirical study. The research questions were synthesised from an identified research problem and are laid out in detail below:

RESEARCH QUESTION 1 What are some potential directions in which distillates distribution business models might develop as a result of the availability of next-generation remote monitoring?

RESEARCH QUESTION 2 Which best practices for the distillates distribution business are likely to support embracing a new generation of remote monitoring solutions?

The first research question studied existing business models and can be described as mainly descriptive and explanatory. With a wealth

of insight of the current state of the industry gathered in the literature review, a backdrop was created on which additional empirical findings are reflected upon below.

The second research question aimed directly at delivering value to industry practitioners and is explorative in nature. Combining insight from existing literature and research as well interviews, the goal was to extract implications for managers to take into account when embracing technologies with the potential of putting their companies at the industry forefront.

THE IMPACT OF REMOTE MONITORING AS SUCH

The first research questions asks how current business models of the petroleum distillates downstream industry will likely adapt as such to a new generation of remote monitoring technologies. This section synthesises findings from previous chapters fo answer the question.

The industry in question is highly competitive and has commodity bulk products crucial for Western societies at large at its core. Even if the role of pricing, customer service and value-added services have an increasing role in competitiveness, technological advancements are not widely embraced resulting in rather inefficient low-tech operations.

It seems radical innovation is not pursued widely. Companies are developing competitive advantage with a rather narrow palette of tools and light intensity. A seeming lack of imagination, a true need yet to be recognised as well as a lack of understanding of the potential implications of disruptive change hold back investments in technological leaps.

New technologies would likely not be fully embraced, most likely having their full potential suffocated by existing limitations of organisational structures and business models. Opportunities and choices related to ecosystems and Value Networks would likely either be neglected or poorly judged, further limiting the birth of a radical innovation.

Having concluded the above, the current industry business models and related approaches will most likely yield mediocre results in creation, delivery and capture of value using next generation technologies such as remote monitoring.

MANAGERIAL IMPLICATIONS FOR BEST PRACTICES

This section extracts summarising conclusions and related managerial implications and answers the second research question. As a result of a synthesis of the literature review and empirical findings, five managerial implications stood out.

CONCLUSION Competition has relatively recently become increasingly tight in the industry in question. A company not actively investing in and developing their business might soon be either bought or out of business.

IMPLICATION It is more important than ever to maintain a realistic picture of the industry - acknowledging not only the current state but the direction of industry development is vital.

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CONCLUSION With the mature industry seeing increasing competition and a growing trend of M&As, there will likely be less and less space for small players.

IMPLICATION Whether through radical innovation or more traditional, incremental growth, companies must seek to grow their business. New business areas must be constantly under outlook and projects and ventures resourced in sufficient, smart ways.

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CONCLUSION Being involved in radical innovation is emerging as a lifeline more than a luxury. If a company does not get actively involved in seeking operational efficiencies as well completely new revenue streams through disruption, it is bound to get left behind.

IMPLICATION It is vital for all companies to nurture radical innovation and strive for constant re-invention of their business. Disruption is not only for the resource-full, but crucial for everyone willing to stay in business.

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CONCLUSION Even if M&As are currently a very visible development in the industry, any truly significant disruptions are likely based on technological or business innovation. Furthermore, disruptive innovations typically emerge from adjacent industries, combining processes and technologies in novel ways.

IMPLICATION It is not sufficient anymore to follow trends and developments only within one's own industry and only from traditional sources such as newspapers.

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CONCLUSION Across industries disruptions are increasingly based on innovations on ecosystems and Value Networks.

IMPLICATION Even in a traditional industry as the one in question, ecosystems and Value Networks must be embraced. Creativity must be directed towards areas of creating value using technologies and processes that might seem conventional and have little in common.

The results and analysis above lead to the conclusion that next generation remote monitoring and innovations alike must be seen as potential platforms for business innovation. These opportunities must be used for increased proactivity, agility, leanness and customer service as well as decreased costs, delivering Quick Response functionality and Integrated Logistics.

SUMMARY

This was the first chapter in the fourth, concluding part of the research. The goal of this chapter was to present and assess the research results. After a brief review of the research goals and methods fully reviewed in chapter 1, the goal was reached by synthesising the findings of the literature review and the empirical study.

CONCLUDING REMARKS

This is the last chapter of the research. The goal of the chapter is to bring together the background, goals, pursued methods and results of the research. The chapter consists of a review on the research's contribution to knowledge, the significance and overall evaluation thereof as well as suggestions for further work.

Introduction

The previous chapter synthesised the findings of the literature review and empirical study, presenting research results and answering the research questions as laid out in chapter 1. Five managerial implications were presented, forming a palette of tools for practitioners to use in approaching radical innovation to gain operational efficiency.

This chapter approaches critically not only the research findings but the study in its entirety. Also, the study's contribution to knowledge as well overall significance is weighed along with suggested fields and approaches for further research.

CONTRIBUTION AND SIGNIFICANCE

As seen in IBM's Global CEO study [46], business model innovation has a higher correlation with operating margin growth than any other type of innovation, meriting its use in strategy. However, the downstream industry seems to have stalled in development, not taking advantage of opportunities of technological innovation even if the level of competitiveness is on the rise. With the aforementioned state as backdrop, the research's contribution to knowledge and the significance of its findings are briefly reviewed next.

Contribution to knowledge

As a result of extracted managerial implications this research has established a strong association between emerging trends such as digitalisation and the rather conservative industry of petroleum distillates logistics.

Also, to found the aforementioned implications on solid ground a general status of the industry has been established. This is valuable for practitioners in itself, as it can either verify existing understanding of the direction of industry developments or alternatively give guidelines for further information seeking.

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Certainly more research at the theoretical and practical level is needed but this research has laid the first stepping stones to further develop and understand research in this field.

Significance of findings

This research has synthesised a salient literature review with multi-disciplinary empirical findings. It is believed the areas of interest at the core of the research - radical innovation, technological disruption, ecosystems thinking and others - will increasingly be adapted by industry leaders in the near future.

Also, the research is cross-disciplinary in its nature, linking to several fields of academia and practice to further the exhaustiveness, applicability and value. It is argued that the managerial implications should be reviewed, adapted and applied by industry practitioners.

EVALUATION OF RESEARCH

How well a case study succeeds in its objective of producing new knowledge depends on the quality of the research design [47]. This section evaluates the research in hindsight based on the design of the empirical studies. Note that the research methods in specific chosen to be applied by this research were reviewed and criticised in chapter 2.

Yin [48] describes four tests for assessing the quality of empirical qualitative research. These are construct validity, internal validity, external validity and reliability.

INTERNAL VALIDITY Internal validity refers to how well the design ensures the identification and explanation of causal relationships. [48] It is thus not relevant when evaluating exploratory research like the study at hand.

EXTERNAL VALIDITY External validity on the other hand refers to *"whether a study's findings are generalisable beyond the immediate case study"*. [48] This research, due to its exploratory nature, makes no such claim of generalisability of the findings beyond the context of the studied industry and is thus not subject to the test of external validity.

CONSTRUCT VALIDITY Construct validity refers to how well the research operationalises the concepts being studied. Yin [48] notes this as challenging in case studies as defining measurements for the studied topic always is dependent on subjective judgment. This is elaborated below.

To meet the requirements of construct validity two steps are needed. Firstly, the topic needs to be clearly defined in terms of specific con-

cepts. In this research, this is done in the literature review by reviewing the different aspects of the industry as well as radical innovation, concretising the research domain. This has further guided the empirical part of the research. [48]

Secondly, Yin [48] writes that operational measures need to be identified. Even if this study is exploratory and qualitative in nature, data from interviews with informants is combined with academic insight in the form of a literature review. This results in the managerial implications not being only measured by the subjective views of the respondents.

RELIABILITY According to Yin [48], reliability consists of *"demonstrating that the operations of a study - such as the data collection procedures - can be repeated, with the same results"*. Yin further suggests that reliability can be ensured by employing the research tactics of case study protocols[1] and a case study database[2]. This is further discussed below.

For the measure of reliability as presented by Yin [48] above, it would in principle be possible to repeat the data collection phase by conducting the same interviews as done in this research using the same interview questions. It is, however, clear that the obtained data from informants would not be identical as the context within which the interview would be conducted is not replicable. The analysis phase, however, is repeatable using the existing audio transcripts and the coding method presented in chapter 2.

In addition to the evaluation method presented above, the following aspects are to be taken into account when assessing the research:

- Multiple empirical sources have been used, reducing the risk of a single respondent's divergent opinion influencing the findings unproportionally.

- A so-called Chain-of-Evidence[3] has been made visible to the reader of the research. [48]

- All informants have reviewed a draft of the empirical study.

This section is thus concluded by finding that the research can be evaluated as robust, satisfactorily and reliably answering the research questions.

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1 A case study protocol can be considered a guide for how the case study data collection phase should be conducted.
2 A case study database on the other hand contains the data used in the research in the form of interview documents or recordings, the latter of which applies to this research.
3 A chain-of-Evidence refers to the traceability of findings and conclusions down to the original source. This is done by frequent use of citations in the texts with reference to the source in question.

FURTHER RESEARCH

As mentioned in chapter 1.2, adjacent academic fields in management research like strategy, change management and business innovation have been linked to the research only vaguely. Also, as reviewed more thoroughly in chapter 6, the research area of organisation theory should be more thoroughly coupled with the findings of this research.

Synthesising insight from the aforementioned fields would shed light on how the conservative industry of distillates logistics could best embrace, among others, creating eco-system-oriented business models.

SUMMARY

The goal of this chapter was to conclude the research by assessing the overall results. The goal was reached by reviewing the contribution to knowledge and significance of findings as well as assessing the study overall.

This research constitutes an explorative research in the context of a conservative industry facing potentially radical turbulence by technology trends such as sensor networks and data analysis. The research has been based on a design to serve the purpose of both researchers and practitioners. The objective of the research has been twofold, as laid out below:

Firstly, the research has laid the ground work for development of operational efficiencies for practitioners. This has been done by providing a conceptualisation of business and technological aspects creating industry trends. This part is heavily based on academic literature and also serves as a pre-study for future research conducted within the relevant scope.

Secondly, combining empirical data with the aforementioned academic backdrop, the research provides an initial holistic base for future business development aspirations. As the bulk liquids delivery industry faces a new generation of technologies such as remote monitoring - and resulting business implications - practitioners don't have to embrace new opportunities immediately, but cannot be the last ones to do so.

AUTHOR	DEFINITION
Johnson et al.	"*A business model, from our point of view, consists of four interlocking elements that, taken together, create and deliver value. The most important to get right, by far, is the first.*"
Mitchell and coles	"*A business model is the combination of 'who', 'what', 'when', 'where', 'why', 'how', and 'how much' an organization uses to provide its goods and services and develop resources to continue its efforts.*"
Osterwalder and Pigneur	"*A business model describes the rationale of how an organization creates, delivers, and captures value*".
Pateli and Giaglis	"*In other words, business models are not conceived as a purely management- related concept, but embrace a broad spectrum of organizational activities, from the operational (processes) to the strategic level. Moreover, given the evolution of networked organizations and the growing adoption of eBusiness, the definition of business models has been extended to include inter-organizational activities, roles, and elements as well.*"
Rappa	"*A business model is a method of doing business. All business models specify what a company does to create value, how it is situated among upstream and downstream partners in the value chain, and the type of arrangement it has with its customers to generate revenue.*"

Table 2: Definitions for the term Business Model as summarised by Schallmo and Brecht. [33]

BIBLIOGRAPHY

[1] N Viswanadham, John J Jarvis, and Roshan S Gaonkar. "Ten Mega Trends in Logistics." In: *White Paper* (2003).

[2] Alan Bryman. *Social research methods*. Oxford university press, 2012.

[3] Copacino W. C. Lee H. L. Anderson D. L. *Sustaining the High-Performance Business: Research and Insights on the Role of Supply Chain Mastery*. 2003.

[4] Kathleen M Eisenhardt. "Building theories from case study research." In: *Academy of management review* 14.4 (1989), pp. 532–550.

[5] Mark NK Saunders, Mark Saunders, Philip Lewis, and Adrian Thornhill. *Research methods for business students, 5/e*. Pearson Education India, 2011.

[6] Matthew B Miles, A Michael Huberman, and Johnny Saldaña. *Qualitative data analysis: A methods sourcebook*. SAGE Publications, Incorporated, 2013.

[7] Yvonna S Lincoln and Egon G Guba. *Naturalistic inquiry*. Vol. 75. Sage, 1985.

[8] Benjamin Gordon. "Seven mega-trends that will reshape logistics." In: *Traffic World* (February 2005).

[9] Martin Christopher. *Logistics & Supply Chain Management*. 2011.

[10] Alan Rushton. *The handbook of logistics and distribution management*. Kogan Page Publishers, 2010.

[11] *Walmart: Keys to Successful Supply Chain Management*. 2014. URL: http://www.usanfranonline.com/resources/supply-chain-management/walmart-keys-to-successful-supply-chain-management/#.VM40WVWUcz0.

[12] Council of Supply Chain Management Professionals. *2013 State of Logistics Report*.

[13] *Cambridge Dictionaries Online*. 2014. URL: http://dictionary.cambridge.org/.

[14] Togar M Simatupang, Alan C Wright, and Ramaswami Sridharan. "The knowledge of coordination for supply chain integration." In: *Business process management journal* 8.3 (2002), pp. 289–308.

[15] Material Handling Institute. *Material Handling & Logistics U.S. Roadmap*. 2014.

[16]   Wally Klatch. *Supply Chain for Liquids*. Auerbach Publications, 2005.

[17]   *Öljynjalostuksen liiketoimintaympäristö*. 2014. URL: `http://www.archive-fi-2014.com/fi/n/2014-01-03_3454907_62/\%C3\%96ljynjalostuksen-perusteet-Neste-Oil-Fi/`.

[18]   Clayton M Christensen and Michael E Raynor. *The Innovator's Solution*. Harvard Business Press, 2003.

[19]   Clayton M Christensen. *The Innovator's Dilemma. HarperBusiness Essentials*. 2003.

[20]   Joe Peppard and Anna Rylander. "From value chain to value network: Insights for mobile operators." In: *European Management Journal* 24.2 (2006), pp. 128–141.

[21]   Vlad Krotov and Iris Junglas. "RFID as a Disruptive Innovation." In: *Journal of theoretical and applied electronic commerce research* 3.2 (2008), pp. 44–59.

[22]   Paul JH Schoemaker. "Scenario planning: a tool for strategic thinking." In: *Sloan management review* 36.2 (1995), pp. 25–50.

[23]   Michael Chui, Markus Löffler, and Roger Roberts. "The Internet of Things." In: *McKinsey Quarterly* 2 (2010). URL: `http://www.mckinsey.com/insights/high_tech_telecoms_internet/the_internet_of_things`.

[24]   Norman H Nie. "The rise of big data spurs a revolution in big analytics." In: *Revolution Analytics Executive Briefing* (2011), pp. 1–8.

[25]   Andrew McAfee, Erik Brynjolfsson, Thomas H Davenport, DJ Patil, and Dominic Barton. "Big Data: The Management Revolution." In: *Harvard Business Review* (October 2012).

[26]   Viktor Mayer-Schönberger and Kenneth Cukier. *Big data: A revolution that will transform how we live, work, and think*. Houghton Mifflin Harcourt, 2013.

[27]   Kate Crawford et al. "Six provocations for big data." In: (2011).

[28]   Gary Hamel. *Leading the revolution: How to thrive in turbulent times by making innovation a way of life*. Harvard Business School Press Boston, 2002.

[29]   Zhenya Lindgardt, Martin Reeves, George Stalk, and Michael S Deimler. *Business Model Innovation - When the Game Gets Tough, Change the Game*. 2009.

[30]   Joseph L Bower and Clayton M Christensen. *Disruptive technologies: catching the wave*. Harvard Business Review, January 1995.

[31]   Edward Giesen, Saul J Berman, Ragna Bell, and Amy Blitz. "Three ways to successfully innovate your business model." In: *Strategy & Leadership* 35.6 (2007), pp. 27–33.

[32] Eivind Breiby and Magnus Haug Wanberg. "Successful business model innovation." In: (2011).

[33] Daniel Schallmo and Leo Brecht. "Business model innovation in business-to-business markets–procedure and examples." In: *Proceedings of the 3rd ISPIM Innovation Symposium*. Vol. 12. 2010, p. 15.

[34] Scott M Shafer, H Jeff Smith, and Jane C Linder. "The power of business models." In: *Business horizons* 48.3 (2005), pp. 199–207.

[35] Christoph Zott, Raphael Amit, and Lorenzo Massa. "The business model: recent developments and future research." In: *Journal of management* 37.4 (2011), pp. 1019–1042.

[36] Alexander Osterwalder and Yves Pigneur. *Business model generation: a handbook for visionaries, game changers, and challengers*. John Wiley & Sons, 2010.

[37] W Chan Kim and Renee Mauborgne. *Blue ocean strategy*. Harvard Business School Press, Boston, 2005.

[38] Clayton M Christensen and Michael Overdorf. "Meeting the challenge of disruptive change." In: *Harvard Business Review* (March 2000).

[39] Paul Trott. "The role of market research in the development of discontinuous new products." In: *European Journal of Innovation Management* 4.3 (2001), pp. 117–126.

[40] Mark W Johnson, Clayton M Christensen, and Henning Kagermann. "Reinventing your business model." In: *Harvard Business Review* (December 2008).

[41] Steven D Eppinger and Karl T Ulrich. *Product design and development*. McGraw-Hill Education, 2011.

[42] WW Bernd. *Business model management: Design-instruments-success factors*. USA: Gabler Verlag, 2011.

[43] Henry Chesbrough. "Business model innovation: it's not just about technology anymore." In: *Strategy & leadership* 35.6 (2007), pp. 12–17.

[44] Jane Webster and Richard T Watson. "Analyzing the past to prepare for the future: Writing a literature review." In: *Management Information Systems Quarterly* 26.2 (2002), p. 3.

[45] Martin Reeves, Knut Haanaes, and Janmejaya Sinha. *Your Strategy Needs a Strategy: How to Choose and Execute the Right Approach*. Harvard Business Press, 2015.

[46] Innovation Horizon. *The Global CEO Study 2006.*

[47] David M McCutcheon and Jack R Meredith. "Conducting case study research in operations management." In: *Journal of Operations Management* 11.3 (1993), pp. 239–256.

[48]   Robert K Yin. *Case study research: Design and methods*. Sage publications, 2013.